

May 1987

HAZARDOUS WASTE

Information on EPA's Proposal to Delete Chemicals from Groundwater Monitoring





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United States General Accounting Office Washington, D.C. 20548

Resources, Community, and Economic Development Division

B-226799

May 19, 1987

The Honorable John D. Dingell Chairman, Subcommittee on Oversight and Investigations Committee on Energy and Commerce House of Representatives

The Honorable Thomas A. Luken
Chairman, Subcommittee on Transportation,
Tourism, and Hazardous Materials
Committee on Energy and Commerce
House of Representatives

The Honorable James J. Florio House of Representatives

In accordance with your March 7, 1986, letter, and subsequent discussions with your offices, we obtained information on certain aspects of the Environmental Protection Agency's (EPA's) groundwater monitoring program applicable to hazardous waste disposal facilities regulated under the Resource Conservation and Recovery Act (RCRA). One concern you raised was EPA's proposal to eliminate from mandatory monitoring, because of suspected laboratory testing problems, approximately 150 chemicals that owners/operators are required to check in the groundwater at their land disposal facilities.

We obtained information on the feasibility of testing for 130 of these chemicals (the list of 130 chemicals was developed using criteria provided by your offices) through surveying 172 testing laboratories. The responses of the 105 laboratories returning our survey indicate that there is general agreement among the laboratories that they cannot test for these chemicals. However, we noted that there appeared to be less consensus on 42 of the chemicals. For these 42, at least 10 laboratories (about 10 percent of the laboratories responding to our survey) reported that they could test for the chemical and, of those testing, approximately half indicated that the test method used was valid and reliable.

We briefed your offices in October and November 1986 on this information at which time we agreed to obtain additional data on these 42 chemicals with respect to (1) the quantities of wastes being generated that contain the chemicals, (2) the toxicity of the chemicals, and (3) whether they would normally be found in hazardous waste land disposal facilities. As requested, this fact sheet provides the information gathered on these 42 chemicals.

In summary, we found that information is not readily available on the quantities of hazardous wastes being disposed of that contain these chemicals. Limited information is available, however, on the amounts of these chemicals being produced annually in pure form that might provide a relative indication of the amounts of these chemicals that could be disposed of in land disposal facilities. In addition, we found that over two thirds of the chemicals (29 out of 42) are considered to be highly toxic and also that over one third (16 out of 42) would possibly be found at hazardous waste land disposal facilities. Detailed information and our analysis regarding each chemical are provided in the following sections of this fact sheet.

The information that you asked us to obtain on the 42 specific chemicals regarding waste quantities, toxicity, and whether they would be found in land disposal facilities was requested from various EPA offices, including EPA's Office of Solid Waste and Emergency Response and EPA's Office of Pesticides and Toxic Substances. As noted above, according to EPA, information is not available on the quantities of waste being generated that contain or possibly could contain these chemicals. EPA did, however, provide us production data on the chemicals that could provide a relative indication of the potential for waste. For example, chemicals being produced in small quantities may not represent a large waste disposal problem.

Although the recency of the production information varies, total production for 27 of the chemicals, as shown in section 3, has ranged up to over 5 billion pounds per year. According to EPA, 10 of the chemicals are not currently produced in the United States. EPA could not provide production data for five of the chemicals. It should be noted, however, that without considering the extent to which chemicals may be consumed or changed through their intended

uses, the amounts of chemicals being produced may not be a reliable indicator of wastes being disposed. For example, a chemical used as an ingredient in a manufacturing process could be completely consumed in the manufacturing process, be embodied in the product being produced, or be changed in form to another chemical. These conditions would lessen the amount of a chemical that would become waste and need to be disposed.

As shown in section 4, 29 of the 42 chemicals are considered to be highly toxic. In some instances, short-term exposure to these chemicals in pure form could lead to death or permanent injury. The other 13 chemicals are considered less toxic. In addition to toxicity, some of the chemicals are known or are suspected of having other harmful effects on humans or animals. For example, 27 of the chemicals are reported or suspected of being carcinogens; and 32 are known or suspected of being either mutagenic (having an impact on body genes or chromosomes), teratogenic (causing physical deformities), fetotoxic or embroyotoxic (adversely impacting the unborn), or tumorigenic (causing tumors).

