TECHNICAL PRIMER ON MAJOR EPA PROGRAMS

DESIGNED FOR USE BY EPA'S QUALITY ASSURANCE COMMUNITY

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INTRODUCTION

The Environmental Protection Agency Quality Assurance Management Staff has a continuing commitment to ensure that Quality Assurance Managers (QAM) and their staff members have the information they need to effectively perform their tasks. This includes knowledge of the multitude of the agency's programs. This document was produced to give the QA team an overview of the agency's programs and issues.

The Manual is intended to serve as a reference guide to major EPA operational programs. It is an effort to address each program concisely and broadly and to discuss and record on a few pages the program's highlights. The Manual deliberately does not contain a comprehensive discussion of agency programs. Rather, its goal is to foster a general understanding of the purposes and operation of the programs. It is intended to familiarize staff with a wide range of programs and issues.

This Manual should be useful to many who want to broaden their knowledge about various EPA programs. While this effort was designed as a quick reference, it should be of assistance to other EPA professionals who become involved with an EPA program that may not be included in their past experience. The brief review in this Manual of a particular EPA program provides information about each program's background, as well as an understanding of program language and data systems. The document is not meant to be comprehensive and totally self-sufficient in terms of any of the programs. Rather, it is intended to serve as a general introduction to each program, with a list of references presented at the end of each chapter for further detailed reading.

Each program discussion contains a summary of the pollution, environmental or other concerns, as well as the management strategies and data systems employed. The summary is followed by sections that describe sources, the nature and extent of the problems; program controls; regulatory controls or other actions to control the concerns; data systems and quality assurance requirements to support the standards, criteria, rules,

advisories, or permits; and any special national studies of significance to the program office. Lastly, the discussion is followed by selected reading references for the person wanting to gain a more comprehensive understanding of the program and its needs.

Your reactions and suggestions for improvement of this Manual are encouraged and are welcome. Comments and concerns should be addressed to Mr. Kevin Hull, Quality Assurance Management Staff, RD-680, U.S. Environmental Protection Agency, 401 M Street, SW, Washington, DC 20460, (202)382-5763.

DRINKING WATER

SUMMARY

Public water systems supply drinking water from rivers, lakes, reservoirs, and wells. Pathogens, organic compounds, excess nitrates, and tastes and odors that may be associated with these supplies are overcome through disinfection and proper water treatment system operation. The U.S. Environmental Protection Agency promulgates drinking water regulations that ensure safe drinking water at the tap and provide for a public water systems supervision program that is principally conducted by the States.

EPA has a designated Quality Assurance Officer for Drinking Water programs in Headquarters and a Quality Assurance Coordinator in its Technical Support Division in Cincinnati, OH. The EPA laboratory certification program for drinking water analysis requires on site laboratory technical system audits that examine quality assurance procedures and quality controls in analytic performance, and performance evaluation sample analyses. States and EPA require that a certified laboratory analyze all water system samples for compliance monitoring. EPA Regions certify State laboratories which, in turn, certify plant and commercial laboratories.

Drinking water quality is monitored via Federally approved sampling, analytical and data handling requirements as provided by 40 CFR 141. All laboratories conducting analysis under the Safe Drinking Water Act must follow Federally approved methods of sampling and analysis. To ensure adequate laboratory control over the analysis and to obtain data of known quality, routine quality control (QC) procedures are carried out in the field, as well as in the laboratory. QC procedures may include standardization of titrants, analysis of spikes, duplicates and analysis of quality control samples. In addition to QC measures, the laboratory must prove competence via annual Performance Evaluation (PE) analyses of unknown samples, and the facility must be certified on an on-site triennial basis by a State Quality Assurance Officer (QAO) or EPA QAO for States where the programs are not delegated. Certification consists of on-site inspections of sampling, preservation, analysis, QC and data handling techniques to ensure adherence to Federal regulations governing analysis of water samples.

In addition to certification of laboratories, States may provide a water treatment operators' certification program. Annual treatment plant operator's short courses, usually four or five days in length, provide continuing education for the operator in state-of-the-art plant operation.

EPA provides oversight of State drinking water programs, training of State personnel, audits and inspections, and training for small public water systems personnel.

SOURCE OF SUPPLY

Drinking water for public water systems comes about equally from surface supplies or from wells. Both types of sources are subject to spills and other sources of contamination.

SURFACE SUPPLIES: These include rivers, lakes, and impounded reservoirs. They may receive runoff and stormwater from the land, discharges from industries or from cities, drainage from mines, or return flows from agricultural irrigation, or they may be supplied by well-controlled, protected watersheds. Turbidity, mineral content, and degree of contamination may vary daily in a river and temperature may vary throughout the year. Deep water intakes in lakes and reservoirs provide cool water with generally consistent quality.

WELLS: Water may contain hardness caused by calcium and magnesium leached as the water percolates through mineral deposits; it may contain iron and manganese in objectionable concentrations.

QUALITY CONCERNS

PHYSICAL: Concerns are turbidity, color, temperature, taste and odor. Clay, silt, and finely divided organic matter cause turbidity. Dissolved organic materials from decaying vegetation and certain inorganic matter cause color in water. Temperature is dependent upon the source of supply. Inorganic salts, and dissolved gases, cause taste and odor.

Impounded water may leach undesirable materials from flooded soils. Land clearing, or covering, of organic materials prior to flooding in reservoir

construction or rehabilitation will reduce potential taste and odor problems. Ground water from certain areas may contain hydrogen sulfide gas, which must be removed to preclude taste and odor.

CHEMICAL: Toxic or hazardous substances enter surface waters through pollution or accidental spills. Rich ore deposits contribute to concentrations of certain toxic inorganic properties. Most waters contain chloride in solution; excessive concentrations produce taste, and may cause corrosion in hot water pipes. Copper, in excess, causes taste and porcelain staining. Iron and manganese cause taste and a brownish color to laundered goods.

Organic compounds from effluents, land runoff, natural decomposition, and water and wastewater chlorination cause human health concerns. They are presently the subject of an intensive EPA effort to regulate allowable concentrations and to develop analytical techniques for measuring them.

Excess nitrate in drinking water has produced serious and occasional fatal poisoning in infants, particularly those less than three months old. Nitrate interferes with the capacity of their blood pigment to carry oxygen. Excess sulfates tend to form scales in boilers and cause taste and laxative effects.

BIOLOGICAL: Safe drinking water requires it to be free from pathogens that may come from human, animal or industrial wastes. Production of water that poses no threat to health depends upon continuous vigilance and use of appropriate disinfectant technology.

Iron bacteria in distribution systems may cause turbidity and discoloration, taste and odor, and hard deposits that fill pipes. Algae corrode metal tanks and concrete reservoir walls, clog sand filters, and cause taste and odor in surface supplies. Other problem organisms may be bloodworms, clams, snails, and nematodes in distribution systems.

TREATMENT

pH: This is a measure of the hydrogen ion activity, which indicates the degree of acidity. On a scale of 0 to 14, a pH of 7.0 is neutral. At low pH, water is acid and tends to be corrosive and dissolve materials. Lead, cadmium, iron or

copper may enter the supply from pipes. At high pH, water is alkaline and may deposit calcium and/or magnesium carbonate scale in pipes. Sodium hydroxide, lime, soda ash, carbon dioxide, and sulfuric acid are used to adjust pH to within a range of 6.5 to 8.5.

SEDIMENTATION: Settling removes settleable materials. Coagulants are used to speed settling and aid in the removal of both settleable and suspended materials. Following addition of a coagulant, water passes slowly through a sedimentation basin where materials settle and are removed.

FILTRATION: Sand, anthracite, and diatomite filters, or microstrainers remove particles too light or too finely divided to be removed by sedimentation. Water is passed through a layer of filtering material. As algae or debris collect on the filter surface, the process is slowed, and the filter must be taken out of service and backwashed to remove the collected debris. A microstrainer is a drum-shaped screen with uniform small openings through which water passes. A low-quantity jet spray on the opposite side of the screen removes the collected debris as the screen rotates.

DISINFECTION: This process destroys pathogenic organisms. Generally chlorine is used and is applied as a gas or a solution, either alone or in conjunction with other chemicals. Ozone may be used in place of chlorine. However, this practice is not common in the United States, since unlike chlorine, ozone does not provide a residual disinfectant throughout the distribution system.

AERATION: This process removes volatile substances and excess carbon dioxide. Aerators include cascades and sprays that expose water to the atmosphere.

COMBINATIONS: The several basic water treatment operations described above are used in sequence or in combination along with other treatment methods to produce a safe and aesthetically pleasing product. Iron and manganese may be controlled by aeration followed by filtration, lime and soda softening, ion exchange, or by adding polyphosphates or other organic sequestering agents. Corrosion protection may be achieved by good engineering design, proper selection of pipe materials, pH adjustment, reduction of oxygen, use of inhibitors such as phosphates and silicates, and lining of tank and pipe walls with coatings and paints.

REGULATORY CONTROLS

NATIONAL PRIMARY DRINKING WATER REGULATIONS: These regulations protect health by specifying maximum levels allowed in drinking water at the tap for certain bacteriological, radioactive, organic and inorganic chemical contaminants. Over 65 contaminants are addressed (Table 1); monitoring, reporting, record keeping, and public notification for certain regulatory noncompliance are required. Use of lead pipes, solder and flux are prohibited.

NATIONAL SECONDARY DRINKING WATER REGULATIONS: Not Federally enforceable, these aesthetic quality goals are guidelines for States. Thirteen contaminants are addressed (Table 1).

STATE PROGRAMS: All but a very few States have been delegated primary enforcement responsibility to operate the public water systems supervision program. To do so, a State must have a drinking water program in agreement with 40 CFR 142. Regulations require record keeping, reporting, a State laboratory certification program unless all compliance samples are analyzed in the State laboratory which is certified by EPA, and certain administrative and approval matters.

QUALITY ASSURANCE

LABORATORY CERTIFICATION PROGRAM: The Office of Drinking Water provides program policy and guidance for the drinking water laboratory certification program. A manual has been developed for this purpose (see Suggested Reading). EPA's Environmental Monitoring Systems Laboratory, Las Vegas, NV, oversees radiological testing; the Environmental Monitoring Systems Laboratory, Cincinnati, OH, oversees other testing and certifies EPA Regional Laboratories. EPA Regional laboratories, in turn, certify State laboratories. State laboratories certify public water systems and commercial laboratories. Certification involves inspection of facilities, equipment, procedures, personnel training, quality assurance plans, quality control procedures, and satisfactory completion of periodic performance evaluation samples. Compliance monitoring data from water systems plants must be produced by certified laboratories.

Table 1. Regulated Drinking Water Contaminants as of June 15, 1990

Primary Drinking Water Regulations (40 CFR Part 141)

Microbiology & Turbidity
- Total coliform organisms
- Turbidity

Inorganic Elements
- Arsenic
- Barium
- Cadmium
- Chromium
- Lead
- Mercury
- Nitrate
- Selenium
- Silver
- Fluoride

Organic Chemicals
- Endrin
- Lindane
- Methoxychlor
- Toxaphene
- 2,4,-D
- 2,4,5-TP
- Total trihalomethanes

Volatile Organic Chemicals
- Trichloroethylene
- Carbon tetrachloride
- Vinyl chloride
- 1,2-Dichloroethane
- Benzene
- para-Dichlorobenzene
- 1,1-Dichloroethylene
- 1,1,1-Trichloroethane

Radionuclides
- Radium 226 and 228
- Gross alpha particle activity
- Beta particle and photon radioactivity

Required Monitoring for Unregulated Volatile Organic Chemicals

- Chloroform
- Bromodichloromethane
- Chlorodibromomethane
- Bromoform
- trans 1,2-Dichloroethylene
- Chlorobenzene
- m-Dichlorobenzene
- Dichloromethane
- cis-1,2-Dichloroethylene
- o-Dichlorobenzene
- Dibromomethane
- 1,1-Dichloropropene
- Tetrachloroethylene
- Toluene
- p-Xylene
- o-Xylene
- m-Xylene
- 1,1-Dichloroethane
- 1,2-Dichloropropane
- 1,1,2,2-Tetrachloroethane
- Ethylbenzene
- 1,3-Dichloropropane
- Styrene
- Chloromethane
- Bromomethane
- 1,2,3-Trichloropropane
- 1,1,1,2-Tetrachloroethane
- Chloroethane
- 1,1,2-Trichloroethane
- 2,2-Dichloropropane
- o-chlorotoluene
- p-chlorotoluene
- Bromobenzene
- 1,3-Dichloropropene
- Ethylene dibromide
- 1,2-Dibromo-3-chloropropane

Secondary Drinking Water Regulations (40 CFR Part 143)

- Chloride
- Color
- Copper
- Corrositivity
- Fluoride
- Foaming agents
- Iron
- Manganese
- Odor
- pH
- Sulfate
- Total dissolved solids
- Zinc

PERFORMANCE AUDITS: Sealed, numbered vials of drinking water samples whose constituent concentrations are unknown to the receiving laboratory generally are sent to each laboratory at least every 12 months. They are currently supplied by the Cincinnati, OH, EPA laboratory. Analytical results must be reported by the receiving laboratory within a specified time frame. Laboratory certification may be denied or withdrawn following an unsatisfactory performance on the performance audit sample(s).

STATE PROGRAM OVERSIGHT: EPA Regions conduct audits and inspections of primacy State enforcement and compliance programs. States inspect water treatment plants routinely, which includes operator performance, plant operation, and the facility. In addition, Headquarters and EPA Regions provide technical assistance and training, particularly to small public water systems. Emphasis is on noncompliance or potential noncompliance problems but may involve sampling, reporting, or management concerns.

DATA SYSTEMS: FRDS, the Federal Reporting Data System is a computerized repository for compliance monitoring data from water supply systems. Samples are analyzed by a certified laboratory. Individual system's analytical results are forwarded to the State, which reviews the data either manually, or by a computer program designed to highlight noncompliance with drinking water regulations and potential errors in data or information entry. States forward the violation of the regulations to EPA Regions. Regions conduct data verification audits at intervals based upon an examination of the data at hand, and enter data into the computerized system, FRDS. The computer is programmed to check entry errors, but a computer check of the analytical data is not made. A data base for unregulated contaminants also is maintained.

NATIONAL PESTICIDE STUDY: EPA often conducts special studies to support the development of regulations. One example of a major study of this type that falls within the drinking water area and has strong QA elements is the effort, now being completed, to understand and characterize the problem of agricultural chemicals in ground water. The study tested 750 rural domestic wells representing a universe of 13 million wells, and 599 community water systems representing a universe of 51,000 community water systems. The quality assurance (QA) organization was extensive, with a full time QA officer, under

contract to EPA, and assistance from QA officers from the Offices of Drinking Water and Pesticide Programs, who supported the Survey jointly. Well sampling adhered to a QA Project Plan and a Sampling Manual. Because of the complexity of the QA program, various aspects of the Survey adhered to eight QA Project Plans under the umbrella of a master QA Project Plan.

SUGGESTED READING

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SURFACE FRESH WATERS

SUMMARY

Surface waters are used as sources of drinking water, as recipients of treated and sometimes inadequately treated wastes, for fishing, recreation, navigation and in agricultural and industrial activities. Principal regulations to control surface water pollution include effluent guidelines, water quality standards, discharge permits, and wastewater sludge management requirements. Pollution control activities for surface fresh waters are managed by the EPA Offices of Water Regulations and Standards, Water Enforcement and Permits, and Municipal Pollution Control. National data-gathering studies collect information to support regulation development. These data-gathering activities are subject to quality assurance program plans. They require project plans where environmental data are collected by EPA, through grants to States, or by contracts with consultants and others. A number of different data systems then are used to store and provide data to program managers.

WATER RESOURCES

Rivers, streams, lakes, reservoirs, and ponds are the focal points of this surface water discussion; wetlands will be discussed in a separate chapter. Rivers drain the land and carry with them wastes from cities and industries, as well as pollutants in runoff from agriculture and urban areas. U.S. rivers, on the average, carry 12 cubic miles of water in their channels; many exceed 1,000 miles in length. U.S. lakes and reservoirs, numbering in excess of 1.5 million, contain 4,500 cubic miles of water. Geologically, lakes may be considered as temporary water-holding vessels on the landscape.

The water quality determines the uses that may be made of any specific water body. Waters are used by humans in many (and sometimes competing) ways including boating, swimming, fishing, aesthetics, navigation, for drinking water, and for agricultural and industrial purposes. Many cities were built on rivers because of their navigation potential.

POLLUTION CONCERNS AND SOURCES

PHYSICAL: Aesthetically pleasing waters add to the quality of human experience. Oil contamination is toxic to aquatic life. Settleable solids and erosion from natural sources, construction activity or farmland screen out necessary light, change heat radiation and blanket the stream bottom, thereby smothering bottom dwelling food organisms, as well as removing organic materials and nutrients. They also may introduce toxic substances into the water body. Temperature is one of the most important and influential water quality characteristics that affects biological life in water.

CHEMICAL: Toxic or hazardous substances may enter surface waters through direct discharge, runoff, or accidental spills. They may bioaccumulate, impair reproductive activity, or cause tumors or cancer. Some chemicals, when bioaccumulated in aquatic organisms and ingested by humans, can cause diseases such as cancer. Fish eating birds and mammals have been killed by ingesting the chemicals secondhand. Excess nitrogen and phosphorus nutrients stimulate aquatic plant growth, which result in vegetation decay, water oxygen reduction, fish kills, foul odors, and unsightly decomposing algal masses. When water becomes too acid or too alkaline, aquatic life is affected adversely. Thus, for example, dense algal growths can make the water alkaline, while acid mine wastes destroy aquatic life by lowering the pH below tolerable limits.

BIOLOGICAL: Pathogenic organisms that cause infection or disease may be present in surface water. Natural beaches are monitored closely and may be closed when body contact water quality criteria are exceeded. The basic indicator is the concentration of fecal coliform bacteria, which can cause diarrhea. Swimmers itch, an irritating rash caused by a parasite liberated by certain snails, is prevalent in some areas. Some species of blue-green algae, when stimulated to grow in massive quantity because of abundant nutrients, produce a toxin that has been fatal to mammals, birds, and fish when ingested. It has caused gastroenteritis in humans. Human respiratory and skin disorders also have been associated with algae.

SOURCES: Spills, leaks, and illegal dumps contribute to surface water pollution. Point source discharges from industrial plants and municipal wastewater treatment systems historically have been principal contributors, but, in recent years, much has been accomplished to abate these sources. Nonpoint source runoff (such as from farmland or construction), stormwater, and combined sewer overflows are major sources yet to be effectively addressed in many areas of the country.

PROGRAM CONTROLS

WASTEWATER TREATMENT: Publicly owned treatment works are designed to separate solids from liquids (primary treatment) and to provide optimum conditions in a confined area for bacteria and other organisms to decompose and convert liquid wastes to more simple and stable products (secondary treatment). Wastewater entering a treatment plant is passed slowly through a sedimentation tank, where heavier materials settle to the bottom and are removed. Grease and scum are skimmed from the liquid surface. Following this primary treatment process, the liquid may be sprayed over a trickling filter column of rocks where organisms feed upon and digest the organic material. In other facilities, it is introduced into an activated sludge unit which is aerated to provide organisms with optimum conditions to feed upon the organic material. As a result of this secondary treatment, the oxygen demanding quality of the wastewater is greatly reduced. This is a critical factor in the maintenance of the oxygen level of the water body into which this treated wastewater is discharged. In some facilities, chemicals may be added to remove phosphates and nitrates where eutrophication is a problem in receiving waters (tertiary treatment).

INDUSTRIAL WASTE TREATMENT: Many types of industrial wastes require treatment other than the biological process described for domestic wastewater. Such treatment may include processes such as neutralization of excessive acidity or alkalinity; chemical precipitation; air flotation, thus removing fats, oils, and greasy solids; ion exchange; decolorization; resource recovery; and waste minimization procedures.

BEST MANAGEMENT PRACTICES (BMPs): These are good "common sense" practices employed to reduce the quantity of a waste and minimize its effects upon the receiving environment. For construction sites, for example, a BMP may involve staking bales of hay to serve as a filter and silt basin for silt-laden runoff water. In lake management, it may involve stormwater and treated wastewater diversion around the lake or a vegetated buffer zone to filter land runoff before it enters a lake. For an industry, BMPs involve such things as spill control, reporting, and containment; secondary containment; materials compatibility; employee training; inspections and audits; mitigation clean up methods; and spill drills.

TOXIC POLLUTANT IMPAIRED WATERS: States are required to develop lists of toxic pollutant impaired waters, and identify the point sources and amounts of pollutants discharged that cause violations of water quality. Individual control strategies for the point sources identified then must be provided. EPA has approval authority over these State lists and itself prepares lists and individual control strategies for those States whose lists have been disapproved.

