



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

OCT 13 1983

OFFICE OF
THE ADMINISTRATOR

Ms. Rebecca Harmer
Acting Assistant Administrator
for Water (WH-556)
U. S. Environmental Protection Agency
Washington, D.C. 20460

Dear Ms. Harmer:

In April 1983, Mr. Dave Davis, Director of your Sludge Task Force, asked that the Environmental Engineering Committee of the Science Advisory Board review a draft report entitled "An Overview of the Contaminants of Concern in the Disposal and Utilization of Municipal Sewage Sludge." The review has now been completed, and we are pleased to forward to you our report.

We appreciate the opportunity to work with your staff, and we look forward to reviewing the scientific basis of your policy on municipal sludge management when it has been finalized.

If you have any questions, or should you wish further action on our part, please call on us.

Sincerely,

A handwritten signature in cursive script, reading "Ernest F. Gloyna".

Ernest F. Gloyna
Chairman, Executive
Committee
Science Advisory Board

cc: W. D. Ruckelshaus
A. Alm
T. Yosie
D. Davis
C. Spooner
D. Ehreth

REPORT
ON THE REVIEW OF
"AN OVERVIEW OF THE CONTAMINANTS
OF CONCERN IN THE DISPOSAL
AND UTILIZATION OF MUNICIPAL
SEWAGE SLUDGE"

by the

ENVIRONMENTAL ENGINEERING COMMITTEE
SCIENCE ADVISORY BOARD
U.S. ENVIRONMENTAL PROTECTION AGENCY

JULY 1983

EPA NOTICE

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BACKGROUND

The EPA Intra-Agency Sludge Task Force was formed to bring together information related to sludge management options. The information will be used in the development of policy to promote the use and disposal of sludge in a manner that is safe to humans and to the environment.

As a first step, the Task Force is focusing on municipal sewage sludge management. The Task Force Director, Mr. David G. Davis, briefed the Environmental Engineering Committee (EEC) on the Task Force's activities at the December 1982 and April 1983 EEC meetings. Minutes of these meetings are available for public review in the offices of the Science Advisory Board. At the April meeting, Mr. Davis gave EEC members a copy of a draft report, "An Overview of the Contaminants of Concern in the Disposal and Utilization of Municipal Sewage Sludge," dated April 15, 1983. The report had been prepared for the Task Force by the firm of Booz-Allen and Hamilton.

The EEC was requested to review the draft report and particularly to comment on the following questions:

1. Does the report accurately characterize the principal effects and exposures of sewage sludge disposal in the various media?
- 2a. Does the rough categorization of all contaminants into three major categories reflect a reasonable priority segregation for purposes of formulation of national policy and implementing strategy for sludge management?
- 2b. Are there better ways to subdivide these contaminants for such purposes, for example, more and/or different groupings?
- 3a. Have important references been overlooked?
- 3b. Have discredited or highly controversial references been included?

The EEC formed a subcommittee consisting of Dr. Raymond Loehr (Chairman), Mr. Allen Cywin, and Dr. Davis Ford to review the draft report. This document constitutes that review, and provides general comments on the content of the draft "overview" report, as well as responses to the questions noted above.

GENERAL COMMENTS

An important output of the Sludge Task Force is to be a comprehensive multi-media comparison of the costs, benefits, and environmental and health hazards of sludge disposal and utilization options. The purpose of the draft report is to

identify the contaminants of concern in municipal sewage sludge disposal. The objective of this identification is to narrow the field of potential contaminants to those that can reasonably be considered to cause significant adverse impacts, based on current information. In developing the report, no new research was involved. The report is based entirely on existing reports or data.

1. The attempt at a comprehensive multi-media comparison is sound. Such a comparison has been needed to help provide a framework for sludge policy decisions, but has yet to be done. Both the attempt and the direction taken appear reasonable.
2. When the suggestions incorporated herein, together with those from other reviewers, are included, the report can be helpful to decision makers in regulatory and non-regulatory agencies.
3. The report is uneven in the level of detail associated with the disposal options. The discussion related to incineration is not very detailed, while that related to ocean disposal is of considerable detail. The coverage provided is not consistent with the hazards of specific contaminants or the potential degree of health and environmental concern associated with specific disposal options.
4. It is difficult to list contaminants of concern without identifying the impact of the technologies used to treat the sludges. Sludge treatment and stabilization processes affect the composition and form of contaminants in sludge that is disposed of by the methods described in the draft report. The draft report does not provide enough guidance with respect to sludge conditioning and site specificity in terms of the contaminants of concern and their effects on the environment.
5. The value of an overview document, such as the draft report, lies in the interpretive aspects of the overview. Not all information in reports and published papers is equally valid or important. The report appears to use the information in the references as if it were all equally credible and valid. No comment is provided on why the reviewers chose certain reports and papers to cite and how the relevance and validity of the respective data were determined. Statements about how pertinent information was chosen and interpreted should be included in the final overview report.
6. In Appendix A, use of ppm to identify the concentration of constituents in sludge is inappropriate, since

