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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

AUG 17 1983

Dr. Carl Leventhal
Associate Director for Human
Resources & Social Services
Office of Science & Technology Policy
Executive Office of the President
Room 360
Old Executive Office Building
Washington, D.C. 20500

Dear Dr. Leventhal:

I am pleased to send you a draft of the Environmental Protection Agency's National Dioxin Strategy. Also enclosed is the draft interim guidance to the Regions on dioxin site investigations prepared by the Office of Solid Waste and Emergency Response.

The strategy provides a framework under which the EPA proposes to investigate and address dioxin contamination as it affects human health and the environment.

As indicated in the strategy, EPA proposes to initiate a comprehesive national program to identify sources, including manufacturing sites, most likely to have produced dioxins, then gather specific information on their operations to assess the potential for contamination. After the information gathering effort, some sites will be selected for further investigtion, including sampling.

I invite you to review this strategy and related guidance, and provide us with your comments on it and any other role or responsiblity that you may want to assume in its implementation. In addition, it is likely that other State and Federal agencies will participate. Please note that the strategy is still in the draft stage and not yet available for public distribution. Your advice concerning their role would also be welcome.

A briefing date has been scheduled for you on August 26, 10:00 AM to 12:00 Noon, Room S353, at Waterside Mall, 401 M Street, S.W., Washington, D.C. Other briefings will be held on August 24-25 at 10:00 AM to 12:00 Noon, Room S353 should you be unable to attend the scheduled briefing. Any written comments be submitted to me no later than September 2. Please address comments to: Steven Schatzow, Director, Office of Water Regulations and Standards, U.S. EPA, 401 M Street, S.W. (WH-551), Washington, D.C. 20460.

Your cooperation in matters designed to protect our environment is greatly appreciated.

Sincerely yours,

Steven Schatzow

Steven Schatzow, Director
Office of Water Regulations and Standards

Enclosure

United States
Environmental Protection
Agency

Prepared by the Office of
Water Regulations and Standards
and the Office of Solid Waste and
Emergency Response in conjunction
with the Dioxin Strategy Task Force

August 15, 1983
Washington DC 20460

EPA

Dioxin Strategy

Draft

EPA's DIOXIN STRATEGY

August 15, 1983

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EXECUTIVE SUMMARY

The strategy presented here provides a framework under which the U.S. Environmental Protection Agency (EPA) will 1) study the extent of dioxin contamination and the associated risks to humans and the environment, 2) implement necessary clean-up actions at contaminated sites, and 3) further evaluate regulatory alternatives to prevent future contamination as well as disposal alternatives to alleviate current problems.

EPA will be investigating and taking appropriate response action at production, disposal, and processing sites where pesticides (including herbicides) contaminated with dioxin were or are being handled. In addition, the Agency will be sampling other possibly contaminated sites as well as the ambient environment throughout the United States for the presence of dioxin. This overall investigation is in response to concerns raised by the increasing number of instances when environmental contamination by chlorinated dioxins has been documented. EPA will also continue its evaluations of human health risks associated with exposure to chlorinated dioxins and of disposal and destruction methods.

Although there are 75 different chlorinated dioxins, 2,3,7,8-tetrachlorodibenzo-p-dioxin (2378-TCDD) is the one of primary concern because it is the most toxic dioxin isomer, has been the most studied, and potentially poses a number of significant health and disposal issues. check

The 2378-TCDD isomer is known to be a contaminant of 2,4,5-trichlorophenol (2,4,5-TCP), an ingredient used in the manufacture of various phenoxy herbicides, including 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) and Agent Orange, a defoliant herbicide used in Vietnam. The emphasis on 2,4,5-TCP and its derivatives is based on the fact that nearly every place where 2378-TCDD has been found in the environment, it can be associated, if not definitively linked, to 2,4,5-TCP production or disposal sites.

To facilitate implementation of the strategy, EPA has defined the following study tiers based on decreasing potential for 2378-TCDD contamination:

<u>Tier 1</u> - 2,4,5-TCP production sites and associated waste disposal sites.

<u>Tier 2</u> - Sites (and associated waste disposal sites) where 2,4,5-TCP was used as a precursor to make pesticide products.

<u>Tier 3</u> - Sites (and associated waste disposal sites) where 2,4,5-TCP and its derivatives were formulated into pesticidal products.

<u>Tier 4</u> - Combustion sources.

<u>Tier 5</u> - Sites where pesticides derived from 2,4,5-TCP have been and are being used on a commercial basis.

<u>Tier 6</u> - Certain organic chemical and pesticide manufacturing facilities where improper quality control on certain production processes could have resulted in the formation of 2378-TCDD.

<u>Tier 7</u> - Control sites where contamination from 2378-TCDD is not suspected.

The strategy calls for investigating and taking any necessary response action at tier 1 sites and, eventually, at tier 2 sites. Sites in tiers 3-6 will also be studied to determine the probability of contamination at these types of sites. Sampling at sites in tiers 1-6 will initially consist of a screening of areas most likely to be contaminated to determine if 2378-TCDD is present at the site. If it is, further sampling may include all media (air, water, soil, stream sediments, fish tissue) which are appropriate to define the extent of contamination and health risk. Sampling at tier 7 sites will initially focus on fish tissues since 2378-TCDD is thought to have a very high bioconcentration factor. If dioxin is found in the fish tissues at these sites, EPA will conduct further investigations to locate the source(s). All sampling done under this strategy will follow prescribed analytical protocols.

Another important aspect of the strategy is to determine the potential health and environmental risks from exposure to 2378-TCDD in different media. EPA in conjunction with other appropriate federal agencies such as CDC, FDA, and NIOSH will undertake research to understand more fully the specific effects of 2378-TCDD on humans and other species, and to develop techniques to determine actual risk given different levels of environmental contamination.

While investigations into the extent of human health and environmental risks from contamination by 2378-TCDD proceed, EPA will also be evaluating different alternatives for containing and eventually disposing of soils and wastes contaminated with 2378-TCDD. These alternatives include various methods of securing contaminated soil and preventing leachate runoff or percolation, removal and secure containment of contaminated soil, solvent extraction of dioxin from soils, and incineration or photolysis for destruction of dioxins.

Finally, the strategy lists a number of research activities to define the potential human health and environmental risks from dioxin isomers other than 2378-TCDD. These activities include 1) assessing the toxicity of the other isomers, 2) determining their specific sources, 3) evaluating their environmental fate and transport properties, 4) developing exposure and risk assessments based on the above information, and 5) recommending appropriate control measures. To assist in these activities, the sampling program for 2378-TCDD includes provisions to analyze for other dioxin isomers (and even other chemicals) when appropriate to the situation or the sampling site.

Regulatory Activities

EPA's efforts to regulate dioxin in the environment began in 1973 when the Agency instituted proceedings to cancel the registration of the pesticide 2,4,5-T, based primarily on its contamination by 2378-TCDD. (Earlier, the U.S. Department of Agriculture had already limited uses of 2,4,5-T on food crops.) EPA terminated the cancellation proceedings in 1974, partly because the analytical chemistry techniques available at the time were not capable of measuring 2378-TCDD in food or the environment at the low levels which could pose a hazard. The Agency has since significantly improved its analytical capabilities. In 1978, EPA initiated the Rebuttable Presumption Against Registration (RPAR) process against pesticide products with 2,4,5-T. In 1979, based on a study of miscarriage rates in Alsea, Oregon (where 2,4,5-T had

been sprayed on forest land), EPA ordered an emergency suspension of 2,4,5-T and silvex use on forests, rights-of-way, pastures, home gardens, turf, and aquatic vegetation. Other uses were still being evaluated under the RPAR process. Dow Chemical Company appealed the suspension in federal court and lost. In 1980, an EPA Administrative Law Judge began consolidated cancellation hearings on the suspended and nonsuspended uses of 2,4,5-T and silvex. These hearings were postponed in 1981 to allow Dow and EPA to concentrate on settlement discussions. These discussions are still ongoing.

Other programs have also been involved in regulatory activities related to dioxin. Under the Clean Water Act (CWA), 2378-TCDD is listed as one of the 65 compounds and classes of compound which EPA is required to control in industrial effluents. To date, no national discharge regulations have been issued for 2378-TCDD, primarily because the only time it has been measured in effluents was when EPA's Region 5 personnel measured it at the 50 part per quadrillion level in the Dow effluent. (Analytical problems may be one of the reasons why 2378-TCDD was not otherwise detected.) EPA is working with the State of Michigan on developing limitations for Dow's permit. Under the Clean Air Act, EPA has initiated the process of listing 2378-TCDD as a hazardous air pollutant. see p. 12

As an interim step to control the disposal of any wastes containing 2378-TCDD (defined as wastes resulting from the production of 2,4,5-TCP or its pesticide derivatives, or substances produced on equipment that was previously used for the production of 2,4,5-TCP or its pesticide derivatives), EPA in 1980 promulgated a rule under the Toxic Substances Control Act (TSCA) which requires any persons intending to move or otherwise dispose of these wastes to notify EPA of its plans 60 days prior to initiating any action. This allows EPA to review the plans and ensure that the wastes are properly managed. In 1983, EPA proposed to regulate wastes containing any tetra-, penta-, and hexachlorodibenzo-p-dioxins under the Resource Conservation and Recovery Act (RCRA). This action will cover a wider range of wastes and is designed to ensure that no future sites are contaminated with dioxin wastes. in any amount?

As this dioxin strategy is carried out and the data are assembled, analyzed, and reviewed, various regulatory options to prevent or control future 2378-TCDD contamination will be evaluated. Control options will include new applications of existing regulations as well as development of new regulations. Such actions as RCRA waste stream listings, CWA 307(a)(2), TSCA Section 6 rule, and Clean Air Act hazardous pollutant listings, for example, will be evaluated and recommendations to initiate regulatory actions will be made by appropriate program offices. Programs initiating regulatory actions are urged to use the Dioxin Strategy Task Force as a steering committee for regulatory development. who is on this?

Management and Implementation of the Strategy

The Assistant Administrator (AA) for the Office of Solid Waste and Emergency Response (OSWER) under the direction of the Deputy Administrator is responsible for implementing the strategy. OSWER will directly manage the investigations and responses for sites in tiers 1 and 2. The Office of Water (OW) has been delegated responsibility for the overall management of the studies within tiers 3-7. Within tiers 3-7, individual program offices will be responsible

for developing study plans relating to their programs; for example, the Office of Air, Noise, and Radiation (OANR) will prepare the study plan for tier 4. The AA for OSWER will have review and approval authority for any policy or plans developed by other EPA offices that are implementing delegated portions of the strategy.