FINANCIAL ASSISTANCE: Grants and a new revolving loan fund are made available by EPA by way of the States to the local communities to assist them in construction of publicly owned treatment works, clean lakes restoration, conducting water quality investigations, management, pollution abatement, and corrective or restorative activities.

REGULATORY CONTROLS

EFFLUENT GUIDELINES: The regulations that are specific for each industry consist of national levels of wastewater contaminant control based upon the highest level of treatment technology economically achievable and technically feasible. Addressing an industrial category with applicable subcategories, effluent guidelines involve engineering and economic studies, wastewater characteristics, treatment options, and economic effects of regulations upon the affected parties. Guidelines for 57 industrial categories have been promulgated. They are easily adapted to a discharge permit to regulate a specific industrial discharge.

WATER QUALITY STANDARDS: Adopted by States, and approved by EPA, water quality standards identify water body uses, provide water quality criteria to support the designated uses and include an antidegradation policy for waters presently of higher quality than that designated for their uses. Designed for ambient water conditions, such standards define human health and aquatic life water quality goals and provide the basis for enforceable requirements through discharge permits. Those discharge permits, using the effluent guidelines described above, are designed to see that the receiving water body attains and remains at the desired water quality levels.

DISCHARGE PERMITS: Specific for each identified point source discharge, they provide effluent limits, discharge conditions, monitoring requirements, and reporting schedules. Biological toxicity testing of effluents now is commonly required. A BMP plan, as well as an industrial waste pre-treatment program, may be required. Permit limits are based upon applicable effluent guidelines where available, best professional judgement where promulgated guidelines are inapplicable, and water quality standards.

WASTEWATER SLUDGE MANAGEMENT: For wastewater sludge pollutants with potential public health or environmental effects, regulations have been developed that specify acceptable sludge management practices and pollutant specific numeric criteria for each of five major sludge disposal options.

QUALITY ASSURANCE

Surface fresh water pollution controls are addressed by the EPA offices of Water Regulations and Standards, Water Enforcement and Permits, and Municipal Pollution Control.

ENVIRONMENTAL DATA COLLECTION: The Office of Water Regulations and Standards has prepared a number of quality assurance documents, references to which are included in the Suggested Reading section. They operate under a quality assurance program plan that addresses quality assurance policies, procedures, and management systems (OWRS QA-4), as do other EPA offices involved with surface waters. The program plan

requires a quality assurance work/project plan when environmental data are collected either by EPA or through contractor support. A detailed quality assurance project plan is not required for the initial screening or a pilot survey to establish the boundaries of a study; however, a standard operating procedure short form project plan is used instead. OWRS operates the Sample Control Center which manages the sample analyses for effluent guidelines development under a quality assurance project plan.

DISCHARGE MONITORING: The Office of Water Enforcement and Permits (OWEP) is responsible for Discharge Monitoring Reports submitted by a permittee. A permittee is currently supplied performance evaluation samples, furnished by the EPA Cincinnati, OH, laboratory, for the constituents for which the permittee must monitor in wastewater to meet permit conditions. If analytical data from the performance evaluation samples are of inferior quality, an inspection is made by the applicable EPA Region or State to determine the cause. Routine performance audit inspections also are made of permittees and may include permit compliance evaluation or biological toxicity testing. Enforcement action has been taken against a permittee for violating quality assurance procedures. OWEP also is in the planning and development stage of providing quality assurance guidance for biological toxicity testing.

MUNICIPAL POLLUTION CONTROL NEEDS: The Office of Municipal Pollution Control is responsible for the long-standing biennial survey to determine municipal pollution control needs. Data are provided by the States. A contractor reviews and enters the data into the Municipal Pollution Control Needs Survey. There is a computer audit for data logic and data entry errors.

DATA SYSTEMS: OWRS operates a number of location-type data systems. These include the surface drinking water supply facilities file, industrial facilities discharge file, stream flow gage station file, and fish kill file. The widely known STORET, a water quality data system, has a history dating back 25 years. A Water Quality Data Systems Steering Committee is working to integrate all of the data systems in the Office of Water.

OWEP manages the Permit Compliance System where permits information and the discharge monitoring report data are stored. Quality assurance procedures are being developed and implemented to quality assure these data. A statistical sampling check of the data is in a pilot test mode. A guidance document on quality assurance is being developed.

OMPC operates the Grants Information Control System, which provides information on municipal pollution control grants and facilities to program managers. Data are supplied by the States and there is a computer audit programmed for the system.

SPECIAL STUDIES

Examples of data-gathering special studies conducted by OWRS include the National Dioxin Study, which examined water, sediment and fish; the Fish Bioaccumulation Study, which examined fish flesh for many potential bioaccumulants at 400 locations, and selected sediments; the National Sewage Sludge Survey, which determined the hazardous condition of wastewater sludge resulting from the hazardous waste exclusion when such wastes are mixed with domestic wastewater in a sewer system to a publicly-owned treatment works, and identified new industries to regulate with effluent guidelines; and the National Sediment Project, which will examine sediment constituents at 400 locations. These large data-gathering studies have separate quality assurance project plans.

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GROUND WATER

SUMMARY

As a result of the increase of freshwater withdrawals, ground water depletion and contamination have become significant issues in almost every State. Irrigation of crops creates the greatest demand on ground water quantity. More than 200 different organic and inorganic chemicals, pesticides, radionuclides and organisms have been found in ground water as contaminants. Pollution sources are many and include virtually any source that affects land or water. Although ground water quantity is vast, its quality must be diligently protected because pollutants are very difficult and costly to remove from the subsurface.

To protect the ground water resource, EPA established an Office of Ground Water Protection in 1984. This emerging program does not generate environmental data, develop regulations, maintain a data system, or conduct special studies. Rather, it provides assistance, guidance, direction, and program approval. The focus is on policy development, inter- and intra-agency operational coordination for resource protection, ground water monitoring strategies, and a wellhead protection program. EPA Regions implement the wellhead protection and other programs with States through their ground water program offices. Other EPA offices support the Office of Ground Water Protection in data collection, regulations and data systems.

GROUND WATER RESOURCE

Each day approximately 4.2 trillion gallons of precipitation fall on the continental United States. About two-thirds of that precipitation evaporates, about 61 billion gallons (1.5 percent) soak into aquifers, and the remainder is carried away by streams and rivers.

Estimates of the ground water resources of the U.S. found within one-half mile of the land surface range from 15 to 100 quadrillion gallons. These resources are 50 times greater than all of the Nation's surface waters at any given time. They are 35 times the total annual surface runoff and

400 times the country's total water withdrawals.

Ground water depletion and contamination are localized problems. Ground water availability is a significant issue in almost every State. Declining ground water levels have occurred in a number of areas, including portions of California, the Dakotas, Illinois, Indiana, Iowa, and Wisconsin.

Fresh water withdrawals from ground water more than doubled between 1950 and 1980. Crop irrigation alone uses 60 billion gallons per day of ground water. Other major users include public water supplies, rural water supplies, and industrial withdrawals from other than public supplies.

POLLUTION CONCERNS AND SOURCES

CHEMICAL: About 245 different chemical substances have been found in the Nation's ground water according to U.S. Congress' Office of Technology Assessment (OTA). These include 175 organic chemicals (including pesticides), 50 inorganic chemicals, and 20 different radionuclides. Adverse health effects associated with these contaminants include cancer; reproductive, teratogenic, and pyschological disorders; and adverse effects on nearly all body systems. Contaminants, once they have entered ground water, are difficult and expensive to treat or remove.

Ground water velocities are low in comparison to surface water velocities; thus, a contaminant introduced into a ground water system does not mix rapidly with the existing water in the aquifer. Generally the flow paths, concentration, and chemical changes that a contaminant may undergo as a result of such processes as degradation or reactions with the soil are either unknown or difficult to ascertain. Identifying the source and extent of contamination is made problematic by the complex physics and chemistry of the flow system.

BIOLOGICAL: The OTA study also found bacteria, viruses and parasites in ground water during their survey. Adverse health effects associated with these biological contaminants are similar to those listed above for chemicals.

SOURCES: Sources of ground water pollution are numerous and varied. (See Table 1 on next page.) High on the list of concerns of ground water pollution control authorities are failing systems of the existing 23 million domestic septic systems; leaking underground storage tanks; agricultural activities including pesticide and fertilizer applications, irrigation return flows, and animal feedlot runoff; landfills; surface waste water impoundments; and abandoned waste sites.

PROGRAM CONTROLS

EPA's Office of Ground Water Protection was created in 1984 to provide a focal point for evolving agency ground water programs. Efforts thus far have concentrated on policy development, inter- and intra-agency operational coordination for resource protection, ground water monitoring strategies, and wellhead protection. EPA Regions implement programs with States through their ground water program offices.

MONITORING: In 1982, the US Geological Survey began a national program to study toxic wastes and their behavior and fate in aquifer systems. At least eight separate Federal statues require ground water monitoring under specific conditions. In 1985, EPA formulated a national ground water monitoring strategy designed to coordinate many of these disparate monitoring efforts. The strategy contains an action plan designed to characterize the Nation's ground water resource, identify new contaminate problems, assess known problems, assure compliance with regulations, evaluate program effectiveness, improve data quality, and develop a ground water data system for storing all ground water quality and related well information. A minimum set of 22 data elements necessary to use information from wells and springs across ground water related programs has been developed. Thirty-eight States monitor ground water quality or are developing monitoring programs.

WELLHEAD PROTECTION: There are 187,000 public drinking water well systems including 47,000 community and 140,000 non-community facilities such as camp grounds and truck stops. The wellhead protection program is designed to protect the surface and subsurface areas through which contaminants are likely to pass and eventually reach a well or wellfield

TABLE 1

SOURCES OF GROUND WATER CONTAMINATION

CATEGORY I - Sources designed to discharge substances
Subsurface percolation (e.g., septic tanks and cesspools)
Injection wells
- Hazardous waste
- Non-hazardous waste (e.g., brine disposal and drainage)
- Non-waste (e.g., enhanced recovery, artificial recharge solution mining, and in-situ mining)

Land application
- Waste water (e.g., spray irrigation)
- Wastewater byproducts (e.g., sludge)
- Hazardous waste
- Non-hazardous waste

CATEGORY II - Sources designed to store, treat, and/or dispose of substances; discharge through unplanned release
Landfills
- Industrial hazardous waste
- Industrial non-hazardous waste
- Municipal sanitary

Open dumps, including illegal dumping (waste)
Residential (or local) disposal (waste)
Surface impoundments
- Hazardous waste
- Non-hazardous waste

Waste tailings
Waste piles
- Hazardous waste
- Non-hazardous waste

Materials stockpiles (non-waste)
Graveyards
Animal burial
Aboveground storage tanks
- Hazardous waste
- Non-hazardous waste
- Non-waste

Underground storage tanks
- Hazardous waste
- Non-hazardous waste
- Non-waste

Containers
- Hazardous waste
- Non-hazardous waste
- Non-waste

Open burning and detonation sites
Radioactive disposal sites

CATEGORY III-Sources designed to retain substances during transport or transmission
Pipelines
- Hazardous waste
- Non-hazardous waste
- Non-waste

Materials transport and transfer operations
- Hazardous waste
- Non-hazardous waste
- Non-waste

CATEGORY IV - Sources discharging substances as a consequence of other planned activities
Irrigation practices (e.g., return flow)
Pesticide applications
Fertilizer applications
Animal feeding operations
De-icing salts applications
Urban runoff
Percolation of atmospheric pollutants
Mining and mine drainage
- Surface mine-related
- Underground mine-related

CATEGORY V - Sources providing conduit or inducing discharge through altered flow patterns
Production wells
- Oil (and gas) wells
- Geothermal and heat recovery wells
- Water supply wells

Other wells (non-waste)
- Monitoring wells
- Exploration wells

Construction excavation

CATEGORY VI - Naturally occurring sources whose discharge is created and/or exacerbated by human activity
Groundwater - surface water interactions
Natural leaching
Salt-water intrusion/brackish water upconing (or intrusion of other poor-quality natural water)

Source: Office of Technology Assessment, Protecting The Nation's Groundwater From Contamination, October 1984.

that supplies a public water system. Because the ground water around a pumping well is depressed as water is drawn into a well, wellhead areas are most vulnerable to pesticides, fertilizers, road salts, and other contaminants that may enter near-surface ground water. Government management activities include land use regulation, land acquisition, and prohibition of specified activities in the vicinity of the wellhead. Funding for Federal support of State programs has been authorized.

REGULATORY CONTROLS

EPA does not develop regulations for groundwater. This is done by some States.

QUALITY ASSURANCE

The EPA Office of Ground Water Protection does not generate environmental data. Basically, it provides assistance, guidance, direction, and program approval. No data system presently is maintained, although one is being developed, as described in the above section on monitoring. Quality assurance is provided in the minimum set of data elements mentioned above in the section on monitoring. These elements have seven geographic descriptors, seven well/spring descriptors, and eight sample/analysis descriptors. However, EPA grants are provided to the Universities of Texas and Wisconsin to maintain data systems for ground water quality and wellhead studies. There are no special studies except for those conducted by the Office of Drinking Water, which were described in the chapter on drinking water. These involve the problem of agricultural chemicals in ground water.

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ESTUARIES AND OCEANS

SUMMARY

Most of the principal population centers of the United States are located within 100 miles of estuaries and near-shore oceanic coastal waters. Consequently, rich aquatic resources found in these waters are subjected to multiple, conflicting, and often degrading uses; in addition, they are the ultimate recipients of pollutants transported from the land by rivers. Contamination concerns are similar in category to those associated with freshwater, except for the addition of large quantities of floatable materials. These floatable materials, which include plastics, bottles, medical wastes, other trash, pollutants from combined sewer overflows, as well as from illegal dumping from shore and ships at sea, have become the subject of significant public outrage.

The ocean dumping permit program, the national estuary program, and point source discharges to the marine environment are managed by the EPA Regions. The programs originate with the Office of Marine and Estuarine Protection (OMEP). These programs are coordinated with several other Federal agencies who have statutory interest in oceans and estuaries.

Ocean dump site monitoring, the ocean data evaluation system, and the comprehensive national estuary program operate with quality assurance programs. Analytical methods for the estuarine and marine ecosystem components are being developed into standard techniques by the Office of Marine and Estuarine Protection.

WATER RESOURCE

Estuaries, coastal waters, and adjoining oceans comprise three-fifths of the U.S. International Boundary. About 100 million people, more than one out of every three U.S. citizens, live within 100 miles of an ocean or Great Lakes coast. Estuaries and embayments are among the most biologically productive waters because of an abundance of nutrients, shallow well-mixed waters, and teeming plant and animal communities. There are over 150 large estuaries, myriad inlets, and small embayments

in the United States. These highly productive estuaries are the transitional zones formed when rivers and ocean meet.

The oceans, estuaries, and the Great Lakes provide for multiple, conflicting human uses related to resource extraction, commercial shipping, recreational boating, body contact recreation, sunbathing, aesthetic enjoyment, drinking water supply, and waste disposal. The estuaries and oceans are the ultimate recipients of pollutants transported from the land by rivers.

POLLUTION CONCERNS AND SOURCES

PHYSICAL: Solid wastes including plastics, bottles, medical wastes, and other non-biodegradable materials that float have become the focus of public concern for many beaches and certain parts of the open ocean. Flotable wastes strangle and mutilate wildlife, as well as destroy habitats. They originate principally from illegal dumping of trash from shore or ships at sea. Other sources include combined sanitary-stormwater sewer overflows, wastewater treatment plant bypasses, and ocean dumping.

Spills, leaks, and accidents including those from tankers and offshore or coastal oil production rigs introduce crude oil and oil products into water. Results include ecosystem destruction and death to fish, birds, and marine mammals. Death is caused by toxicity from the oil, coating the animals, drowning through loss of buoyancy, exposure caused by loss of body heat insulation, or starvation.

CHEMICAL: These come from a variety of sources including industrial wastes, municipal wastewater, agricultural and urban runoff. They are primarily organic chemicals including chlorinated hydrocarbons and heavy metals. Toxic substances adversely affect fish, shellfish, wildlife, and human health. Major organism responses include death, tumors or cancer, bioaccumulation with threats to the food web, and reduced reproductive ability.

BIOLOGICAL: Bacterial or viral organisms that cause diseases in humans, including diarrhea, hepatitis, and typhoid, come from ingestion of water at a beach or the consumption of contaminated shellfish. The prevalence of these organisms in recent years has resulted in closures of shellfish beds and recreational beaches. Excessive marine algal and other plant growths resulting from high nitrogen and phosphorus concentrations are problems in many estuarine and coastal areas. Decomposing plants reduce necessary oxygen for aquatic life, algal mats smother the plankton beneath them, and foul odors of decomposition fill the shoreline air.

SOURCES: Many types of sources contribute to the above quality concerns. Estuaries and oceans are the ultimate receivers of wastes from the continent and ships at sea. Direct discharges, ocean dumping, stormwater and runoff, spills, leaks, accidents, and illegal solid waste disposal are contributing sources.

PROGRAM CONTROLS

POINT SOURCE CONTROLS: The Clean Water Act has two sections applicable to direct dischargers to the marine environment: it requires a Publicly Owned Treatment Works to provide secondary treatment, but allows for a waiver to less than secondary treatment if the plant meets certain criteria; it also allows regulators to consider sediment, as well as water column effects in issuing a discharge permit, and is intended to protect unique, sensitive, and ecologically critical species, in addition to aquatic life in general. This section may require zero discharge following assessment of alternative disposal or recycling options and the impact of alternative uses on the oceans. Both sections require site-specific evaluation of environmental information.

NATIONAL ESTUARY PROGRAM: Currently composed of 12 estuaries located from Massachusetts to Washington State, this program has four phases leading to cleanup. These phases include a management conference for decision making, information to characterize and define the problems, creation of a comprehensive conservation and management plan to identify action plans for pollution control and resource management, and implementation of the plan. Each of the original six estuaries in this program will have completed management plans in the early 1990s.

REGULATORY CONTROLS

OCEAN DUMPING PERMITS: Regulations and criteria controlling ocean dumping as described in 40 CFR 220 through 229 are governed by the requirements of The Marine Protection, Research and Sanctuaries Act and The International Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, which was ratified by the United States in April, 1974. EPA issues permits for non-dredged materials; the U.S. Army Corps of Engineers issues permits for dredged materials in conformity with criteria established by EPA. EPA specifies sites where dumping may be permitted and develops an environmental impact statement on each specified site. EPA may specify areas of the ocean where no dumping shall occur. The law has prohibited the ocean disposal of certain agents of war. The Ocean Dumping Ban Act of 1988 terminates the dumping of wastewater sludge and industrial wastes by December 31, 1991.

MULTIAGENCY COORDINATION

Several Federal agencies are involved in studies and other activities related to estuaries and oceans. The National Oceanic and Atmospheric Administration (NOAA) is dedicated to improving the comprehension and uses of the physical environment and oceanic life. The Coastal Program Division in NOAA provides financial and technical assistance to approved State Coastal Zone Management Programs, the Estuarine Program Office which coordinates NOAA's various estuarine activities, the Ocean Assessment Division, and the Ocean Pollution Planning Office. The U.S. Army Corps of Engineers manages ocean dumping through permits of dredged material. The U.S. Fish and Wildlife service has review authority over ocean dumping permits and discharges to marine waters. Coordination of EPA estuarine and ocean programs with these Federal agencies is an ongoing activity.

QUALITY ASSURANCE

MONITORING: Ocean dump sites are monitored by EPA to determine environmental impacts and to ensure that adverse effects as a result of dumping are confined to the dumpsite. When a survey plan is prepared for

monitoring a dumpsite, a quality assurance project plan is developed.

DATA SYSTEM: EPA's Ocean Data Evaluation System contains water quality data, tissue data, and sediment data for the marine environment. There is strict control of data entry. Data related to the conditions for a waiver to less than secondary treatment are checked by a biologist for reasonableness and methods used to obtain the data. Other data are checked electronically for conformance to a designated range of values.

SPECIAL STUDIES

NATIONAL ESTUARY PROGRAM: Twelve estuaries are undergoing intensive study. Each has a number of specific study efforts, perhaps 12 to 15 for each estuary. One such effort may concentrate on sediments and constituent concentrations, while another may examine the biota including fish, benthos, and plankton. Each of the individual study efforts must have an approvable quality assurance project plan. OMEP has prepared a Guide for Preparation of Quality Assurance Project Plans for the National Estuarine Program (EPA-556/2-88-001). Two of the intensive estuarine studies operate under a quality assurance program plan approved jointly by the EPA Regional Quality Assurance Officer and the Office of Marine and Estuarine Protection Quality Assurance Officer.