Information provided by EPA indicates that 16 of the 42 chemicals could possibly be found at hazardous waste disposal facilities. These are shown in section 5. Of these 16, EPA officials told us that 3 have been found at facilities being cleaned up under EPA's Superfund program. EPA indicated that 13 chemicals are not likely to be found at disposal facilities. There was disagreement between EPA offices as to whether another 13 of the 42 chemicals would be found at disposal facilities.

EPA formally proposed changing the number of chemicals to be routinely tested for in the groundwater at RCRA hazardous waste land disposal facilities in a July 1986 notice of proposed rulemaking. EPA officials told us that, based on additional information received from laboratories and other sources since its proposed rulemaking, EPA now plans on retaining 2 of the 42 chemicals that were proposed for deletion on its list of chemicals that must be tested for at land disposal facilities. These chemicals are noted in section 2. EPA's decision on these two chemicals has not yet been finalized; therefore, we did not review EPA's documentation supporting this action. EPA currently anticipates issuing its final rulemaking in May 1987.

EPA officials also told us that the Agency has several research and development projects underway that should result in new test methods for a large proportion of the chemicals proposed for deletion. We did not review these projects in detail. Agency officials indicated that as new testing methods become available, EPA will assess requiring their use in groundwater monitoring at RCRA facilities.

We discussed the contents of this fact sheet with EPA officials and have included their comments where appropriate. As discussed with your offices, unless you publicly release its contents earlier, we will not make copies of this fact sheet publicly available until 30 days after the date of this letter. At that time, copies will be sent to appropriate congressional committees; the Administrator, EPA; the Director, Office of Management and Budget; and other interested parties.

As you are aware, the other groundwater questions addressed in your March 1986 letter are being pursued under a separate assignment. Please call me at (202) 275-5489 if you would like additional information on this fact sheet. Major GAO contributors are listed in appendix I.

Hugh J. Wessinger

Senior Associate Director

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	ABBREVIATIONS	
GAO	General Accounting Office	
EPA	Environmental Protection Agency	
RCRA	Resource Conservation and Recovery Act	

BACKGROUND, OBJECTIVES, SCOPE,

AND METHODOLOGY

BACKGROUND

Under the Resource Conservation and Recovery Act (RCRA), owners/operators of hazardous waste land disposal facilities are to monitor the groundwater underlying their facilities for the leakage of hazardous waste. RCRA regulations require owners/operators to initially monitor the characteristics of the groundwater against several pollution parameters. This phase of monitoring is referred to as detection monitoring. If the concentration limit for any of the pollution parameters is exceeded during detection monitoring, and it is suspected that the hazardous waste facility is responsible for the contamination, then the owner/operator must begin sampling the groundwater for an extensive list of hazardous This phase of testing is referred to as either assessment or compliance monitoring. Through this phase of testing, the chemicals actually causing the increase in contamination are to be identified and the extent and rate of contaminant migration determined. This analysis would generally be used in developing a plan of action to correct the pollution problem.

The list of chemicals to be tested for during assessment or compliance monitoring is contained in Appendix VIII to 40 CFR Part The existence of valid and reliable methods to test for all the Appendix VIII chemicals has been a controversial issue since the requirements were promulgated in 1982. This issue was heightened with the 1984 amendments to RCRA which required hazardous waste facilities to submit applications for an operating permit by November 8, 1985. Under EPA's regulations promulgating this requirement, facilities known to be contaminating groundwater are to test for all Appendix VIII constituents and submit the test results with their operating permit applications. Owner/operator problems in testing for these chemicals, without which EPA could not permit the facilities, led to EPA's reevaluation of the feasibility of testing for each of the Appendix VIII constituents in December 1985. This reevaluation resulted in EPA's proposal to delete about 150 Appendix VIII chemicals from mandatory groundwater monitoring.

