ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 261

[FRN–6469–9]

RIN 2050–AE07

Hazardous Waste Identification Rule (HWIR): Identification and Listing of Hazardous Wastes

AGENCY: Environmental Protection Agency.

ACTION: Proposed rule and request for comments.

SUMMARY: Today's action proposes to retain and amend the mixture rule and the derived-from rule in the Resource Conservation and Recovery Act (RCRA). The mixture and derived-from rules ensure that hazardous wastes that are mixed with other wastes or that result from the treatment, storage or disposal of hazardous wastes do not escape regulation and thereby cause harm to human health and the environment.

EPA is proposing two revisions to the mixture and derived-from rules. These revisions would narrow the scope of the mixture and derived-from rules, tailoring the rules to more specifically match the risks posed by particular wastes. The first is an exemption for mixtures and/or derivatives of wastes listed solely for the ignitability, corrosivity, and/or reactivity characteristics. The second is a conditional exemption from the mixture and derived-from rules for ''mixed wastes'' (that is, wastes that are both hazardous and radioactive).

Today's document also discusses an implementation framework for an exemption from hazardous waste management for wastes that meet chemical-specific exemption levels, also known as the Hazardous Waste Identification Rule (HWIR) exemption. The HWIR exemption would identify a broad set of listed hazardous waste that could be safely managed in nonhazardous waste management units. The current version of the model that could be used to derive the exemption levels is designed to evaluate simultaneous exposures across multiple media and pathways in order to estimate the resulting health and environmental effects. Before using a revised risk assessment to support a final regulatory action, we would propose the HWIR exemption, providing public notice and the opportunity to comment on the revised risk assessment and resulting exemption levels.

In addition, today's document discusses the possibility of revising the Land Disposal Restrictions (LDRs) by replacing technology-based treatment standards in the RCRA regulations with risk-based treatment standards.

DATES: To make sure we consider your comments on revisions to the mixture and derived-from rules (Sections I–IV, Sections XXI–XXVI (as applicable) of the preamble and proposed regulatory language amending 40 CFR part 261), they must be postmarked on or before February 17, 2000.

To make sure we consider your comments on the discussed concentration-based HWIR exemption and the possible revisions to the LDR Treatment Standards (Sections V–XX and Sections XXI–XXVI (as applicable) of the preamble), they must be postmarked on or before May 17, 2000.

ADDRESSES: Please send an original and two copies of your comments referencing Docket number F–99–WH2P–FFFFF to (1) if using regular U.S. Postal Service mail: RCRA Docket Information Center, Office of Solid Waste (5305W), U.S. Environmental Protection Agency Headquarters (EPA, HQ), 401 M Street, S.W., Washington, D.C.. 20460, or (2) if using special delivery, such as overnight express service: RCRA Docket Information Center (RIC), Crystal Gateway One, 1235 Jefferson Davis Highway, First Floor, Arlington, Virginia 22202. It would also be helpful, although not mandatory, to include an electronic copy by diskette or Internet email. In this case, send your comments to the RCRA Information Center on labeled personal computer diskettes in ASCII (TEXT) format or a word processing format we can convert to ASCII (TEXT). Please include on the disk label the name, version, and edition of your word processing software as well as your name and docket number F–99–WH2P–FFFF. Protect your diskette by putting it in a protective mailing envelope. To send a copy by Internet email, address it to: *rcra-docket@epamail.epa.gov.* Make sure this electronic copy is in an ASCII format that doesn't use special characters or encryption. Cite the docket Number F–99–WH2P–FFFFF in your electronic file.

The RCRA Information Center is located at Crystal Gateway One, 1235 Jefferson Davis Highway, First Floor, Arlington Virginia. If you would like to look at and copy supporting information for RCRA rules, please make an appointment with the RCRA Information Center by calling (703) 603–9230. Docket hours are from 9 A.M. to 4 P.M. Monday through Friday, except for Federal holidays. You may copy up to 100 pages from any regulatory document at no cost. Additional copies cost $0.15 per page.

FOR FURTHER INFORMATION CONTACT: For general information about this proposed rule, contact the RCRA Hotline, Office of Solid Waste, U.S. Environmental Protection Agency, Washington, DC 20460, (800) 424–9346 (toll free); TDD (800) 553–7672 (hearing impaired); in the Washington, D.C. metropolitan area the number is (703) 412–9810; TDD (703) 486–3323 (hearing impaired). For technical information on this proposed rule, contact Adam Klinger at (703) 308–3267 or Tracy Atagi at (703) 308–8672; for specific information on the risk modeling system, contact David Cozzie at (703) 308–0479. To get copies of the reports or other materials referred to in this proposal, contact the RCRA Docket at the phone number or address listed above.

SUPPLEMENTARY INFORMATION: The proposal and other material associated with this action can be electronically accessed on the Internet at http://www.epa.gov/epaoswer/hazwaste/id

The official record for this rulemaking will be kept in paper form. Accordingly, EPA will transfer all comments received electronically into paper form and place them in the official record, which will also include all comments submitted directly in writing. The official record is the record maintained at the address in **ADDRESSES** at the beginning of this document.

We will respond to submitted comments, whether written or electronic, in a notice in the **Federal Register** or in a response to comments document placed in the official record for this rulemaking. We will not immediately reply to electronically submitted comments other than to seek clarification of comments that may be garbled in transmission or during conversion to paper form, as discussed above.

Affected Entities

Entities potentially affected by this proposed action are generators of industrial hazardous waste, and entities that treat, store, transport and/or dispose of these wastes. Different sets of entities (*i.e.*, industrial and service sectors) are affected by different provisions of this regulatory proposal, as displayed below: This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be affected by this action.

SIC code	NAICS code	List of potentially affected U.S. industrial entities
A. Proposed Revision to 40 CFR 261.3 RCRA Mixture-and-Derived-from Rules:		
2800	32xxxx	Chemicals & allied products manufacturing.
2819	Five possible codes	Industrial inorganic chemicals manufacturing.
2821	325211	Plastics materials & resins manufacturing.
2833	325411	Medicinal chemicals & botanicals manufacturing.
2834	325412	Pharmaceutical preparations manufacturing.
2851	32551	Paints & allied products manufacturing.
2869	Five possible codes	Industrial organic chemicals manufacturing.
2879	32532	Pesticides & agricultural chemicals manufacturing.
3089	Four possible codes	Plastics products manufacturing.
3241	32731	Hydraulic cement products manufacturing.
3479	Four possible codes	Fabricated metal coating & allied services.
3711	Five possible codes	Motor vehicle & passenger car bodies manufacturing.
4212	562111 & 562112	Local trucking services (industrial waste shipment).
4953	Five possible codes	Refuse (industrial waste) treatment/disposal services.
7389	36 possible codes	Business services.
7532	811121	Auto repair & auto paint shops.
9511	92411	Waste management.
9711	811121	National security (military bases).

Explanatory Notes:
(1) SIC = 1987 Standard Industrial Classification system (U.S. Department of Commerce's traditional code system last updated in 1987).
(2) NAICS = 1997 North American Industrial Classification System (U.S. Department of Commerce's new code system as of 1997).
(3) Refer to the Internet website *http://www.census.gov/epcd/www/naicsdev.htm* for additional information and a cross-walk table for the SIC and NAICS codes systems.

This table lists those entities that EPA believes could be affected by this proposed action, based on industrial sectors identified in the economic analysis in support of this proposal. A total of about 120 entities are expected to benefit from the proposed revisions to 40 CFR 261.3 in the 17 industrial sectors listed above, but primarily in the chemicals and allied products sector (*i.e.*, SIC code 28, or NAICS code 325). Other entities not listed in the table also could be affected. To determine whether your facility is regulated by this action, you should examine 40 CFR parts 260, 261 and 268 carefully in concert with the amended rules found at the end of this **Federal Register** document. If you have questions regarding the applicability of this action to a particular entity, consult the persons listed in the preceding **FOR FURTHER INFORMATION CONTACT** section.