CHESAPEAKE BAY OVERSIGHT: Chesapeake Bay is the largest estuary in the contiguous United States, one of the most productive estuaries in the world, and potentially the most complex ecosystem anywhere. It receives wastes from 3,000 point source discharges in Maryland and Virginia. Its nutrients, sediment, water, plankton, benthos, fish, shellfish, and vegetation are being monitored at 50 mainstem and 85 tributary locations. Data are screened by a computer programmed to identify outliers. The monitoring program operates under a quality assurance program plan.

ANALYTICAL METHODS: Analytical methods for estuarine and marine environmental studies currently are not as advanced as for the freshwater environment. The Office of Marine and Estuarine Protection is developing a compendium of satisfactory analytical methods.

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WETLANDS

SUMMARY

Wetlands, including marshes, swamps, and bogs, provide food and habitat for water, air, and land animals; spawning and nursery areas for aquatic life; sanctuary for rare and endangered species; flood protection; erosion control; wood and other products; hunting and fishing; and aesthetic enjoyment. Once regarded by humans as wastelands and a tax burden, they were destroyed at random until the Nation's wetlands resource was diminshed by more than half. Now recognized as among the most productive ecosystems and as essential to the survival of many fish and other species, they are being protected.

Wetlands protection began after the enactment of the 1972 Clean Water Act, which required a permit for the discharge of dredged or fill materials into the waters of the United States. The gradual growth of that program resulted in an Office of Wetlands Protection in EPA. The focus of EPA's program has been on the development of guidance to identify wetlands and their boundaries in a consistent manner, enhance monitoring capabilities and requirements, and require mitigation and the creation of new wetlands elsewhere when wetland areas must be destroyed. While the US Army Corps of Engineers issues permits for the discharge of dredged and fill material, EPA has review authority and the ability to veto action over permits when environmental quality may be threatened. No environmental data presently is generated by EPA concerning wetlands.

WETLANDS RESOURCES

Wetlands is a collective term for marshes, swamps, bogs, and similar areas that are either inundated or saturated by water during the growing season so that they support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands are among the most productive natural ecosystems in the world. They are critical to the survival of a wide variety of animals and plants. They provide food and habitat, including that necessary for spawning and growth for fish and wildlife, improvement in water quality, flood protection, erosion control,

natural products for human use, and opportunities for a variety of recreation and aesthetic enjoyment. A number of rare and endangered species depend upon wetlands for survival.

The need for wetlands protection is evident from the fact that of the original 215 million acres of wetlands in the lower 48 states, only 99 million acres, or 46 percent, remained as of the mid-1970s. Between 1955 and 1975, 11 million acres were lost while 2 million acres of new wetlands were created; the net loss equals an area the size of New Jersey. The most extensive losses have occurred in Louisiana, Mississippi, North Carolina, the Dakotas, Nebraska, Florida, and Texas.

POLLUTION CONCERNS AND SOURCES

PHYSICAL: Major causes of wetlands loss and degradation through physical means include drainage, dredging and stream channelization, filling, diking and damming, tilling for crop production, grazing by domestic animals, and any actions that lead to flow alteration.

CHEMICAL: Although wetlands are efficient in stabilizing organic wastes and removing suspended solids, they are affected by toxic and hazardous wastes in a manner similar to surface waters. Wetlands are particularly vulnerable because they are inhabited by the very young of aquatic life. Persistent, bioaccumulative, toxic, organic chemicals head the list as destructive forces in this type of ecosystem. The food web in wetlands extends from small invertebrates through fish to predator animals and humans. There is a broad problem with contamination of wetlands. Irrigation return flows have introduced high selenium levels in some western areas that have resulted in deformed ducks in refuges. Boron, heavy metals, and PCBs have created pollution problems in many areas.

SOURCES: Agricultural drainage of wetlands was responsible for 87 percent of wetlands losses between the mid-50s and mid-70s. Urban and other development accounted for the remaining 13 percent of the losses. Irrigation return flows in the West, and both point and nonpoint source pollutant discharges are responsible for the chemical pollutant concerns.

PROGRAM CONTROLS

GUIDANCE: Guidance has been provided by EPA to States and eligible Indian Tribes on the designation of wetlands as surface waters of a State, the application of water quality standards and dredge and fill permits to wetlands, and the use of the Clean Water Act Section 401 certification process for a federally permitted or licensed activity (See EPA, 1989 in Suggested Reading).

MONITORING: Currently, there is insufficient monitoring in wetlands to fully understand their environmental complexities. Efforts are being made to bring wetlands into national monitoring programs and into the water quality reports submitted biennially by States and summarized by EPA as a National Water Quality Inventory Report to Congress. These efforts require the development of water quality criteria for wetlands and the identification of satisfactory monitoring indicators to represent biological integrity.

EVALUATION TECHNIQUES: A goal of this emerging program is to ensure that wetlands are identified consistently and that their boundaries are established consistently throughout the Nation. To meet this need, a Federal manual for identifying and delineating jurisdictional wetlands was developed as an interagency cooperative publication by EPA and three other agencies whose interests include wetlands.

MITIGATION: When wetlands destruction may occur as a result of a permit to dredge or fill, mitigation is required. Such mitigation takes the form of stopping the discharge of dredged or fill material, minimizing such discharge, and/or creating new wetlands in another location.

REGULATORY CONTROLS

The US Army Corps of Engineers issues permits under Section 404 of the Clean Water Act for the discharge of dredged or fill materials through the application of EPA guidelines developed to protect the environment. The EPA guidelines take the form of specifications for disposal sites for dredged or fill material. The guidelines prohibit the discharge of

dredged or fill material if there could be a violation of any applicable State water quality standard and stresses that a filling operation in wetlands is considered to be among the most severe environmental impacts. EPA maintains review authority over permit issuance. In the final analysis, EPA has veto power over an action by the US Army Corps of Engineers to issue a specific permit. The procedures and conditions under which this can occur are contained in 40 CFR Part 231. In addition to these regulations, there are others that specify the conditions under which a State may administer its own program in lieu of the US Army Corps of Engineers.

QUALITY ASSURANCE

The Office of Wetlands Protection does not generate data, but coordinates with other agencies and Offices within EPA, to obtain program data. It maintains a data system of State wetlands programs and the wetlands associated with such programs. The US Army Corps of Engineers maintains a programmatic data system, used by EPA, that contains regulations, policies, and an information bulletin. No special quality assurance programs are involved.

SPECIAL STUDIES

No special studies of a national scope are conducted by EPA. The US Fish and Wildlife Service conducts a national trend analysis related to wetlands destruction that is based upon 3,700 two-mile square plots throughout the United States.

SUGGESTED READING

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AIR QUALITY: INDOOR AIR

SUMMARY

Indoor air quality is becoming a major cause of employee complaints in the office environment. Residential indoor air quality is even of greater concern because persons have contact with it for a longer period of time and often do not realize that they have a problem. A large number of physical, chemical, biological, and radiological pollutants are associated with indoor air. Many can lead to serious health effects. These pollutants come from stoves, heaters, building materials, carpets, pets, hobbies, tobacco smoke, household chemicals, some water supplies, motor vehicles in attached garages, and the soils and rocks beneath a house.

EPA has established a new program in the Office of Atmospheric and Indoor Air Programs to deal with the problems associated with indoor air quality. Although this program does not now have statutory authority to generate regulations, other EPA Offices have produced regulations for certain pollutants. Major programs for indoor air quality control include asbestos, radon, formaldehyde in building materials, environmental tobacco smoke, volatile organic compounds, and building ventilation.

POLLUTION CONCERNS AND SOURCES

PHYSICAL: Indoor air sources can emit products of combustion from appliances, dirt, dust, asbestos, fabric fibers, insect parts and environmental tobacco smoke that may cause eye and respiratory irritation, respiratory function impairment, allergic and infectious diseases, asbestosis, and cancer.

CHEMICAL: Many chemicals are emitted within a building from household or commercial products by evaporation, combustion, volatile breakdown, degassing or intentional use. A partial list includes the following. Inorganic gases such as nitrogen dioxide, carbon monoxide, and sulfur dioxide can cause eye and respiratory irritation, neurotoxicity, blood effects, and respiratory function impairment. Volatile organic compounds such as kerosene and mineral spirits can cause neurotoxicity. Aromatic hydrocarbons such as toluene, styrene, ethylbenzene, benzene and xylenes can cause liver and kidney effects, blood effects, leukemia, and anemia. Halogenated carbons such as methylene chloride, 1, 1, 1-trichloroethane, chlordane, ethylene dichloride, freon, PCBs, carbon tetrachloride, and chloroform can cause liver and kidney effects, neurotoxicity, and cancer. Alcohols such as ethanol, methanol, ethylene glycol, phenol, and cresol can cause developmental effects, neurotoxicity, and liver and kidney effects. Ketones such as acetone, methyl ethyl ketone and methyl isobutyl ketone can cause developmental effects and eye and respiratory irritation. Aldehydes such as formaldehyde can cause eye and respiratory irritation and cancer. Organic pesticides such as malathion can cause neurotoxicity.

There are many more. It should be noted that many of these chemicals may be present as the volatile breakdown products of materials of construction, dry cleaning, pressed wood, insulation, carpets, and spray-on materials, etc. It is cautioned that the effects noted above may not necessarily occur at indoor exposure levels. In many cases the exposure data are insufficient to determine the levels at which the listed effects will occur.

BIOLOGICAL: Many potential sources of biological irritants and toxicants may be found in residential and commercial buildings. In many cases, they are of much greater concern indoors than out because of the close proximity, closed environment, and fertile breeding grounds. Among the potential concerns, bacteria and viruses can cause illnesses such as Legionnaire's disease, and pneumonitis. Animal dander and excreta, and molds and mildews can cause respiratory irritation, allergic and infectious diseases, and produce immune effects.

RADIOLOGICAL: Radon found in soils and rocks beneath a house can cause cancer. Electromagnetic radiation from nearby high-voltage power lines, appliances and television sets is suspected of causing reproductive, developmental, and neurobehavioral effects, as well as cancer.

SOURCES: Sources of all of these air pollution problems are many and varied; they include gas stoves, kerosene heaters, building materials, human activities, pets, insects, arachnids, pesticides, combustion fuels, painting supplies, hobby supplies, solvents, cleaners, tobacco smoke, toilet deodorizers, fabric protectors, adhesives, certain cosmetics, some tap water, motor vehicles in attached garages, facilities such as damp basements and air conditioning cooling towers that serve as bacterial, viral and fungal breeding grounds, the soils and rocks beneath a building and nearby power lines.

PROGRAM CONTROLS

Title IV of the Superfund Amendments and Reauthorization Act of 1986 directed EPA to establish an indoor air quality research program, to coordinate with other public and private organizations, and to disseminate information on indoor air quality issues to the public. This new program, based in the Office of Atmospheric and Indoor Air Programs, has used EPA programs and laws other than the Clean Air Act to implement controls on indoor air pollutants, since the Clean Air Act does not directly address Indoor Air Quality. Among the existing and developing programs within EPA that deal with indoor air are the following.

ASBESTOS: The asbestos program is a major national program that encompasses the full range of regulatory, grant, and technical assistance activities. It responds to the Asbestos Hazard Emergency Response Act, the Asbestos School Hazard Abatement Act, and the Toxic Substances Control Act. EPA has published a rule on proper asbestos inspection, management planning and appropriate response actions in schools, as well as a model accreditation plan to provide for training and accreditation of persons who inspect school buildings, develop management plans, or design and conduct response actions. Several asbestos-related regulations have been issued under the Clean Air Act, including regulations specifying workplace procedures to use in demolitions and renovations where asbestos is present. Under the Toxic Substances Control Act, a rule was issued to extend worker protection in abatement activities, to ban certain asbestos products and phase out others.

RADON: EPA estimates that about 20,000 lung cancer deaths each year may be attributable to indoor radon, and as many as 8 million houses may be affected. The Indoor Radon Abatement Act was signed into law in 1988. The action program consists of problem assessment, mitigation and prevention, capability development, and public information. Standardized measurement protocols have been issued. The mitigation and prevention program includes demonstrations and evaluations of cost-effective methods to reduce radon levels in existing homes and the identification and evaluation of ways to prevent elevated radon levels in new construction.

FORMALDEHYDE: EPA is currently investigating the need for, and potential nature of, additional Federal regulations under the Toxic Substances Control Act affecting formaldehyde emissions from pressed wood products such as particleboard, hardwood plywood paneling, and medium density fiberboard.

ENVIRONMENTAL TOBACCO SMOKE: Reports published by the Surgeon General and the National Research Council of the National Academy of Sciences conclude that exposure to environmental tobacco smoke is a cause of lung cancer in healthy nonsmokers and is responsible for other health

effects. Published risk estimates of lung cancer in nonsmokers from environmental tobacco smoke range from about 4,000 to 50,000 deaths per year. EPA has undertaken activities including research, risk assessment, and public information. EPA has no regulatory authority in this area.

VOLATILE ORGANIC COMPOUNDS: Chronic exposure to some volatile organic compounds is suspected to contribute to mortality from cancer. Common sources include building materials and furnishings, paints and related products, cleaning, disinfecting and odor control products, and pesticides. EPA is conducting research under the Toxic Substances Control Act on building materials and furnishings in chamber laboratories.

BUILDING VENTILATION: Another program promoted by the indoor air program is that of building ventilation. The air we breath while at work can affect our job performance, comfort, general sense of well being, and our health. With millions of Americans working in buildings with mechanical heating, ventilation, and air-conditioning systems, the system's efficiency and effective operation can well determine our indoor air quality. For example, when ventilation is inadequate, excess carbon dioxide produced by people breathing accumulates. Building spaces may become stuffy, and occupants grow drowsy, get headaches, and function at lower activity levels. Ventilation rates specified in local building codes often are not enforced and in many jurisdictions the rates are designed to conserve energy rather than promote indoor air quality. EPA has no regulatory authority in this area. The American Society of Heating, Refrigerating, and Air Conditioning Engineers establishes ventilation rate procedures which become mandatory ventilation standards when adopted by applicable building codes. EPA promotes the concept that energy costs should be balanced with indoor air quality considerations, as well as employee health and productivity costs.

QUALITY ASSURANCE

The asbestos program consists of detailed regulations on how samples are taken and analyzed. Certification is required of asbestos inspectors and removers. The sampling process requirements are built around the concept of QA/QC. Similarly, regulations are provided for formaldehyde.

The generation of most environmental data as they may affect indoor air, however, are conducted by EPA and Federal offices other than the Office of Atmospheric and Indoor Air Programs. Quality assurance and quality control are provided these data by the respective offices that generate them. These include such data as radon measurement and indoor auto emissions.

The radon program conducts proficiency evaluations of private radon measurement companies and non-commercial laboratories who voluntarily demonstrate their measurement capacities. Several States use these proficiency evaluations as a basis for regulating measurement companies. A radon mitigation contractor proficiency program is under development.

SPECIAL STUDIES

An example of a special study was the Total Exposure Assessment Methodology (TEAM) study to directly measure human exposure to pollutants. The study focused on volatile organic compounds and developed methods to measure individual total exposure and the resulting body burdens of toxic and carcinogenic chemicals. The TEAM study involved 600 participants from New Jersey, North Carolina, North Dakota, and California. These participants were chosen to represent a total population of 700,000. Inhalation provided greater than 99 percent of the exposure risk for 10 of 11 target volatile organic compounds studied.

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AIR QUALITY: MOBILE SOURCES

SUMMARY

The Clean Air Act provides for the regulation of on-road vehicle and commercial aviation emissions. Proposed revisions to the Act now under consideration would authorize the regulation of off-road vehicle emissions as well. Mobile sources contribute as much as 60 percent of the urban air toxics emissions.

EPA's Office of Mobile Sources undertakes a number of programs to curtail emission pollution. Technology within the auto industry is continually assessed. Testing procedures often must be developed to enable laboratories to conduct reliable and repeatable tests. There are three principal testing procedures associated with the sale of motor vehicles. Before a manufacturer can offer a motor vehicle for sale, a certificate of compliance with emission standards must be obtained. This is a preproduction test where the prototype design model must pass an emissions test conducted under EPA inspection before the model can be offered for sale. Second, as cars are produced on the assembly line, EPA representatives randomly select some for emission testing by the manufacturer. If enough of the vehicles tested fail to meet standards, the manufacturer must make a change in the design of the vehicle to correct the problem. Third, random vehicles in use are selected to determine their emission levels after they have been purchased and driven by their owners. These tests are conducted with the owners' consent. If a substantial number of any class of vehicles do not conform to emission standards during their useful lives, they may be subject to an EPA order to recall the vehicles. In addition, EPA coordinates with States and cities in their vehicle inspection programs and provides the public with information on its fuel economy program for new model cars and trucks. Regulations are promulgated to provide the structure and enforcement for these pollution abatement programs.

A data system is maintained for the data collected in the in-use emissions testing program. This system provides data for predicting emissions from future model vehicles and for requiring manufacturers to recall a class of vehicles that fails to conform to the emission standards.

POLLUTION CONCERNS AND SOURCES

The pollutants and their sources of concern to the Office of Mobile Sources are those found in emissions from motor vehicles in operation, as well as the volatilization of fuels that are being pumped into those vehicles. Currently there is authority for regulating on-road vehicles only. The revisions to the Clean Air Act now under consideration would authorize regulating off-road vehicles as well, which would include railroads, boats, construction equipment, motorized farm equipment, lawnmowers, and similar equipment. Specific regulated pollutants include particulates, hydrocarbons, carbon monoxide, oxides of nitrogen, lead, and the vapors from gasoline and other fuels.

Hydrocarbons from combustion processes and gasoline vapors can react with the oxides of nitrogen from motor vehicles in sunlight to form ozone. The ozone, formed in the lower atmosphere, contributes to respiratory problems, eye irritation and crop damage. Nitrogen dioxide causes the yellow-brown color that is sometimes seen in the urban atmosphere. This and other oxides of nitrogen may affect the respiratory system causing bronchitis, pneumonia and lung infections.

Carbon monoxide is a colorless, odorless and poisonous gas produced by the incomplete combustion of fuel. Most of it comes from motor vehicles and, thus, is especially bad in urban areas. Carbon monoxide enters the blood stream and binds to hemoglobin, reducing the transport of oxygen to the cells. Persons already in ill health can be more severely affected. Even at low levels, carbon monoxide can affect mental function and visual acuity.

Lead is a toxic metal that tends to accumulate in the tissues of man and other animals. It is strongly suspected of producing subtle effects such

as impaired neurologic and motor development and renal damage in children. The control of lead in gasoline has been exceptionally successful; the lead in the atmosphere from cars has gone down 97 percent in the last 10 years.

PROGRAM CONTROLS

TECHNOLOGY ASSESSMENT: The Office of Mobile Sources keeps abreast of technological developments within the auto industry in order to be able to advise the Administrator, other Federal agencies, and the Congress as to the ability of the industry to meet emission standards and fuel economy goals.

TEST PROCEDURE DEVELOPMENT: Once a need for control is determined, reliable and repeatable test procedures must be developed and published to enable laboratories to conduct identical tests. Test procedures generally are published as appendices to the regulations. One such example is the pollutant characterization of currently unregulated vehicle pollutants and fuel additives that have the potential of being health hazards. Special test procedures to measure levels for the new pollutants must be developed for this purpose.

VEHICLE CERTIFICATION: Before a manufacturer can offer a motor vehicle for sale in the United States, a certificate of compliance with emission standards must be obtained. The prototype design model must pass an emissions test conducted under EPA inspection before the model can be offered for sale.

ASSEMBLY-LINE TESTING: As cars are produced, EPA representatives randomly select some for emissions testing by the manufacturer. For every car randomly selected for the manufacturer's test during an audit, over a hundred cars are voluntarily tested by auto producers to assure that the audits do not result in failures which could affect vehicle production. If enough of the vehicles tested fail to meet standards, the manufacturer must make a change in the design of the vehicle to correct the problem. Quality assurance is built into this program, as

well as the vehicle certification program cited above. Confirmatory tests are made by the EPA testing laboratory at Ann Arbor, MI on some of the same vehicles that the manufacturer tests. EPA personnel audit all testing procedures from the selection of the vehicles to be tested to the completion of the tests and the recording of the data.

SURVEILLANCE OF IN-USE VEHICLES: Randomly selected vehicles in use are chosen to determine their emission levels after they have been purchased and driven by their owners. The results of this EPA program, conducted with the cooperation and consent of the vehicle owner, serve two purposes. First, the data are used to estimate emission rates for air quality planning purposes and are entered into a computer modeling program to project future emission levels and suggest whether new or different control programs are necessary. Second, Section 207(c) of the Clean Air Act authorized EPA to order the recall of vehicles if a substantial number of any class do not conform to emission standards during their useful lives. During 1987, a total of 1.5 million vehicles were recalled as a result of EPA investigations. In the same period, manufacturers voluntarily recalled an additional 1.4 million vehicles to correct emission problems.