EPA provided specific reasons for deleting each chemical from the list. In some cases chemical names were removed from the list because the listings were not clear or the listed chemical represented a broad category of chemicals and was not specific as to which chemical within the category was to be monitored. The majority of chemicals, however, were removed because of various questions associated with laboratory capabilities to test for the

substances using EPA standardized screening methodologies. EPA implemented the reduced testing requirement as guidance in February 1986 and proposed it as a formal rulemaking in July 1986. The new list of constituents to be tested is being proposed as Appendix IX to 40 CFR Part 261. According to agency officials, EPA anticipates issuing the final rulemaking in May 1987.

OBJECTIVES, SCOPE, AND METHODOLOGY

By letter dated March 7, 1986, the Subcommittee on Oversight and Investigations, and the Subcommittee on Commerce, Transportation, and Tourism, both of the House Committee on Energy and Commerce requested that we evaluate certain aspects of EPA's groundwater monitoring program applicable to hazardous waste disposal facilities regulated under RCRA. One concern raised by the Subcommittees was EPA's proposal to delete the 150 Appendix VIII chemicals from mandatory groundwater monitoring at RCRA land disposal facilities. Through subsequent discussions with the Subcommittee offices, it was agreed that we would address this concern by (1) reviewing EPA's decisionmaking process in deleting the 150 Appendix VIII chemicals from mandatory groundwater monitoring, (2) gathering information from private and state laboratories regarding laboratory capabilities to test for the chemicals proposed for deletion, and (3) determining the research EPA has underway to develop test methods for these chemicals.

In October and November 1986, we briefed representatives of the requesting Subcommittees on the results of our review in regard to the above three objectives. At that time we presented information on past problems in testing for the Appendix VIII chemicals and EPA's decisionmaking process resulting in its proposal to delete certain chemicals from mandatory testing. also presented the results from a laboratory survey that we had conducted which indicated that the majority of laboratories cannot test for 130 of the chemicals being deleted (as explained below these 130 chemicals were selected from the list of 150 chemicals proposed for deletion based on criteria provided by representatives of the Subcommittee offices), and that they agreed with EPA's rationale for deleting these chemicals. We also presented information on EPA's research activities to develop new groundwater testing methods. It was agreed that the information presented at these briefings satisfied the Subcommittees' needs regarding the above objectives.

However, on the basis of these briefings, Subcommittee representatives asked us to gather additional information on 42 of the 130 Appendix VIII chemicals included in our laboratory survey. With respect to these 42 chemicals, we were asked to develop information regarding (1) the quantities of wastes being currently generated that contain these chemicals, (2) the toxicity of the

chemicals, and (3) whether these chemicals would normally be found in hazardous waste land disposal facilities.

These 42 chemicals were identified from responses to a survey questionnaire that we administered to 172 (128 private and 44 state) testing laboratories. The questionnaire was designed to gather information on the capabilities of laboratories to test for 130 of the chemicals proposed for deletion from monitoring. The list of 130 chemicals was developed using criteria provided by the requester staffs and focused on those chemicals being deleted for one or more of four specific laboratory testing problems identified by EPA. We asked the laboratories for their views on EPA's rationale for deleting each of the Appendix VIII chemicals and which of the 130, if any, they were capable of testing. We also asked them to identify the methods used to test for any such chemicals and their assessment of the reliability and validity of the methods used.

The 128 private laboratories were selected from our review of industry publications containing firms capable of groundwater testing, a list of firms provided by the Association of Official Analytical Chemists, and laboratories participating in EPA's contract laboratory program. We were unable to find a list of groundwater testing laboratories at EPA, nor were we able to obtain one from industry associations. We were also unable to find such a list in open literature. Consequently, we cannot say what percent of the laboratory testing universe is represented by our sample.

We called each laboratory before mailing them our survey questionnaire to verify that they did, in fact, do groundwater testing and to ask if they would be willing to participate in our survey. We also pretested a draft survey questionnaire with three laboratories to ensure the validity of the survey questions before finalizing our survey instrument. During these preliminary inquiries, several laboratories indicated that they would be willing to complete our survey instrument if they could be given a pledge of confidentiality that their answers would not be disclosed. With the Subcommittees' approval, a pledge of confidentiality was given to the laboratories participating in our survey. Of the 128 private laboratories that indicated a willingness to participate, 74, or about 59 percent, actually responded to our survey--27 identified themselves as EPA contract laboratories and 47 said that they were not a contract laboratory.