ACRONYMS

Acronym	Definition
3MRA	Multimedia, Multipathway and Multireceptor Risk Assessment.
AOI	Area of Interest.
APA	Administrative Procedures Act.
AT	Aerated Tank.
BDAT	Best Demonstrated Available Technology.
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act.
CFR	Code of Federal Regulations.
CMA	Chemical Manufacturers Association.
CWA	Clean Water Act.
DOT	Department of Transportation.
EPA	Environmental Protection Agency.
EPACMTP	EPA's Composite Model for Leachate Migration with Transformation Products.
EXAMS	Exposure Analysis Modeling System.
EXAMSIO	Exposure Analysis Modeling System—Input Output Interface.
FRAMES	Framework for Risk Analysis in Multimedia Environmental Systems.
GIRAS	Geographic Information Retrieval and Analysis System.
HEAST	Health Effects Assessment Summary Table.
HQ	Hazard Quotient.
HSWA	Hazardous and Solid Waste Amendments of 1984.
HWIR	Hazardous Waste Identification Rule.
HWIR99	Hazardous Waste Identification Rule—1999 Framework.
ICR	Information Collection Request.
IEUBK	Integrated, Exposure, Uptake and BioKinetic Model.
IRIS	Integrated Risk Information System.
ISCST3	Industrial Source Complex Short Term model.
LAU	Land Application Unit.
LCR	Lead and Copper Rule.
LDR	Land Disposal Restriction.
LF	Landfill.
LLMW	Low Level Mixed Wastes.
LLRWDF	FLow Level Radioactive Waste Disposal Facility.
LOEL	Lowest Observed Effects Level.

ACRONYMS—Continued

Acronym	Definition
MACT	Maximum Achievable Control Technology.
MCL	Maximum Containment Level.
MINTEQA2	Geochemical speciation model; originally a combination of Mineral Equilibrium Model (MINEQL) and the thermodynamic database WATEQ3.
NAPL	Non-Aqueous Phase Liquid.
NOEL	No Observed Effects Level.
NRC	Nuclear Regulatory Commission (NRC).
NTTAA	National Technology Transfer and Advancement Act.
OMB	Office of Management and Budget.
ORD	Office of Research and Development.
OIRM	Office of Information and Resources Management.
OSW	Office of Solid Waste.
OSWER	Office of Solid Waste and Emergency Response.
PBMS	Performance Based Measurement System.
QA/QCl	Quality Assurance/Quality Control.
RCRA	Resource Conservation Recovery Act.
RfD	Reference Dose.
RfC	Reference Concentration.
RIC	RCRA Docket Information Center.
RMS	Root Mean Square.
SAB	Science Advisory Board.
SAMSON	Solar and Meteorological Surface Observation Network.
SBREFA	Small Business Regulatory Enforcement Fairness Act.
SCIM	Sampled Chronological Input Model.
SI	Surface Impoundment.
SPARC	System Performs Automated Reasoning in Chemistry.
SSLs	Soil Screening Levels.
SVOC	Semi-Volatile Organic Compound.
SZM	Saturated Zone Module.
TC	Toxicity Characteristic.
TCLP	Toxicity Characteristic Leaching Procedure.
TDD	Telecommunications Device for the Deaf.
TOC	Total Organic Carbon.
TRI	Toxic Release Inventory.
TSCA	Toxic Substance Control Act.
TSDF	Treatment, Storage, and Disposal Facility.
TSS	Total Suspended Solid.
UMRA	Unfunded Mandates Reform Act.
USLE	Universal Soil Loss Equation.
UTS	Universal Treatment Standards.
VO	Volatile Organics.
VOC	Volatile Organic Compounds.
VZM	Vadose Zone Module.
WMU	Waste Management Unit.
WP	Waste Pile

Outline

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Background

I. Under What Legal Authority Is EPA Proposing These Regulatory Changes?

These regulations are proposed under the authority of Sections 2002(a), 3001, 3002, 3004, and 3006 of the Solid Waste Disposal Act of 1970, as amended by the Resource Conservation and Recovery Act of 1976 (RCRA), as amended by the Hazardous and Solid Waste Amendments of 1984 (HSWA), 42 U.S.C. § 6912(a), 6921, 6922, 6924, 6926.

II. What Is EPA Proposing Today and on What Other Actions Is EPA Seeking Comment?

A. What Is Included In Today's Notice?

Today EPA:

1. Proposes to retain the mixture and derived-from rules, currently set forth in 40 CFR 261.3(a)(2)(iii), 261.3(a)(2)(iv) and 261.3(c)(2)(i). As explained in Section III, these rules, which are currently in effect on an emergency basis, regulate wastes that are mixed with, or are derived from the treatment, storage, or disposal of, listed hazardous wastes.

2. Proposes to narrow the scope of the mixture and derived-from rules by exempting mixtures and derivatives of wastes listed solely for the ignitability, corrosivity, and/or reactivity characteristics which no longer exhibit any characteristic of hazardous waste and comply with land disposal restrictions applicable to characteristic wastes.

3. Discusses an implementation framework for two exemptions from Subtitle C management requirements for wastes meeting a set of conditions and procedures. The two options are:

(a) A ''generic'' exemption that has no specific requirements as to how the waste is managed once conditions of the exemption are met; and

(b) a ''landfill-only'' exemption that limits the subsequent management of the exempted waste to disposal in a landfill and prohibits placement on the land before disposal;

4. Discusses the current version of the risk assessment that EPA intends to use to create exemption levels to be used in the implementation framework; and

5. Discusses whether to revise the Land Disposal Restrictions by replacing the technology-based treatment standards in 40 CFR 268.40 and 268.48 with risk-based treatment standards.

B. What Related Regulatory Action Is EPA Also Proposing Elsewhere in Today's **Federal Register**?

In a separate proposal published elsewhere in the **Federal Register** today, we are also proposing to conditionally exempt hazardous waste mixed with low-level radioactive wastes (low-level mixed wastes, or LLMW) or mixed with Naturally Occurring and/or Accelerator-produced Radioactive Material (NARM mixed waste) from the storage, transportation, and disposal requirements of RCRA. Treated LLMW and NARM mixed waste would be exempt from RCRA hazardous waste transportation and disposal facility requirements if it is disposed at a low level radioactive waste disposal facility (LLRWDF) regulated by the Nuclear Regulatory Commission (NRC). In addition, we are also proposing that untreated LLMW and NARM mixed waste generated by the NRC licensees may be stored according to NRC regulations instead of RCRA hazardous waste storage regulations.

C. What Is EPA's Legal Obligation With Respect to This Proposal?

Our legal obligation for this proposal stems from EPA's fiscal year 1993 appropriation act, which required EPA to revise the mixture and derived-from rules, 40 CFR 261.3(a)(2)(iv) and 40 CFR 261.3(c)(2)(i), by October 1, 1994. (Pub. L. No. 102–389, 106 Stat. 1571). Congress made the deadline enforceable under RCRA's citizen suit provision, section 7002, 42 U.S.C. § 6972. We did not meet this deadline for revisions, and in early October 1994 several groups of waste generating and waste managing industries filed suits to enforce the deadline.

Two of the cases were consolidated and a third was dismissed with the plaintiffs being added as intervenors to the consolidated cases. *Environmental Technology Council* v. *Browner*, C.A. No. 94–2346 (TFH)(D.D.C.). The U.S. District Court for the District of Columbia entered a consent decree resolving the consolidated cases on May 3, 1993. The consent decree, as subsequently amended, required the Administrator to sign a proposal to revise the mixture and derived-from rules by November 13, 1995 and a notice of final action on the proposal by February 13, 1997. The decree reflects the parties' understanding that EPA's leading option was developing a multipathway risk assessment to establish constituent-specific, risk-based ''exit levels'' for listed hazardous wastes. It does not, however, specify what types of revisions EPA needs to propose or promulgate. On November 13, 1995, the Administrator signed the proposed Hazardous Waste Identification Rule (HWIR) to revise the mixture and derived-from rules. This proposal was published in the **Federal Register** on December 21, 1995. (60 FR 66344). It proposed a set of exemption levels for hundreds of hazardous constituents. Many of these exemption levels were based on a complex multipathway risk assessment. The notice also proposed to revise the derived-from rule to provide relief for

hazardous wastes listed because they exhibited the characteristics of ignitability, corrosivity and/or reactivity, and solicited comment on the concept of providing a separate exemption for hazardous wastes mixed with low level radioactive wastes.