FUEL ECONOMY TESTING: Concurrent with its emission testing, EPA tests new car models and light trucks to determine their fuel economy. These data are made available to the public through the annual Gas Mileage Guide published in cooperation with the Department of Energy. These data also are used by the Department of Transportation in administering the fuel economy standards program.

VEHICLE INSPECTION PROGRAM: Urban areas which obtained an extension in the deadline for attaining the ambient air quality standards for ozone and carbon monoxide beyond 1982 are required by the Clean Air Act to implement an inspection and maintenance program. To assure that operating inspection programs are achieving the planned emission reductions, EPA has instituted a systematic auditing program. Audits and follow-up audits have indicated major operating problems in some areas and have required several States to submit corrective plans. Many States are switching to computerized analyzers in the inspection networks.

TAMPERING AND FUEL SWITCHING: EPA is responsible for programs to deter tampering with vehicle emissions control systems or the use of leaded fuel in vehicles which require unleaded fuel. Surveys undertaken by EPA have shown tampering and fuel switching to be continuing serious problems which undermine the emissions control performance of many in-use vehicles, particularly those of fleets such as taxi cabs and municipalities. The 1987 Motor Vehicle Tampering Survey indicates that about 19 percent of the vehicle fleet is subject to gross tampering, and about 7 percent to fuel switching. EPA promotes the implementation of State and local antitampering enforcement programs. Tampering or the removal of emission control equipment is a Federal offense for repair shops, while fuel switching is a Federal offense for fleet and gas station owners.

REGULATORY CONTROLS

Regulations for motor vehicles are to be found at 40 CFR Parts 85 and 86; regulations for motor vehicle fuels are at 40 CFR Parts 79 and 80. Fuel economy regulations are at 40 CFR Part 600. Emission standards are set at levels that are technically and economically feasible and to provide maximum health protection achievable. EPA provides enforcement for motor vehicle emissions and the Federal Aviation Administration provides enforcement for commercial aviation standards.

One of the major regulatory actions that has been very successful has been the regulation of lead in gasoline. This activity has reduced lead emissions from motor vehicles by more than 90 percent. The regulation of hydrocarbons from tailpipe emissions also has been quite successful.

Limitations are placed on additives other than lead in fuels, e.g., ethanol. Certain characteristics of diesel fuels are regulated. The vaporization of gasoline while being pumped into motor vehicles, which is a major source of urban pollution, is controlled by some cities that require devices on the fuel injector. Legislation now in Congress may require additional equipment on motor vehicles that will capture gasoline vapor and burn it.

QUALITY ASSURANCE

FIELD FACILITY: The field facility and motor vehicle testing and fuel testing laboratory is located in Ann Arbor, MI. Contract laboratories also are used. The Office has a quality assurance officer in its Ann Arbor facility. The laboratory operates under a quality assurance plan.

DATA SYSTEM: Data from the testing of in-use vehicles are stored in MTS, the Michigan Telecommunications System. Such data include background information on the vehicle tested, results of the emission tests, and responses to a routine questionnaire by the vehicle owner. Prior to entry into the data system, a contractor manually checks the data to determine that all required data are there and that the information is within expected bounds. There is a range check of the data by the computer and the contractor reviews any information that the computer flags. Data from the system are used in MOBILE-4, a computer model to predict emissions from future automobile models and to determine potential environmental effects based upon these predictions.

SPECIAL STUDIES

OFF-ROAD VEHICLES: A review of available information is being conducted on emissions from off-road vehicles, particularly diesel engines used in railroads, farming, and construction equipment. This study is being done in anticipation of potential changes to the Clean Air Act that would include such vehicles within the regulatory framework.

ALTERNATIVE FUELS: Alternate fuels and alternative vehicles are being examined as an opportunity for further vehicle emissions reduction. Alternative fuels currently being examined include methanol and ethanol, natural gas, which principally is methane and liquid petroleum gas, which is propane and butane or a combination of the two. Electric powered vehicles also are being examined. The alternative fuels program is supported both by EPA personnel and through contract funding.

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AIR QUALITY: STATIONARY SOURCES

SUMMARY

EPA has set National Ambient Air Quality Standards (NAAQS) for six air pollutants; ozone, oxides of nitrogen, carbon monoxide, lead, particulate matter, and sulfur dioxide. A geographic area is termed in attainment for a specific pollutant if the ambient concentration is less than the standard; it is in non-attainment if the concentration exceeds the standard. The attainment status is determined through direct measurement of the six pollutants by the State and Local Ambient Monitoring Station (SLAMS) Networks. These networks of fixed monitors are developed, deployed, and operated according to uniform criteria specified in the regulations.

In addition, the States and EPA monitor the ambient concentrations of many air pollutants that are not specifically regulated. For example, many States measure ambient concentrations of acid deposition parameters, volatile organics, other metals, benzo-alpha-pyrene and other semi-volatiles, along with meteorological parameters needed for pollutant transport modeling.

The stationary source compliance program focuses on the six pollutants for which EPA has specified National Ambient Air Quality Standards and on the hazardous air pollutants for which EPA has designated National Emission Standards for Hazardous Air Pollutants (NESHAPS). Examples of stationary sources include power plants, factories, or waste treatment facilities that generate various air pollutants and emit them through stacks or as fugitive emissions. This program is based on the permitting process, in which specific sources that apply for permits to construct and operate facilities are tested to demonstrate compliance with permit conditions, and are audited to confirm continuing compliance. In general, EPA delegates authority to administer the compliance program to States through the State Implementation Plans (SIPS) or through direct delegation of specific Federal programs such as NESHAPS, the Prevention of Significant Deterioration (PSD), or New Source Performance Standards (NSPS).

The most important data elements relate to the demonstration of source compliance, usually in the form of stack emission tests, overseen by EPA or State QA personnel. Emission data, along with compliance information are stored in a large national data base, the Aerometric Information Reporting System (AIRS).

POLLUTION CONCERNS AND SOURCES

Not a respector of boundaries, the effects of air pollution frequently appear far from their source. Atmospheric pollution, however, principally is an urban problem. Most air pollution from stationary sources comes from industries such as factories, power plants, and smelters.

EPA has set National Ambient Air Quality Standards (NAAQS) based upon medical and other scientific evidence of health and environmental effects for six pollutants. These standards apply to ozone, oxides of nitrogen, carbon monoxide, lead, particulate matter, and sulfur dioxide. Ozone and smog are formed when volatile organic compounds and oxides of nitrogen interact in the presence of sunlight. Ozone irritates the eyes, aggravates respiratory problems, and causes crop damage. Oxides of nitrogen affect the respiratory system and can cause bronchitis, pneumonia, and lung infections. Lead, which can come from battery factories and non-ferrous smelters, is a dangerous pollutant because it accumulates in body tissues (particularly in children) and can cause neurological impairment and behavioral disorders. Particulate matter is a general term for airborne particles, some of which are seen in the form of smoke or dust; some are too small to be seen. Particulates can irritate the respiratory system and may carry metals, sulfates, and nitrates. Sulfur oxides, and particularly sulfur dioxide, come primarily from the burning of coal and oil and various industrial processes. In the atmosphere, they react to form sulfuric acid, sulfates and sulfides. They can affect the respiratory system, especially when the sulfuric acid settles on a fine particle which is inhaled.

In addition to the National Ambient Air Quality Standards, EPA establishes National Emission Standards for Hazardous Air Pollutants, which are called NESHAPS. These standards are designed to control the emission of toxic substances, even small amounts of which may adversely affect health. Examples of these pollutants are benzene, asbestos, beryllium, mercury, vinyl chloride, coke oven emissions, and radionuclides.

PROGRAM CONTROLS

AMBIENT AIR MONITORING: States and local agencies are required to develop, set up, maintain, and operate the State and Local Air Monitoring Stations (SLAMS) networks to provide year-round measurements of the six NAAQS pollutants. A sub-set of these monitors, specifically designated as National Ambient Monitoring Stations (NAMS), is used by EPA for national trend analyses. The NAMS and SLAMS monitoring must adhere to very specific network design, probe siting, monitoring method and equipment, and quality assurance requirements stated in the EPA regulations. There are about 4,500 SLAMS monitors and 1,000 NAMS nationwide. The resulting data are used by EPA and the States to determine the attainment status of specific geographic areas, to evaluate air quality trends, and as the basis for the development of air pollution control strategies and regulations to reduce or maintain ambient concentrations.

STATE IMPLEMENTATION PLAN (SIP): SIPS form the basis of all State air pollution assesment and control activities, as well as management of emerging problems. They contain a State's plans, policies, regulations, and schedules for controlling air pollution. They result from the formal requirement for a State to determine if national air quality standards are being attained. States must develop and enforce a SIP that details measures to be undertaken to achieve compliance with national air quality standards for any non-attainment areas. EPA approves these plans. If a State plan is not acceptable, EPA is required to provide a Federal implementation plan which EPA itself must then enforce. When a State has not shown that it can achieve air quality standards by an acceptable

date, EPA may disapprove the SIP and propose bans on construction in the area involved or take other measures.

NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAPS): Developed for a particular source category, NESHAPS currently control arsenic, benzene, asbestos, beryllium, mercury, vinyl chloride, coke oven emissions, and radionuclides in about 25 source emissions categories. Several more substances are under consideration for NESHAPS action. NESHAPS is a Federal permit program, delegatable to the States, that is designed to control emission of particular hazardous materials without regard to NAAQS.

NEW SOURCE PERFORMANCE STANDARDS (NSPS): NSPS is a Federal permit program for new sources of air pollution in specific source categories. Any new or modified facility in one of these categories is required to install control equipment along with the process construction. The level of control required depends upon the current air quality in the area for the pollutant in question. If the area to be affected by the source is currently attaining the NAAQS, the source is required to install the best available control technology, while a source in a non-attainment area must meet the lowest achievable emission rate for that source category. Source testing and monitoring requirements, along with quality assurance, are specified in the regulations. While NSPS is a Federal program, it may be delegated to any State that demonstrates its ability to enforce a program at least as stringent as EPA's.

PREVENTION OF SIGNIFICANT DETERIORATION (PSD): PSD is a program designed to ensure that new or modified air pollution sources constructed in areas with clean air will not cause ambient air concentrations to rise over the NAAQS. It requires that a potential source demonstrate that its process and controls will achieve the desired ambient air concentrations. It is different from NSPS and NESHAPS in that they are emission and control oriented while PSD is oriented toward ambient air quality impact.

REGULATORY CONTROLS

Principal stationary source pollution control regulations are the National Ambient Air Quality Standards, National Emissions Standards for Hazardous Air Pollutants, New Source Performance Standards, Significant Deterioration standards in pristine areas, and State Implementation Plans. Ambient air monitoring reference and equivalent test methods are published in 40 CFR 53. The NAAQS set levels for six pollutants that must be attained. NESHAPS establish source levels for specific pollutants to protect ambient air from toxic pollutants. NSPS require best available control technology in air quality attainment areas and lowest achievable emission rate in ambient air non-attainment areas, which are specified on a case-by-case determination.

An SIP describes in detail the measures being undertaken or planned by a State to attain ambient air quality standards in non-attainment areas. A SIP is Federally enforceable.

QUALITY ASSURANCE

EPA administers a national performance audit program for ensuring SLAMS and NAMS monitor performance and conducts periodic audits of sites, equipment, and the State programs as a whole. For specific stationary source sampling, the analytic procedures are included in QA project plans, which often are called stack test protocols in this program. These must be approved ahead of time and must be followed during the testing. In addition, EPA and State personnel often are able to arrange for performance evaluation audit samples to improve confidence in the analytical results.

DATA SYSTEMS: The Aerometric Information Reporting System (AIRS) is a new integrated data system that consolidates existing data systems at the national level. AIRS contains the ambient air monitoring data collected through SLAMS and NAMS programs. States are required to enter NAMS data and yearly summary data from SLAMS activities. They may enter other or all data collected in the SLAMS program. AIRS contains stack emission data originally entered into the National Emissions Data System (NEDS).

AIRS also contains data describing the compliance status and the enforcement activities of all major and many minor stationary sources of air pollution. These data previously were stored in the Compliance Data System (CDS). Output reports from the system enable management to (1) maintain an inventory of facilities emitting regulated pollutants; (2) assess enforcement strategies with regard to those sources; (3) monitor local, State and regional enforcement actions; and (4) measure compliance and enforcement programs.

AIRS further contains geographic and common information, which includes city and county location codes and other descriptive information. When AIRS becomes fully operational, the other data systems described above will lose their individual identity.

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RADIATION

SUMMARY

The health effects associated with radiation exposure may include anemia, loss of hair, deleterious genetic changes, risk of cancer, or death from a single rapid dose. Environmental sources of radiation are many, but natural background and radiation associated with diagnosis and treatment of diseases are among the major contributors. However, any exposure to radiation carries some risk, which increases as the exposure increases.

EPA's Office of Radiation Programs conducts a radon action program that involves identifying the problem in homes, schools, offices, and Federal buildings. The Government has the capability to respond to nuclear accidents. Protective action guides have been issued to States to protect persons from accidents at nuclear power plants. Assistance is provided in the clean-up of radioactively contaminated hazardous waste sites. Routine monitoring is carried out at 268 nation-wide sampling stations on milk, surface water, drinking water, and air. Regulations have been developed to control disposal of spent nuclear fuels, high- and low-level radioactive wastes, uranium mines and mill tailings, and industrial radionuclide emissions. Two field facilities are operated by EPA that provide technical assistance, investigations, and emergency response.

POLLUTION CONCERNS AND SOURCES

CONCERNS: Concerns involving radiation are associated with exposure and resultant bodily effects. Ionizing radiation can remove electrons from atoms. Whether in the form of x-rays, neutrons, protons, alpha or beta particles, or gamma rays, it acts either directly or by secondary reactions to produce biochemical lesions that initiate a series of histologic changes, as well as physiologic symptoms and signs that vary with the radiation dose and time. A single rapid dose may be fatal, while the administration of the same dose over a period of weeks or months may be tolerated with few measurable acute effects. Tissues vary in response to immediate radiation injury, and, generally, the more rapid the turnover of the cell, the greater the radiation sensitivity. Prolonged or repeated exposure to low dose rates may produce decreased fertility, anemia, leukopenia, cataracts, loss of hair, skin atrophy, deleterious genetic changes, and cancer.

SOURCES: Environmental radiation sources include uranium mine and mill tailings, industrial emissions, nuclear reactors, high-level radioactive waste disposal, naturally occurring radon from soils and rocks, nuclear weapons production, medical radiation in x-rays and radiopharmaceuticals, low-level radioactive waste disposal, and radio frequency radiation. Secondary contaminant sources include air, precipitation, surface and drinking water and milk. Natural background (cosmic, terrestrial, internal) accounts for 44.6 percent of annual whole-body radiation dose-equivalent rates, medical radiation for 49.4 percent, fallout from weapons testing 2.4 percent, consumer products 1.9 percent, and airline travel 0.3 percent.

PROGRAM CONTROLS

The basic assumption behind radiation protection programs is that any exposure to radiation carries some risk, which increases as the exposure increases.

RADON ACTION PROGRAM: The program consists of four main elements: problem assessment, mitigation and prevention, capability development, and public information. Problem assessment relates to determining the national distribution of radon occurrences in schools, houses, the workplace, and the associated health risks that go with those locations. A National Residential Radon Survey has been initiated by EPA. Mitigation and prevention includes demonstrations and evaluations of cost effective methods to reduce radon levels. Capability development includes radon diagnostic and mitigation techniques, training courses, implementation of regional radon training centers, a radon measurement proficiency program and a radon contractor proficiency program. Public information includes the dissemination of information through brochures and technical reports.

PROTECTIVE ACTION GUIDES: EPA has issued Protective Action Guides and Implementation Guidance for use by States relating to exposure of the whole body and the thyroid gland to airborne radioactivity from accidents at nuclear power plants.

RADIOACTIVELY CONTAMINATED SITES: The Office of Radiation Programs supports the Superfund program to ensure that site cleanup activities do not result in radiation hazards and that appropriate cleanup technology and methods are adopted to effectively and efficiently reduce the hazards associated with radiation problems encountered at the sites. Twenty-one sites on EPA's National Priority List are contaminated with radioactive materials. The Office is responsible for establishing safety protocols, data quality objectives, investigative procedures, and cleanup levels.

RESIDUAL RADIOACTIVITY: EPA is developing criteria for cleanup of sites and buildings that are contaminated with radioactivity. Thousands of facilities, such as laboratories and power plants in operation around the country use radioactive materials. When these facilities cease operation,

they must be cleaned before they can be made available for other uses. Any remaining equipment must be decontaminated.

REGULATORY CONTROLS

LOW-LEVEL RADIOACTIVE WASTE: It is estimated that by the year 2000, there will be about 3 million cubic meters of low-level radioactive wastes generated by commercial activities and 1.5 million cubic meters generated by the Department of Energy. There are now three operational land disposal commercial sites at Barnwell, SC; Beatty, NV; and Richland, WA. There are 16 Federal storage sites widely distributed around the country. Proposed standards for management and land disposal of low-level radioactive wastes are being developed and publication is expected in 1990. The standards will include natural and accelerator produced wastes and will establish criteria for designating levels of radioactivity in wastes below regulatory concern.

SPENT NUCLEAR FUEL AND HIGH-LEVEL RADIOACTIVE WASTES STANDARDS: In 1987, there were about 16,000 metric tons of commercial spent nuclear fuel and 382,000 cubic meters of liquid and solified waste. High-level radioactive waste is the waste from reprocessing spent reactor fuel. Commercial wastes are now stored at individual reactor sites or at storage sites in West Valley, NY; Aiken, SC; and Morris, IL. Department of Defense wastes are stored at special sites in Richland, WA; Aiken, SC, and Idaho Falls, ID. Spent nuclear fuel is being stored temporarily in pools of water at individual reactor sites and at three specifically designated sites in the United States. Environmental standards for the management and disposal of spent nuclear fuel, high-level, and transuranic radioactive wastes were issued but portions were remanded by the Court. They are being reevaluated and it is expected that they will be proposed late in 1990.

URANIUM AND THORIUM STANDARDS: Both air and water standards have been issued for the control of effluents and emissions from uranium and thorium milling operations and for the final disposal of tailings for 27 active milling sites, and 24 inactive sites. Tailings must be stabilized so that health hazards will be controlled and limited. Quantitative

standards are being developed for inactive sites, including ground-water protection standards.

RADIONUCLIDES EMISSION STANDARDS: EPA has listed radionuclides as hazardous air pollutants. Early in 1989, EPA proposed four alternative approaches for controlling radionuclide emissions from 12 source categories including reactors and support facilities, elemental phosphorus plants, coal fired utilities and industrial boilers, uranium mines and tailing piles. The Agency found, for example, that the emission rate of radon from underground mines may be highly variable depending on mine ventilation rates, ore grade, exposed surface areas, mining practices and geologic formations. This latest effort is in accordance with a court-mandated process following earlier standards setting actions.

QUALITY ASSURANCE

There are two types of EPA activities in the radiation field that emphasize quality assurance. These include the field facilities and data systems.

FIELD FACILITIES: Two field facilities are operated by EPA; one is in Montgomery, AL, the other is in Las Vegas, NV, which coordinate monitoring activities east and west of the Mississippi River, respectively. The Eastern facility conducts field and laboratory measurement programs, operates two radon calibration chambers to evaluate instruments and methods for radon measurements, operates the Environmental Radiation Ambient Monitoring System, provides personnel and equipment for EPA's nuclear accident response program, develops and validates computer radiation dose models, provides technical assistance and laboratory assistance to States and conducts special studies and programs in support of Superfund. The Las Vegas facility conducts studies in radiation problem areas such as Superfund sites, waste disposal, mill tailings, construction materials, and uranium and plutonium operations; operates a radon chamber in support of the Radon Measurement Proficiency Program; conducts measurements related to electromagnetic fields; estimates dose and risk from radionuclides with

the use of computer models; provides an emergency response capability for radiation incidents; and provides assistance and advice on radiochemical analyses and measurements of both ionizing and electromagnetic radiation.

EPA established the Radon Measurement Proficiency Program to assess the capabilities of private radon measurement companies and non-commercial laboratories. Under this program, companies offering measurement services voluntarily demonstrate their measurement capabilities. EPA provides lists of successful participants to the States who distribute them to homeowners upon request. Over 800 companies are listed.