We also contacted each states' environmental officials to determine if their state laboratories performed groundwater analysis and if they would participate in our survey. Forty-four states laboratories said they would participate, and thirty-one, or about 70 percent, answered our survey.

Information provided by the laboratories in response to our survey indicated that the laboratory testing community generally

could not test for the 130 chemicals and that they supported EPA's rationale for deleting the chemicals. However, for 42 of the 130 chemicals, the consensus appeared to be less. Our analysis of the information provided by the laboratories showed that at least 10 laboratories (about 10 percent of the laboratories responding to our survey) reported that they could test for each of these 42 chemicals and, of those testing for the chemicals, approximately half indicated that the test method used was valid and reliable.

Information to answer the additional questions raised by the Subcommittees with respect to the quantities of waste generated, their toxicity, and whether the chemicals would be found in hazardous disposal facilities, was requested from EPA's Office of Pesticides and Toxic Substances, EPA's Office of Solid Waste and Emergency Response, and EPA's Office of Groundwater Protection. addition to these sources, we also reviewed several technical publications for information on these chemicals. We were told by EPA that information is not readily available on the quantities of wastes generated that contain these chemicals. Absent this information, we asked EPA to provide us information on the quantities of the chemicals being produced. Although production quantities cannot be directly linked to wastes, it does provide a relative indication of the potential wastes that these chemicals could represent. Production information provided by EPA does not include production data reflecting confidential business information.

Because of its technical nature, we did not verify the information provided by EPA in response to the questions on the 42 chemicals to EPA's source documents.

Our work was conducted between March 1986 and February 1987 and was performed in accordance with generally accepted government auditing standards.

FORTY-TWO CHEMICALS ON WHICH ADDITIONAL INFORMATION WAS GATHERED

	CHEMICAL	NUMBER OF LABORATORIES <u>TESTING</u>
1	Formaldehyde	40
	Aldicarb	
		38
	Formic acid	31
	Methomyl	26
5.	Bis(chloromethyl)	
_	ether	25
	Dichloromethyl benzene	23
	Acrylamide	20
8.	1-Naphthyl-2-thiourea	20
9.	Ethyl carbamate	19
10	Endothal	19
11.	Thiourea	19
12.	Dimethoate	18 ^a
13.	N-N1troso-N-ethylurea	18 ^b
14.	Phenylenediamine	. 18
15.	Benzyl chloride	17
16.	N-Propylamine	17
17.	Toluenediamine	17
18.	Chloromethyl methyl ether	16
19.	Hydrazine	16
20.	N-Phenylthiourea	16
21.	Dibenza(a,h)acridine	15
22.	Methylthiouracil	15
23.	Nitroglycerin	15
24.	Crotonaldehyde	14
25.	Ethylenethiourea	14
	Nicotine and salts	14
27.	Amitrole	13

		1.
28.	N-Nitroso-N-methylurea	1 3 ^b
29.	Aflatoxins	12 ^b
30.	2-Cyclohexyl-4,6-dinitrophenol	12
31.	Methanethiol	12
32.	Strychnine and salts	12
33.	Toluene diisocyanate	12
34.	Ethylenimine	11
35.	7H-Dibenzo(c.g)carbazole	11
36.	Thiosemicarbazide	11
37.	5-(Aminomethyl)-3-isoxazolol	10
38.	Benz(c)acridine	10
39.	Benzotrichloride	10
40.	Bromoacetone	10
41.	Reserpine	10
42.	Sym-trinitrobenzene	10ª

aAccording to EPA these chemicals will not be deleted from testing.

bThese chemicals were included in the list of chemicals presented in Subcommittee briefings. However, in subsequent analysis we found that, because of respondent errors in completing our survey, these chemicals did not meet our selection criteria. Specifically, these chemicals did not meet our criteria that 50 percent of the laboratories testing for the chemical judged their test method to be valid and reliable. For aflatoxins, 33 percent of the laboratories considered their test method to be valid and reliable; for N-Nitroso-N-ethylurea, 45.5 percent; and for N-Nitroso-N-methylurea, 42.9 percent. We are including these chemicals in this fact sheet because they were previously presented to Subcommittee representatives.