there is no knowledge of whether the number refers to wet weight or dry weight. Since the liquid fraction of sludge can vary widely, data related to wet weight is meaningless unless the water content also is known. All sludge concentrations should be identified as mg/kg of solids (dry weight) to be comparable and useful.

7. One of the concerns is that the comments related to impact are general and tend to be superficial. General comments can be appropriate in an overview document, but given that the intent of this document is to help to formulate policy and implement strategy, more specific and less superficial summary comments are desirable.

A listing of contaminants and generalizations about their potential effects on land, sea, or air will not do much for national policy. Sludge treatment processes, quantities of pollutants, and site specific guidance must be used in developing national policy and strategy guidance. As noted on page V-3, a discussion of impacts should be interpreted with caution since meaningful generalization of overall effects is difficult, if not misleading.

SPECIFIC QUESTIONS

1. Does the report accurately characterize the principal effects and exposures of sewage sludge disposal in the various media?

The subcommittee review found that, in general, the draft report provides a reasonable characterization of the principal effects and exposures. It was noted that no information on possible bioaccumulation effects or genetic effects that may result from the various disposal options was included in the report. In addition, there is unevenness in the material that is reported, and there are gaps that should be filled.

Land Application/Land Disposal

- a. The effects of disposal are handled more extensively in terms of the impact of constituents on soils than in terms of airborne constituents from incineration or the volatilization of organics during land spreading or land application. Aerosols and volatile organics resulting from land application methods are subjects of public concern. Additional discussion on these topics is needed.

- b. Page III-1 notes, "The potential for groundwater contamination is greatest where sludge is placed in direct contact with groundwater." While true, it is not recommended practice to place sludge in such contact. The statement should be deleted and a note added that sludge should only be disposed of in a landfill which has been suitably designed to avoid contact (direct or indirect) with groundwater.
- c. Hexavalent chromium (Cr^{+6}) is quite toxic, but the statement on page II-7 that the "carcinogenic potential in man is still under investigation" seems to leave some doubt.
- d. The comments about the study by Bartlett and James (page II-7) give undue emphasis to that report. The statement that "the possibility for oxidation of Cr^{+3} to Cr^{+6} must be considered conservatively as a concern" is unwarranted in light of the available information.
- e. The type of vegetation grown on sludge amended soils and the use of the vegetation is important relative to metals uptake. Additional discussion of these topics is warranted.
- f. The potential for surface and groundwater contamination receives inadequate attention.

Incineration

- a. This Chapter appears to focus solely on multiple hearth incineration. In certain cases, other forms of incineration and air pollution control devices may be needed. Comments on the impact of other types of incineration are needed.
- b. The Chapter is extremely short and inconsistent with the detail provided in other Chapters. This imbalance should be corrected.
- c. The potential impacts of gaseous and particulate emissions from incineration need considerably more elaboration.
- d. The inference (page IV-1) that there are few volatile organics emitted from sludge incinerators needs careful elaboration, and the references cited (4,5) need careful interpretation. Were the PCB and 2,4,5-T removals accomplished in a sludge incinerator or in one designed for their removal? What other volatile organics

are emitted from incinerators? Are there no other data on this subject other than the two cited references? Why are there no citations and information from the European literature?

- e. It is not adequate to infer that atmospheric emissions of various contaminants will be minimal. Incineration temperatures are not always maintained at or near optimum; sludge characteristics can vary; and overall management of the process can range from poor to excellent. More information on the characteristics of atmospheric emissions from sludge incinerators is needed. Since this is to be a guidance-type document, a comparison of the characteristics of such emissions to limits in existing regulations would be appropriate.
- f. Incinerator ash disposal is not an insignificant matter. The characteristics of such ash and the environmental aspects of the disposal of incinerator ash need more detailed discussion in the final document.