DATA SYSTEMS: The Environmental Radiation Ambient Monitoring System (ERAMS) comprises 268 nation-wide sampling stations at which air, precipitation, surface water, drinking water, and milk samples are collected to derive radiation levels. In cooperation with State radiation program personnel, 65 composite pasteurized milk samples, which are representative of a significant fraction of the US milk consumption, are collected quarterly; air filter and precipitation samples are obtained twice weekly from locations; and river samples are obtained quarterly from 58 locations. In all, the monthly sampling schedule accounts for 2,000 samples for 6,000 analyses. Results of this monitoring are published in Environmental Radiation Data, which is distributed quarterly to States and interested private organizations. ERAMS is subjected to rigid quality assurance controls.

SPECIAL STUDIES

Three studies, national in scope, relate to radon. The National Residential Radon Survey, mentioned earlier, involves a year-long testing of 7,500 homes selected according to population density. A contractor collects the samples, which are analyzed in a commercial laboratory. The Office of Radiation Programs is working with other Federal Agencies to survey all Federal buildings for radon. A national survey of schools is being initiated through the States.

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FEDERAL ACTIVITIES

SUMMARY

EPA has far-reaching environmental review and comment authority associated with the National Environmental Policy Act, Section 309 of the Clean Air Act, Executive Order 12088, and Office of Management and Budget's Circular A-106. These authorities provide oversite authority for virtually all major Federal actions that may impact the environment. In addition, EPA's Office of Federal Activities exercises oversight of EPA compliance with these statutory and administrative authorities.

Programs that manage the above authorities include Federal facilities compliance, NEPA compliance, environmental review, and compliance with certain cross-cutting environmental statutes. In addition, an Indian activities program ensures adequate protection of human health and the environment on Indian reservations. Two programmatic data systems, the Environmental Review Tracking System and the Federal Facilities Information System, provide the reservoir of information necessary to manage the programs.

PROGRAM ACTIVITIES

EPA's Office of Federal Activities is the focal point for oversight of other Federal agencies to ensure that they carry out their activities in an environmentally sound manner. This oversight addresses multimedia environmental concerns, with particular emphasis on natural resources, environmental values, and public health. This Office is EPA's principal liaison with the Council on Environmental Quality and the center within EPA for environmental impact studies and evaluation.

The National Environmental Policy Act (NEPA), signed on January 1, 1970, is the basic national charter for protection of the environment. That law establishes policy, sets goals, and provides means for carrying out the policy. The Council on Environmental Quality regulations, 40 CFR 1500, notify Federal agencies of what they must do to comply with the procedures and achieve the goals of the Act. These regulations provide

guidance on the necessity for environmental impact statements, as well as the recommended procedures and format for their development and issuance for public review.

EPA has been delegated the management of the official filing system for all Federal Environmental Impact Statements (EISs). The Office of Federal Activities provides general liaison and coordination between EPA and other Federal agencies on environmental issues. Further, the Office oversees EPA compliance with a variety of environmental statutes and Executive Orders primarily administered by other agencies such as the Endangered Species Act and the Floodplain Management Executive Order. Any significant environmental action by another Federal agency receives EPA review and comment under the authority of Section 309 of the Clean Air Act.

EPA has significant review and comment authority in three legislative and administrative areas: NEPA, Section 309, and the Office of Management and Budget's Circular A-106. About 10,000 environmental assessments for projects with minimal environmental impacts are prepared annually by Federal agencies. About 450 environmental impact statements are prepared annually for projects that the proposing agency views as having significant potential for environmental impacts. EPA reviews all of the environmental impact statements and about 20 percent of the environmental assessments. In addition, EPA reviews the environmental impacts of legislation, regulations, or other major actions proposed by a Federal agency.

In its public comments, EPA assigns a rating to its environmental impact statement reviews. The rating scheme may indicate a lack of objection, an environmental concern that should be avoided or mitigated, environmental objections that must be corrected to provide adequate environmental protection, or the project may be classed as environmentally unsatisfactory. In the latter case, if a negotiated agreement cannot be reached between the proposing agency and EPA to correct the problem in the Final EIS, EPA may refer the matter to the Council on Environmental Quality for further investigation under the authority of Section 309 of the Clean Air Act.

Under Circular A-106, EPA reviews all Federal agency annual pollution abatement plans and budgets and provides comments to the Office of Management and Budget. In 1988, there were 758 proposed Federal pollution abatement projects that totaled nearly $1.1 billion.

PROGRAM CONTROLS

FEDERAL FACILITIES COMPLIANCE: The Office provides oversight and coordination of EPA activities designed to bring Federal facilities into compliance with pollution control requirements, and in conformance with Executive Order 12088. Federal environmental statutes require that facilities of the U.S. Government comply with Federal, State, and local pollution control requirements to the same extent as non-Federal entities. Executive Order 12088 established the Executive program for carrying out these legislative mandates. Disputes regarding compliance by Federal facilities are resolved through administrative procedures specified in the Executive Order. EPA coordinates implementation of pollution abatement programs with other Federal agencies, provides technical advice and assistance to ensure cost-effective and timely compliance, conducts reviews and inspections to ensure compliance by Federal facilities, assists agencies and the Office of Management and Budget in developing budgetary plans for controlling pollution from Federal facilities, tracks Federal agency compliance records, and resolves disputes between Federal agencies and States regarding non-compliance by Federal facilities.

ENVIRONMENTAL REVIEW: EPA has responsibility to review and comment on major Federal actions affecting the quality of the environment. Under Section 309 of the Clean Air Act, as well as under NEPA, EPA's comments are made available to the public. Major Federal actions presently include the Waste Isolation Pilot Plant for Department of Defense nuclear wastes; the Army's program for destruction of obsolete chemical munitions; Department of Interior's Outer Continental Shelf oil and gas lease sales; the U.S. Forest Service's forest management plans; the Corps of Engineers public works projects; navigation projects; flood control projects; Section 404 dredge and fill permits; highway and airport

projects; and the Bureau of Reclamation's water contracts, dams, or operating plans.

NEPA COMPLIANCE: Procedual compliance with the National Environmental Policy Act is required for municipal wastewater treatment construction grants, EPA-issued NPDES permits for discharges subject to new source performance standards, research and development projects and EPA facility construction. Voluntary development of an environmental impact statement pursuant to EPA policy applies to radiation and portions of the clean air program, ocean dumping regulations and ocean dump site specifications. The remainder of EPA's programs are deemed to provide reviews that are "functionally equivalent" to NEPA reviews. EPA's NEPA compliance involves the preparation of an environmental assessment, a finding of no significant impact, or the preparation of an environmental impact statement, as well as overview of State programs under delegation of the construction grants program and under the State Revolving Fund.

INDIAN ACTIVITIES: EPA's programs are designed to ensure adequate protection of human health and the environment on Indian reservations. The policy involved is to ensure that EPA works with Tribes on a government-to-government basis and that Indian tribal governments have a role in the environmental programs on the reservation, ranging from a participatory role in program implementation to full program delegation where this is appropriate.

CROSS-CUTTING ENVIRONMENTAL STATUTES: EPA is responsible for complying with a number of environmental statutes and Executive Orders where the agency does not have primary responsibility for their implementation, but where agency action may come within their purview. Examples of such statutes and Executive Orders are the National Historic Preservation Act, Historic Sites Act, Endangered Species Act, Wild and Scenic Rivers Act, Farmlands Protection Policy Act, Fish and Wildlife Coordination Act, Coastal Zone Management Act, Coastal Barrier Resources Act, the Executive Order on Floodplains, and the Executive Order on Wetlands. Interagency agreements are developed to detail procedures for compliance with the requirements and to enable State agencies directly to assure project compliance with these statutes for the State Revolving Fund program.

REGULATORY CONTROLS

40 CFR Part 6 regulations provide EPA procedures for compliance with NEPA. Revised NEPA-implementing regulations for Research and Development Projects are in the development stage.

QUALITY ASSURANCE

DATA SYSTEMS: Although environmental data are not collected, the Office operates two data systems. The Environmental Review Tracking System (ERTS) is operated in coordination with the Council on Environmental Qaulity. The system maintains information on environmental impact statements, date of draft publication, date of comment closure period, and date of final publication. The system also maintains information on Section 309 EPA reviews and comments. ERTS has the capability to provide information on any of 14,000 environmental impact statements that have been filed since 1970.

The Federal Facilities Information System (FFIS) tracks needs information for Federal facilities for budget purposes. The system provides information on the environmental pollution control facilities needed by various Federal agencies. EPA reviews all Federal budgets for expenditures for Federal facilities pollution control needs and provides comments on these reviews to the Office of Management and Budget.

SPECIAL STUDIES

Investigations and studies are undertaken where there is disagreement among States over the environmental impacts of Federal actions or where additional information is needed for NEPA compliance. Special studies of the Office of Federal Activities are limited to environmental impact statement type actions. Examples of such studies include a study of the environmental effects of EPA's new source performance standards based on effluent guidelines for Alaska's placer mining industry, studies related to Federal projects on Indian reservations, and a study of the Illinois River and the placement of a Federally-funded sewage treatment plant. These studies generally are of a localized, short-term nature. Quality assurance is applied to the contractor-operated studies.

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PESTICIDES

SUMMARY

Chemicals formulated to kill a multitude of plant and animal pests can cause serious human health and environmental damage when used improperly or against other than a target species. EPA regulates the sale and use of pesticides through registration and labeling. It is unlawful for anyone to use a pesticide in violation of label instructions. Further, for the protection of human health, EPA sets maximum legal limits for pesticide residues on foods sold in the United States.

EPA regulates a pesticide in a manner such as to preclude unreasonable risk from its use to human health or the environment. The process requires a balancing of risk against the benefits to be derived by pesticide use. Pesticides are registered on the basis of their active ingredients. Recent amendments to the Federal Insecticide, Fungicide and Rodenticide Act require EPA to reregister all existing pesticides in the context of current standards and testing by 1991. If a registered pesticide shows evidence of unreasonable adverse effects, EPA can conduct a Special Review. The results of that Special Review can lead to cancellation, suspension, restriction of pesticide use to certified applicators, requiring protective clothing, prohibiting certain application methods or use in certain areas, or continued registration with no change.

Product enviornmental and health effects data for registration requirements include the use of Good Laboratory Practice standards, as well as EPA chemical fate testing guidelines, environmental effects testing guidelines, and health effects testing procedures. Good Laboratory Practices compliance audits are conducted by EPA's Office of Compliance monitoring. Quality assurance audits and protocols apply to pesticide registrants and laboratories analyzing pesticide samples for registration.

ENVIRONMENTAL CONCERNS AND USES

By definition, pesticides are toxic chemicals. They are designed to kill specific pests including terrestial and aquatic plants, insects, fungi, bacteria, nuisance snails, clams, barnacles, and selected fish. Some pesticides have been found to cause cancer, birth defects, skin, eye, and other adverse health effects in human beings.

EPA regulates the sale and use of pesticides in the United States under the authority and direction of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) and the Federal Food, Drug, and Cosmetic Act (FFDCA). Under FIFRA, all pesticides must be registered with EPA before they may be sold or distributed in commerce. There is an overall risk-benefit standard for pesticide registration, requiring that pesticides perform their intended function, when used according to labeling directions, without posing unreasonable risks of adverse effects on human health or the environment. In making pesticide registration and labeling decisions, EPA is required to take into account the economic, social, and environmental costs and benefits of pesticide uses. Under FFDCA, EPA sets tolerances, or maximum legal limits, for pesticide residues on food and feed commodities marketed in the U.S. The purpose of the tolerance is to ensure that consumers are not exposed to unsafe food-pesticide residue levels.

In addition to the use of pesticides in agriculture and silviculture, they also are used as slimicides, as antifouling paints on ships and boats, in hospitals, in greenhouses, and for a variety of home and garden applications. Pesticide use in the United States more than doubled in 21 years; it increased from 540 million pounds of active ingredients in 1964 to over one billion pounds in 1985. Agriculture accounted for 77 percent of the uses in 1985, which cost the farming industry $4.6 billion. Pesticides are used on as many as two million farms, in 75 million households, and by 40,000 commercial pest control firms. Thirty major and 100 minor companies produce active pesticide ingredients, 3,000 companies formulate pesticides, and there are 29,000 distributors.

The regulation of pesticides requires a balancing of risks and benefits, including a balancing of human health and environmental protection with agricultural and other pest control needs. For the 50,000 pesticide products registered on the basis of their active ingredients, EPA can (1) continue registration with no changes where risks and benefits already are in balance; (2) modify the terms and conditions of the registration to lower the risk by requiring protective clothing for application including gloves, hats, respirators, outer clothing; restricting use to persons who have been certified by a State as qualified; prohibiting certain formulation uses; prohibiting certain application methods; and other constraints; (3) cancel the use of a pesticide; or (4) suspend use of a pesticide on a regular or emergency basis.

PROGRAM CONTROLS

REGISTRATION OF NEW PESTICIDES: Pesticide registration is a pre-market review and licensing program for all pesticides marketed in the U.S. EPA annually reviews about 15,000 registration submissions of various kinds. Only about 15 new active ingredients chemicals are registered each year. The agency bases registration decisions for new pesticides on its evaluation of test data provided by applicants. Required studies include testing to show whether a pesticide has the potential to cause adverse effects in humans, fish, wildlife, and endangered species. Data on environmental fate and effects also are required so that EPA can determine whether a pesticide poses a threat to ground or surface water. EPA reviews, evaluates, and validates data submitted on toxicological and adverse effects on humans and domestic animals and on effects on fish and wildlife, as well as ultimate fate. Human and non-human risk assessments are made. Economic analyses on the impacts of regulatory options are developed. Registration standards are issued for new active ingredients. Registration standards include a comprehensive review of all available data on a chemical, a list of additional data needed for full registration, and the agency's current regulatory position on the pesticide. For a new active ingredient that has not been marketed before, it may take six to nine years and $2 million to $4 million to comply with all registration data requirements. EPA may issue experimental use permits or temporarily authorize State or Federal

agencies to combat emergencies with pesticide uses not permitted by existing Federal registrations.

REREGISTRATION OF EXISTING PESTICIDES: The Federal Insecticide, Fungicide and Rodenticide Act, as amended in 1988, now requires the reregistration of all existing pesticides within an approximate nine year time. For reregistration, a pesticide must meet the same no-unreasonable-adverse-effects criteria that apply to new pesticides. Through its Registration Standards program, EPA is reexamining, by current scientific standards, the health and environmental safety of the approximately 600 active ingredients contained in 45,000 currently registered products.

SPECIAL REVIEW: If a registered pesticide shows evidence of posing a potential safety problem, EPA can conduct a Special Review of risks and benefits in which all interested parties and the general public may participate. A notice initiating a Special Review can lead to cancellation, suspension proceedings, or to restricting pesticide use to certified applicators, requiring protective clothing, and prohibiting certain application methods or use in certain areas.

TOLERANCE LEVELS FOR PESTICIDE RESIDUES: EPA sets tolerances or maximum legal limits for pesticide residues on food commodities marketed in the United States. Before a pesticide can be registered for use on a food or feed crop, EPA must either establish a tolerance designed to ensure that consumers are not exposed to unsafe food-pesticide residue levels, or grant an exemption from the tolerance requirement. The Food and Drug Administration and the Department of Agriculture are responsible for enforcing pesticide tolerances and for taking any necessary regulatory action.

APPLICATOR CERTIFICATION AND TRAINING: Most States have primacy for the enforcement of pesticide regulations and for certifying pesticide applicators. EPA establishes policy and maintains national oversight for the applicator programs.

FARM WORKERS PROTECTION: Because it is unlawful to apply a pesticide in violation of label directions, EPA's authority is through label issuance. EPA is issuing label statements to protect farm workers by requiring protective clothing, washwater and shower availability, and defining reentry days for work in a field following spraying.

PESTICIDES STORAGE, TRANSPORTATION, AND DISPOSAL: EPA is authorized to establish labeling requirements for transportation, storage, and disposal of pesticides and pesticide containers, including rinsates used to clean a pesticide container, or other materials used to contain or collect excess or spilled pesticides. EPA is directed by the 1988 FIFRA amendments to regulate the design of pesticide containers to facilitate their safe use, disposal, refill, and reuse.

GROUND WATER PROTECTION: For pesticides not yet on the market, EPA is using sophisticated environmental chemistry and mathematical models to predict whether a pesticide has the potential to reach ground water. All prospective registrants of outdoor usage pesticides must submit a range of test data to enable prediction of pesticide fate. Efforts are being made to bring all previously registered pesticides up to current ground water safety standards.

ENDANGERED SPECIES: As an emerging program, efforts are underway to identify through range maps the potential location of endangered or threatened species. When this is accomplished, action is taken for a label amendment to restrict use of certain pesticides within the endangered species range area.

REGULATORY CONTROLS

Regulations are the vehicles for implementing the programs described above. Regulations provide requirements for registration of a product to be used for pest control, or for reregistration of existing pesticides. Registration standards for active ingredients are provided through the regulatory process. Special review procedures are implemented through

notice and regulation, as are cancellation and suspension actions. Tolerances for pesticide residues on raw agricultural commodities are established through regulatory procedures.

Regulations provide chemical fate testing guidelines, environmental effects testing guidelines, and health effects testing procedures, including the use of quality assurance and Good Laboratory Practices Standards. Regulations govern the requirements for States to be delegated primacy in the enforcement of pesticide regulations and the certification and training requirements of pesticide applicators.

QUALITY ASSURANCE

Quality assurance for pesticide registration is regulated through Good Laboratory Practices, which EPA's Office of Compliance Monitoring enforces. Other aspects, such as test protocols and data acceptability, are provided in test guidelines and data acceptance criteria, which are required by the 1988 FIFRA amendments. EPA's QA program is applied to data collected or funded directly by the pesticide program and includes the requirement for quality assurance project plans for cooperative agreements and special projects.

LABORATORIES: EPA operates two pesticide laboratories, one in Beltsville, MD, and one in Bay St. Louis, MS. The Beltsville, MD, laboratory validates analytical methods submitted by industry to enforce tolerances and ingredient statements, collaborates on analytical methods development with other national laboratories, distributes technical reference standards, and performs special analytical measurements. The laboratory has its own quality assurance program. The laboratory's quality assurance coordinator chaired committees in development of the second laboratory validation programs and a split sample program, and developed the standard Evaluation Procedures for Petition Method Validation.

The Bay St. Louis laboratory supported the National Survey for Pesticides in Drinking Water Wells, validated an ASTM Organotin Release Rate Method,

prepares performance evaluation samples (e.g., for dioxins and furans in pulp, sludge, and water), and operates under its own quality assurance program. Each laboratory has a quality assurance coordinator and an alternate quality assurance coordinator.

QUALITY ASSURANCE PLANS: The Office of Pesticides Programs operates under a QA Management Plan and a QA Facilities Plan. Audits are performed periodically to ensure that the plans are consistent with operations. All cooperative agreements must contain approved quality assurance project plans prior to funding. EPA's two pesticide laboratories use a QA Project Plan Short Form, except for projects of more than 100 samples where a quality assurance project plan is developed. Standard operating procedures have been developed for routine operations.

Because pesticide registration programs rely on data submitted by those who wish to have a pesticide product registered, EPA's principal role is one of data validation, audits, and information confirmations.

AUDITS: Each organization funded undergoes at least one audit each year. Laboratories involved in pesticide sample examinations are audited via a protocol and questionnaire. Technical audits, systems audits, and data audits are performed concurrently with an examination of the organization's management of QA and its adherence to QA Project Plans. The laboratories are scored so that improvement can be judged readily. Laboratory audits follow the good laboratory practice regulations. Before audit reports become final, an auditor obtains a commitment from the facility to implement specific corrective actions in response to problems observed by the auditor. The commitments are detailed in the final audit report. Laboratories, contractors, and subcontractors for the National Pesticide Survey of Drinking Water Wells are audited every six months.

Performance evaluation pesticide ingredient containing samples are formulated in the Bay St. Louis laboratory and sent to cooperative agreement laboratories.

DATA SYSTEMS: A National Pesticide Information Retrieval System (NPIRS) contains information on products, active ingredients in pesticide products, and commodities treated such as tobacco or peas, and pests. Information can be retrieved through any of the above information routes. An effort is underway to develop a data system that will track all current pesticide programs.

The Pesticide Information Network (PIN) is a collection of up-to-date pesticide information files on a personal computer accessible by data-phone. PIN contains the Pesticide Monitoring Inventory, which is a compilation of pesticide monitoring projects performed by Federal, State and local governments and private institutions; the Restricted Use Products File, which is a listing of all pesticide products that have been classified as Restricted Use Pesticides; and the Chemical Index, which is a list of all chemicals in the above two files with cross references to synonyms and CAS numbers.

SPECIAL STUDIES

The pesticide program, especially at the Bay St. Louis laboratory, is heavily involved in the national study on pesticides in drinking water, which was discussed in the Drinking Water chapter.