The actual detailed sampling plans for sites in tiers 3-7 will be prepared by the regional offices in cooperation with the States and will be reviewed by the appropriate program office. Sampling plans for sites in tiers 1 and 2 will be prepared by the regional offices in cooperation with the Centers for Disease Control (CDC), the National Institute for Occupational Safety and Health (NIOSH), and, when appropriate, the States.

OSWER is issuing detailed interim guidance (see Part 3) to the regional offices on how to proceed with investigations of the tier 1 and tier 2 sites. This guidance differentiates between the actual production sites (tiers 1 and 2) and the associated transportation, treatment, storage, and disposal sites (referred to as tiers 1A and 2A in the guidance). The basic approach outlined in the guidance is first to collect detailed information on each of the sites from EPA and State data bases and, if necessary, from site visits and employee interviews. Initially, any new field investigations (screening) will be limited to tier 1 sites; new sampling work at sites in tiers 1A, 2, and 2A will be initiated after the information being collected has been evaluated. Where the need for a clean-up response is identified, initial efforts are to be directed at getting potentially responsible parties to take appropriate action. If prompt and appropriate clean-up is not assured by responsible parties, EPA will respond in a manner consistent with the National Contingency Plan.

Funding for investigations and response actions for sites in tiers 1 and 2 will come from CERCLA, while funding for studies related to tiers 3-7 will come from a special appropriation for what is referred to as "The National Dioxin Study". If contamination is detected at sites in tiers 3-7, the data will be forwarded to OSWER for further evaluation, in accordance with the interim guidance.

Implementation of the strategy will require close coordination with a number of other federal agencies, including FDA, CDC, NIOSH, and others. As delegated by OSWER, the Office of Pesticides and Toxic Substances (OPTS) is responsible for ensuring that proper coordination does take place. One of the key issues requiring interagency coordination is health effects research. EPA's Office of Research and Development (ORD) is responsible for developing an initial list of research needs to be submitted to the AA for OSWER.

Background - Toxicology

Most of the available toxicological information on dioxins is for the 2378-TCDD isomer, which has caused lethal effects in laboratory animals at lower levels than any other man-made chemical. However, both the lethal dose levels and the toxicological effects vary considerably among different animal species. EPA's Cancer Assessment Group regards 2378-TCDD as both an initiator and a promoter of cancer. Based on its estimated carcinogenic potency, cancer

risks to individuals exposed to soils or fish contaminated by 2378-TCDD may be significant under certain exposure conditions which are probably not wide spread. Thus, estimates of national aggregate risks cannot be made with any degree of accuracy until more data on exposure are collected.

Background - Sources

A number of the dioxins, including 2378-TCDD, are formed as inadvertent byproducts during the manufacture of certain organic chemicals, particularly chlorinated phenols. The 2378-TCDD isomer is formed during the production of 2,4,5-trichlorophenol (2,4,5-TCP), which is a basic chemical feedstock used to make several pesticides (herbicides) including 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), silvex, hexachlorophene, ronnel, and erbon. EPA scientists estimate that 80 to 95 percent of the 2378-TCDD which is formed during the production of these chemicals ends up in the waste still bottoms from the toluene distillation step of 2,4,5-TCP production. Most manufacturers disposed of these wastes by placing them in landfills or incinerating them; however, some of the still bottoms may have been injected into disposal wells or trans ported for disposal by contractors. Other possible releases to the environment of 2378-TCDD from the 2,4,5-TCP manufacturing process include wastewaters generated by contact cooling and product separation, and air emissions caused by venting reaction
vessels.

In addition, the 2,4,5-TCP product itself could have been contaminated with 2378-TCDD, particularly if it was manufactured prior to the mid 1970's when reaction conditions began to be more carefully controlled. This product contamination means that sites where 2,4,5-TCP was used to make pesticide products and, to a lesser extent, sites where those pesticide products were formulated for final uses might also be contaminated. Finally, sites where these pesticide products were used could also be contaminated.

At the present time, there are no known producers of 2,4,5-TCP; however, more than a dozen facilities have produced it in the past and may still be using contaminated equipment. A somewhat larger number of facilities were involved in manufacturing 2,4,5-TCP based pesticides, and perhaps hundreds of facilities were involved in formulating these pesticides. (Part of EPA's strategy will be to refine the inventories of these facilities.) Finally, although past uses were more widespread, current uses of these pesticides is limited primarily to Arkansas and Louisiana rice fields, western rangeland, sugarcane fields in Florida, and certain rights-of-way.

Combustion sources such as municipal and industrial waste incinerators and accidental transformer fires (where the transformers contained a mixture of PCBs and chlorobenzenes) have been implicated as sources of 2378-TCDD and other dioxins. Generally, levels of the 2378-TCDD isomer from these sources have been relatively low; however, there is a potential for increased risk to populations in the vicinities of these sources.

PART 1

INTRODUCTION

OVERVIEW

This strategy provides a framework for actions that EPA, in coordination with other Federal and State agencies, will be taking in response to concerns about health risks from exposure to dioxin contamination in the United States. Since dioxin contamination can be found in soil, water, and air samples, several programs within EPA, at both the headquarters and regional levels, are involved in this strategy; States are likewise actively involved.

There are 75 different chlorinated dioxins, divided into 8 homologues (groups), each with different physical and chemical properties depending on the number and location of chlorine substitution. One of the 22 isomers with four chlorine atoms, 2,3,7,8-tetrachlorodibenzo-p-dioxin (2378-TCDD), is of primary concern because of its extreme toxicity in animals, which includes carcinogenicity.

Much information has already been collected on dioxins. Information is still being collected, and response efforts are being taken to reduce human exposure to dioxins. However, unless these efforts are part of a systematic national plan, inconsistent actions could occur, and information collected for one purpose might not be available to others who need it.

The EPA dioxin strategy provides for intensive study of locations potentially contaminated with the most toxic of the dioxin isomers, 2378-TCDD (about which the most is known, both on toxicology and sources). At the same time, the other dioxin isomers will be evaluated to determine whether they merit the same intensive investigation. In addition, much incidental information will be collected on these isomers as part of the 2378-TCDD effort.

In addition to the investigation and response activities called for in the strategy, the 2378-TCDD study will address five questions: 1) Where does it come from? 2) Where does it go? 3) What are the levels of concern? 4) Once it is in a medium at levels of concern, what can be done about it? and 5) What can be done to prevent it getting into the media?

This strategy does not suggest that 2378-TCDD is the only toxic pollutant the Agency must address. It may not even be the most critical in terms of environmental and human health effects. Therefore, it is important that the individual program offices implementing this strategy weigh their efforts on this contaminant versus the demands on their resources from other problems.

APPROACH

To implement this strategy, EPA has established seven categories (or tiers) for investigation and/or study ranging from the most probable tier of contamination (2,4,5-TCP production and waste sites) to the least. The functional components of implementation include:

a. a comprehensive investigation leading to clean-up at the most contaminated sites;

b. a national study to learn more about the extent of environmental contamination;

c. prevention of future contamination through development of control actions and regulations.

This strategy addresses the most toxic of the dioxin isomers, 2378-TCDD, and concurrently evaluates the other dioxin isomers to determine whether the same type of intensive investigation is necessary. Some initial screening for other isomers will be done at some sites being investigated for 2378-TCDD.

One of the most important elements of this strategy is that it be coordinated with other Federal agencies and with States, as well as within EPA. The dioxin problem cannot be adequately addressed without active coordination of all these groups.

EPA relies on the Food and Drug Administration (FDA) for action levels and consumption advisories for fish and other consumables, on the Centers for Disease Control (CDC) for all health advisories under CERCLA, and on the National Institutes of Occupational Safety and Health (NIOSH) for limits on exposure in the workplace. In addition, the Federal Emergency Management Agency (FEMA) coordinates the relocation of people during immediate removals under CERCLA, and the Veterans Administration (VA) has developed a large body of expertise from dealing with veterans on the Agent Orange issue.

States will continue to have the lead or joint responsibility in investigating and responding to individual sites in tiers 1 and 2 as they do under CERCLA.

The Agency hopes to involve each of these groups so that everyone can benefit from the others' experience, knowledge, expertise, and resources.

2378-TCDD Questions

1. Where does it come from? and 2. Where does it go?

For these two questions, EPA has set up seven categories (or tiers) for study. These include former production sites, dump sites, incineration sites, formulation sites, etc. Under the overall direction of the Assistant Administrator for Solid Waste and Emergency Response (OSWER), individual offices will evaluate the areas in which they have the greatest familiarity.

3. What are the levels of concern?

The respective program offices are currently reviewing three dioxin hazard assessment documents (ambient water quality criteria for 2378-TCDD; health assessment document for dioxins; and health and environmental effects profile for tetra-, penta-, and hexachlorodibenzo-p-dioxins) being prepared by ORD to determine the implications these documents have on the dioxin strategy.

EPA's OSWER, in conjunction with ORD and the Chlorinated Dioxin Work Group (CDWG), is responsible for developing a list of health and environmental effects research needs. They should also standardize hazard assessment information, establish exposure scenarios, and develop a nomograph for converting from 2378-TCDD levels of contamination in all environmental media to estimates of upper risk limits for a variety of exposure scenarios.

4. Once it is in a medium at levels of concern, what can be done about it?

Available techniques are quite limited at this time. EPA's OSWER, in conjunction with ORD and the Dioxin Disposal Advisory Group will be responsible for pilot testing the more promising disposal/destruction techniques.

5. What can be done to prevent it getting into the environment?

Since there is no known current production of 2,4,5-TCP, future production of 2378-TCDD is likely to be limited to much smaller quantities from such sources as hazardous waste incinerators, transformer fires, and possibly municipal incinerators. These assumptions will be tested during the study. Under the Toxic Substnces Control Act (TSCA), EPA must be notified of any future production of 2,4,5-TCP.

Other Dioxin Isomers

The Office of Solid Waste has the lead responsibility for developing a program to assess the other dioxin isomers. Activities are to include: 1) determining the specific sources of other dioxin isomers, 2) assessing their toxicity, 3) evaluating their environmental fate and transport properties, 4) developing exposure and risk assessments based on the above information, and 5) recommending appropriate control actions.

Comparison of Risks

In comparing the risks posed by 2378-TCDD with the risks attributed to other pollutants, it is important to identify and understand the components of risk. Simply stated, risk is a function of exposure to a chemical and the likelihood of some kind of harmful effect. One of the harmful effects can include cancer if it can be demonstrated that the chemical causes cancer in either laboratory animals or humans. The risk from carcinogens is usually expressed in quantitative terms as a probability value based on an exposure level. Other harmful effects may include, for example, heart disease and emphysema, although quantitative risk estimates for these kinds of effects are not usually expressed in probablistic terms.

It is also important to discern between individual risks and aggregate (population) risks. Concern about individual risk focuses on the effect of a pollutant on increasing the risk to particular individuals, without regard to the number of individuals involved. Concern about aggregrate risk couples individual risks with the number of individuals involved, and thus deals with the number of cancer cases which can be prevented.