PRODUCTION INFORMATION ON THE FORTY-TWO CHEMICALS

CHEMICALS WITH PRODUCTION OF AT LEAST 1 MILLION POUNDS PER YEAR

	CHEMICAL		ON INFORMATION ds per year)	YEAR
1.	Formaldehyde	5	billion	1985
2.	Toluene diisocyanate	663	million	1984
3.	Toluenediamine	100-200	million	1981
4.	Benzyl chloride	72	million	1982
5	Formic acid	41	million	1983
6.	Benzotrichloride	35	million	1982
7.	Phenylenediamine	under 20	million	1982
8.	Chloromethyl methyl ether	10	million	1987
9.	Nitroglycerin	4.3-43	million	1983
10.	Methomyl	5	million	1974
11.	Hydrazıne	2	million	1977
12.	Ethyl carbamate	1	million	1981

PRODUCTION OF AT LEAST 5,000 POUNDS PER YEAR BUT LESS THAN 1 MILLION POUNDS PER YEAR

13.	Aldicarb	1982
14.	Dichloromethyl benzene	1982
15.	Endothal	1984
16.	Ethylenethiourea	1983
17.	Ethylenimine	1986
18.	1-Naphthyl-2-thiourea	1983
19.	Nicotine and salts	1983
20.	N-Propylamine	1979
21.	Reserpine	1979
22.	Thiosemicarbazide	1981

PRODUCTION LESS THAN 5,000 POUNDS PER YEAR

23.	Acrylamide	1975
24.	Aflatoxins	NA
25.	Crotonaldehyde	1975
26.	Methanethiol	1975
27.	N-Phenyl thiourea	1981

NOT PRESENTLY COMMERCIALLY PRODUCED IN THE UNITED STATES

- 28. Amitrole
- 29. Benz(c)acridine
- 30. Bis(chloromethyl)ether
- 31. Dibenz(a,h)acridine
- 32. 7H-Dibenzo(c,g)carbazole
- 33. Dimethoate
- 34. N-Nitroso-N-ethylurea
- 35. N-Nitroso-N-methylurea
- 36. Thiourea
- 37. 2-Cyclohexyl-4,6-dinitrophenol

NO PRODUCTION DATA AVAILABLE

- 38. 5-(Aminomethyl)-3-isoxazolol
- 39. Bromoacetone
- 40. Methylthiouracil
- 41. Strychnine and salts
- 42. Sym-trinotrobenzene

^aProduction information provided by EPA does not include production data classified as confidential business information.

TOXICITY OF THE FORTY-TWO CHEMICALSa

WIT	CHEMICALS H HIGH TOXICITY	<u>CARCINOGEN</u> b	<u>MUTAGEN</u> C	<u>TERATOGEN</u> ^d	OTHER
1.	Acrylamide	X	X		
2.	Aflatoxins	X	X	X	X
3.	Aldicarb				
4.	5-(Aminomethyl) 3-isoxazolol	_			
5.	Amitrole	X			X
6.	Benzotrichlorid	e X	x		X
7.	Benzylchloride	X	x		X
8.	Bis(Chloromethy, ether	1) X	x		x
9.	Bromoacetone				
10.	2-Cyclohexyl-4, 6-dinitropheno	ı x			
11.	Dimethoate				
12.	Dichloromethyl benzene	x	x		
13.	Endothal		X	X	
14.	Ethylenimine	x	x		
15.	Formaldehyde	X	X		X
16.	Hydrazine	X	X		
17.	Methanethiol		X		
18.	Methomyl				
19.	Strychnine and salts				