EPA is investigating the nature and extent of the pesticide container problem as it may relate to size restrictions, pouring hazards when transferring a concentrated pesticide to a solution, residues in empty containers, and household and agricultural uses. More information is being sought on household use patterns, which will impact exposure and risk assessments, as well as the economics of regulatory actions.

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TOXIC SUBSTANCES

SUMMARY

EPA has been given broad powers by Congress to regulate chemical substances that may present an unreasonable risk of injury to health or the environment. More than 60,000 chemical substances are manufactured or processed for commercial use and nearly 2,000 new chemical substances are introduced each year. EPA regulates these substances through review and action on premanufacture notification for new chemical substances, as well as by requiring testing and reporting of unpublished health and safety data for existing chemical substances. Regulatory action may take the form of label modifications such as the introduction or warnings; limits on manufacture, import, processing, distribution, use or disposal; recall of a substance; or total ban.

Quality assurance is provided in good laboratory practice standards promulgated to control data submitted to the agency, and through a Guidance Document for the Preparation of Quality Assurance Project Plans. All risk assessment and other reports are subjected to stringent peer review, which may include scientists within EPA, scientists and academic experts external to EPA, the Agency's Science Advisory Board, and the National Academy of Sciences. A number of data systems are associated with the program, which track both confidential and non-confidential information regarding the universe of chemicals in commerce.

ENVIRONMENTAL CONCERNS AND SOURCES

The production of chemicals and allied products accounts for roughly 5 percent of the U.S. Gross National Product, and the industry employs over one million people. More than 60,000 chemical substances are presently manufactured or processed for commercial use in the United States, and about 2,000 more are introduced every year. Many of these chemicals pose toxic hazards to both humans and the environment.

In 1971, the President's Council on Environmental Quality developed a legislative proposal for coping with the increasing problems of toxic chemical substances. After five years of public hearings and debate, Congress enacted the Toxic Substances Control Act (TSCA) in the fall of 1976. The Congress defined the coverage of the Act as the manufacture, distribution, processing, use, or disposal of a chemical substance or mixture that may present an unreasonable risk of injury to health or the environment. With the specific exceptions of tobacco, nuclear material, firearms and ammunition, food additives, drugs and cosmetics, Congress gave EPA broad powers to regulate a chemical risk at any stage of that chemical's life cycle.

Programs have been implemented to evaluate chemicals prior to their appearance on the market through premanufacture notification for new chemical substances and significant new uses of existing chemical substances, evaluation of existing chemicals by requiring testing and reporting of unpublished health and safety data, and control of unreasonable risks of existing chemicals by regulatory action. Regulatory action can include label modification; limits on manufacture, import, processing, distribution, use or disposal; recall of a substance; or total ban. Asbestos, formaldehyde, methylene chloride, and polychlorinated biphenyls are among the more toxic chemicals regulated.

PROGRAM CONTROLS

The Toxic Substances Control Act cuts across all environmental media. EPA must decide whether or not it is most effective to regulate a substance under this Act or under other laws such as those associated with surface water, air, drinking water, pesticides, marine protection,

hazardous wastes or Superfund. EPA activities must be coordinated with other Federal programs involved in toxic chemical control such as the Consumer Product Safety Commission, the Food and Drug Administration, the Department of Agriculture, the Occupational Safety and Health Administration, the Department of Transportation, the Department of Health and Human Services, and others.

Programs for toxic substances control mostly are divided between those directed at new chemical substances and existing chemical substances.

NEW CHEMICAL SUBSTANCES: Manufacturers are required to provide EPA with a premanufacture notification 90 days prior to manufacture or import of a new chemical substance, or the creation of a significant new use for an existing chemical substance. Any chemical which is not listed on the inventory of existing chemicals published by the agency is considered to be "new" for this purpose. The premanufacture notification must include the identity of the chemical; its molecular structure; proposed categories of use; estimate of amounts to be manufactured, imported or processed; byproducts resulting from the manufacture, processing, use and disposal of the chemical; exposure estimates, and test data related to human health and environmental effects. In addition, if a rule requiring testing of the chemical or its chemical class already has been issued, the notice must include the test data developed from that testing.

Chemicals produced in small quantitites solely for experimental or research and development purposes are automatically exempt from the premanufacture and significant new use notification requirements. In addition, exemption may be made for chemicals used solely for test marketing purposes or those determined by EPA not to present an unreasonable risk of injury to human health or the environment.

If EPA determines that insufficient information is in a notification to evaluate potential risks, it may extend the 90 day review period for 90 more days and order that the manufacture or importation of the chemical be limited or prohibited until adequate data are developed. Most of new chemical substances reviewed are determined by EPA not to present an unreasonable risk of injury to health or the environment. In such event,

a Notice of Commencement of Manufacture after the review, when actual manufacturing begins, must be submitted by the manufacturer to EPA and the new substance then is added to the Chemical Substances Inventory.

EXISTING CHEMICAL SUBSTANCES: The goal of this program is to reduce unreasonable risk to health or the environment from chemicals already in commerce. To attain the goal, EPA identifies potential risks to health or the environment from those chemicals, evaluates the risks, and addresses risks with regulatory action when appropriate. EPA may require testing by manufacturers and processors when there are insufficient data available with which to perform a reasonable risk assessment; when a chemical may present an unreasonable risk to health or the environment; and when a chemical is produced in substantial quantities resulting in significant human exposure or environmental release.

BIOTECHNOLOGY: EPA is responsible for regulating microorganisms used as pesticides, or for general industrial or environmental purposes. Special consideration is given to microorganisms that contain new combinations of traits or that are new to the environment in which they are to be used, microorganisms that are pathogens or that contain genetic material from pathogens, and microorganisms that are deliberately released. As with all toxic substances, EPA must be notified by manufacturers, processors, or distributors if they become aware of new information that suggests that microorganisms or any chemical substance present a substantial risk of injury to human health or the environment.

POLYCHLORINATED BIPHENYLS: Congress singled out PCBs for both immediate regulation and phased withdrawal from the market. PCBs are of concern because tests on laboratory animals show that long-term exposure to PCBs may cause reproductive failures, gastric disorders, skin lesions, and tumors. PCBs are persistent and tend to accumulate in tissues of living organisms. Standards for the cleanup of spilled PCBs have been published, as have other regulations involving their manufacture, use and disposal. Efforts continue for a phase-out leading to total prohibition.

ASBESTOS: An agressive asbestos reduction program is underway. EPA has issued a rule to protect State and local government employees from the

potential hazards of asbestos abatement work. In addition, all schools must have asbestos removed. The manufacture, import, and processing of certain asbestos products have been banned. Labeling of non-banned asbestos products has been proposed. Asbestos abatement training courses have been sponsored by EPA and certification requirements have been developed by EPA, states and some cities for personnel involved in the surveying and removal of asbestos.

REGULATORY CONTROLS

SIGNIFICANT NEW USE RULES: Any person who intends to manufacture or import a substance for a specifically designated significant new use is required to submit a notification for EPA review, as described above under Program Controls.

PREMANUFACTURE NOTIFICATION: This rule, which carries out the Program Control on that subject described above, details the required information on worker exposure and release to the environment; and data concerning the health and environmental effects, confidentiality and public access information, compliance and inspections; as well as the required information on proposed uses, amounts to be manufactured, byproducts and planned commencement of manufacture or import.

HEALTH AND SAFETY DATA REPORTING: This regulation provides requirements for submission of health and safety studies on chemical substances and mixtures selected for priority consideration for testing.

TEST RULES AND CONSENT AGREEMENTS: A test rule specifies the chemical to be tested, health and environmental effects for which testing is required, test standards, schedules for submission of data, and who is responsible for conducting the testing. To require testing, EPA must find that a chemical may present an unreasonable risk, that there are insufficient data available with which to reasonably determine or predict the effects of the chemical, and that testing is necessary to generate such data. A test rule may also be based on a finding of substantial production and exposure to humans and the environment. Procedures are included for using enforceable consent agreements to require testing.

This allows EPA to negotiate with manufacturers, processors, and other interested parties to establish testing programs that satisfy EPA testing needs.

LABORATORY PRACTICES AND TESTING GUIDELINES: Good laboratory practice standards, chemical fate testing guidelines, environmental effects testing guidelines, and health effects testing guidelines with quality assurance and standard operating procedures provisions have been promulgated. These good laboratory practices and other guidelines are applicable to data submitted under any test rule.

QUALITY ASSURANCE

OTS GUIDANCE DOCUMENT: The Office of Toxic Substances Guidance Document for the Preparation of Quality Assurance Project Plans is tailored to the needs of toxic substance investigations. It provides specific and additional requirements, in addition to the minimum standards for quality assurance provided in the good laboratory practices and associated testing guidelines.

PROGRAM MANAGEMENT: Toxic substances programs are examined pursuant to the Federal Managers Federal Integrity Act to ensure good program quality. Reports receive a quality check on their technical merits through both an internal and external peer review. For example, the risk assessment report on formaldehyde was reviewed by the EPA Science Advisory Board after it received external peer review. In another example, the National Academy of Sciences is reviewing procedures in the National Human Adipose Tissue Survey.

DATA SYSTEMS: A number of data systems are associated with toxic substances; some contain confidential business information and others are more generally accessible. The Chemicals in Commerce Information System (CICIS) contains inventory information on the more than 60,000 chemical products in the United States. The Chemical Update System (CUS), which contains non-confidential business information, has about 12,000 of the 60,000 chemical products, as well as inventory information about them. There is a confidential tracking system for premanufacture notices, and

there is a document tracking system with some portions held as confidential. The Chemicals on Reporting Rules (CORR) system is a list of chemical substances, categories, and mixtures that are or have been the subject of proposed or final regulations. The Toxic Release Inventory System (TRIS) is a more recent system arising from the requirement that industries report the quantities of toxic substances environmentally released.

Data are entered into data systems by contractors. A recent internal check of 1,000 forms compared with data entry on TRIS revealed less than 2 percent data entry errors. In addition, 15,000 data entries were sent to reporting industries and, in the returns received, there were less than 2 percent data entry errors.

SPECIAL STUDIES

NATIONAL HUMAN ADIPOSE TISSUE SURVEY: NHATS is a long-term study where human tissues are sent by coroners and others to a central collection agency. Such tissues later are analyzed for volatile and semi-volatile organic compounds, PCBs, dioxins, furans, and some elemental metals to track the national body burden of toxic substances.

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SOLID AND HAZARDOUS WASTES

SUMMARY

EPA estimates that about 3.6 pounds of municipal solid waste were generated per person per day in 1986. With these wastes straining the Nation's landfills, EPA's goal is a 25 percent reduction by 1992. This is to be accomplished through source reduction, including reuse of products, recycling of materials and composting, with special emphasis on yard wastes. Incinerators are projected to handle about 20 percent of the waste stream, and the remaining 55 percent is projected for landfills. This is a reemerging program because, until recently, EPA's solid and hazardous resources have been directed towards placing the hazardous waste cradle-to-grave regulatory system in place.

With 60,000 large quantity hazardous waste generators, 140,000 small quantity generators, 12,500 transporters and 5,700 facilities that treat, store or dispose of a hazardous waste, the management program is formidable. Since 1980, regulations have been promulgated to identify and define hazardous wastes, as well as to provide a paper trail and best management practices for those who generate, store, transport, treat, or dispose of hazardous waste. Permits are required for those who treat, store or dispose of the waste. Waste testing, ground water monitoring, labeling, and reporting are requirements of various activities within the program.

Hazardous waste disposal on land is prohibited by the 1984 amendments except for such methods as EPA may determine will be protective of human health and the environment for as long as the waste remains hazardous. One million underground storage tanks containing hazardous substances or petroleum products, have recently been brought into the program. Designed by the Congress as a State program with EPA oversight, most States have been authorized for basic program implementation. However, the 1984 Hazardous and Solid Waste Amendments substantially increased Federal accountability, and only a few States, thus far, have been delegated program implementation for this enlarged and modified program.

A new program information management system, RCRIS, for use by States and EPA, is to be implemented in every State by 1992.

ENVIRONMENTAL CONCERNS AND SOURCES

This chapter covers the solid waste and hazardous wastes programs as mandated by the Resource Conservation and Recovery Act and amended and expanded by the 1984 Hazardous and Solid Waste Amendments. There is a considerable overlap between the two in the case of solid hazardous wastes.

In the past 25 years, municipal solid waste has risen from 87 million tons per year to nearly 158 million tons per year. Paper and paperboard make up 41 percent of this waste; yard wastes, 18 percent; metals, 8.7 percent; rubber, leather, textiles, and wood, 8.1 percent; glass, 8.2 percent; food wastes, 7.9 percent; plastics, 6.5 percent; and miscellaneous inorganic wastes, 1.6 percent. Sources of these wastes include residences, institutions, commercial businesses, municipalities, and industry. EPA estimates that about 3.6 pounds of municipal solid waste were generated per person per day in 1986. At present, about 11 percent of all US solid waste is recycled, but the full recyclable potential may be as high as 50 percent.

Solid wastes are defined in the 1984 Amendments to include both hazardous and non-hazardous wastes. A hazardous waste is a particular solid waste (so defined) that is listed as hazardous in the regulations, or it is a solid waste that exhibits hazardous characteristics. There are four characteristics that define hazardous wastes: 1) Ignitable wastes such as solvents and friction-sensitive substances can flash and create fires under certain conditions. 2) Corrosive wastes include those that are acidic and those that can corrode metals. 3) Reactive wastes are unstable normally, and can create intense heat, explosions or toxic fumes when mixed with water. 4) Toxic wastes are those that have the potential to pollute ground water. They are identified by failing laboratory-conducted solubility and analytical tests. There are specific laboratory tests for each of the hazardous characteristics.

Waste generators include chemical manufacturers, vehicle maintenance shops, the printing industry, leather products manufacturing, the paper industry, construction industry, cleaning agents and cosmetics manufacturing, furniture and wood manufacturing and refinishing, metal manufacturing, and others. It is estimated that 527 million tons of hazardous waste are generated annually. There are 200,000 generators of hazardous waste; about 60,000 of these are large quantity generators and the remainder are small quantity generators. A large quantity generator produces more than 2,200 pounds of hazardous waste per month. A small quantity generator produces between 220 pounds and 2,200 pounds of hazardous waste per month. There are 12,500 firms that transport hazardous waste from one place to another, and there are 5,700 facilities that treat, store, or dispose of hazardous waste. Source reduction, recycling, incineration, and land disposal are the four principal waste management means.

PROGRAM CONTROLS

INTEGRATED WASTE MANAGEMENT: For non-hazardous wastes, EPA's present goal, established in 1988, is a 25 percent reduction in solid waste by 1992. This is to be achieved through source reduction, including reuse of products, recycling of materials, and composting, with special emphasis on yard wastes. On-line and already permitted combustion units are projected to handle about 20 percent of the total waste stream and the remaining 55 percent is projected for disposal in landfills. EPA intends to reach these goals through increasing its available information in the form and guidance and materials on the technical aspects of source reduction, combustion, recycling, landfilling, composting, and collection; and through encouraging State and Indian Tribe strategies and planning for managing municipal solid wastes. EPA already has initiated a number of these programs, including guidance on operator training and certification on combustion and landfill activities, on improving source reduction, and recycling. For the latter, yard wastes and paper products have been given high priority, because these products contribute significantly to the filling of landfills.

LAND DISPOSAL: The 1984 Hazardous and Solid Waste Amendments require EPA to evaluate all hazardous wastes according to a strict schedule to determine whether land disposal of these wastes is protective of human health and the environment. Certain toxic materials above specified concentrations are banned from land disposal, as are certain solvents and dioxins. Deep well injection is to be minimized. Bulk or non-containerized liquid hazardous wastes, including free liquids, are prohibited from disposal in landfills. Land disposal, either by land treatment or landfill, of other materials can be permitted if the waste meets specified standards. This action was taken by Congress because of long-term uncertainties about the persistence, toxicity, mobility and accumulation in plants, animals and human tissues of land-disposed hazardous wastes.

UNDERGROUND STORAGE TANKS: One million underground storage tanks containing hazardous substances or petroleum products, including gasoline and crude oil, are now subject to hazardous waste regulations. The installation of corrodable tanks is banned. Standards have been developed covering leak prevention, leak detection, and corrective actions.

PERMITTING: The treatment, storage, and disposal facilities that receive hazardous waste from a transporter are subject to an EPA permitting system that ensures their safe design, construction and operation. The 1984 amendments provide several new restrictions for land disposal facilities, which include: banning underground injection of hazardous wastes within 1/4-mile of a drinking water well; requiring more stringent structural and design conditions for landfills; requiring cleanup or corrective action if hazardous waste leaks occur from a facility; requiring information from disposal facilities on pathways of potential human exposure to hazardous substances; and requiring location standards that are protective of human health and the environment. Up to 4,000 facilities may require corrective action to meet these standards.

STATE PROGRAMS: EPA implements the hazardous waste requirements until a State is authorized to assume that responsibility. Forty-five States have been authorized for basic program implementation. The 1984

Amendments increased Federal accountability for the program, and only a few States have been authorized to implement the new, expanded program.

REGULATORY CONTROLS

Regulations have been promulgated for the management of both the solid waste and hazardous waste programs. The former begin at 40 CFR 240; the latter begin at 40 CFR 260. Solid waste management regulations provide guidelines for land disposal of solid wastes; solid waste storage and collection; resource recovery facilities; criteria for classification of solid waste disposal facilities and practices; and guidelines for development and implementation of State solid waste management plans.

Complex hazardous waste regulations are separated into identification and listing of hazardous wastes; standards for owners and operators of hazardous waste treatment, storage, and disposal facilities; and requirements for authorization of State hazardous waste programs. A rule to implement corrective actions is expected to be promulgated soon.

QUALITY ASSURANCE

DATA SYSTEMS: Developed cooperatively by EPA and the States, RCRIS, the Resource Conservation and Recovery Information System, is to be implemented in every Region and State by the end of 1992. RCRIS is replacing the Hazardous Waste Data Management System (HWDMS), and the data stored in HWDMS will be archived by the end of 1991. RCRIS is an information management system. States and Regions will use it to collect, enter, track, and report day-to-day hazardous waste handler, permitting, inspection, and enforcement information. It will be used, also, to track and report budgeting and program management information. Six major modules will be designed to report information on hazardous waste handlers; permitting, closure, and post-closures; compliance monitoring and enforcement; corrective actions; program management; and facility management planning. States and EPA will enter data to the system. Edit-checks of data entry will be made by computer. The system will not contain environmental quality data.

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SUPERFUND AND EMERGENCY RESPONSE

SUMMARY

The Superfund program was established to provide a mechanism for cleaning up abandoned or uncontrolled hazardous waste sites in order to protect human health and the environment. The National Priorities List is a listing of hazardous waste sites with EPA priority for long-term remedial response. EPA has now identified 1,200 sites as proposed or final for this list. Once remedial action has begun, it may take four to five years at some sites and up to 50 years at others to remediate the site to the required clean-up levels, particularly where there is extensive ground water contamination. Only those sites included on the National Priorities List are considered eligible for Fund-financed remedial action. EPA has an additional list of 31,000 sites that have been provided to it by the States for possible inclusion on the National Priorities List.

Procedures for Superfund site cleanup are detailed in the National Contingency Plan (NCP) at 40 CFR 300. The steps taken in cleanup are discussed in the NCP. They include discovery or notification of a hazardous waste release or potential problem, and an investigation to determine if response action is warranted, must occur immediately, or if long-term cleanup is required. In the latter case, the site may be placed on the National Priorities List. A remedial investigation/feasibility study is undertaken to characterize the nature and extent of contamination and the risk posed by the site, as well as to analyze potential remedial alternatives. The selection of a remedy for the site is documented in the Record of Decision (ROD). A remedy may involve several process technologies depending on the media affected and other considerations. Remedial design and action follow. Remedial design involves the preparation of detailed engineering plans and specifications for the selected remedy. Remedial action or site cleanup may involve treatment, disposal, and containment of the hazardous waste and cleanup, restoration, or replacement of the affected resources. EPA works closely with the States throughout the above activities.

EPA's Emergency Response Program is designed to react quickly to the spillage of oil or hazardous substances. The National Contingency Plan describes a scenario for this response, in which EPA works closely with the States and the Coast Guard to plan, implement, and evaluate the effectiveness of the cleanup operation.

Enforcement activities are a key part of the Superfund and emergency response programs. Where possible, legal or other actions are used to persuade the responsible parties to conduct the cleanup operations. When EPA does the cleanup, legal actions may then follow against identified responsible parties to recover cleanup costs.