The derivation of cancer risks requires an assessment of the chemicals' potency and the amount of the chemical to which the animal is exposed. Thus, understanding or quantifying exposure is a necessary component in defining risk. Comparing the quantitative risks associated with 2378-TCDD with other chemicals is, therefore, confounded because of the lack of good exposure information. We are, therefore, left with a comparison that is qualitative based on relative carinogenic potency, the amount estimated to be in the environment and its behavior.

The quantities of 2378-TCDD produced and released are much smaller than other pollutants of concern. On the other hand, its toxicity and carcinogenic potency are much greater. Thus, for example, the release of 2378-TCDD in past years is estimated to be about 30,000,000 times less than the release of benzene, 4,000,000 times less than carbon tetrachloride, and 130,000 times less than PCBs. On the other hand, carcinogenic potency of 2378-TCDD is estimated to be 17,000,000 times greater than benzene, 5,000,000 times greater than carbon tetrachloride, and 100,000 times greater than PCBs. The bioaccumulation potential of 2378-TCDD is 20,000 times greater than that of benzene, 6,000 times greater than carbon tetrachloride, and 4 times greater than PCB. Also, compared to benzene, 2378-TCDD is very persistent in the environment.

established by EPA Cancer Assessment group - Based on animal data only - should be clarified

Based on what is known about 2378-TCDD release and behavior (i.e., low levels of release, very persistent, and extremely potent), it is believed that risks to some individuals may be significant; however, the risks may not be widespread. Consequently, it should not be expected that the aggregate risk to 2378-TCDD would match that of such a ubiquitous pollutant as benzene (from gasoline), a pollutant with a large level of release, not very persistent and not a very potent carcinogen when compared to 2378-TCDD.

PART 2

EPA's DIOXIN STRATEGY

Study Tiers

1. The following tiers are defined based on decreasing potential for contamination and will be addressed by this strategy as described in the succeeding sections:

Tier 1 - Current (if any) and former sites of 2,4,5-TCP production including dump sites where wastes were disposed. The number of tier 1 production sites is estimated to be about 20; the total number of sites to be investigated (production sites plus waste disposal sites) is not presently known.

Tier 2 - Sites (current and former) where 2,4,5-TCP was used as a precursor to make another chemical product (e.g., hexachlorophene production sites, 2,4,5-T, silvex, etc.) including sites where wastes were disposed. The number of tier 2 production sites is estimated to be about 80, which doesn't include the sites where wastes were disposed.

why this distinction? How many sites in Tier 3?

Tier 3 - Sites (current and former) where 2,4,5-TCP and its derivatives (e.g., silvex) were formulated into a pesticidal product. An example would be a site where 2,4,-D and 2,4,5-T were mixed to make Agent Orange. Tier 3 also includes sites where formulating wastes were disposed.

Tier 4 - Combustion sources such as industrial and municipal incinerators, home heating units, PCB-transformer fires, etc. The number of sites in this tier is estimated to be in the hundreds.

Tier 5 - Sites where 2378-TCDD contaminated pesticides have been used or are being used on a commercial basis. These areas include rights-of-way, rice fields of Arkansas and Louisiana, certain pastures and western rangeland, sugarcane fields in Florida and Louisiana, certain aquatic sites, and forests (e.g., Pacific northwest). In addition, animals which have been grazed on treated land and fish from treated waterbodies may contain 2378-TCDD residues.

Tier 6 - Sites where production of certain other organic chemicals or pesticides may have resulted, through improper quality control, in the formation of 2378-TCDD. The total number of sites in this tier is probably in the hundreds.

Tier 7 - Control sites; places where contamination of 2378-TCDD is not suspected based on current knowledge. These sites are to be considered uncontaminated ambient sites and the information from sampling at these sites will be used to establish "background" levels of 2378-TCDD.

Management and Funding

2. The Assistant Administrator for Solid Waste and Emergency Response (OSWER) is responsible for implementing the overall strategy; he will report directly to the Deputy Administrator for purposes of this strategy.

3. The AA for OSWER will be assisted by three coordinating groups: (1) the Dioxin Strategy Task Force (DSTF), (2) the Chlorinated Dioxin Work Group (CDWG) and (3) its sub-group, the Dioxin Disposal Advisory Group (DDAG) formerly called the Dioxin Task Force. Membership on groups (2) and (3) is currently set; membership on the DSTF shall be AA/OD level individuals from Headquarters and RA/DRA level individuals from the Regions.

4. The extent of Headquarters and Regional Membership on the DSTF shall be determined by the AA for OSWER.

5. The Dioxin Strategy Task Force will assist the AA for OSWER in implementing the overall strategy and function as a steering committee dealing with policy and resource issues. The Chlorinated Dioxin Work Group will continue to provide technical expertise as necessary and the Disposal Advisory Group will continue to make technical recommendations about site-specific clean-up and disposal/destruction options.

6. Efforts conducted in tiers 1 and 2 will be managed directly by OSWER and funded under CERCLA authority.

7. Efforts conducted in tiers 3 thru 7 have been delegated to the Office of Water, in conjunction with appropriate program offices. In particular, OANR will manage the development of a study plan for tier 4. Funding for efforts in tiers 3 thru 7 will be from a special appropriaion which has been referred to as "The National Dioxin Study".

8. The AA for OSWER or his designate shall be the focal point for dealing with the press in conjunction with EPA's press office. Each Regional office should designate one individual to deal with the press on regional issues; policy issues and any issue not of a regional nature should be referred to the AA for OSWER who will consult with appropriate program offices as necessary.

Determining the Extent of Environmental Contamination

9. Management of tiers 1 and 2 will result in a comprehensive assessment of sites under CERCLA authority leading possibly to identification of responsible parties, enforcement actions and site clean-up.

10. The program in tiers 3 thru 7 constitute "The National Dioxin Study"; it is a study to learn more about the magnitude of the problem by sampling respresentative facilities and sites. It is not as comprehensive an investigation as that planned for tiers 1 and 2 which are thought to represent over 80 percent of the problem.

Tiers 1 and 2

11. Sites (both manufacturing facilities and waste disposal sites) in tiers 1 and 2 will be investigated following the attached guidance (Part 3) being issued by OSWER.

12. The interim guidance sub-divides tiers 1 and 2 into two parts: Tier 1A, and tier 2A which includes transport, treatment, storage, and disposal handlers or sites used by tier 1 and tier 2 facilities. A primary objective of the interim guidance is to set forth a process for defining the dimension of the universe to be investigated in these tiers.

13. A second objective of this interim guidance is to make certain that the Agency's limited sampling resources are initially focused on the most serious sites. Regions are therefore directed to place primary emphasis on tier 1 sites, and later, on tier 1A sites. New sampling at tier 2 sites should be delayed, where it is not inconsistent with prior commitments, until the size of the universe for both tiers (1 and 2) are better defined.

14. The interim guidance directs Regional activities through several phases: an information collection phase, a field investigation phase and a response phase. Also included in the interim guidance are sections which provide guidance on community relations, enforcement procedures, and guidance on disposal alternatives.

Tiers 3 thru 6

15. Because of the large number of sites to be investigated for 2378-TCDD in these tiers, sampling at every site is not practicable.

16. The field investigations to be done at tiers 3 thru 6 will be from a selected sample of sites based on a sample frame developed by the Office of Water in conjunction with the Regional offices and Headquarters program offices (e.g., OPTS, OANR). The development of the sampling frame for tier 4 - combustion sources - will be managed by the Office of Air, Noise and Radiation (OANR) in conjunction with ORD (OEET). They will be supported by OSWER (Office of Solid Waste) for designing the sampling frame for hazardous waste incinerators and OPTS for municipal waste incinerators.

17. The initial sampling to be done at tiers 3 thru 6 will be funded through a special appropriation which has commonly been referred to as "The National Dioxin Study"; this appropriation is directed to the Office of Water. The Water office will work closely with OSWER in allocating resources to the Regions and program offices based on the final sampling plans.

18. The Office of Water in conjunction with the other program offices anticipates having a completed sampling plan for the "The National Dioxin Study" available for peer review by October 1, 1983. This plan will focus on tiers 3 thru 6 in decreasing order of emphasis since it is believed that 2378-TCDD contamination at sites in tier 6 is less than that of sites in tier 3. The primary basis for selecting sites in tier 3 will be the information

obtained during the investigation phase of tier 1 and additional data bases available from the compliance staff within the Office of Pesticides and Toxic Substances.

19. In developing the sampling plan for tiers 3 thru 6, it is anticipated that multi-media samples will be taken at sampled sites, including samples of water, aquatic sediments, fish, soils, groundwater, vegetation, air, and waste streams (liquid, gaseous, solid) as appropriate. Additionally, the sampling plan will draw upon information already available from previous sampling efforts (e.g., OPTS source sampling of municipal incinerators). The Office of Water, in conjunction with the appropriate program offices and the Regions, will identify the sites to be sampled. The Regions will then develop the detailed sampling plans (e.g., number of samples per media) for each site and, once the plan is reviewed by the appropriate program office, initiate field sampling.

20. It is recommended that not all samples collected at sites in tiers 3 thru 6 be initially analyzed for 2378-TCDD. For each site, some number of samples, which represent the locations most likely to be contaminated in the site, are to be analyzed for 2378-TCDD. If they prove to be positive, the remaining samples are then to be analyzed. Sample compositing or pooling is a technique which may accomplish somewhat the same results - to see if there is any 2378-TCDD contamination at a site. Compositing and pooling can, however, dilute the concentration in the pooled or composited sample which is to be analyzed, therefore, care must be used in making this kind of decision.

21. Funds available for "The National Dioxin Study" are to be used primarily to establish whether sites in tiers 3 thru 6 are contaminated with 2378-TCDD. The object of the study is to learn more about 2378-TCDD contamination at sites in these tiers. If 2378-TCDD is detected at a site during the study, the data will be forwarded to OSWER for further evaluation. Also, there may be reasons, such as public requests and requests from state governments, to sample sites in tiers 3 thru 6 that are not part of the sample design. Any activity at these sites will be in accordance with the interim guidance.

22. While the Office of Water has been delegated the overall lead in implementing "The National Dioxin Study", the interpretation of results and decision to take actions (e.g., remedies, control actions, etc.) is the responsibility of the respective program offices.

Tier 7 - Control Sites

23. Tiers 1 thru 6 represent sites of known or suspected sources of 2378-TCDD. A portion of the samples to be taken at these tiers will be ambient samples of suspected contaminated media, such as aquatic sediments, soils, fish, vegetation and groundwater. These samples will be useful in establishing the extent of outward migration of 2378-TCDD from a source that is shown to be contaminated.