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	WITH	CHEMICALS H HIGH TOXICITY	<u>CARCINOGEN</u> ^b	<u>MUTAGEN</u> C	<u>TERATOGEN</u> ^d	OTHER
	20.	Nicotine and salts	x	x	x	
	21.	Nitroglycerin	x			
	22.	N-Nitroso-N- ethylurea	x	X	х	x
	23.	N-Nitroso-N- methylurea	х	x	x	x
	24,	N-Phenyl- thiourea			х	
	25.	Sym-Trinitro- benzene		x		
	26.	Thiosemicarbazio	de	X	X	
	27.	Thiourea	x			x
	28.	Toluene diisocyanate		x		
	29.	Formic acid		x		
		EMICALS WITH ERATE TOXICITY				
	30.	Chloromethyl methyl ether	x			x
	31.	Ethyl carbamate	X		X	x
1	32.	Ethylene- thiourea	x	х	x	x
1 1 1 1	33.	Phenylene- diamine	x	х		x
	34.	N-Propylamine				

CHEMICALS WITH

NON	SPECIFIC TOXICITY INFORMATION	CARCINOGEN	<u>MUTAGEN</u> C	TERATOGEN	<u>OTHER</u> ^e
35.	Benz(c)- acridine	x	x		x
36.	Crotonaldehyde	x	x	•	
37.	Dibenz(a.h) acridine	х			x
38.	7H-Dibenzo (c,g)-carbazole	x	x		x
39.	Methylthiouracil	x		x	
40.	1-Naphthyl- 2-thiourea	x			
41.	Reserpine	x	x	x	X
42.	Toluenediamine		X		x

afor some chemicals the toxicity was reported in ranges, such as low to moderate. In such cases we reported the highest level.

bWe have included as carcinogens those chemicals that were reported to be either suspected, or known, human or animal carcinogens.

^CWe have included as mutagens those chemicals that were reported to be either suspected, or known, human or animal mutagens.

dwe have included as teratogens those chemicals that were reported to be either suspected, or known, human or animal teratogens.

eIncluded in this category are those chemicals that were reported, or suspected, to be fetotoxic, tumorigenic, or embryotoxic.

LIKELIHOOD OF FINDING THE FORTY-TWO CHEMICALS IN HAZARDOUS WASTE FACILITIES

CHEMICALS THAT WOULD POSSIBLY BE FOUND IN HAZARDOUS WASTE FACILITIES

- 1. Acrylamide
- 2. Benzyl chloride
- 3. Crotonaldehyde
- 4. Dimethoatea
- 5. Dichloromethyl benzene
- 6. Endothal
- 7. Ethyl carbamate
- 8. Ethylenethiourea
- 9. Formaldehyde
- 10. Formic acida
- 11. Methanethiola
- 12. Thiosemicarbazide
- 13. Thiourea
- 14. Toluene diisocyanate
- 15. Toluenediamine
- 16. Dibenz(a,h)acridine

CHEMICALS NOT LIKELY TO BE FOUND AT HAZARDOUS WASTE FACILITIES

- 17. Aflatoxins
- 18. 5-(Aminomethyl)-3-isoxazolol
- 19. Bromoacetone
- 20. Ethylenimine
- 21. 2-Cyclohexyl-4,6-Dinitrophenol
- 22. Methylthiouracil
- 23. 1-Naphthyl-2-thiourea
- 24. Nicotine and salts
- 25. N-Nitroso-N-ethylurea
- 26. N-Nitroso-N-methylurea
- 27. Reserpine
- 28. Sym-trinitrobenzene
- 29. Strychnine and salts

DISAGREEMENT AS TO LIKELIHOOD OF BEING FOUND AT HAZARDOUS WASTE FACILITIES

- 30. Aldicarb
- 31. Amitrole
- 32. Benz(c)acridine
- 33. Benzotrichloride
- 34. Bis(chloromethyl)ether
- 35. Chloromethyl methyl ether
- 36. 7H-Dibenzo(c,g)carbazole
- 37. Hydrazine
- 38. Methomyl
- 39. Nitroglycerin

- 40. N-Propylamine
- 41. N-Phenylthiourea
- 42. Phenylenediamine

^aThese chemicals have been found in at least one Superfund site.

APPENDIX I

MAJOR GAO CONTRIBUTORS

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