ENVIRONMENTAL CONCERNS AND SOURCES

Superfund, The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, and its subsequent amendments, was created to address the potentially hazardous conditions at the many inactive, abandoned hazardous waste sites through the nation. The solid and hazardous waste program, discussed in another chapter, was designed to provide guidelines for prudent hazardous waste management and disposal in the present and the future, and to provide a tracking system for hazardous waste from generation to disposal. The objectives of Superfund are:

- Develop a comprehensive program to set priorities for cleaning up the existing abandoned or uncontrolled hazardous waste sites with the greatest risk to human health or environmental quality;
- Use enforcement procedures to make responsible parties pay for cleanup wherever possible;
- Operate under a Trust Fund for the purposes of performing Federal remedial cleanups in cases where responsible parties could not be identified or held accountable;
- Respond to emergency situations involving hazardous substances.

In the case of Federal payment for remedial cleanup or emergency situations, enforcement actions may be taken later to recover costs from responsible parties after they are identified.

The list of sites submitted by the States to EPA for possible inclusion on the National Priority List numbers 31,000, with an average of 2,000 new sites added to that list each year. EPA now has 1,200 sites as proposed or placed on the National Priority List and has determined that about 16,000 others are not condidates for the List. Cleanup action may take four to five years at some sites, and decades at others. In cases of extensive ground-water contamination, long-term "pump and treat" response actions are often projected to take 20 to 30 years, and, in some cases, up to 50 years. The cost of cleanup now approaches an average of $25 million for construction costs at each site. The current projected total cost of construction for all sites on the current National Priority List is $30 billion.

States have always been encouraged to participate in the Superfund process. States are formally involved in the selection, initiation, and development of remedial responses. There are a number of opportunities for States to participate, including review and comment on planning documents, involvement in long-term planning activities, and participation in negotiations.

Either EPA or the State may take the lead role in managing cleanup activities. When EPA takes the lead, the U.S. Army Corps of Engineers manages the remedial design and remedial action phases for EPA. Private contractors may complete the work at a site under Federal or State government supervision.

The National Oil and Hazardous Substances Pollution Contingency Plan is designed to provide a rapid response cleanup to a spill of oil or hazardous substances, so that major incidents may be avoided or minimized. EPA works closely with the Cosat Guard in this activity.

General activities associated with actions on a Superfund site are shown in Exhibit 1. Principal activities are discussed more fully in the next section.

SUPERFUND SITE CLEANUP

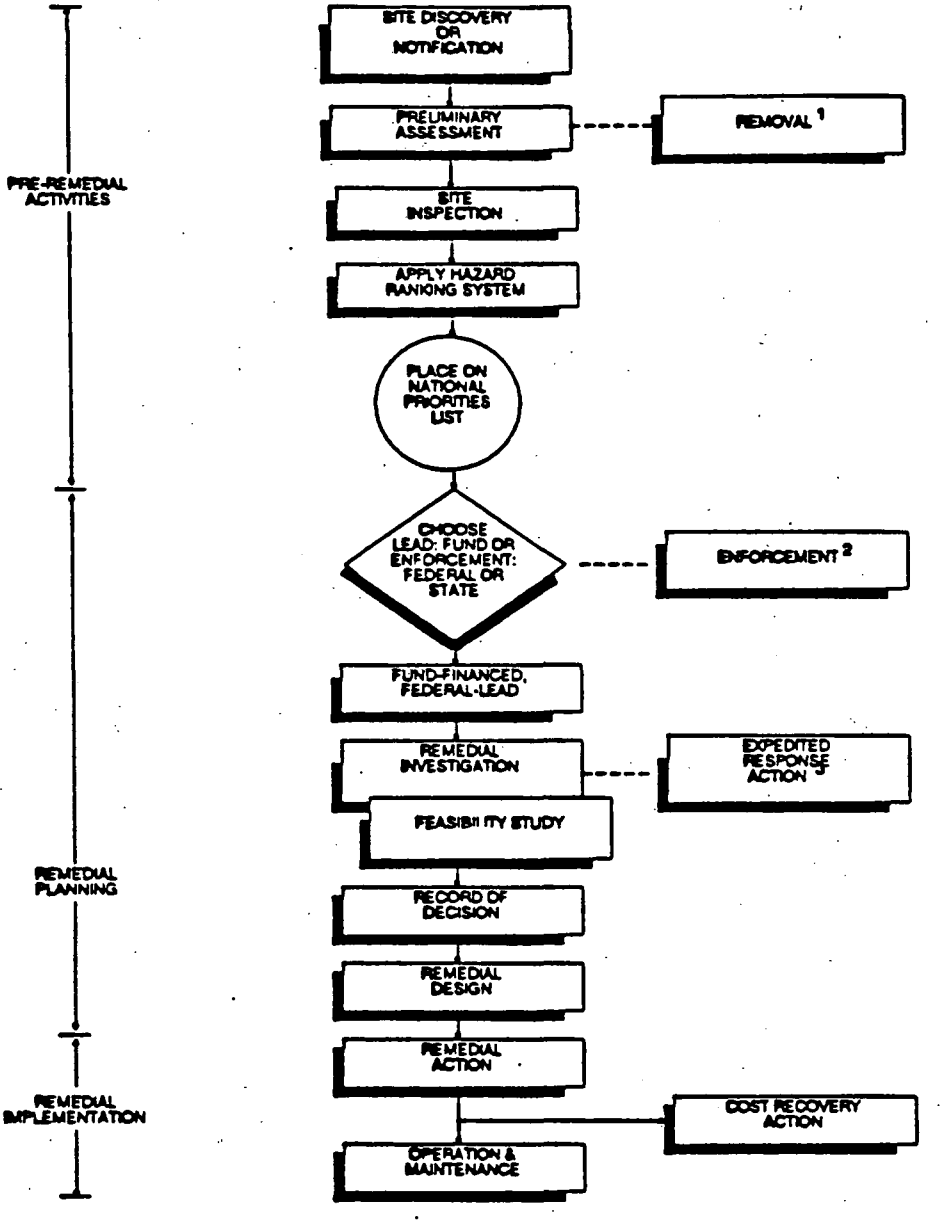
DISCOVERY: The Superfund program is intended to clean up existing hazardous waste sites. This program has a number of identifiable steps, the first of which is discovery. EPA learns of potential hazardous sites through reports submitted in regulatory compliance, investigations by government authorities, and citizen petition.

RESPONSE ACTION AUTHORIZATION: Should there be immediate risk to human health or the environment, EPA is authorized to administer response actions immediately using Fund monies. Responsible parties can undertake a response action as a result of EPA's enforcement authorities. States can act using Fund monies pursuant to a cooperative agreement with EPA, described in 40 CFR 35, Subpart O. Many States now have their own Superfund trust funds and deal with some sites on their own.

PRELIMINARY ASSESSMENT: Once EPA learns of a possible hazardous site, it collects all available background information from files, State and local records and U.S. Geological Survey maps. This information is used to identify the site and perform a preliminary assessment of its potential hazards. EPA determines, where possible, the size of the site, the identity of the parties most likely to have disposed wastes there, the types and quantities of wastes, local, hydrological and meteorological conditions, and the possible impacts of the wastes on the environment.

REMOVAL EVALUATION: Where prompt action is required because of an emergency or time-critical situation for the protection of human health or the environment, a removal site evaluation is made. If it is found that a potential exists for fire, explosion, contamination of drinking water or other hazardous release, removal action may be instituted at any time during the remediation process. Removal actions range from

Exhibit 1
FUND-FINANCED, FEDERAL-LEAD REMEDIAL RESPONSE PROCESS



[1]Removals may occur at any point in the remedial process. If the lead agency determines that there is a threat to human health or the environment, the lead agency may take a removal action to abate, minimize, stabilize, mitigate, or eliminate the release or threat of release.

[2]Where the responsible parties are known, efforts are made, to the extent practicable, to have them perform the response actions. Enforcement negotiations commonly occur just prior to the RI/FS and again just prior to the RD/RA.

[3]Expedited Response Action (ERAs) are taken at NPL sites by the remedial program using removal program authorities. ERAs must comply with the policies, procedures, and regulations of the removal program. Like removals, ERAs may occur at any point during the remedial process.

Source is Reference 6.

installing security fencing to excavating and removing wastes for appropriate disposal. EPA has conducted removal actions in response to a wide range of situations including illegal disposal and transportation-related incidents.

SITE INSPECTION: Where there is evidence that a site poses a threat to human health or the environment, inspectors collect information to rank its hazard potential. Site inspectors look for obvious signs of danger such as leaking storage drums, dead or discolored vegetation, and soil discoloration. They may take samples of soil, water or air. They analyze ways that hazardous materials from the site could be polluting enviornmental resources, and check to see if children have access to the site.

HAZARD RANKING: Each site is evaluated against a ranking system that addresses a variety of factors, including the types, quantities, and toxicity of the wastes involved, the number of people potentially exposed, the likely pathways of exposure, and the importance and vulnerability of the underlying supply of ground water. Sites which meet a threshold score on the ranking are added to the NPL.

NATIONAL PRIORITIES LIST (NPL): The NPL is EPA's list of priority releases for long-term remedial response. Only those releases included on the NPL are considered eligible for Fund-financed remedial action. The NPL identifies the sites and the potentially responsible parties. It is updated once each year based on input from the States.

ENFORCEMENT: For all Superfund sites, EPA and the States make significant efforts to identify potentially responsible parties and to compel them, through legal action, if necessary, to undertake the required cleanup activities. If this cannot be done, EPA will proceed with the cleanup, using Trust Fund resources, and will attempt to recover the costs later, or it may ask the State to take the lead in the cleanup. Thus, maintaining complete and detailed records of site activities is essential for the purposes of enforcement activities. Enforcement actions involve settlement agreements with responsible parties, administrative orders against potentially responsible parties

compelling them to take various forms of action to deal with problem hazardous waste sites, and civil actions in which EPA and the Department of Justice are involved.

REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS): The purpose of the RI/FS is to characterize the nature and extent of contamination, the likely exposure pathways at a site and the extent of risk raised by the contamination, in order to select and evaluate potential remedies. The Remedial Investigation focuses on collecting data and characterizing the site in order to assess threats or potential threats to human health and the environment posed by the site and provide data needed to support remedy selection. The Feasibility Study provides a detailed evaluation of remedial alternatives using environmental, engineering, and economic factors in accordance with statutory requirements. The RI/FS results in a recommendation of preferred remedial action. EPA documents the selection of the remedy in a Record of Decision (ROD). Remediation goals, which establish acceptable exposure levels that are protective of human health and the environment, must consider "applicable or relevant and appropriate (Federal and State environmental) requirements"(ARARs). The evaluation of potential remedial alternatives may involve bench or pilot scale treatability studies to determine if an alternative can attain the expected or needed cleanup levels.

EXPEDITED RESPONSE ACTION: When threats or potential threats to the public or the environment are determined during the remedial investigation, an expedited response action may be initiated. This is a removal action and must comply with the regulations, procedures, and policies of the removal program. It starts with an engineering evaluation and cost analysis. It may address such issues as alternative public water supplies and should address permanent solutions and alternative treatment techniques to the maximum extent practicable. An expedited response action must meet National Environmental Policy Act equivalency and must undergo a public comment period.

RECORD OF DECISION (ROD): The selection of a remedy is documented in the ROD. All facts, analyses of facts, and site-specific policy determinations considered in the course of carrying out activities in the

RI/FS are documented in the Record Of Decision for inclusion in the administrative record. The Record Of Decision describes how statutory criteria are applied to the candidate remedial alternatives in order to select a remedy. The ROD defines the performance levels, which provide a baseline for demonstrating remedy effectiveness and compliance with ARARs. The ROD also provides the basis for future EPA efforts to recover Fund monies spent on cleanup from responsible parties.

REMEDIAL DESIGN: Remedial design includes the preparation of detailed engineering plans, drawings, and specification to implement the chosen remedial alternative. It specifies the requirements necessary for construction or other remedial action activities to meet the objectives of the remedial alternative.

REMEDIAL ACTION: Site cleanup is conducted during remedial action as specified in the Remedial Design. This generally involves treatment, disposal or containment of the hazardous waste and cleanup, restoration, or replacement of the affected resources. The final step in the remedial process is operation and maintenance subsequent to the cleanup, which is designed to ensure continued functioning and effectiveness of the remedial response action. Operation and maintenance is the responsibility of the States.

OIL AND HAZARDOUS MATERIAL SPILLS: The National Oil and Hazardous Substances Pollution Contingency Plan defines four operational response phases for oil and hazardous substances removal: discovery and notification; preliminary assessment and initiation of action, containment, countermeasures, cleanup, and disposal; and documentation of cost recovery. The preliminary assessment evaluates the magnitude and severity of the discharge, assesses the feasibility of removal, determines the existence of potential responsible parties, and ensures that jurisdiction exists for undertaking additional response actions. In the clean-up phase, defensive actions should begin as soon as possible to prevent, minimize, or mitigate damage. Actions may include: analyzing water samples to determine the source and spread of the oil or hazardous material; controlling the source of discharge; measuring and sampling;

damage control or salvage operations; placement of physical barriers to deter the spread of the oil or hazardous substance or to protect endangered species; control of water discharged from upstream impoundment; use of chemical; and waterfowl conservation activities. Documentation is collected and maintained to support all actions taken under the Clean Water Act and to form the basis for cost recovery.

SARA, TITLE III

The Superfund Amendments and Reauthorization Act of 1986 (SARA), includes the Emergency Planning and Community Right-to Know Act of 1986, known as Title III. It establishes an emergency planning and notification program and a series of new reporting requirements designed to inform local communities about chemical operations. This law requires that a state emergency response commission be established for each state, which, in turn, designates emergency planning districts and local emergency planning committees. Facilities that handle extremely hazardous substances in excess of amounts established by EPA through regulation must notify the state commission of such fact and of any releases to the environment.

Other Title III requirements include sending the relevant emergency planning committee and the local fire department a list of all Material Safety Data Sheets for chemicals used by a facility, which provide chemical, health, and safety information. An inventory form must also be submitted, which includes an estimate of the average daily amounts of chemicals at the facility for those chemicals requiring Material Safety Data Sheets. Another Title III requirement is an annual report by facilities on chemical releases to the air, water, and land environments that result from normal business operations. This report goes to EPA, as well as to the emergency response commissions.

REGULATORY CONTROLS

NATIONAL OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN (NCP): The NCP is the regulation governing Superfund and Emergency Response. Revisions to 40 CFR Part 300 were promulgated on March 8, 1990 (55 Federal Register 8666). The preamble provides a full explanation of the cleanup program and the rationale for any changes. The NCP addresses both oil and hazardous wastes.

QUALITY ASSURANCE

Quality Assurance (QA) is an integral component of the Superfund program and applies to all activities affecting decisions on site listing, emergency removals, remedial siste investigations, and remedy selection, design, and construction. The planning, implementation, and review of quality assurance and quality control activities associated with program activities help to assure that the environmental data collected, analyzed, and used to make key decisions are of the type and quality necessary for each decision. The Agency has defined a comprehensive QA program to help decision-makers identify their data and quality needs, provide the needed level of oversight to assure that the needs are being met, and provide a more complete understanding of any limitations in the use of the data for their intended decisions.

DATA SYSTEMS: EPA's comprehensive data base and management system that inventories and tracks releases addressed or needing to be addressed by the Superfund program is CERCLIS, the Comprehensive Environmental Response, Compensation, and Liability Information System. CERCLIS consists of three distinct inventories: Removal Inventory, Remedial Inventory, and Enforcement Inventory. Within each of the three categories are active and inactive releases. Inactive releases are those where a determination has been made based on available information that no further action is needed. Active releases are those for which (a) a lead agency has not yet had an opportunity to evaluate response actions, (b) there has been a determination that further action is needed, or (c) there is currently ongoing response action.

The Emergency Response Notification System, ERNS, tracks response action notifications or discovery, how and when such are received, and what happened as a result.

OHMTAD, the Oil and Hazardous Materials Technical Assistance Data System, is a chemical information data base that provides human health and environmental effects data, criteria and standards, and other information related to a particular substance. These data are gleaned from the literature, and EPA reports and research.

RODS Data System for the Records of Decisions may be searched to identify the ROD text, abstract, or remedy for a site; the contaminated media or principal contaminants; and the name and location of the site addresssed by the ROD including EPA Region, State, name of site, and location ID number.

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ENFORCEMENT AND COMPLIANCE MONITORING

SUMMARY

The first goal of enforcement is to deter persons from violating the laws or regulations, which protect human health and the environment. For deterrence to occur, both a potential violator and the general public must be convinced that the penalty places a violator in a worse position than those who have complied in a timely fashion. EPA obtained civil action cash penalties of $24.4 million and over $3.6 million in criminal fines in 1987. The Clean Water Act led the list of civil judicial and administrative penalties with 66 cases and $6.9 million. the median penalty was $50,000.

All programs are designed to encourage and check compliance with environmental laws and regulations. Compliance monitoring includes not only self monitoring and reporting by the manager of a facility in order to comply with permit conditions, but also inspections by the regulatory agency. Inspections determine the compliance of a facility to environmental regulations including the general operation of a facility.

Inspections or monitoring activities may uncover permit or law violations. In such event, EPA may take one of four legal actions pursuant to the appropriate statute. Generally, the first action is an informal notice of noncompliance or a warning letter. If corrections are not forthcoming as a result, the second stage may be an administrative action under an administrative law judge. Usually, these actions result in an order to correct the deficiencies plus a penalty. The vast majority of actions that EPA takes are through this process. For more serious or recalcitrant cases, EPA can use the U.S. Court system in civil or criminal actions. In such cases, the actions are taken by the Department of Justice at the request of and with assistance by EPA. Criminal cases, which can include incarceration as one of the penalties, are least used of the potential legal actions.

CONCERNS

Compliance with Federal statutes and regulations is the foremost goal of a regulatory agency. Obtaining compliance and deterring the regulated party from future violations are the major purposes behind penalties and related enforcement actions. Deterrence fits into two categories: Specific deterrence fosters compliance and deters an individual from committing a violation or allowing it to reoccur. General deterrence is an enforcement action that deters the individual's peers, the rest of the regulated community, from violation.

Thus, the first goal of penalty assessment is to deter persons from violating the law or regulation. Successful deterrence is important because it provides the best protection for the environment and it reduces resources necessary for program administration. If a penalty is to achieve deterrence, both a potential violator and the general public must be convinced that the penalty places a violator in a worse position than those who have complied in a timely fashion. The second goal of penalty assessment is the fair and equitable treatment of the regulated community. This goal is tempered by factors such as degree of willfulness or negligence, history of noncompliance, ability to pay, degree of cooperation or noncooperation, and other unique factors specific to a violator or a case. The third goal of penalty assessment is swift resolution of environmental problems.

Penalties are associated with most EPA statutes, including the Clean Water Act, Safe Drinking Water Act, Clean Air Act, Toxic Substances Control Act, Resource Conservation and Recovery Act, The Comprehensive Environmental Response, Compensation and Liability Act, etc. Cash penalties are only one element of EPA's overall enforcement effort. EPA and States use other sanctions in addition to penalties, such as revoking permits, imposing additional compliance conditions, and publicizing enforcement actions to create deterrence. EPA has obtained over $114 million in civil penalties from its creation through 1987. In 1987, $24.4 million in civil penalties were obtained and, in addition, over $3.6 million in criminal fines and over 84 years of incarceration were imposed.

The Clean Water Act led the list of civil judicial and administrative penalties with 66 cases and 6.9 million in penalties. The median penalty was $50,000. The Stationary Source Air program was second with 62 cases and $5.6 million in penalties. The Mobile Source Air program had 353 cases with $4.8 million in penalites. The largest single penalty obtained in 1987 was $2.6 million, which was brought under the Mobile Source Air program. The total number of cases in 1987 was 1,442.

PROGRAM CONTROLS

COMPLIANCE PROGRAM: For each environmental law and regulatory program, EPA has developed a systematic program to achieve high compliance levels. Each program is different, taking advantage of the unique opportunities presented by the nature of the regulated community and the provisions of the law. One element of a compliance strategy is a compliance monitoring plan, which sets out the priorities and rationale for conducting on-site inspections and other types of compliance monitoring. Another element is an enforcement response policy, which details the appropriate level of enforcement action associated with the many ways that a regulation can be violated, and the principles and rationale for determining the seriousness of various types of violations as a factor in assessing penalty amounts.

COMPLIANCE MONITORING: A fundamental principle of EPA environmental policy is that regulated parties should keep track of their compliance status and report all or part of the resulting data to the responsible environmental agency. Thus, monitoring activity usually is conducted by the regulated entity. Monitoring may be augmented with inspection by the regulating agency. An inspection is an examination into the records-operations of a single regulated facility to determine if it is in compliance with applicable environmental requirements. Inspections may be routine, as a result of a reason to suspect that a violation exists, to support the development of a case, or, as a follow-up to determine whether a facility found to have been in violation is in compliance with an administrative order or a consent degree.