24. EPA believes it is equally important to assess the extent of environmental contamination of 2378-TCDD by taking ambient samples at sites not suspected of being directly influenced by known sources of 2378-TCDD.

This may be considered an attempt to establish what many call a "background" concentration, and also serves to provide discrete data which addresses the general perception that 2378-TCDD contamination may be more widespread than previously documented. A portion of the special appropriation for "The National Dioxin Study" is specifically earmarked for this work.

25. Pursuant to this, the Office of Water, in conjunction with Regions and Headquarters program offices, will develop a sampling plan designed to determine the extent of 2378-TCDD contamination of the ambient environment. This plan should be available for implementation by October 1, 1983. It will probably call for the collection of fish and aquatic sediments at specific stations on selected streams throughout the U.S. Both finfish and shellfish are to be collected since they are known bioaccumulators of 2378-TCDD. Sampling of ambient media that does not concentrate 2378-TCDD, such as water or ambient air, is not recommended for this portion of "The National Dioxin Study".

26. Ambient sites which show 2378-TCDD contamination will be evaluated by the Office of Water and the Regions to establish, if possible, the source of contamination. The data will also be forwarded to OSWER for addition evaluation.

27. This strategy acknowledges the current proposal by OPTS to measure dioxin (and furan) levels in human adipose tissue, although at this time this effort is judged to be outside the scope of sampling and funding pursuant to "The National Dioxin Study". Nonetheless, EPA believes that this study should be implemented in conjunction with the Veterans Administration and HHS as part of the overall inter-agency research agenda.

Analytical Issues

28. For soil and sediment sampling at the ppb level, EPA's Office of Research and Development (ORD), working through the Environmental Monitoring Systems Laboratory, Las Vegas, Nevada (EMSL-LV) has issued guidance on sampling and preservation techniques, QA/QC procedures and analytical protocols. This guidance already exists and is being used by the Regions in collecting and analyzing soils at the ppb level.

29. Samples of surface water, groundwater, air (ambient and point source), fish, and other biological specimens are to be analyzed at the ppt level; in certain cases, such as the development of a discharge permit, ppq level of detection may be necessary. Interim guidance on analytical protocols and QA/QC for ppt and ppq levels of detection is available from ORD in a document dated July 27, 1983, which is being sent to all regional offices.

30. The Regions are to continue to use their existing analytical resources (either their own laboratories or contractor support) to process soil and sediment samples at the ppb level.

31. EPA's ORD will provide analytical services for samples of water, air, fish, sediment or any other sample type at the ppt and ppq level of detection; they will be able to process 150 samples per month for two years. Documentation on these arrangements and the identification of a sample control coordinator will be available by September 1, 1983.

32. There may be samples collected in tiers 1 thru 7 where analyses for other chemicals (e.g., dibenzo furans) and other dioxin isomers, in addition to 2378-TCDD, is justified. The rationale for such analyses should be discussed in the sampling plans developed by the Regions.

33. The decision to sample for other dioxin isomers and for other chemicals will be made on a case-by-case basis by OSWER for sites in tiers 1 and 2 and the Office of Water in tiers 3 thru 7. Decisions will be made in conjunction with the Regions and coordinated through the respective offices. Presently, analytical protocols, QA/QC procedures, internal standards, etc. are not well established for the other dioxin isomers (and probably for some of the other "obscure" chemicals as well).

34. Analytical protocols and QA/QC procedures will be developed for some of the other dioxin isomers (those judged to be most important) by EPA's ORD as part of this strategy's concurrent approach to studying other dioxin isomers. These protocols are expected to be available in FY 85; interim guidance will be available in FY 84.

35. Until such time that analytical procedures and a rationale for source investigations for the other isomers is established the Regions should collect a sample volume necessary to analyze initially for 2378-TCDD and subsequently for the other isomers. Wherever the Regions suspect contamination from more than one dioxin isomer, duplicate samples should be collected; one for 2378-TCDD analysis and the other to be used in analyzing for the other isomers.

36. Because of the number of samples to be collected from tiers 1 thru 7, analytical prioritization may become a critical issue, depending on laboratory capacities. As a general rule, the first samples collected are the first to be processed. However, whenever a conflict arises, samples from tier 1 take priority over samples in tier 2 and so on. Prioritization conflicts, should they arise, shall be resolved at the AA for OSWER or his designate.

37. This strategy recognizes that because the number of potentially contaminated sites has not been enumerated, the number of samples to be processed cannot be accurately estimated. Thus, samples collected from these tiers could conceivably outstrip current analytical capability. It is important, therefore, to understand that if this happens, increasing laboratory capability will require additional resources and time.

Assessment of Data

38. The data obtained from sites sampled in tiers 1 thru 6 will be assembled by the respective Regions. The Regions in conjunction with the program offices, will then prepare a report for each sampled site which summarizes available information including the analytical results. This report should also contain recommendations from the Regions on follow-up sampling, if necessary, and remedial actions at sites found to be contaminated, especially sites sampled in tiers 1, 2, and 3.

39. Reports on sites in tiers 1 and 2 will be forwarded to OSWER for review, comment, and assessment of follow-up actions.

40. Reports on sites in tiers 3 thru 6 will be forwarded to OW and OSWER for review and comment. Reports on sites in tier 4 - combustion sources - will also be reviewed by OANR with assistance by OSW and OPTS. A written report on samples from tier 7 is not necessary; the analytical results are to be tabulated and entered into EPA's STORET system.

41. Sites in all tiers that are determined to be contaminated with 2378-TCDD will be further evaluated by OSWER to determine the need for further sampling and/or response.

how is this decided?

42. Whenever it is determined that there is sufficient sampling to demonstrate that 2378-TCDD contamination constitutes a potential public risk, State health officials and CDC should be notified immediately, as stated in the OSWER Interim Guidance.

43. CDC and FEMA will continue to work through the OSWER program office as defined in the Executive Order pursuant to CERCLA and redelegation agreements pursuant thereof.

44. While there is general agreement among the program offices to centralize all the data to be collected from tiers 1 thru 7 the mechanism for centralization has not been determined. Under consideration are current ADP systems (e.g., STORET) and a separate system created specifically for this program. The Office of Water and OSWER will reach a resolution on data centralization and issue guidance by October 1, 1983.

45. The development of site-specific response actions at contaminated sites will be managed by OSWER in conjunction with respective Regions and other Federal/State agencies involved with the site. The technical basis for these actions shall be reviewed as necessary by the Chlorinated Dioxin Work Group and its subgroup, the Dioxin Disposal Advisory Group.

46. The Office of Water in conjunction with the other program offices will determine the extent of 2378-TCDD contamination in tiers 3 thru 6 by extrapolating from the sampled sites. The basis for extrapolation will be developed from the information assessed at the sampled sites and must be consistent with the overall sampling frame.

47. The Office of Water will also evaluate the data collected at tier 7 sites. This information, plus the site specific information from sampling tiers 1 thru 6, will be the basis for determining the extent of environmental contamination of 2378-TCDD. This overall determination shall be made jointly by OSWER and OW in conjunction with those program offices that have major assignments in the strategy.

48. Pursuant to the special appropriation for "The National Dioxin Study", OSWER and OW in conjunction with the other program offices will prepare a report which documents the extent of environmental contamination. This report shall be forwarded to the Deputy Administrator and made available to the public.

49. As the data are assembled, analyzed and reviewed, various regulatory options to prevent or control future 2378-TCDD contamination will be evaluated. Such actions as RCRA waste stream listings, CWA 307(a)(2) action, TSCA Section 6 rule, and Clean Air Act hazardous pollutant listings, for example, will be evaluated and recommendations to initiate regulatory actions will be made by appropriate program offices. Equally important will be the evaluation of current permit authorities (e.g., underground injection, ocean disposal, etc.) to assess if changes are necessary. Programs initiating regulatory actions are urged to use the Dioxin Strategy Task Force as a steering committee for regulatory development.

See p. iii

"Clean-up" of 2378-TCDD Contaminated Sites

50. Based on the information obtained and analyzed from sites sampled in tiers 1 thru 6, short and long-term clean-up strategies will be implemented at those sites where dioxin contamination is judged to warrant action. This judgment shall be made by OSWER with technical assistance from the Chlorinated Dioxin Work Group and ORD. Clean-up activities will proceed in accordance with the interim guidance.

51. Presently, alternatives which appear to be most feasible for uncontrolled sites are listed below:

A. Secure soil in place - in situ soil fixation, subsurface perimeter grout curtain, impermeable cap, diversion of surface runoff, resident relocation from immediate area and monitoring.

B. Consolidate and secure soil - removal of soil to secure landfill; or containment of soil in a concrete vault, possibly on-site.

C. Incineration - following excavation and transportation, a size reduction process is required before incineration.

D. Solvent Extraction - solvents would be used to extract dioxin from the soil into a soluble form. Several different technologies could then be used to destroy the dioxin.

52. OSWER in conjunction with ORD and the Dioxin Disposal Advisory Group will be responsible for pilot testing the more promising disposal/destruction techniques. A specific research agenda shall be developed by September 1, 1983.

53. Several important questions need to be addressed through pilot studies before these alternatives can be fully evaluated. For example, to destroy dioxin, the treatment technology must first break the dioxin/soil particle bond. In doing so, partially treated residues, or contaminated materials which may be released during processing, have the potential to spread contamination. Therefore, ORD will conduct a sorption/desorption study on contaminated soils to determine dioxin release rates. While these treatment technologies may present the ultimate solution to contaminated media, they could present significant health risks during processing. Thus, during the pilot testing phase, the potential for further contamination must be assessed.

54. Based upon the success of the pilot testing phase, OSWER staff in conjunction with ORD and the DDAG will recommend full field validation projects to the AA for OSWER. Upon approval, ORD will implement the full field validation studies in conjunction with the Region where testing is to occur.

55. The results of pilot testing and full field validation will be reported to OSWER. These results will be used to support specific guidance concerning the alternatives for clean-up given specific conditions of contamination and exposure. This guidance will be used by in deciding upon final clean-up options.

Health and Environmental Effects of 2378-TCDD

56. EPA realizes that much remains to be discovered about the effects of 2378-TCDD on both human health and the environment. This strategy recognizes that additional work must be done in this area and the information integrated into an authoritative view of the risks associated with exposure to 2378-TCDD. Some of this work is short-term in nature and appropriately conducted by EPA; other types of studies are longer-term and are beyond the purview of EPA. Thus, inter-agency coordination in this area is essential.

57. For purposes of intra-agency coordination, OSWER in conjunction with ORD and the program offices, shall develop a list of specific health and environmental effects research needs that will assist EPA in implementing the elements of this strategy. This list will also be used to assist in coordination with other Federal agencies.