Ocean Discharge

- a. The report dwells at length on the New York Bight (some 12 miles off-shore) but does not give any data or information about deep ocean disposal. EPA has such information and has recently proposed moving the sludge disposal site to 112 miles off the coast of Delaware. The possibility of deep ocean disposal and the relative impacts need detailed discussion.
 - b. The report does not mention site factors such as depths, littoral currents, proximity to shore, or other features of concern. Sludge contaminants will have different effects in different disposal locations. Discussion of these items should be included in this section.
- 2a. Does the rough categorization of all contaminants into three major categories reflect a reasonable priority segregation for purposes of formulation of national policy and implementing strategy for sludge management?

The subcommittee review indicates a qualified yes to this question. The following unevenness and gaps should be changed.

- a. 216 contaminants--metals, organics, toxic organics, and pathogens--are identified and ranked to evaluate potential risks (p. I-5). Some of

the chemicals--such as water, calcium, sulfur, potassium--are not contaminants and should not be included in such a list. Care should be used when compiling such lists. Once a chemical is identified as a "contaminant," even though it is subsequently stated to be of little or no concern, it is still considered to be a contaminant by much of the public.

- b. The attention given to the 216 contaminants is uneven and possibly infers that specific metals are more important or have more impact than either specific synthetic organics or specific pathogens. The impact of specific metals is discussed; however, the impacts of "toxic organics" and "pathogens" are considered as a group.

Greater specificity with regard to toxic organics and pathogens is needed if the overview is to be useful for policy or strategy use. A statement on page I-10 indicated that such detail is planned. It is recommended that such detail and a more specific evaluation and classification be included in this overview document before it is released.

- 2b. Are there better ways to subdivide these contaminants for such purposes, for example, more and/or different groupings?

- a. It is possible that the three major categories can be further subcategorized on some rational basis. For example, metals can be subcategorized based on the periodic table; toxic organic compounds can be subcategorized according to chemical structure and activity or physical characteristics such as volatility or solubility; and pathogens can be subcategorized based on some logical microbiological format or known pathogenicity to humans. Such subcategorization is desirable for the more detailed evaluation suggested under question 2a.
- b. There are several general unit operations that render sludge suitable for disposal--disinfection, immobilization, stabilization, and detoxification. The categorization of contaminants based on unit operations and general site considerations (e.g., proximity to groundwater or shell-fish beds) also could provide a matrix for policy and strategy development.

3a. Have important references been overlooked?

- a. There are additional references that should be obtained and reviewed. These include the following:

Chaney, R.L. "Fate of Toxic Substances in Sludge Applied to Cropland," in Proc. International Sympos. Land Application of Sewage Sludge, Oct. 1982, Tokyo, Japan. (A copy can be obtained from USDA-Beltsville Agricultural Research Center.)

Environmental Protection Agency, Process Design Manual on Utilization of Municipal Sludge on Land, 1983.

Loehr, R.C., Jewell, W.J., Novak, J.D., Clarkson, W.W., and Friedman, G.S. Land Application of Wastes, Van Nostrand Reinhold Co., New York, 1979--contains information on the transformation and fate of potential contaminants when applied to the soil.

Overcash, M.R. and Pal, D. Design of Land Treatment for Industrial Wastes--Theory and Practice, Ann Arbor Science Publishers, Ann Arbor, Michigan, 1979--contains information on transformation and fate of potential contaminants when applied to the soil.

- b. There is other important information which should also be reviewed:

--The position papers presented at the "Workshop on Utilization of Municipal Wastewater and Sludge on Land," held in Denver, Feb. 1983. These papers are excellent summaries of topics very relevant to those discussed in the overview document. (See Tom Gleason, EPA/ORD, for papers.)

--Papers that resulted from NSF-supported research on sludge management. A description of that research and the reports and papers from that research are appended.

--European papers. Land application of sludge has occurred in Great Britain and on the continent for decades. No references to the results of such efforts appear to have been reviewed.

--Additional references dealing with ocean disposal. A list of suggested references is appended.

--Information on sludge incineration in Europe.

3b. Have discredited or highly controversial references been included?

a. Not to the knowledge of the subcommittee. However, as noted under General Comments, all data in the references appear to have been used as if they were of equal importance. The statements and data in the references need to be carefully evaluated and interpreted before being used in an overview document.