We received extensive comments, many critical, on the 1995 HWIR proposal, particularly with respect to the scientific risk assessment. We continued to view risk-based exemption levels based on a multipathway risk assessment as our preferred option. We concluded that considerable work needed to be done to resolve the complex scientific and technical issues raised in the comments. We negotiated with the parties to extend the deadlines in the decree to allow us time to address these issues. On April 11, 1997, the District Court entered an order amending the consent decree in *Environmental Technology Council* v. *Browner.*

The amended decree revised the deadlines for a revision to the mixture and derived-from rules, with an October 31, 1999 deadline for the Administrator to sign a proposal, and an April 30, 2001 deadline to sign a notice taking final action. The amended decree also included 11 different provisos that we are obligated to make our best efforts to address. They require EPA to solicit comment on a number of issues related to risk assessment and to the implementation scheme we were developing for the exemption levels that the risk assessment would support. Today's rulemaking, in conjunction with the mixed waste proposal, also to be published today, fulfills our obligations under the consent decree.

Specifically, the amended consent decree required EPA to sign a notice proposing revisions to the mixture and derived-from rules in 40 CFR 261.3(a)(2(iv) and (c)(2)(i), and request comment on the 11 provisos listed in the decree. The consent decree reflected EPA's intent to further study three broad areas regarding hazardous constituents in hazardous waste and to establish a constituent-based exemption from hazardous waste regulation for low-risk wastes currently subject to RCRA subtitle C regulation. It also reflected EPA's intent to ''make best efforts'' to describe and discuss the items in the 11 provisos.

The three areas of study were: (a) Modeling of anaerobic biodegradation of hazardous constituents in the saturated zone, (b) the physical relationship between waste concentrations and leachate concentrations, and of mass limitations in leachate, and (c) the use of additional toxicity data from sources outside EPA. Seven of the 11 provisos concerned particular issues for EPA to study with respect to these three areas of study. Three provisos concerned options for implementing the exemption levels EPA expected to derive from the modeling. Finally, one proviso concerned an exemption from hazardous waste regulation for certain radioactive hazardous mixed wastes generated by nuclear power plants that are subject to regulation by the Nuclear Regulatory Commission (or states authorized to implement those regulations).

As contemplated in the consent decree, we developed a new model to analyze hazardous constituents in hazardous waste. We addressed the seven modeling-related issues listed in the provisos, either by incorporating steps in the model to produce data with respect to those issues, or by studying the issues and concluding that it was not possible to include them in a model at this time (see Sections XV to XIX). We addressed the three implementation-related provisos by developing a plan to implement a program to exempt certain waste currently regulated as hazardous waste under RCRA subtitle C from full hazardous waste regulation, based on meeting risk-based exemption levels for hazardous constituents (see Sections V to XIV). Finally, as stated above, the mixed waste provision is addressed in a separate notice of proposed rulemaking.

Despite a concerted, sustained effort, we did not succeed in developing within the consent decree time frame a risk assessment capable of generating reliable exemption levels. We concluded that we could not implement our preferred option by the October 31 deadline for proposed revisions. Moreover, we were not sure how much additional time we would need to address the remaining modeling issues. We concluded that we would better serve the public interest and better utilize our rulemaking resources by proceeding with the options that were ready for proposal rather than seeking another deadline extension for the purposes of resolving the complex technical issues presented by the risk assessment. Therefore, we decided to propose (1) Revisions to the mixture rule for wastes listed because they exhibit the characteristics of ignitability, corrosivity, and/or reactivity described in Section IV below, and (2) a set of conditional exemptions from various Subtitle C regulations (including the mixture and derived-from rules) for certain low-level radioactive wastes as described in the separate proposal published elsewhere today, including the conditional exemptions from the mixture and derived-from rules proposed here today.

D. How Does Today's Notice Relate to the 1995 HWIR Proposal?

In 1995, we published an HWIR proposal that included revisions to the mixture and derived-from rules and a discussion of exemptions similar to the HWIR exemption scenarios discussed in today's notice (60 FR 66344 (December 21, 1995)). Comments we received on the HWIR95 proposal have been invaluable in crafting today's notice, particularly in revising the risk assessment, and we will formally respond to those comments, as well as to comments on today's notice, when we promulgate a final rule. Today's notice is technically a supplement to HWIR95. However, because it has been four years since the 1995 HWIR proposal, we have written today's notice as a stand alone proposal. You do not have to read the 1995 proposal to understand today's notice.

E. What Other Regulatory Options Have Been Received From EPA Stakeholders?

In August 1999, we received a paper from the Chemical Manufacturers Association (CMA) describing five additional regulatory options, including suggested regulatory language, for revising the mixture and derived-from rules (see *Memorandum from Dorothy Kellogg, CMA to Elizabeth Cotsworth, Acting Director, Office of Solid Waste,* August 1999). CMA forwarded these options seeking regulatory relief for some specific high-volume wastes that they believe are low-risk and feel that EPA could propose to exempt with very little delay. Although we have not had time to analyze these options, we would like to present them here for others to provide their views.

Three of these options involve exempting from the hazardous waste derived-from rule: (1) Residues from the combustion of listed hazardous waste, (2) leachate from the land disposal of listed hazardous waste (that is subsequently managed in a system regulated under the Clean Water Act), and (3) sludges from the biological treatment of listed hazardous wastewaters. In each of these cases, CMA argues that the wastes are both physically and chemically dissimilar from the wastes that were originally listed. In addition, CMA notes that combustion and biological treatment can greatly reduce or eliminate organic chemicals. Under the options presented in CMA's discussion papers, each of these wastes would not be hazardous, even though they are generated from the

treatment, storage or disposal of hazardous waste, unless they exhibit one or more of the hazardous waste characteristics of 40 CFR Part 261.3.

CMA's paper does not, however, explicitly address how LDR treatment standards would apply to these residues. Especially in the case of the ash and wastewater treatment sludge, which would often result from LDR treatment, if the wastes do not meet the LDR standards, then there would be a question of whether further treatment to meet LDRs would be required.

EPA has already been considering another possible approach for addressing combustion residues, which would list these derived-from wastes under their own multi-source listing code, similar to multi-source leachate (F039). This listing would continue to regulate these wastes as hazardous, but application of other requirements could be tailored to fit the physical and chemical properties of these wastes. EPA is developing an Advance Notice of Proposed Rule Making (ANPRM) that would discuss the idea of a new listing for combustion residues. More information on this ANPRM (SAN No. 4093) can be found in the most recent agenda of regulatory and deregulatory actions (64 FR 21987 (April 26, 1999)).

In their materials, CMA has forwarded specific changes to regulatory language currently in effect and found in the Code of Federal Regulations (CFR). EPA has not evaluated this language and presents it here to enhance public dialogue on these ideas. CMA suggests that we modify 40 CFR 261.3(c)(2)(ii) and add the following language:

''[1] Wastes derived from burning any listed hazardous waste in a permitted or interim status hazardous waste combustion device; [2] Leachate derived from landfills or land treatment units containing listed hazardous waste, which is managed in a wastewater treatment system the discharge of which is subject to regulation under either section 402 or section 307(b) of the Clean Water Act (including wastewater at facilities which have eliminated the discharge of wastewater); [3] Wastes derived from the aggressive biological treatment of listed hazardous wastewaters in a wastewater treatment systems the discharge of which is subject to regulation under either section 402 or section 307(b) of the Clean Water Act (including wastewater at facilities which have eliminated the discharge of wastewater).''

The other two options presented in the paper involve specific wastes that result from the mixture of hazardous wastes with solid wastes. One option involves an expansion of the current ''headworks'' exemption in 40 CFR 261.3(a)(2)(iv)(A) and (B). The headworks exemption exempts from the mixture rule wastewaters containing small quantities of particular F-listed solvents, based on the mass-balance flow of these solvents through the headworks of industrial wastewater treatment systems. CMA's options paper requests that this exemption be amended in three ways.