58. The following short-term activities are to be conducted by ORD with assistance from CDC and the affected program offices:

A. Using best data at hand (carcinogencity and reproductive effects) ORD will coordinate hazard assessment techniques used by EPA in making site-specific risk assessments.

B. ORD in conjunction with the CDWG will establish exposure scenarios to estimate exposure under various conditions likely to be encountered at tiers 1 thru 6. A report is to be completed during FY 84.

C. OHEA will develop a nomograph for converting from 2378-TCDD levels of contamination in environmental media to estimates of upper risk limits for a variety of exposure scenarios; a final product will be completed during FY 84. OHEA will provide guidance to the Regions and States on use of exposure nomographs; guidance will be available during 1985.

59. The respective offices will review the three dioxin hazard assessment documents being prepared by ORD and determine the implications these documents have on the elements of this strategy. In addition, the Office of Water will work with the FDA in assessing the relationship between the FDA action levels for 2378-TCDD in fish and the proposed ambient water quality criteria. Any conflicts between the two numbers are to be identified and resolved, if possible.

60. EPA's ORD will study the bioavailability and uptake mechanism of sorbed 2378-TCDD. ORD will also investigate the transport and transformation processes (bioaccumulation and biomagnification) of 2378-TCDD in fish, sediments, and plants for use in food chain models and establishment of acceptable levels. ORD will develop a time frame for these activities and identify resource needs by September 1, 1983.

61. EPA's ORD has been delegated the responsibility to serve as EPA's focal point in the development of health and environmental research needs that are beyond the purview or capabilities of EPA. The following research items are judged to be of sufficient importance to the strategy that they should be specifically identified in any inter-agency meetings concerning this topic:

A. Understanding the pharmacokinetic mechanism of 2378-TCDD induced toxicity to determine differences between species in reaction to 2378-TCDD.

B. Understanding and developing the toxicological and analytical relationship between 2378-TCDD and "2378-TCDD equivalents" in complex mixtures for more rapid and less expensive determinations of 2378-TCDD levels and effects.

C. Conducting epidemiological studies at contaminated sites to provide better information of risks for regulatory decisions. This work will help establish the cause/effect relationship of 2378-TCDD to human disease.

Other Dioxin Isomers

62. There are a number of dioxin isomers other than 2378-TCDD which have the potential for causing significant exposure and risk problems because they have been and are still being produced in substantial quantities and because, even though they are less toxic than 2378-TCDD, they are still highly toxic. These other dioxin isomers are inadvertent byproducts of a number of production processes involving halogenated phenols and are also created by a number of combustion processes. The production and use of pentachlorophenol is of major concern.

63. As part of this strategy's dual approach to dioxin, the Office of Solid Waste has the lead responsibility for developing a program to study the other dioxin isomers. Activities are to include: 1) determining the specific sources of other dioxin isomers, 2) assessing their toxicity, 3) evaluating their environmental fate and transport properties, 4) developing exposure and risk assessments based on the above information, and 5) recommending appropriate control actions.

64. The Office of Solid Waste plans to use existing information and chemical structure analyses to develop during FY 84 a sampling program to evaluate potential sources of dioxins including the sources which were analyzed as part

of the 2378-TCDD sampling program. A program plan shall be available for review by January 1, 1984. The sampling program for sources of the other dioxin isomers will begin in FY 85.

65. In order to take advantage of the sampling effort being conducted for 2378-TCDD, the Regions will collect sufficient sample volumes to analyze for both 2378-TCDD and the other dioxin isomers at those sites determined to be potentially contaminated with other dioxin isomers.

66. As part of the development of inter-agency research needs, EPA's ORD will coordinate with the other Federal agencies in developing a research program which addresses the toxicology of the other dioxin isomers.

67. During FY 84, the Office of Research and Development (ORD) will work with the Centers for Disease Control (CDC), the U.S. Fish and Wildlife Service, and other Federal agencies to develop analytical protocols to measure dioxins in biological tissues, waste emissions, and environmental media.

68. ORD, in conjunction with OSW, will develop and apply methods to predict the fate, persistence, and bioaccumulation potential of dioxins in the environment. These efforts will begin in FY 84 in conjunction with the development of the sampling program discussed above. The results of these analyses will be combined with the source asessments and toxicity studies to provide interim exposure and risk assessments for the other dioxin isomers.

Coordination

69. Coordination between the various agencies and intergovermental coordination is a crucial element necessary to answer questions that have been raised about dioxin exposure, environmental effects, and risk. In the area of health research (toxicological studies and epidemiological studies), the federal health and safety agencies, e.g., CDC, NIOSH, FDA, VA, and EPA should work together in a coordinated fashion. The governments of Canada and Italy, in particular, should also be involved in the coordination of efforts pursuant to this strategy. OSWER will have overall responsibility for coordination.

70. Pursuant to effective inter-agency coordination, OPTS will develop a plan which will frame the issues to be addressed by the agencies and, in relationship to EPA's strategy, investigate various mechanisms (e.g., HHS committee to coordinate environmentally related programs) to secure interagency coordination. This plan will be available by October 1, 1983 for review by the Deputy Administrator.

71. EPA recognizes the importance of the States in effectively implementing this strategy. Accordingly, the Regions are to coordinate with the States in gathering information on specific sites, in developing sampling plans and collecting samples, and in devising the apropriate response. It is especially important to encourage States' initiative in any response efforts that may take place at a contaminated site including direction of responsible private party action. Such coordination will minimize duplication and maximize resource availability.

72. It is very likely that the results of EPA's dioxin strategy will point out the need for more work in a number of areas; especially in the area of source characterization and control technologies for the other dioxin isomers. Since funds are not yet available for additional work, requests for additional funding should be developed through the appropriate EPA and other agency budget processes.

PART 3

INTERIM GUIDANCE FOR TIERS 1 AND 2

August 16, 1983

MEMORANDUM

SUBJECT: Interim Guidance to Regions on 2,3,7,8-TCDD Site Investigations

FROM: Lee M. Thomas
Assistant Administrator
Office of Solid Waste and Emergency Response

TO: Regional Administrators Regions I - X

EXECUTIVE SUMMARY

INTRODUCTION

The Agency has been developing an overall strategy for responding to the public health risks associated with dioxin contamination. The major components are:

1) A national study of selected sites to estimate the extent of dioxin contamination (the "study" component);

2) Identification and coordination of research and regulatory initiatives to prevent contamination (the "regulatory" component);

3) Development of appropriate response measures at contaminated sites (the "cleanup" component).

The EPA dioxin strategy provides for intensive focus on the most toxic of the 75 dioxin isomers - 2,3,7,8 tetrachlorodibenzo-pdioxin (TCDD). The other dioxin isomers, which have different physical and chemical properties, will be evaluated as part of the strategy to determine whether they merit the same intensive investigation.

This memorandum provides interim guidance on the third major component listed above: the identification of TCDD contaminated sites and the development of appropriate response measures.

For the overall strategy, the Agency has identified a seven tier hierarchy of sites based on an estimated decreasing potential for 2,3,7,8-TCDD contamination. The focus of the cleanup component will be initially on the most serious sites, and this guidance sets up a controlled, structured approach for working down through Tiers 1 and 2 to identify TCDD contaminated sites. The national study will utilize the data being collected in the cleanup component, but will focus its resources on Tier 3 through 7. Of course, any site discovered to be contaminated with 2,3,7,8TCDD in the national study or otherwise will be referred for appropriate cleanup response.

For the cleanup component, the 2 tiers of concern are:

Tier I - Current, if any, and former sites of 2,4,5-TCP production

Tier IA - Transport, treatment, storage, and disposal (TTSD) handlers or sites used by Tier I facilities.

Tier II - Sites, where 2,4,5-TCP was or is used as a precursor to produce another chemical product (e.g., hexachorophrene; 2,4,5-T; silvex, etc.)

Tier IIA - Transport, treatment, storage, and disposal (TTSD) handlers or sites used by Tier II facilities.

Due to the manufacturing processes involved, it is estimated that 80-95% of the 2,3,7,8-TCDD produced in this country is associated with Tier I and IA. While it is believed that there are approximately 20 facilities in Tier I and 80 in Tier II, there is no accurate count of handlers or sites in Tiers IA or IIA. Accordingly, a primary objective of this guidance is to set forth a process for defining the dimensions of the universe to be investigated.

A second objective of this guidance is to see that the Agency's limited sampling resources are initially focused on the most serious sites. Regions are directed to place primary emphasis on Tier I sites, and later on Tier IA.

Additionally, it is recognized that some regions are already sampling at sites in Tier 2. The demand that this sampling has placed on the national lab capacity and Superfund support contracts is considerable. In order to focus on the potentially more serious sites in Tier 1A, and to maintain resources for other Superfund work, the Agency has made a decision that new sampling at Tier 2 sites should be delayed, where it is not inconsisent with prior commitments, until the size of the universe for both tiers is better defined. Then, the Agency will make decisions regarding the best way to apportion laboratory capacity, support contracts and technical resources. This interim guidance sets forth certain other decisions which will have to be coordinated with OSWER in order to maintain a coherent Agency approach and to control the resource demands nationally.

APPROACH

The regions' activities at the sites will involve several phases. The basic approach, explained in more detail later in this interim guidance, is as follows:

Information Collection

1. Consolidate regional and headquarters data bases to identify Tier 1 and 2 sites.

2. Collect information for known Tier 1 and 2 sites to begin identification of Tier 1A and 2A facilities and sites.

3. Depending on the results, arrange site visits, employee interviews, and other evidence collection necessary in the field.

Field Investigation

1. Sampling at Tier 1 Sites should begin during the information collection phase.

2. No new sampling should be initiated at Tier 2 sites until the results of the information collection process are analyzed, and the Agency determines how it will proceed. The same is true for transportation, treatment, storage and disposal handlers or sites associated with any of the 2 tiers.

Response Activities

1. If 2,3,7,8-TCDD contamination requiring a cleanup response is identified, direct initial efforts at getting potentially responsibe parties (PRPs) to take appropriate action (e.g., remedial investigation, emergency response, etc.)

2. If necessary, develop a Superfund cleanup response.

DETAILED GUIDANCE

Whenever possible, the Agency will work closely with the States and encourage them to be the lead Agency as it does throughout the Superfund program. After the Agency has conducted an initial screening of the sites, it will look to potentially responsible parties (PRPs) to undertake Remedial Investigations (RI). Due its resource demands placed on the Agency, the Agency has made a management exception to current policy by allowing PRPs to undertake Remedial Investigations. The scope of any remedial investigation conducted by a PRP will be incorporated into an administrative order.

Community Relations Plans

Community Relations Plans (CRPs) must be developed for each site in accordance with the guidance issued to the Regions on May 9, 1983 with modification as necessary for consistency with this interim guidance.