INFORMAL ADMINISTRATIVE ACTIONS: These are notices of noncompliance or warning letters, which are advisory in nature. In these actions, EPA advises the manager of a facility what violation was found, what corrective action is needed, and by what deadline the violation should be corrected. Generally, informal actions carry neither penalty nor power to compel action. The record of an informal action can be used later to support more severe actions.

FORMAL ADMINISTRATIVE ACTIONS: These are legal actions that result in an order requiring the violating facility to correct the violation and, in most cases, to pay a civil penalty that is commensurate with the seriousness and the circumstances of the violation. These administrative actions are strong enforcement tools; if a person violates the terms of an administrative order, EPA may obtain U.S. Court action to force compliance with the order. Because they are generally the most expedient means of requiring correction, administrative actions are used in lieu of civil or criminal actions whenever appropriate.

Administrative actions are taken under EPA's internal administrative litigation system, which is comparable to any court system, except that it is presided over by EPA's administrative law judges. All administrative actions have the potential to be challenged in the U.S. Court system. Therefore, conduct of these actions is governed by an extensive set of procedural rules designed to provide due process to the alleged violator and ensure the integrity of the system. Violators may appeal the initial rulings of the administrative law judge to the EPA Administrator and may appeal the Administrator's final decision to the U.S. Courts.

CIVIL JUDICIAL ACTIONS: Civil actions are taken in the U.S. Court system by the U.S. Department of Justice at the request of EPA. Typically they are used against the more serious or recalcitrant violators of environmental laws. Generally they are intended to seek prompt correction of imminent hazard situations posing an immediate threat to human health or the environment. Preparation of civil judicial cases is resource intensive, both because of the Department of Justice involvement and the more formalized procedures required for court actions as compared

to administrative actions. Sometimes judicial litigation may take several years to complete. For these reasons, EPA usually addresses violations through administrative mechanisms, if possible. Civil cases often result in penalties and court orders requiring correction of the violation and requiring specific actions such as specialized monitoring to prevent future noncompliance.

CRIMINAL JUDICIAL ACTIONS: Criminal actions are taken when a person or company has knowingly and willfully committed a violation of the law. In a criminal case, the Department of Justice prosecutes an alleged violator in the U.S. Court system, seeking criminal sanctions, usually including fines and incarceration. Criminal actions are taken for flagrant, intentional disregard for environmental laws and deliberate falsification of documents or records. Criminal cases are usually brought by the Department of Justice at the request of EPA, but the Department of Justice can initiate them on its own. Criminal cases are the most difficult to pursue. They require special investigation and case development procedures, and they involve the highest standard of proof, including proof of the intent of the violator to commit the violation.

STATE/EPA AGREEMENTS: Virtually every environmental statute provides for EPA delegation to or approval of State programs to implement national standards and regulations through State-specified rules, permits, and enforcement activities. In the enforcement arena, although States have primary responsibility for compliance and enforcement action within delegated or approved States, EPA retains overall responsibility for ensuring fair and effective enforcement of Federal requirements and a credible national deterrent to noncompliance. States conduct 80 to 90 percent of all compliance inspections under delegated or approved programs. EPA may also conduct inspections in a delegated or approved program State. State-EPA enforcement agreements reflect the criteria for direct enforcement in delegated States, protocols for advance notification and consultation, and the data the State will report to EPA. EPA may take direct enforcement action under the following conditions: at the request of a State; when State enforcement response

is not timely or appropriate; when there are national legal or program precedents involved; or when there is a violation of an EPA order or consent degree.

QUALITY ASSURANCE

NATIONAL ENFORCEMENT INVESTIGATIONS CENTER (NEIC): The NEIC manages and directs EPA's criminal investigation program. NEIC provides expertise and guidance for the development of multi-media compliance monitoring strategies and assists the Department of Justice in evaluating a broad range of waste disposal and emission problems, monitoring technology, and remedial programs. NEIC operates an extensive quality assurance program because any piece of data must be able to withstand the scrutiny of the Court.

Standard operating procedures have been developed for sampling in a variety of environmental media and conditions. A quality assurance project plan is prepared for each sampling effort. This plan may be built upon standard operating procedures that have been prepared on a program-specific basis. A sample documentation process has been prepared that addresses field measurements and sampling processes, laboratory analytical methodology, chain of custody, sample identification, sample seal, and field logbook entry. Detailed procedures have been prepared on all aspects of sample collection, packaging, and shipment to a laboratory.

SUGGESTED READING

1. US EPA. 1984. Memorandum: Courtney M. Price, Assistant Administrator for Enforcement and Compliance Monitoring, New Civil Penalty Policy. US Environmental Protection Agency, Washington, DC (February 16).

2. US EPA. 1985. Study of Literature Concerning the Roles of Penalties in Regulatory Enforcement. US Environmental Protection Agency, Office of Enforcement and Compliance Monitoring, Washington, DC (September).

3. US EPA. 1986. Memorandum: A. James Barnes, Deputy Administrator, Revised Policy Framework for State/EPA Enforcement Agreements. US Enviromental Protection Agency, Office of the Administrator, Washington, DC (August 25).

4. US EPA. 1988. FY 1988 Enforcement Accomplishments Report. US Environmental Protection Agency, Office of Enforcement and Compliance Monitoring, Washington, DC.

5. US EPA. 1989. Basic Inspector Training Course: Fundamentals of Environmental Compliance Inspection. US Environmental Protection Agency, Office of Enforcement and Compliance Monitoring, Washington, DC.

INFORMATION RESOURCES MANAGEMENT

SUMMARY

Information gathering and management are extensive and capital intensive investments of EPA's human and operational resources. In the information area, EPA is governed by a number of applicable Federal laws including The Paperwork Reduction Act, The Brooks Act, Freedom of Information Act, Privacy Act, Federal Records Management Amendments, Competition in Contracting Act, and Federal Information Processing Standards. These Acts and Standards mandate that the gathering, use, and storage of information be done wisely, with adequate safeguards for sensitive information and privacy protection.

EPA has established an internal information resources management office that has review and oversight authority of EPA data systems, of which there are 600, including 10 to 15 major systems, that concern the generation of new systems, data collection instruments including regulations, and general use of hardware and software. Before a new data system can be implemented, it must receive careful planning and documented justification. A "mission needs analysis" requires consideration of the mission to be served, problems with the present data management system, alternative solutions, costs, users of and uses for the system, an investigation of similar systems within EPA that might be adapted and whether adaptable hardware and software are available within the Agency.

Federal Information Processing Standards and EPA Data Standards require that data elements are consistent among all Agency data systems and that one type of data is defined in the same manner in all systems. A Systems Development Center is provided for the evaluation of new system development methodologies and technologies and to support, develop, and enhance EPA existing data systems.

CONCERNS

Information is an Agency asset, like personnel, funds, and property. The gathering and management of information and information technology represent an extensive and capital intensive investments of EPA's human and other operational resources. The Paperwork Reduction Act of 1980 introduced Information Resources Management to the Federal Government, and emphasized information as a resource with associated costs and values. This Act established a broad mandate for agencies to perform their information activities in an efficient, effective manner. Concepts advanced through the Information Resources Management approach include the life cycle management of information activities, i.e., creation, collection, and use; information functions, i.e., automatic data processing, records management, reports management, and telecommunications; the integrated approach to managing information resources, i.e., total systems concept; and the promotion and use of new technologies to improve the effective use and dissemination of information. The objectives of the Act are to reduce the Federal paperwork burden; reduce the Federal cost of collecting, using, and disseminating information; increase the use of Federally-collected information; and ensure that applicable laws relating to confidentiality and privacy are followed.

There are several other associated laws and directives. The Brooks Act (1965) is the primary law governing the overall Federal acquisition and management of automatic data processing equipment. The Freedom of Information Act (1966) allows public access to a wide variety of Federal Information. The Privacy Act (1974) provides certain safeguards for individuals against an invasion of personal privacy. The Federal Records Management Amendments (1976) require the establishment of standards and procedures to ensure efficient and effective Federal records management practices. The Competition in Contracting Act (1984) requires full and open competition in as many procurements as possible. The Federal Information Processing Standards (FIPS), issued by the National Institute of Science and Technology (NIST) in accordance with the Brooks Act, contain standards and guidelines concerning the standardization of computer hardware, software, and systems. The National Archives and

Records Administration Regulation, 36 CFR 1220 and 41 CFR 201-22, establish standard records management practices throughout the Federal government.

All EPA regulations and other data collection instruments are reviewed to ensure that the Agency does not impose an unnecessary paperwork burden on the public. EPA has about 600 data systems of which 10 to 15 are major systems. An approval and clearance process now is maintained for new data systems and for data collection instruments.

PROGRAM CONTROLS

STATE/EPA DATA MANAGEMENT: It is EPA policy that Agency reporting requirements and information systems will be responsive to the information needs of State environmental agencies and will take into account the diversity among States in terms of organization, resources and program responsibilities. New EPA systems and data bases developed to process and store data obtained from State environmental agencies are designed to support timely and reliable State access to these data. For those States that agree to meet EPA reporting requirements by directly entering data into EPA systems, the Agency will regard such data as the official State record of the delegated program. EPA will allow the States, at their option, also to enter data regarding non-delegated programs into the EPA systems.

MISSION-BASED PLANNING: EPA policy requires the annual preparation of mission-based information resource management plans for investments and management of information resources and technology. Where costs for systems development exceed $250,000, or meet other established criteria, the development stages and the decision process require a mission needs analysis, preliminary design and options analysis, and system design, development and implementation for a fully implemented system. The mission needs analysis specifies the nature of the program mission, problem, functions, processes, information flows, and defines a specific set of users and uses. When this planning process has been completed, EPA's decision regarding a new system can be based on an analysis of

need, benefits, life-cycle costs, and whether adaptable hardware and software are available within the Agency.

DATA STANDARDS: As required by OMB Circular A-130, EPA adheres to Federal Information Processing Standards (FIPS) and will develop and implement other data standards to ensure consistency in the use of data elements, and that one type of data is defined in the same way in all systems. This means having the same name, the same number of maximum characters and the same type and content of data in all systems where a specific data item appears. This consistency will permit the cross media approach necessary to achieve environmental results and it will enhance the sharing of environmental data with States and other Federal agencies.

INFORMATION COLLECTION: EPA policy provides that the data requirements of information collection from the public must be clearly dictated by the need to support decisions that serve an identifiable program mission. It also provides that any information collection ought to represent the least cost alternative of acceptable options in terms of both cost to EPA and burden on the public. Burden refers to the total time, effort, or financial resources expended by persons to provide information to the Agency. EPA maintains safeguards to protect the confidentiality, integrity, and availability of sensitive information and the privacy of individuals, as required by The Privacy Act of 1974.

SYSTEMS DEVELOPMENT CENTER: The Systems Development Center is the EPA's Center of Excellence for systems and software development projects which support, develop, and enhance EPA data systems. The Center evaluates new systems development methodologies and technologies to improve system and software development methods and strives to better integrate them into the development process. The Center was conceived to help meet the challenges of the next decade, which include better integration of environmental data and systems, creating common user interface and data standards, and utilizing new technologies in the systems development process.

REGULATORY CONTROLS

No EPA rules have been promulgated regarding information resources management. However, policy statements and administrative directives that affect the internal operations of EPA are issued after Green Border clearance by the Assistant Administrators. Examples of such directives and policy statements include information resources management controls, review, and approval; mission-based planning; State/EPA data management; software management; data standards; automated data processing resources management; voice communication; information security; information collection; records management; and privacy safeguards.

QUALITY ASSURANCE

GEOGRAPHIC INFORMATION SYSTEM: This is a computer-based system that combines geographic and cartographic analysis with a computer data base system that can support data entry, data management, data manipulation and data display capabilities. The system facilitates the overlaying of information on standard USGS quadrangle maps. Standards are being developed by information resources management on building the mapping information system.

DATA SYSTEMS: The Information Systems Inventory (ISI) contains basic information on the approximately 600 EPA systems, data bases, and models. One of the uses of this system is in the gathering of background information when new data systems are being contemplated.

Data standards are one form of quality assurance. Data standards now are under development to identify facilities in data systems. With the current use of Dun and Bradstreet numbers for facility identification, there is often confusion when a parent corporation owns a number of facilities. Each facility must be identified with a unique number. Data standards also are under development for location data. The use of latitude and longitude is not universal throughout the United States.

Such standards have been developed for the entry of laboratory analyses. Such data, generally from contract laboratories, must meet this standard to be entered into an EPA data system.

SUGGESTED READING

1. US EPA. 1987. Information Resources Management Policy Manual. US Environmental Protection Agency, Office of Information Resources Management, Washington, DC.

2. US EPA. 1989. EPA System Design & Development Guidance: Volume A, Mission Needs Analysis; Volume B, Preliminary Design and Options Analysis; Volume C, System Design, Development and Implementation. US Environmental Protection Agency, Office of Information Resources Management, Washington, DC.

3. US EPA. 1989. Information Resources Directory. US Environmental Protection Agency, Office of Information Resources Management, Washington, DC.

4. US EPA. 1989. Systems Development Center. US Environmental Protection Agency, Office of Information Resources Management, Washington, DC.

LIBRARY SERVICES

SUMMARY

EPA has 28 libraries in Headquarters, Regional Offices and Laboratories. Their collections include general and specialized books, journals, reports, microfiche, reprints, and maps. Their services are many and include a world-wide interlibrary loan system for any piece of literature that may not be found among the library's abundant collection; a literature search of 37 available databases with access, if necessary, to 300 commercial databases; and a translation service for foreign language scientific and technical documents. A special collection of references for hazardous wastes has been established in 17 EPA libraries.

In addition, EPA has specialized libraries, such as the Legislative Reference Library, Law Library and the Headquarters Office of Toxic Substances Non-Confidential Information Center. That Center specializes in chemical literature in areas of biotechnology, chemical industry and process technology, ecology, health, international chemical control, and pesticides.

EPA's dockets provide information related to rulemaking actions. This includes the official legal files, hearing transcripts, litigation records, and public comments. There are eight individual dockets addressing EPA's major rulemaking activities.

GENERAL LIBRARIES

There are 28 EPA libraries in Headquarters, Regional Offices, and EPA Laboratories. These libraries contain a combined collection of over 128,900 books, 5,088 journal subscriptions, 357,146 hard copy reports, 2,166,500 documents on microfiche, 9,000 journal article reprints, and 2,000 maps. Most of the EPA library holdings are catalogued on OCLC, (Online Computer Library Center) a national cataloging system.

The services provided include acquisition of books, journals, and reports; cataloging; circulation; access to the collections of other Federal, academic, public and special libraries through interlibrary loans; and reference assistance, including preparation of special subject bibliographies and bibliographic database search services. There is a special collection of 3,100 books, journals and reports on hazardous waste, which is housed in 17 selected EPA libraries. The documents in the hazardous waste collection have been entered into a PC-based database, which is updated quarterly and may be obtained.

The EPA Headquarters library has 15,000 books; 625 current subscriptions to journals, abstracts and indexes, newsletters and newspapers; 23,000 hard copy documents and technical reports generated by government sources or the private sector; 335,000 documents on microfiche, including technical reports produced by EPA and its predecessor agencies; and a microfilm collection that includes back files of newspapers, abstracts and indexes, and periodicals.

GENERAL EPA LIBRARY SERVICES

By their nature, EPA libraries are organized to serve. They offer a number of services in addition to the literature resources available in a multitude of environmental subjects.

ACQUISITIONS: Books, reports, subscriptions, and other reference materials are ordered. The policy varies among Regions regarding payment by the library or program office for literature materials purchased.

CATALOGING: Books, journals, and other documents are cataloged into the EPA national catalog.

INTERLIBRARY LOAN: The interlibrary loan service is a cooperative lending and borrowing arrangement between government, academic, special and public libraries throughout the world. This service provides EPA staff with information resources that are not held in a particular library. EPA employees may use this service for EPA projects and activities. EPA contractors also may use the service for EPA projects and activities if the contract project officer sends a signed letter to the Head Librarian stating that he/she will be liable for items borrowed, how long the library should serve the contractor, and the name of the contractor. The average turnaround time for borrowing through library loan is approximately 3 to 7 working days.

LITERATURE SEARCHING: Computerized searching of commercial databases and selected EPA databases is performed for EPA employees to retrieve information for policy decisions, report preparation, data analysis and background research, and for preparation of special subject bibliographies. EPA uses 37 databases and has access to over 300 commercial databases. Examples are: CAS Online, Chemical Information System, DIALOG, Ground Water On-line, LEXIS/NEXIS, National Library of Medicine, NewsNet, Washington Alert, EPA's Hazardous Waste Database and Information Systems Inventory, Integrated Risk Information System, Toxic Release Inventory, Record of Decisions (ROD), the Department of Justice's JURIS, Comprehensive Environmental Response, Compensation and Liability Information System, and Facilities Tracking System (FINDS).

REFERENCE: On-site ready reference service is available to EPA staff and the public.

EQUIPMENT: Photocopy machines and microform reader/printers are available to library patrons for the reproduction of up to 25 pages of literature not covered by copyright.

TRANSLATIONS: The EPA translations service was established in 1972 to provide EPA employees with a mechanism for having scientific and

technical documents translated from and into English. A microfiche collection of over 10,000 documents translated by EPA since that service was initiated is available. Microfiche copies are available to EPA employees at no cost. Non-Government requestors can purchase EPA translations.

SPECIALIZED LIBRARIES

LEGISLATIVE REFERENCE LIBRARY: The Legislative Reference Library is maintained by the Headquarters Office of External Affairs to provide Federal environmental legislation information for the Agency. The Library contains over 8,000 documents produced by Congress such as copies of bills, reports, public laws, committee prints, committee hearings, legislative histories, Congressional Records, Senate and House calenders, phone books, directories, and other information.

LAW LIBRARY: The EPA Law Library is maintained by the Office of General Counsel to provide information services to the Agency's legal and enforcement personnel, and to the ten Regional Counsels. The Library contains 9,500 volumes of legal and law-related material concentrating on Federal law, with special emphasis on administrative and environmental law. Included are statutes, codes, regulations, case reporters, digests, citators, and legal reference sources.

HEADQUARTERS OFFICE OF TOXIC SUBSTANCES NON-CONFIDENTIAL INFORMATION CENTER: The Center has 5,000 books, 89 current journals, a collection of 5,000 technical reports, and a microfiche collection of 140,000 scientific and technical journal articles. The collection covers chemical literature in areas of biotechnology, chemical industry and process technology, ecology, health, international chemical control and pesticides.

DOCKETS

Dockets are the official legal files of rulemaking actions. They include official statements of the Administrator's position, represented by published rulemaking documents; information considered by the Agency during rulemaking; transcripts of hearings; litigation records, and comments received from persons outside the Agency. Dockets are open to the public in accordance with the requirements set forth in the Freedom of Information Act.

The major dockets in EPA are: (1) Public Information Reference Unit (Water, Air, Noise), (2) Air Docket, (3) Resource Conservation and Recovery Act (RCRA) Docket, (4) Superfund Docket, (5) Drinking Water Docket, (6) Toxic Substances Docket, (7) Federal Insecticide, Fungicide & Rodenticide Act (Pesticides) Docket, and (8) Underground Storage Tank Docket.

SUGGESTED READING

1. US EPA. 1985. Translation Services. Information Services and Library, US Environmental Protection Agency, Washington, DC.

2. US EPA. 1986. The Interlibrary Loan Service of the Headquarters Library. Information Services and Library, US Environmental Protection Agency, Washington, DC.

3. US EPA. 1987. Services of EPA's Public Information Center. Public Information Center, US Environmental Protection Agency, Washington, DC.

4. US EPA. 1987. Searching for Answers: A Guide to Database Searching at the EPA Headquarters Library. US Environmental Protection Agency, Washington, DC.

5. US EPA. 1988. EPA Headquarters Library Information Services and Collections. US Environmental Protection Agency, Washington, DC.

6. US EPA. 1988. Technology Transfer: Clearinghouses. US Environmental Protection Agency, Washington, DC, EPA/IMSD/88-006.

7. US EPA. 1988. Directory of State Indoor Air Contacts. US Environmental Protection Agency, Washington, DC, EPA-400/1-88-003.

8. US EPA. 1988. Directory of State Environmental Libraries. US Environmental Protection Agency, Washington, DC, EPA-IMSD/88-010.

9. US EPA. 1989. A Pathfinder to Major EPA Dockets. US Environmental Protection Agency, Washington, DC, EPA/IMSD/87-001 (Revised in 1989).

10. US EPA. 1989. Guide to EPA Libraries and Information Services. US Environmental Protection Agency, Washington, DC, EPA/IMSD/89-008.