First, CMA's suggested revision would allow direct monitoring of the actual concentration of spent solvents in untreated wastewater to demonstrate compliance. The current requirement is to perform a weekly mass balance of the solvents entering the system. Losses due to volatilization must be counted in the mass balance determination under the current system. We note that CMA's suggested wastewater monitoring would provide accurate data at the point the wastewater enters the treatment system, but the losses due to volatilization would not be counted in this approach.

Second, under the revised headworks exemption, benzene, 2-ethoxyethanol, 2-nitropropane, and 1,1,2-trichloroethane would be incorporated into the list of chemicals. These four chemicals were added to the 261.31 list of spent solvents in 1986 but the exemption does not currently include these chemicals.

Third, under the revised headworks exemption, multi-source leachate (F039) derived solely from the disposal of the spent solvents listed in 40 CFR 261.31 would be eligible for the exemption.

Again, CMA has forwarded specific changes to regulatory language currently in effect and found in the Code of Federal Regulations (CFR). EPA has not evaluated this language and presents it here to enhance public dialogue on these ideas. CMA suggests that we modify 40 CFR 261.3(a)(2)(iv)(A) and (B) to read as follows:

''40 CFR 261.3(a)(2)(iv)(A). One or more of the following solvents listed in § 261.31—carbon tetrachloride, tetrachloroethylene, trichloroethylene [add solvents that meet the standards to be included in this paragraph], including multi-source leachate derived from the disposal of these solvents and no other listed hazardous wastes—Provided, That either the actual concentration of these solvents or the maximum total weekly usage of these solvents (other than the amounts that can be demonstrated not to be discharged to wastewater) divided by the average weekly flow of wastewater into the headworks of the facility's wastewater treatment or pretreatment system does not exceed 1 part per million; or * * *

40 CFR 261.3(a)(2)(iv)(B). One or more of the following solvents listed in § 261.31—methylene chloride, 1,1,1-trichloroethane, chlorobenzene, o-dichlorobenzene, cresols, cresylic acid, nitrobenzene, toluene, methyl ethyl ketone, carbon disulfide, isobutanol, pyridine, spent chlorofluorocarbon solvents [add solvents that meet the standards to be included in this paragraph], including multi-source leachate derived from the disposal of these solvents and no other listed hazardous wastes—Provided, That either the actual concentration of these solvents or the maximum total weekly usage of these solvents (other than the amounts that can be demonstrated not to be discharged to wastewater) divided by the average weekly flow of wastewater into the headworks of the facility's wastewater treatment or pretreatment system does not exceed [25] part per million; or * * *''

These modifications add 4 chemicals to either paragraph (A) or (B), include leachate derived from the disposal of these solvents and no other listed hazardous waste and allow for the demonstration by direct measurement that concentrations do not exceed the specified levels. Note the 25 ppm threshold specified in 40 CFR 261.3(a)(2)(iv)(B) is the threshold within current regulations, and we do not believe it was CMA's intention to alter this level to 1 ppm, the level stated in their materials.

The other regulatory option involving hazardous waste mixtures would be an expansion of a current exemption for ''de minimis'' losses that result from the manufacture of commercial chemical product. The current exemption, found in 40 CFR 261.3(a)(2)(iv)(D), exempts from the mixture rule small losses of a commercial chemical product that can result from normal handling of the chemicals during the manufacturing process. The existing exemption applies to some but not all hazardous wastes listed in 40 CFR 261.33 (see 46 FR 56586). CMA's suggested expansion of this option would also exempt small losses from the normal handling of all listed hazardous wastes (instead of just the handling of commercial chemical products). One rationale for the current ''de minimis'' exemption is that a facility has little economic incentive to allow spills, leaks or other losses of commercial products. With respect to wastes, CMA believes that tank and container and air emission management standards of 40 CFR Parts 264 and 265, Subparts I, J, BB, and CC serve to encourage safe management of these wastes.

Specific changes forwarded by CMA would modify 40 CFR 261.3(a)(2)(iv)(D). EPA has not evaluated this language and presents it here to enhance public dialogue on these suggestions. Their language reads as follows:

''40 CFR 261.3(a)(2)(iv)(D). One or more hazardous wastes listed in Subpart D, arising from de minimis losses of these materials from manufacturing and related operations in which these materials are generated. For purposes of paragraph (a)(2)(iv)(D), ''*de minimis*'' losses include those from normal material handling operations (e.g., spills from the unloading or transfer of materials from bins or other containers, leaks from pipes, valves or other devices used to transfer materials); minor leaks of process equipment, storage tanks or containers; leaks from well maintained pump packings and seals; sample purging; relief device discharges; discharges from safety showers and rinsing and cleaning of personal safety equipment; and rinsate from empty containers or from containers that are rendered empty by that rinsing; or''

Note that the phrase ''One or more hazardous wastes listed in Subpart D'' replaces the more narrow eligibility contained in the current regulation as ''a discarded commercial chemical product, or chemical intermediate listed in 261.33.'' Also note the origin of these wastes has been made broader by the inclusion of the term ''generated'' replacing the phrase ''used as raw materials or are produced in the manufacturing process.''

We request comment on the merits and drawbacks of all these possible revisions to the mixture and derived-from rules and on how LDR standards should apply. We also request any data that may help us to further evaluate (a) the potential risks to human health and the environment, (b) any special or unique technical considerations, and (c) the economic effects of each of the possible revisions.

Retaining the Mixture and Derived-From Rules

III. Why Is EPA Proposing To Retain the Mixture and Derived-From Rules?

A. What Are the Mixture and Derived-From Rules?

The mixture and derived-from rules are a part of the RCRA regulations that define which wastes are considered to be hazardous and therefore subject to RCRA Subtitle C regulations. The mixture rule discussed in today's notice refer specifically to 40 CFR 261.3(a)(2)(iii) and (iv). Under the mixture rule, a solid waste becomes regulated as a hazardous waste if it is mixed with one or more listed hazardous wastes The derived-from rule discussed in today's notice refers specifically to 40 CFR 261.3(c)(2)(i). Under the derived-from rule, any solid waste generated from the treatment, storage, or disposal of a hazardous waste remains regulated as a hazardous waste. These derived-from wastes include wastes such as sludges, spill residues, ash, emission control dust, and leachate.

B. What Is the Legal History of the Mixture and Derived-From Rules?

EPA promulgated the mixture and derived-from rules in 1980 as part of the comprehensive ''cradle to grave'' requirements for managing hazardous waste. 45 FR 33066 (May 19, 1980). Numerous industries that generate hazardous wastes challenged the 1980 mixture and derived-from rules in *Shell Oil Co.* v. *EPA*, 950 F. 2d 741 (D.C. Cir. 1991). In December 1991 the D.C. Circuit Court of Appeals vacated the rules because they had been promulgated without adequate notice and opportunity to comment. The court, however, suggested that EPA might want to consider reinstating the rules pending full notice and comment in order to ensure continued protection of human health and the environment.

In response to this decision, we promulgated an emergency rule reinstating the mixture and derived-from rules as interim final rules without providing notice and opportunity to comment. 57 FR 7628 (March 3, 1992). We also promulgated a ''sunset provision'' which provided that the mixture and derived-from rules would remain in effect only until April 28, 1993. Shortly after, we published a proposal containing several options for revising the mixture and derived-from rules. See 57 FR 21450 (May 20, 1992). The May 1992 proposal and the time pressure created by the ''sunset provision'' generated significant controversy. In response, Congress included in EPA's FY1993 appropriation several provisions addressing the mixture and derived-from rules. Pub. L. No. 102–389, 106 Stat. 1571. First, Congress nullified the sunset provision by providing that EPA could not promulgate any revisions to the rules before October 1, 1993, and by providing that the reinstated regulations could not be ''terminated or withdrawn'' until revisions took effect. However, to ensure that we could not postpone the issue of revisions indefinitely, Congress also established a deadline of October 1, 1994 for the promulgation of revisions to the mixture and derived-from rules. Congress made this deadline enforceable under RCRA's citizen suit provision, section 7002.