Information Collection

The Office of Waste Programs Enforcement (OWPE) is in the process of identifying current and former 2,4,5-TCP manufacturing sites (Tier 1) and current and former manufacturers who purchased 2,4,5-TCP as a feedstock in pesticide production (Tier 2). The compliance monitoring staff of the Office of Pesticides and Toxic Substances Enforcement (OPTSE) will assist OWPE in identifying potential 2,3,7,8-TCDD dioxin sites by providing accesss to their FATES computer system from which information on pesticide production can be obtained. Further, OPTSE in conjunction with the Regions (Air and Hazardous Materials Division) will summarize and provide information from the Toxic Substances Control Act (TSCA) Section 6 dioxin inspections. Various program and enforcement offices in Headquarters are being asked to compile information and coordinate it through OWPE. The results of the survey will be available to the regions before September 1.

The Regional Superfund program and enforcement offices should confer with the Regional Pesticides, Toxic Substances and the Resource Conservation and Recovery Act (RCRA) program and enforcement offices to obtain information on production, transport, treatment, storage, and disposal of 2,4,5-TCP wastes from facilities identified by OWPE and other facilities the Regions may identify. The Regions should notify OWPE of the results of their document search by September 6, 1983. This information will be used by OWPE to complete its categorization of sites and facilities into the appropriate tiers. OWPE will provide this "revised categorization" to the respective regions by September 19, 1983, and will update this information as necessary.

In order to gain more informaton on potentially contaminated 2,3,7,8-TCDD sites the Regions will issue CERCLA §104/RCRA §3007 information request letters by September 30 to all Tier 1 and Tier 2 facilities identified by OWPE and the Regions (see attached letter and questionaire). Recipients of the letter will be given 45 days to respond. The letters will request information on the amounts of waste generated and disposed, current and past disposal practices, including disposal site locations and waste haulers, and other pertinent information that may be needed to support an enforcement or Fund-financed response action.

The Regions are advised to remain firm on the 45-day deadline for responses to the information request letters. Extensions, if granted, should only be granted for good cause shown and should not exceed two weeks.

Most responses, even with a two week extension, should be in the Regional offices by November 15, 1983. The Regions should review the responses and provide to OWPE, by December 15, 1983, the following:

1) List of facilities that complied with the request.

2) List of facilities that failed to respond.

3) List of additional sites, including transporters, treatment, storage, and disposal facilities identified in the responses.

4) A regional plan for further investigative and response activities for each site.

After compilation and review of all available information, the Region will determine if additional information gathering through follow-up site inspections, interviews with current and former site employees, responsible party searches, and/or title searches is needed. The Regions should also consider the use of a trained investigator to compile information and assist in investigations.

PRELIMINARY INVESTIGATION PHASE (SCREENING)

This portion of the guidance explains how to conduct a systematic investigation of facilities. Tier I sites will be screened first in order to focus efforts on sites posing (potentially) the most urgent and widespread public health concerns. When OSWER determines that the resources are available nationally, Tier 1A, 2, and 2A sites will be investigated following these same procedures.

During the preliminary investigation phase an initial screening of Tier 1 facilities shall be conducted to determine if 2,3,7,8-TCDD is present at the site. If it is present, further remedial investigation or endangerment assessments shall be conducted as described in the response phase of this guidance. Initial screening of Tier 1 facilities will be conducted by EPA or States concurrent with information gathering.

Once the Region has identified the Tier 1 facilities targeted for preliminary investigation, it will devise a screening program for collection of a limited number of environmental media samples at these sites. In Regions where several Tier 1 facilities are to be screened, an inspection scheme should be developed to help management set priorities and schedule investigations.

In general, where currently operating facilities have been targeted for sampling, the Region should look to FIFRA, TSCA, RCRA, and/or CERCLA

for authorities to conduct record inspections and/or collect environmental media samples.

Field Investigation Procedures

The following procedures for screening sites for potential 2,3,7,8-TCDD contamination should be instituted for Tier 1 sites.

1) Develop and implement 1) Develop and implement an initial site sampling plan (screening program using the protocols and procedures developed by EPA/ORD and the Centers for Disease Control (CDC) to sample the most problable locations of dioxin contamination at the site or in the immediate vicinity. Site inspection schemes should be reviewed with OWPE Regional Coordinators - Compliance Branch. During this round of sampling, limit the number of samples taken to only those which are necessary to determine if dioxin is present. States should be advised by Regions of the site inspection schemes. For active industrial sites, CDC should be contacted to coordinate with the National Institute for Occupational Safety and Health (NIOSH) for further sampling guidance. If there are people living in the area, the State health officials and CDC should review all sampling protocols from the beginning. CDC should be contacted through its staff person in each EPA Regional Office.

2) Initial field investigations must employ EPA chain of custody procedures, document control, site safety plan procedures and Quality Assurance/Quality Control procedures.*

3) Analysis for 2,3,7,8-TCDD in soil will be conducted using State-of-the-art low resolution GC mass spectrometry methodology and appropriate detection limits. Analysis for 2,3,7,8-TCDD will be performed using high resolution GC mass spectrometry methodology in enviormental media other than soil. Qualitative analytical screening for other dioxin isomers should also be considered by the Regions at sites where there is reason to believe that other dioxin isomers may be present. The Regions should contact the National Contract Lab Program in order to schedule sample analysis as early as possible. These samples should be labelled as Tier 1-2,3,7,8-TCDD samples in addition to any of the identifiers used. (Coordination should be through the Regional Environmental Services Division (ESD) Directors).

4) If the initial sampling results indicate 2,3,7,8-TCDD is present, and response action is to be pursued through either enforcement or Fund-financed activities, the procedures set forth in the Response Phase of this guidance should be followed as appropriate. All phases of response must be in accordance with the National Contingency Plan.

* Guidance for QA/QC is available from the Office of Research and Development.

Regional Workplan

The information obtained from the field investigations should be used by each region to develop a Regional workplan which initially determines whether or not a contaminated site will be addressed through Fund-financed activities or enforcement authorities, and projects a schedule for further action. Workplans should be submitted to OSWER by January 15, 1984. These workplans will be reviewed by OSWER in light of the national demand for resources and analytic laboratory capacity. OSWER will consult with the Regional Offices on any adjustments to the workplans based on the dimensions of the national situation.

Response Phase

Response action will be initiated at a site when the analytical results of the preliminary field investigation (screening) confirm the presence of 2,3,7,8-TCDD and the Region determines that the situation warrants response. In evaluating whether or not to take a response action at a site, the Agency will consider criteria such as the following: the location of the site, the site's use, the demography, etc.

If technical assistance or expenditure of funds from other Federal agencies is needed, a Regional Response Team (RRT) meeting should be convened. The RRT will serve as the coordinating mechanism within the Federal government and for Federal/State cooperation. In addition, because the RRT serves as the coordinator for inter-agency actions, it can also become the focal point for communications with the local citizens and the press at a site.

Enforcement Procedures (See Figure II)

To support possible enforcement response actions at Tier 1 sites where 2,3,7,8-TCDD contamination has been confirmed through initial screening, additional information gathering may be needed to supplement the material gleaned from the CERCLA 104 and RCRA 3007 information request letters and from FIFRA/TSCA inspections. In the Regions, the Air and Hazardous Materials Division will determine the sufficiency of information collected and have primary responsibility for compiling information from local, state, and Regional sources. At the Region's request, OWPE will compile information from computer systems such as FINDS in the Management Information Data Systems Division and from the various program and enforcement offices to support an enforcement response action at a particular site.

Once the potentially responsible parties (PRPs) have been identified, notice letters will be issued apprising PRPs that EPA has conducted or will conduct planning or response actions at the site to determine both the nature and extent of the dioxin contamination. The PRP will be offerred the opportunity to undertake the necessary assessment and response actions at the site, and will be apprised of possible liability under CERCLA for injunctive relief or cost recovery in the event Superfund action is taken. If the PRPs choose to undertake the necessary response actions at the site, the Region should, depending upon the evidence available, issue an administrative order on consent in order to gather additional data and

direct the appropriate response measures (e.g., CERCLA §106, RCRA §3013, RCRA §7003).

Where PRPs decline to undertake the necessary remedial investigation activities the Region will pursue, after consultation with the Office of Waste Programs Enforcement (OWPE) and the Office of Enforcement Counsel - Waste (OEC-Waste), one of the following options:

1) Issuance of a unilateral RCRA §3013 or CERCLA §106 order to obtain the information necessary to conduct a feasibility study;

2) Initiation of a Fund-financed removal action;

3) Initiation of a Fund-financed remedial investigation/feasibility study (RI/FS); or

4) Initiation of an enforcement-funded endangerment/alternatives assessment.

The option selected will be dependent upon such variables as the complexity of the case, severity and imminence of hazard, the number of sites needing response action, availability of Superfund and/or enforcement dollars, and availability of personnel.

If Option 1 above is selected and the PRP complies with the order, then EPA will perform the feasibility study. If the PRP chooses not to comply with the order, then the Region should pursue Option 2, or 3, or 4. If option 2 is chosen, the procedures outlined for "removals" in the Response Section below should be followed. For option 4, an endangerment assessment must be performed by the Region. In addition, an endangerment assessment may also be necessary for options 2 and 3 if a cost recovery action is to be taken. This assessment will examine the nature and quantity of the dioxin or any hazardous materials, exposure pathways, human and animal populations exposed or potentially exposed and the actual or potential risks and effects associated with the exposures to the hazardous materials. At this point, CDC should be notified of the information contained in the endangerment assessment and be asked for a health assessment or advisory. CDC will coordinate with NIOSH for active work-related situations. The endangerment assessment along with the subsequent alternatives assessment are considered to be the critical components of the enforcement strategy, and are necessary to ensure successful prosecution of an enforcement action under administrative or judicial statutory authorities.

Upon completion of the Fund-financed RI/FS or the enforcement financed assessments, the Region will have 60-120 days to negotiate an agreement with the PRPs for response action.

If an agreement can be reached, it will be embodied in an administrative order or a consent decree pursuant to §106 and/or §7003. If an agreement cannot be reached, the Region will pursue, after consultation with OWPE and OEC-Waste, one of the following options:

1) Issuance of a unilateral administrative order pursuant to §106 and/or §7003; or

2) Initiation of a judicial action pursuant to §106 and/or §7003; or

3) Initiation of a Fund-financed response action followed by a §107 cost recovery action.

If Option 3 is selected, then the Region will initiate a cost recovery action pursuant to §107 for reimbursement of expenditures under Superfund for site planning and response and other expenditures. Cost recovery actions will be conducted in accordance with existing procedures and policies.

Dioxin sites identified for action by states may require Agency overview in the form of technical support for enforcement actions or response actions. In certain cases, actions may involve joint federal EPA and state efforts. Depending on the success of state enforcement action, direct EPA involvement may be necessary.

Fund-Financed Response

If the initial sampling (i.e., the limited sampling performed as step #1 of the Field Investigation Phase) results indicate that dioxin is present, and the response is to be Fund-financed, then the Agency must decide if the situation warrants a removal action. Regions must recommend removal actions, with required documentation to the Assistant Administrator for OSWER. CDC should be consulted in case a health assessment or advisory is needed. If EPA believes temporary relocation is warranted, it must ask the Federal Emergency Management Agency (FEMA) to make such a determination.

It is possible that either or both short-term and long-term cleanup activities may be necessary at a site. (If the site is going to need long-term or "remedial" work, then the site needs to be scored in accordance with the Hazard Ranking System for ranking and placed on the National Priorities List (NPL), if appropriate).

Additional investigation, planning and design work for long-term activities can be performed while short-term cleanup activities are being performed. If work other than removal action is needed, the following activities should take place:

1) A more detailed sampling effort should be conducted at the site, setting up the sampling locations in a grid network extending beyond the facility boundaries. Environmental media other than soil should also be sampled when appropiate. Once again, CDC and/or NIOSH should be involved in this process. Sample protocols and analysis schedules should be reviewed with OERR. As noted above, the Region should contact the Sample Management Office of the National Contract Lab Program in order to schedule all sample analyses and mark samples "Tier 1-TCDD". Coordination should be through the Regional ESD Directors.

2) Once the results from this second sampling are obtained, EPA should again request a health advisory or assessment from CDC. Based on CDC's recommendations, EPA must decide if temporary or permanent relocation should be considered for persons residing in the vicinity. As noted above, FEMA makes the determination for temporary relocation during removal activities. If temporary relocation is contemplated during remedial actions, EPA makes the determination (under a recent redelegation of authority from FEMA) that it is necessary and FEMA implements the determination. EPA also has the responsibility for making the determination concerning permanent relocation, and FEMA implements it.

3) If further response activities are warranted, and the site has been proposed for inclusion on the NPL, feasibility study and design-work should be initiated, followed by additional construction.

Separate guidance is attached concerning the short-term and long-term technical options for destruction and disposal of dioxin which are currently available or being developed. In addition, information is included regarding the notification procedures to be followed for the transport or disposal of dioxin.

TECHNICAL ASSISTANCE

The Region should consider using their FIT and TAT as well as FIFRA, TSCA, and Water inspection program resources in the information collection and initial screening phases. The Superfund contractors (REM/FIT and TAT) as well as the technical enforcment support (TES) contract should be used to support field investigations, data analysis and development of feasibility studies for 2,3,7,8-TCDD contaminated sites. Water quality program monitoring resources may also be useful in the investigative mode for fish and water sampling. Environmental media samples taken during the field investigations can be analyzed by the Superfund contract laboratory program. If the capacity of these laboratories is exceeded, other laboratories available to the Region through contractual arrangements, ORD or the Environmental Services Division, may be employed after consultation with OERR's Technical Support Division.

Financial Assistance

The States can use the money allotted to them through the CERCLA/RCRA 3012 program to investigate sites thought to be contaminated with 2,3,7,8-TCDD. For example, if the State has targeted 100 site inspections in their application, and now wishes to inspect 20 TCDD sites. The States can perform activities at the 20 TCDD sites as part of their established goal. This would simply reestablish priorities for the States.

The following activities can be funded with these grants: preliminary assessments, site inspections, responsible party searches, discovery, and site inspection followup. For more information about this source of funds, you can refer to the Federal Register Notice of February 7, 1983 and the EPA guidance issued on March 8, 1983.

FIGURE 1

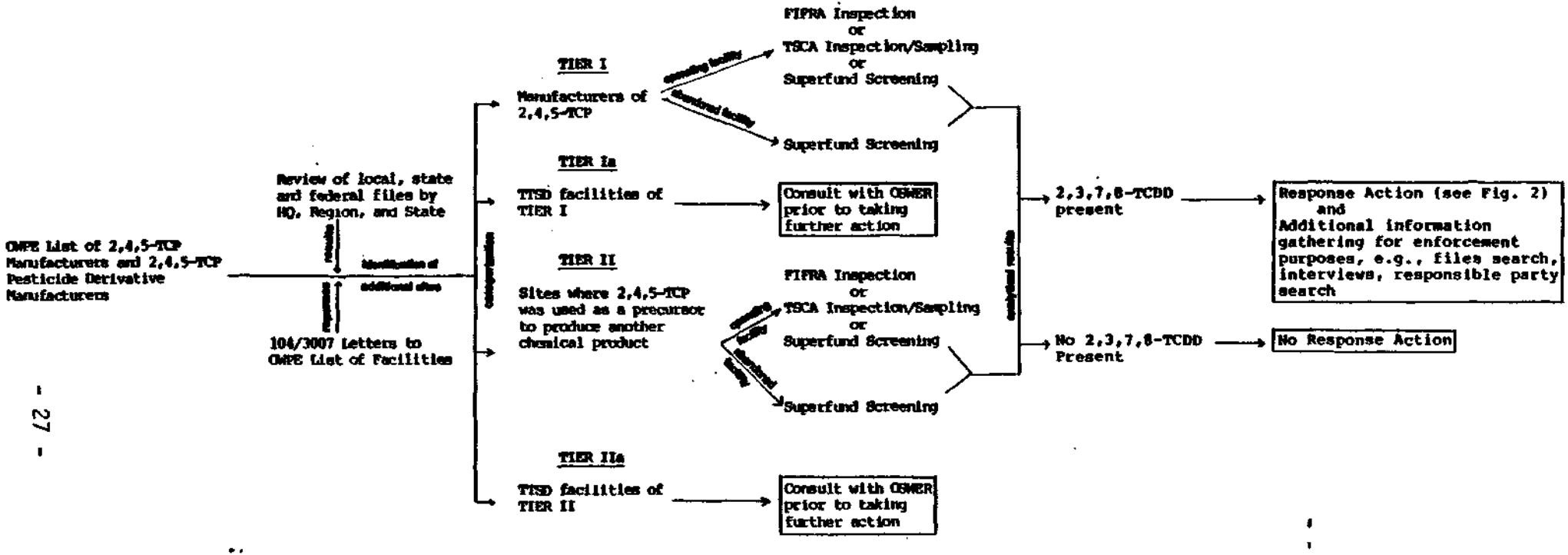
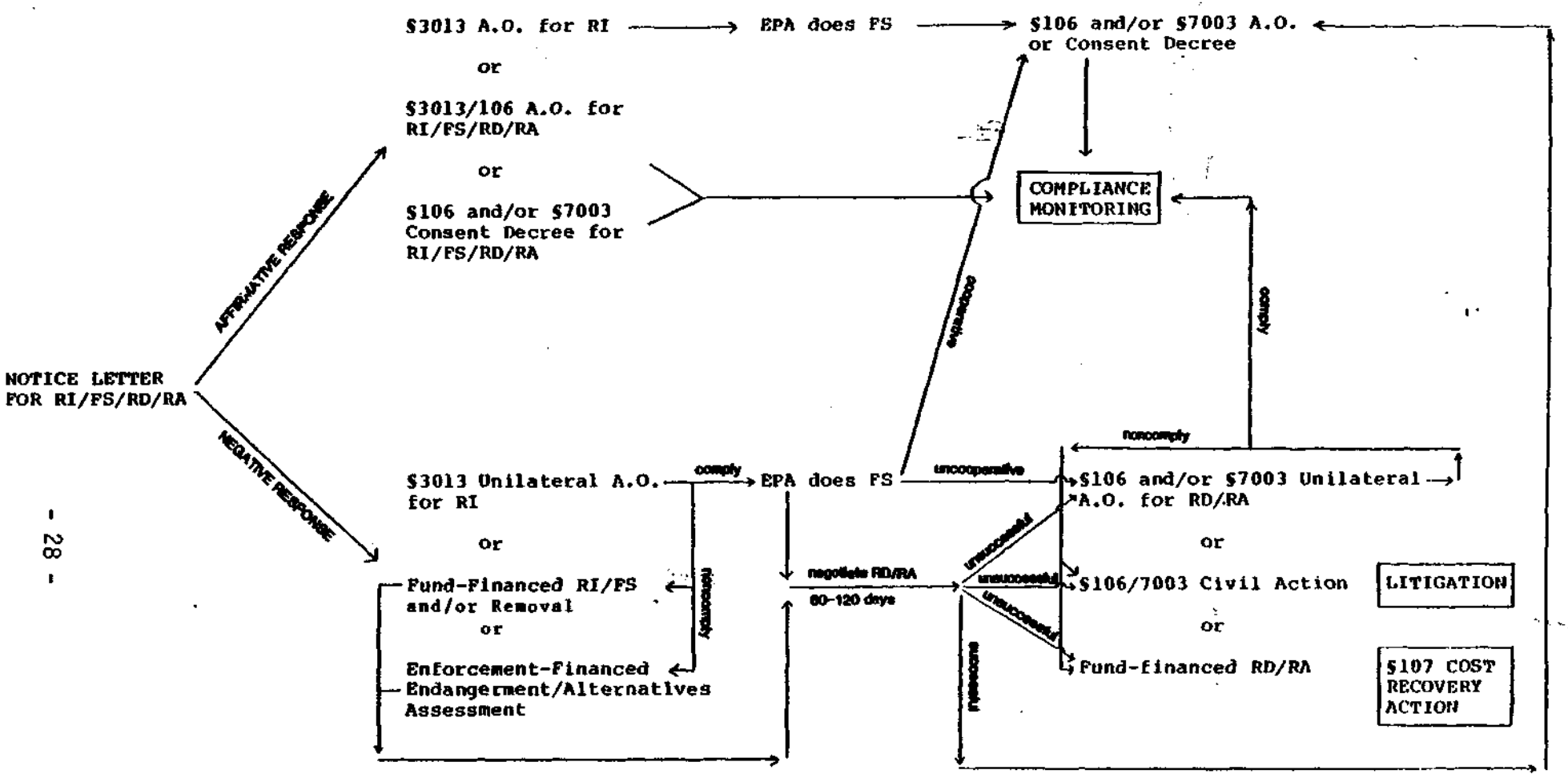