On October 30, 1992, we published two notices, one removing the sunset provision, and the other withdrawing the May 1992 proposal. (See 57 FR 49278, 49280). We had received many comments criticizing the May 1992 proposal. The criticisms were due, in a large part, to the very short schedule imposed on the regulation development process itself. Commenters also feared that the proposal would result in a ''patchwork'' of differing State programs because some states might not adopt the revisions. This fear was based on the belief that States would react in a negative manner to the proposal and refuse to incorporate it into their programs if finalized. Finally, many commenters also argued that the risk assessment used to support the proposed exemption levels failed to provide adequate protection of human health and the environment because it evaluated only the risks of human consumption of contaminated groundwater and ignored other pathways that could pose greater risks. Based on these concerns, and based on EPA's desire to work through the individual elements of the proposal more carefully, we withdrew the proposal.

Subsequently, a group of waste generating industries challenged the March 1992 action that reinstated the mixture and derived-from rules without change. *Mobil Oil Corp.* v. *EPA*, 35 F.3d 579 (D.C. Cir. 1994). The court rejected this challenge, adopting our argument that the appropriations act made the challenge moot because it prevented both us and the courts from terminating or withdrawing the interim rules before we revised them, even if we failed to meet the statutory deadline for the revisions.

We did not meet Congress' October 1, 1994 deadline for revising the mixture and derived-from rules. In early October 1994 several groups of waste generating and waste managing industries filed citizen suits to enforce the October 1, 1994 deadline for revising the mixture and derived-from rules. The U.S. District Court for the District of Columbia entered a consent decree resolving the consolidated cases on May 3, 1993. *Environmental Technology Council* v. *Browner*, C.A. No. 94–2119 (TFH) (D.D.C. 1994). The consent decree originally required the Administrator to sign a proposal to amend the mixture and derived-from rules by November 13, 1995 and a notice of final rulemaking by December 15, 1996, and specified that the deadlines in the appropriations act do not apply to any rule revising the

separate regulations that establish jurisdiction over media contaminated with hazardous wastes. On November 13, 1995, the Administrator signed the proposed Hazardous Waste Identification Rule to revise the mixture and derived-from rules, which was published in the **Federal Register** on December 21, 1995. (60 FR 66344).

We received extensive comments, many critical, on the 1995 proposal, particularly with respect to the scientific risk assessment supporting the proposed revisions to the mixture and derived-from rules. As a result of the comments, we concluded that considerable work needed to be done to resolve complex scientific and technical issues raised by the risk assessment and the comments received. On April 11, 1997, the District Court entered an order amending the consent decree in *Environmental Technology Council* v. *Browner*. The amended decree provided us with additional time to perform further scientific risk assessment work and requires us to address specific issues and options for revising the mixture and derived-from rules. The amended decree calls for a notice of proposed rulemaking to revise the mixture and derived-from rules, with an October 31, 1999 deadline for the Administrator to sign a proposal, and an April 30, 2001 deadline to sign a notice of final rulemaking. Until this rule is promulgated, the mixture and derived-from rules are considered to remain in effect on an ''emergency basis.''

C. Why Is EPA Proposing To Retain the Mixture and Derived-From Rules?

The mixture and derived-from rules are necessary to regulate hazardous wastes in a way that protects human health and the environment. Mixtures and residuals of hazardous waste represent a large and varied universe. Many hazardous wastes continue to be toxic after they have been mixed with other waste or have been treated. As explained below, without the mixture and derived-from rules, such wastes could easily escape coverage of RCRA Subtitle C regulations, while nevertheless posing risks to human health and the environment.

We believe that without the mixture and derived-from rules, some generators would alter their waste to the point it no longer meets the listing description without detoxifying, immobilizing, or otherwise actually treating the waste. For example, without a ''mixture'' rule, generators of hazardous wastes could escape regulatory requirements by mixing listed hazardous wastes with other hazardous wastes or nonhazardous solid wastes to create a ''new'' waste that arguably no longer meets the listing description, but continues to pose a serious hazard. Similarly, without a ''derived-from'' rule, hazardous waste generators could potentially evade regulation by minimally processing or managing a hazardous waste and claiming that the resulting residue is no longer the listed waste, despite the continued hazards of the residue. (See 57 FR 7628). It is therefore necessary for protection of human health and the environmental to capture mixtures and derivatives of listed hazardous waste in the universe of regulated hazardous wastes. A hazardous waste regulatory system that allowed hazardous waste to leave the system as soon as it was modified to any degree by being mixed or marginally treated would be ineffective and unworkable. Such a system could act as a disincentive to adequately treat, store and dispose of listed hazardous waste.

We know that mixtures and residuals of hazardous waste can be hazardous based on our experience in identifying and regulating hazardous waste. For example, during the listing process, we review data on specific waste streams generated from a number of industrial processes to determine whether these wastes would pose hazards to human health or the environment if mismanaged. Through the listing process, we have determined risks arising from the disposal of waste mixtures and derived-from wastes. Leachate generated from hazardous wastes is a particularly good example of residuals of hazardous wastes that contain toxic chemicals that can endanger environmental or human receptors. Our risk analyses have shown that multi-source leachate derived from hazardous waste landfills can contain very high concentrations of toxic organic compounds and metals. (Preliminary Data Summary for the Hazardous Waste Treatment Industry, EPA/OW, 1989). Other derived-from wastes that, because of their treatment process, can result in higher concentrations of chemicals (especially metals) than their parent wastes include wastewater treatment sludge and combustor ash. As a result of either wastewater treatment or combustion, the wastes would have their volumes greatly reduced, but could still contain the same amount of inorganic chemicals, thus resulting in a higher concentration of chemicals.

Our experience with delisting petitions also supports the need to regulate as hazardous mixtures and residuals of listed hazardous waste in order to protect human health and the environment. Generators can petition us under 40 CFR 260.22 to exclude a waste produced at a particular facility from the definition of hazardous waste. Such petitions must demonstrate that the waste does not meet any of the criteria for which it was listed nor has other attributes that might result in the waste being hazardous. As of March 27, 1995, we have denied or dismissed 139 of 809 (17%) of delisting petitions received. This estimate does not include 543 petitions (67% of the total) that were withdrawn (311), mooted (198) or referred to the State authority (34). The chief reason for denying or dismissing most of the 139 delisting petitions was failure by the petitioner to supply adequate information. However, in at least 13 cases, we denied delisting petitions for mixtures or residuals of listed waste because risk analyses indicated that the toxicity and leaching potential of hazardous chemicals in those wastes posed unacceptable risk to human health (see *Disposition of Delisting Petitions for Derived-From/Mixture Wastes*, U.S. EPA memorandum, 1992 and *Analysis of the Delisting Petition Data Management System*, U.S. EPA, September 1998). We have also identified damage cases associated with mixture and derived-from wastes. For example, there are Superfund sites that contain mixture and derived-from wastes (See 50 FR 658). In many cases, determining when the environmental damage occurs on a site is difficult, but we have identified at least nine sites that involve the mismanagement of mixture and derived-from wastes. (see ''Releases of Hazardous Constituents Associated with Mixture and Derived-from Wastes,'' EPA 1999). These waste types are also associated with RCRA corrective actions where high concentrations of hazardous chemicals were found in the vicinity of units that contained a listed waste. (*Data on Mixture and Derived-from Wastes from Closures and Corrective Action at Hazardous Waste Management Facilities*, EPA, 1992).

In addition, through the development of the LDR program, we have considered the appropriateness and effectiveness of various hazardous waste treatment technologies. Treatments specified within the LDR regulations, promulgated under 40 CFR 268, are required for hazardous waste to be land disposed. However, technology-based treatment standards do not always equate with low risk. In addition, treatment that is not performed properly or is not fully optimized may result in residues that present some risk. Further discussion and examples of LDR treatment are presented in a background

document entitled *Memorandum to the Docket from Larry Rosengrant Regarding Section 3004(m) of the Hazardous and Solid Waste Amendments,* U.S. EPA January 21, 1992. Since treatment standards are based on the limits of technology, residuals can still pose sufficient risk to warrant continued regulation under RCRA Subtitle C.

D. Does EPA Have the Legal Authority To Retain the Mixture and Derived-From Rules?

We have had, and we continue to have the statutory and regulatory authority to promulgate the mixture and derived-from rules. The mixture and derived-from rules, particularly with the revisions proposed today, ensure that hazardous wastes that are mixed with other wastes or treated in some fashion do not escape regulation as long as they are reasonably likely to threaten human health and the environment. These rules retain jurisdiction over listed hazardous wastes and clarify that such wastes do not automatically exit the Subtitle C system when they are mixed or treated, however minimally.

The mixture and derived-from rules are valid exercises of our authority to list hazardous waste under section 3001 of RCRA. We have consistently interpreted section 3001(a) as providing EPA with flexibility in deciding whether to list or identify a waste as hazardous, that is to consider the need for regulation. Specifically, section 3001 requires that EPA, in determining whether to list a waste as hazardous waste, or to otherwise identify a waste as hazardous waste, decided whether a waste ''should be subject to the requirements of Subtitle C.'' Hence, section 3001 authorizes us to determine when Subtitle C regulation is appropriate. The statute directs EPA to regulate hazardous waste generators (section 3002(a)), hazardous waste transporters (section 3003(a)), and hazardous waste treatment, storage, and disposal facilities (section 3004(a)) ''as necessary to protect human health and the environment.'' By extension, the decision of when waste should be subject to the regulatory requirements of Subtitle C is essentially a question of whether regulatory controls promulgated under sections 3002–3004 are necessary to protect human health and the environment. We have therefore consistently interpreted section 3001 to give us broad flexibility in fashioning criteria for hazardous wastes to enter or exit the Subtitle C regulatory system. See, *Military Toxics Project* v. *EPA,* 146 F.3d 948, 958 (D.C. Cir. 1998).

EPA's 1980 criteria authorize the listing of classes of hazardous wastes when we have reason to believe that wastes in the class are typically or frequently hazardous. See 40 CFR 261.11(b). As discussed Section III.C. above, EPA has ample reasons for classifying mixtures and residuals of listed hazardous waste as hazardous wastes.

In addition to providing the context in which the determination of whether a waste ''should be subject to the requirements of Subtitle C,'' sections 3002–3004 allow us to impose requirements on waste handlers until wastes have ''cease[d] to pose a hazard to the public.'' *Shell Oil Co.* v. *EPA,* 959 F.2d 741, 754 (D.C. Cir. 1991). See also *Chemical Manufacturers Assoc.* v. *EPA,* 959 F.2d 158, 162–65 (D.C. Cir. 1990) (EPA may regulate the disposal of nonhazardous wastes in a hazardous waste impoundment under section 3004) and *Chemical Waste Management, Inc.* v. *EPA,* 976 F.2d 2, 8, 13–14 (D.C. Cir. 1992) (EPA may require further treatment of wastes under section 3004 even though they cease to exhibit a hazardous characteristic).

Proposed Revisions to 40 CFR 261.3

IV. How and Why Is EPA Proposing To Revise the Hazardous Waste Identification Regulations for Mixtures and Derived-From Wastes?

A. How and Why Is EPA Proposing To Revise the Hazardous Waste Identification Regulations for Wastes That Were Listed Solely for Ignitability, Corrosivity and/or Reactivity?

There are 29 waste codes within the RCRA program listed solely for ignitability, corrosivity, and/or reactivity characteristics. Currently, 40 CFR 261.3(a)(2)(iii) specifies that a *mixture* of these wastes and a solid waste is no longer a hazardous waste if the mixture does not exhibit a hazardous characteristic. These mixtures must still meet the LDR requirements of 40 CFR 268.40.

We believe that wastes listed solely because they exhibit the ignitability, corrosivity and/or reactivity characteristics should all be treated identically, whether they are mixtures, residuals, or wastes meeting the original listing description as generated. For example, ash resulting from the combustion of an ignitable listed waste would no longer exhibit the characteristic of ignitability. Under the current derived-from rule, this ash would not be exempt, however if it were a ''mixture'' rather than a treatment residual, it would be exempt under the current mixture rule. Another example are nitroglycerine patches, which when used for medical purposes are not reactive even at the point they are manufactured, but are regulated as P081 when discarded. Thus, today's proposed revision would expand this exemption which is currently in the mixture rule only, so that all these materials would be exempt from hazardous waste regulation if they are de-characterized and meet the appropriate LDR treatment standards, including treatment for all underlying hazardous constituents (as defined in 40 CFR 268.3(i)). Table 1 presents the 29 wastes codes and the characteristic(s) that are the basis for their listing.

TABLE 1.—WASTES LISTED FOR IGNITABILITY, CORROSIVITY, AND/OR REACTIVITY

	Waste code	Description	Hazard code
1	F003	Spent xylene and other non-halogenated solvents	(I)
2	K044	Wastewater treatment sludges from the manufacturing and processing of explosives	(R)
3	K045	Spent carbon from the treatment of wastewater containing explosives	(R)
4	K047	Pink/red water from TNT operations	(R)
5	P009	Ammonium Picrate	(R)
6	P081	Nitroglycerine	(R)
7	P112	Tetranitromethane	(R)

TABLE 1.—WASTES LISTED FOR IGNITABILITY, CORROSIVITY, AND/OR REACTIVITY—Continued

	Waste code	Description	Hazard code
8	U001	Acetaldehyde	(I)
9	U002	Acetone	(I)
10	U008	Acrylic Acid	(I)
11	U031	n-Butyl alcohol	(I)
12	U020	Benzenesulfonyl chloride	(C, R)
13	U055	Cumene	(I)
14	U056	Cyclohexane	(I)
15	U057	Cyclohexanone	(I)
16	U092	Dimethylamine	(I)
17	U096	Cumene Hydroperoxide	(R)
18	U110	Di-n-propylamine	(I)
19	U112	Ethyl Acetate	(I)
20	U113	Ethyl Acrylate	(I)
21	U117	Ethyl Ether	(I)
22	U124	Furan	(I)
23	U125	Furfural	(I)
24	U154	Methanol	(I)
25	U161	Methyl isobutyl ketone	(I)
26	U186	1,3 Pentadiene	(I)
27	U189	Sulfur phosphide	(R)
28	U213	Tetrahydrofuran	(I)
29	U239	Xylene	(I)

I=ignitability, C=corrosivity, R=reactivity

As explained in Section XXI, the majority of the waste which would be eligible for this exemption would be F003 (spent xylene and other non-halogenated solvents). However, the full listing description for F003 in 40 CFR 261.31 includes the following statement: ''and all spent solvent mixtures/blends containing, before use, one or more of the above non-halogenated solvents, and, a total of ten percent or more (by volume) of one or more of those solvents listed in F001, F002, F004, and F005 * * *'' Although F003 is listed solely for ignitability, its listing description includes references to solvents that were listed for toxicity as well. This is one of the reasons that LDR standards reference a composite list of chemicals that must be treated for F001, F002, F003, F004 and F005. We therefore request comment on whether to allow F003 to be eligible for this proposed exemption.

B. How Is EPA Proposing To Revise The Mixture and Derived-From Rules for Mixed Waste?

In the revisions to 40 CFR Part 261.3 that we are proposing today, we also include a conditional exemption for mixed waste from the mixture and derived-from rules, provided the mixed waste is handled in accordance with 40 CFR Part 266, Subpart N.

The proposed regulatory language in 40 CFR Part 266, Subpart N, which we are including in a separate **Federal Register** notice published elsewhere today conditionally exempts hazardous waste mixed with low-level radioactive wastes (low-level mixed wastes/LLMW), or mixed with Naturally Occurring and/or Accelerator-produced Radioactive Material (NARM mixed waste) from the storage, treatment in tank, transportation, and disposal requirements of RCRA. Nuclear Regulatory Commission (NRC) or its Agreement State licensed LLMW generators can store, or treat LLMW in storage tanks without RCRA Subtitle C permits if all exemption conditions are met. Treated LLMW or NARM mixed waste could be disposed at a low level radioactive waste disposal facility (LLRWDF) regulated by the NRC or its Agreement State if all exemption conditions are met. The rationale for conditionally exempting LLMW from the mixture and derived-from rules is the same as that for creating the conditional exemption from the RCRA regulatory definition of hazardous waste for LLMW. We incorporate by reference the notice of proposed rulemaking for the LLMW conditional exemption (EPA Docket Number F–1999–ML2P–FFFFF). We request comment on whether to conditionally exempt low level mixed wastes from the mixture and derived-from rules.