OMPE List of 2,4,5-TCP Manufacturers and 2,4,5-TCP Pesticide Derivative Manufacturers
Review of local, state and federal files by HQ, Region, and State
Identification of additional sites
104/3007 Letters to OMPE List of Facilities
TIER I
Manufacturers of 2,4,5-TCP
operating facility
discontinued facility
FIFRA Inspection
or
TSCA Inspection/Sampling
or
Superfund Screening
Superfund Screening
TIER Ia
TTSD facilities of TIER I
Consult with OSWER prior to taking further action
TIER II
Sites where 2,4,5-TCP was used as a precursor to produce another chemical product
operating facility
discontinued facility
FIFRA Inspection
or
TSCA Inspection/Sampling
or
Superfund Screening
Superfund Screening
TIER IIa
TTSD facilities of TIER II
Consult with OSWER prior to taking further action
analytical results
2,3,7,8-TCDD present
Response Action (see Fig. 2)
and
Additional information gathering for enforcement purposes, e.g., files search, interviews, responsible party search
No 2,3,7,8-TCDD Present
No Response Action

FIGURE 2


NOTICE LETTER FOR RI/FS/RD/RA
AFFIRMATIVE RESPONSE
NEGATIVE RESPONSE
$3013 A.O. for RI
or
$3013/106 A.O. for RI/FS/RD/RA
or
$106 and/or $7003 Consent Decree for RI/FS/RD/RA
EPA does FS
$106 and/or $7003 A.O. or Consent Decree
COMPLIANCE MONITORING
cooperative
comply
noncomply
$3013 Unilateral A.O. for RI
comply
EPA does FS
uncooperative
$106 and/or $7003 Unilateral A.O. for RD/RA
or
Fund-Financed RI/FS and/or Removal
or
Enforcement-Financed Endangerment/Alternatives Assessment
noncomply
negotiate RD/RA
60-120 days
unsuccessful
unsuccessful
unsuccessful
$106/7003 Civil Action
or
Fund-financed RD/RA
noncomply
LITIGATION
$107 COST RECOVERY ACTION

ATTACHMENT I

DISPOSAL GUIDANCE

Background

Although a significant amount of dioxin-related research work has been published, most is related to the toxicity or destruction of dioxin in a solubilized form. This is rarely applicable to the conditions existing at most Superfund sites. These sites are often characterized by a variety of contaminated soils, gravels, and other materials, for which there is little available information to use in developing a technically sound prediction of dioxin's behavior in the environment, its containment efficiency, or treatment effectiveness.

Due to dioxin's known toxicity and hazards to personnel, the scientific community has been reluctant to conduct controlled investigations of dioxin's environmental behavior outside of the laboratory. These risks, plus the high cost of analytical testing, have also limited rigorous studies of uncontrolled dioxin releases to a few instances. Furthermore, only at Seveso, Italy, and Syntex have significant investigations been conducted into treatment alternatives for dioxin-contaminated soil. At these and the other sites, the contaminated soil was eventually contained in a landfill or is presently in an interim storage facility, awaiting the development of technologies related to dioxin-contaminated soil.

Remedial Action Alternatives Considered

Over 40 possible treatment processes and over 500 sources of information were considered in the initial screening of alternatives for the feasibility study Minker/Stout dioxin site in Missouri.

The treatment processes were screened on the basis of 1) state of development, 2) health and safety risks, 3) process complexity and constructability, 4) reliability, and 5) cost.

Six remedial alternatives were selected for a detailed evaluation. Alternatives A through C rely on the principle of containment to reduce dioxin exposure which, due to the demonstrated insoluble nature of dioxin in these soils, centers around immobilizing the contaminated soil particles. Alternatives D through F rely on the principle of treatment to reduce dioxin level, in addition to containment of the treatment residue. In reality, each treatment alternative is a two-stage process, involving soil extraction (thermal or solvent), followed by a destruction process. Contaminated soil has several unique characteristics that make the application of any of the treatment alternatives a challenge.

Among the special requirements are:

- The need to process a wide range of contaminated materials, e.g., rocks, clay, roots, and other materials on-site.

- The requirement that the remedial alternative be capable of processing all contaminated material. Combination of remedial alternatives for various types and concentrations of contaminated material were not considered.

- The use of Level C or higher personnel protection for all soil handling and treatment activities.

- The potential listing of TCDD as a RCRA waste, which will significantly impact storage, transportation, monitoring, and treatment requirements. If residue tests and other limitations do not enable a delisting of the treated residue, there would appear to be little cost incentive to treat the soil prior to containment in a fully permitted secure landfill.

The following six remedial alternatives were selected for a detailed evaluation at the Minker/Stout site. Alternatives D, E, F and the possible fixation portion of Alternatives A and C have significant technical unknowns that warrant pilot testing to better demonstrate their application to dioxin-contaminated soils. Alternative B and the remainder of Alternatives A and C are highly site-specific and do not warrant pilot testing but may need additional site testing.

Alternative A -- Secure Soil In Place

This alternative would secure the soil in place and prevent public site access. This would likely involve insitu soil fixation and securing the site with a subsurface perimeter grout curtain, an impermeable cap over the contaminated area, and diversion of surface runoff. Permanent resident relocation and house demolition would be necessary within the sites and for any additional households inside an undertermined buffer zone. A longterm site monitoring and maintenance program would be necessary to monitoring the ground water and conditions in the surrounding environment.

Alternative B -- Consolidate Soil On-Site

This alternative would remove the contaminated soil and consolidate it into one area at the site. Due to the varying soil depths, unknown site hydrogeology, and the need for a positive liner and leachate collection system, a double-lined, above-grade concrete vault would be used to contain the contaminated soil. Permanent resident relocation and house

demolition would be necessary within the sites and for additional households inside a buffer zone. A long-term site monitoring and maintenance program would also be required.

Alternative C -- Secure Soil Off-Site

This alternative would remove and transport the contaminated soil to a secure hazardous waste landfill for disposal. In accordance with the April 4, 1983, Federal Register, the Agency is currently proposing the addition of dioxin wastes to the RCRA regulations. If this proposed rule is promulgated, the design and operation of each landfill disposal facility would need to be thoroughly evaluated before dioxin could be added to the landfill's permit. The removed soil volume and up to a foot of additional fill would be added to restore the site drainage and to cover any fugitive traces of contaminated soil. The site would be relandscaped and the houses rehabilitated to completely restore the area.

Alternative D -- Incineration

This alternative would involve the direct thermal extraction and destruction of the TCDD-contaminated soil. The contaminated soil would be stabilized on-site or removed to a concrete vault, or other storage facility, where it would remain while the incineration process was pilot tested and developed for this particular contaminated soil. The low levels of soil contamination, required high destruction and removal efficiency, and widely varying soil characteristics will likely expand the state-of-the-art of incinerator technology.

A significant permitting effort could be necessary for the pilot tests and for the siting of a full-scale facility. Following the permitting process and the construction of the facility, the soil would be transported to a size reduction and handling process, and then to an incinerator. The incinerator particulate and soil residue would be transported to a secure landfill site, unless extensive testing allowed the residue to be delisted under RCRA.

Alternative E -- Solvent Extraction

This alternative would extract the dioxin from the soil with a solvent, concentrate the solvent, and then destroy the dioxin in the solvent. The contaminated soil would be stabilized on-site or removed to a concrete vault where it would remain while the solvent extraction process as pilot tested and developed.

A significant permitting effort could also be necessary for the pilot tests and the siting of a full-scale facility. Following the permitting process and the construction of this process, the

soil would be transported to a size reduction and handling process, and then to the solvent extraction process. The resulting contaminated solvent would be concentrated, with the concentrate undergoing degradation and incineration. The incinerator particulate and the soil residue would be sent to a secure landfill site, unless extensive testing allowed the residue to be delisted.

Alternative F -- Storage While Awaiting Development of Emerging Technology

This alternative would allo for the development of emerging technologies other than incineration and solvent extraction. The contaminated soil would be removed and stored until such time as emerging technologies (such as supercritical water reactors, wet air oxidation, fluidwall reactors, and biological degradation) could be pilot tested and evaluated for their ability to be competitive with existing technology. Today, these technologies are not developed sufficiently to be used commercially for this type of hazardous waste. All of these technologies have several major technical hurdles to overcome before they can be considered viable. There is a risk that these emerging technologies may never become cost effective for these soils and, therefore, a contingency plan would be necessary, should a research and development program not proceed as quickly as planned or be unable to demonstrate an acceptable alternate technology.

Long and Short-Term Control Strategy

Preliminary testing indicates that three Minker/Stout soil samples subject to EP toxicity tests all showed leachate containing no TCDD above the 1-ppt detection limit. In its current soil matrix, TCDD appears to be water insoluble, as well as nonvolatile and, therefore, soil particle movement is necessary to spread the contamination.

Containment technologies are based on the dioxin-soil binding characteristic and focus upon the restriction of soil particle movement. These technologies can be used as a short-term interim solution when coupled with treatment technologies for future processing, or as a long-term remedy.

When dioxin contamination above 1ppb is detected, a short-term control strategy should be immediately developed. This short-term strategy should focus on containing the contaminated soil and preventing airborne migration and surface stormwater erosion. Public access to the site should be limited. Resident relocation will be based on health advisories or assessments issued by the Centers for Disease Control and determinations by the Federal Emergency Management Agency or EPA that relocation is necessary to

protect public health in accordance with a recent redelegation of authority from FEMA. A monitoring program should be designed to determine the extent of surface and subsurface migration. If the site cannot be controlled on a short-term basis, then excavation and temporary storage will be required.

EPA has proposed the listing of a number of dioxins (including TCDD) as hazardous wastes under the RCRA regulations. Currently, however, the disposal of TCDD contaminated wastes (including soils) is covered by TSCA (40 CFR 775.197). These regulations have governed the manner in which temporary storage has been provided at several sites including:

Denny Farm, Missouri
Syntex Verona, Missouri
Vertac Jacksonville, Arkansas
Saugett, Illinois
Love Canal/Hyde Park, New York

Temporary storage may be undertaken by the responsible party, or as a Fund-financed immediate removal or as a remedial action.

As sites are discovered and actions planned, the TSCA mechanism can be utilized for technical review of any actions which might be taken. For further information contact Dr. Donald Barnes, Chairman, Chlorinated Dioxin Work Group at 382-2897.

Contaminated sites will require extensive sampling to determine the extent and severity of the problem and to assess the performance of short-term controls.

The destruction of dioxin in soil will require the development and pilot testing of technologies and should be considered as a long-term (greater than two years) control strategy.

To destroy TCDD, treatment technologies must first vaporize or solubilize the TCDD from soil thus breaking the dioxin soil bond. In doing so, partially treated residues, or contaminated materials released during processing, have the potential to spread contamination via any one of the exposure routes (water, air, and soil) with highly mobile soluble, volatile, or particulate forms of TCDD. While treatment technologies may be considered the ultimate solution, they could entail significant health risks during processing.

State-of-the-art methods will be necessary to mitigate the exposure hazard to workers, the public, and plants and wildlife. The control of dust, treatment emissions, water contact with soil or treatment residue, must be an integral consideration when evaluating destruction technologies and will have to be considered as part of any future pilot testing program.