HWIR Exemption Options

V. Why Is EPA Developing a Chemical-Based HWIR Exemption for Listed Hazardous Waste (Including Both Mixtures and Derived-From Waste)?

A. What Issue Would the HWIR Exemption Address?

The HWIR exemption would refine the regulation of hazardous wastes by improving identification of lower risk hazardous wastes, while ensuring that the health of our nation's citizens and environment is not compromised. Wastes are hazardous and subject to RCRA Subtitle C regulations if they exhibit certain characteristics (''characteristic wastes'') or if they have been placed on certain lists by EPA (''listed wastes'').

Once a waste is identified as a listed hazardous waste, it remains regulated as hazardous, even if it has been treated to remove all hazardous chemicals, unless the wastes are formally delisted. Delisting under 40 CFR 260.22 requires a formal rulemaking process under the Administrative Procedures Act (APA). Delistings are waste stream specific, with close government review of sampling procedures, analytical test results, and the accompanying quality assurance and quality control (QA/QC) data. This process has the advantage of tailoring the delisting determination to the specific waste, but it is also resource intensive and time consuming for both the petitioner and the government. Such costs could discourage a generator from

exploring the use of pollution prevention and new waste treatment technologies to detoxify his waste. By offering a self-implementing alternative, the HWIR exemption would exempt low-risk wastes more quickly and at less cost than the current delisting process.

B. How Would the HWIR Exemption Affect the Regulation of Hazardous Waste?

Under this approach, wastes that have been designated as listed hazardous wastes under Subpart D of 40 CFR Part 261 (or are mixed with, derived from, or contain listed hazardous wastes) would no longer be subject to the full ''cradle to grave'' RCRA Subtitle C hazardous waste management requirements, if the chemicals of concern in the wastes are below risk-based exemption levels. The waste would instead be managed under RCRA Subtitle D nonhazardous waste management requirements, which better match the risks posed by this low-risk waste. The HWIR approach would be self-implementing, and therefore less burdensome both to the generator and the overseeing agency than the current delisting process.

C. How Would the Exemption Continue To Ensure Protection of Human Health and the Environment?

HWIR would continue to ensure protection of human health and the environment by establishing numerical risk levels that are based on a multi-media approach to environmental protection. The risk models that would underlie the exemption levels in the HWIR exemption predict the potential release of hazardous chemicals from waste management units to the air, land, surface water, and groundwater. If wastes contain these chemicals at concentrations greater than these levels, they would remain regulated as hazardous under RCRA Subtitle C. On the other hand, those wastes that no longer contain these chemicals or that can be demonstrated to contain these chemicals below these levels, would no longer be considered hazardous under RCRA Subtitle C, but would still be subject to State nonhazardous waste regulations. The HWIR exemption would also include testing and documentation requirements to ensure that the exemption levels have been and continue to be met.

VI. What Options Is EPA Developing for the HWIR Exemption?

We are developing two options for the HWIR exemption: (1) The ''generic'' HWIR exemption, and (2) the ''landfill-only'' HWIR exemption. As discussed in Section XVII of this preamble, we are not proposing the HWIR exemption because of technical difficulties in developing chemical-specific exemption levels from the model. Before we would promulgate an HWIR exemption, we would first publish an HWIR proposal that would include specific exemption levels and give the public an opportunity to comment. Therefore, our discussion consists of a ''framework'' for the two HWIR exemption options. In this discussion, ''you'' refers to the person who would wish to claim an exemption for a waste under these options.

A. What Is the Generic HWIR Exemption option?

Under the generic HWIR exemption option, your listed hazardous waste would no longer be hazardous once the risk-based exemption levels have been satisfied, and you fulfill the conditions and requirements discussed in Section IX of this preamble. The exemption levels would be listed in a new appendix to 40 CFR Part 261 (Appendix X), found in Table 2, in Section XIV of this preamble. You would have to continue to meet specific waste testing requirements to ensure that the waste remains below the HWIR exemption levels.

This option is based on the premise that the HWIR exemption levels would be protective in all reasonable waste disposal scenarios. Therefore, there would be no limits to where an HWIR waste could be disposed under this option, except for existing State requirements that apply to all nonhazardous industrial wastes. A discussion of the risk assessment model supporting this option can be found in Sections XV through XIX of today's preamble.

B. What Is the Landfill-Only HWIR Exemption?

Under the landfill-only HWIR exemption, your waste would have to meet a different set of HWIR exemption levels, found in Table 2, in Section XIV of this preamble, and you would be required to dispose of the waste in a landfill. A landfill is a land-based unit where non-liquid wastes are placed for permanent disposal, and is not a land application unit (where wastes are incorporated into the soil). This landfill would not need to be a hazardous waste landfill, but nonhazardous landfills are still regulated under existing State requirements, which would help ensure that it is protective of human health and the environment. This landfill disposal requirement is in addition to the other requirements described under the generic HWIR exemption option.

In addition, under the landfill-only exemption, you would also be required to fulfill waste tracking requirements to ensure that the waste does arrive at a landfill, and until the waste is disposed, you would not be allowed to place it on the land. We are concerned about the temporary placement of these wastes in waste piles or other such intermediate land-based destinations, because exemption levels for the landfill-only option (unlike the levels for the generic option) would not consider such risks. See Section XII of this preamble for discussion of these additional conditions and requirements.

We believe that restricting wastes to landfills and customizing the exemption levels to that unit focuses the HWIR exemption on the lowest-risk and most likely disposal scenario for non-liquids. Management in a landfill helps reduce air release and overland transport of hazardous chemicals. This option could allow for less conservative exemption levels, thus reducing regulatory costs while continuing to protect human health and the environment.

C. What Implementation Options Are in Both the 1995 HWIR Proposal and Today's Notice?

In our 1995 HWIR proposal, we developed a number of options for exempting low risk wastes from RCRA Subtitle C hazardous waste regulation. Under a proposed ''base national option,'' generators would be required to demonstrate that constituent concentrations within a waste did not exceed risk-based HWIR exemption levels. Conceptually, the base national option from 1995 is the same as today's generic option discussed in Section VI.A of this preamble. We also proposed several ''contingent management'' options, under which generators were required to meet alternate exemption levels, provided that they met additional waste management requirements. The landfill-only option discussed in Section VI.B of this preamble is similar to one of the contingent management options proposed in 1995.

When we developed today's notice, we considered all of the options discussed or proposed in 1995, plus an additional contingent management option that would require waste to be stabilized and then disposed in a landfill. (see *Evaluation of Contingent Management Options,* U.S. EPA, 1999). One of the most pervasive comments on the 1995 HWIR proposal was related to the number and complexity of alternatives, which made it difficult for readers to understand and comment on the proposal. We have decided to

develop only the two options we have deemed most viable: the base national option and the contingent management national option 1 (disposal in a landfill). As discussed above, these two options are called the generic HWIR option and the landfill-only HWIR option.

The 1999 HWIR options differ from their 1995 counterparts. The biggest changes are to the risk assessment we are developing to support the options. Instead of modeling each exposure pathway separately as we did in 1995, the current version of the model takes into account simultaneous exposures via multiple pathways. See Sections XV through XIX of this preamble for a discussion of the current version of the model. In the 1995 HWIR proposal we included more than 350 exemption levels. About half of these levels were based on risk modeling, while the other have were based on an extrapolation methodology that we have since discarded. As explained in Section XVII, today's discussion does not include any specific exemption levels because of technical difficulties in the risk modeling. Instead, we discuss the framework of the exemption and ask for comment on the modeling approach. Before we would promulgate an HWIR exemption, we would first publish an HWIR proposal that would include specific exemption levels and give the public an opportunity to comment.

In addition to modeling changes, we have also revised the discussion of some of the implementation requirements. We have scaled back the testing requirements so that facilities would not have to document why chemicals would not be in their waste (essentially proving a negative). Instead, under today's options, facilities would only have to test for chemicals ''reasonably expected'' to be in their waste; the guidelines for determining what chemicals we would ''reasonably expect'' to be in a waste are discussed in Section IX of this preamble. Also, for the generic option, we have developed three categories of wastes (liquids, semi-solids, and solids) rather than the two proposed in 1995 (wastewaters and nonwastewaters). These categories are discussed in more detail in Section XIX.C. Finally, for the landfill-only option, we would require tracking requirements to ensure that the waste arrives at its intended destination. These requirements are discussed in Section XII.B.

D. Why Did We Decide Not To Go Forward With Two of the National Contingent Management Approaches Discussed in the 1995 HWIR Proposal?

The 1995 HWIR options included three approaches that required a generator to meet national exemption levels. After carefully evaluating these options and reviewing the input we received from our stakeholders, we determined that, except for the landfill-only national contingent management option (analogous to the first national contingent management option from 1995), it would not be feasible and/or desirable to develop and implement the other approaches at this time.

Under the second national contingent management option for 1995 HWIR proposal, we considered establishing exemption levels for each type of waste management unit: landfill, waste pile, land application unit, tank, and surface impoundment. Upon further review, however, we determined that setting exemption levels for waste piles, land application units, tanks or surface impoundments was not a desirable option for several reasons.

First, waste piles and tanks are intermediate disposal destinations. It is not appropriate to exempt wastes based on exposures from just these units and no others, since the final disposition of the waste is most important for determining long-term risk. Second, we found in 1995 that the land application unit drove most of the non-liquid exemption levels and therefore separate land application unit levels would be no different from levels established for the generic option. Similarly, a surface impoundment option would be expected to be similar to levels for liquids established under the generic option, and we do not believe that separate exemption levels are warranted. Given that the generic option has fewer requirements and similar exemption levels, we decided a contingent management option for land application units and surface impoundments would add unnecessary complexity to the rule.

Under the third national contingent management option, we considered setting exemption levels for waste management units with specific design or operating controls that would allow for less conservative exemption levels. Although specific public comment on the national contingent management options was limited, representatives from industry indicated a support for options that allowed the consideration of site-specific factors. Therefore, in addition to evaluating the approach of developing separate exemption levels for each type of waste management unit, we considered developing exemption levels based upon engineering controls in place at certain units.

However, when we evaluated the unit control option, we found it difficult to quantitatively attribute a set of risk protection levels to specific engineering and management controls, especially over a long period of time. Also, in order to enforce such an option, we would need to make complex judgements regarding whether the required unit controls were being used correctly. Such determinations would be more appropriately made under the oversight of a permitting authority, rather than as a condition of a self-implementing exemption under HWIR.

E. Why Did We Decide Not To Go Forward With the State Contingent Management Approaches Discussed in the 1995 HWIR proposal?

In 1995, we proposed that qualified States would be allowed to manage listed waste in their nonhazardous waste management programs under certain conditions. We included three different State-based approaches. These three approaches differed in terms of (1) the risk-based criteria (10^{-5} versus 10^{-4} cancer risk, for example) that would be used to identify the set of wastes that could be managed under an approved State program; (2) the type of State program review that we would conduct to identify qualified State programs (qualitative and/or quantitative); and (3) the breadth of the State program that we would review and qualify. For example, we could have reviewed the entire State nonhazardous program, or only that portion related to the HWIR exemption.

As we considered the above State program approaches to contingent management, we recognized that State industrial nonhazardous waste programs have improved significantly since the early days of the RCRA Subtitle C hazardous waste program. A well-developed State program could offer a continuum of management for waste of varying risks and allow more local judgements and ongoing oversight of HWIR exemptions. Waste generators have also expressed support for State program approaches to contingent management, because site-specific or regional specific parameters could be considered to a larger extent in State risk assessments. However, after further consideration of the State program options, as well as review of the input we received from our stakeholders, we decided that the implementation of these options would be difficult.

Although the States recognize that relying upon State programs could be a

preferable alternative for the regulated community than a national approach (in terms of less conservative exemption levels for example), they expressed concern about resource implications, should they be required to independently develop exemption criteria. The States would have to perform risk assessments, which are resource-intensive and require specialized expertise. From an implementation perspective, some States would prefer for EPA to develop exemption levels for the States to implement and enforce within their Subtitle D versus Subtitle C programs. (see *Overview: State-Based Contingent Management Case Study Project, Discussion Draft for April 1–2, 1998 Joint ASTSWMO Task Force Meeting,* March 9, 1998).

Furthermore, the transfer of jurisdiction over HWIR-exempt wastes from the Federal to the State governments would entail some type of EPA review of the quality of State Subtitle D programs. One State association indicated it would be inappropriate for EPA to evaluate State Subtitle D programs as part of authorizing states to use the contingent management options.

Finally, State program approaches would result in a variety of disposal standards across the States. States and the regulated community would have to devote additional resources to ensure that waste streams generated and exiting under contingent management standards in neighboring States meet applicable transportation and disposal standards in the receiving States. A representative of the waste management industry expressed concern over the interstate transport ramifications of these approaches. For these reasons, we have decided not to pursue a State contingent management implementation option.

F. What Other HWIR Implementation Option Has EPA Considered?

We also considered another contingent management option which would establish HWIR exemption levels for stabilized wastes when managed in a landfill. This approach was based upon the notion that different risks are posed by the same chemicals in different waste forms. More specifically, the physical nature of stabilized wastes, their ability to reduce the mobility of chemicals in the environment and the requirement to manage such waste in a landfill could provide additional protection. For example, stabilizing the waste and managing it in a landfill would help reduce or eliminate certain releases, such as windblown dust. By taking this additional protection into account, we could develop specific exemption levels that would be less stringent than those developed for the national generic option or the landfill-only option, but equally protective. The focus on stabilized waste forms was partially derived from a screening study that has been placed in the docket (see *Waste Forms Technical Background Document,* U.S. EPA, September 1998).

As explained in the background document, we decided not to further develop a stabilized waste option because of complications in defining which stabilized forms are appropriate and technical difficulties in determining what are the appropriate reductions in mobility from these forms.

VII. What Wastes Would Be Eligible for an HWIR Exemption?

A listed hazardous waste would be eligible for this exemption once all the HWIR exemption levels are achieved. Even though the wastes might still contain chemicals for which they were originally listed, concentrations at HWIR exemption levels would pose very low risk to human health and the environment. However, wastes which exhibit any of the hazardous characteristics would continue to be regulated as hazardous wastes until the characteristic is removed, even if HWIR exemption levels are achieved.

As discussed in Section XVIII of this preamble, we might not develop HWIR exemption levels for all ''chemicals of concern'' (HWIR exemption chemicals). Those wastes that would reasonably be expected to contain HWIR exemption chemicals without exemption levels would not be eligible for the exemption *even if those chemicals are not detected in the waste.* Chemicals can pose risk below levels capable of being detected by analytical methods. If a chemical does not have a risk-based HWIR level to compare against, we cannot evaluate whether it poses a risk below detection. Therefore, we believe that any waste that would be reasonably expected to contain an HWIR exemption chemical that does not have an exemption level should be ineligible for the HWIR exemption, regardless of test results. See Section IX.A for further discussion of this issue.

VIII. What Level of Governmental Review Would Be Needed for an HWIR Exemption Claim?

For both the generic and the landfill-only alternatives, the HWIR exemption would be self-implementing. Self-implementing means that no prior governmental approval or review of documentation is required before wastes are exempted from RCRA hazardous waste regulation. The use of a self-implementing mechanism is consistent with most other hazardous waste exemptions and exclusions, such as exemptions from the mixture and derived-from rules found in 40 CFR 261.3(c)(2)(ii) and exclusions from the definition of hazardous waste found in 40 CFR 261.4(b).

Self-implementation has several advantages: (1) The exemption can take effect quickly, (2) the generator's burden in claiming the exemption is reduced, and (3) the burden for the overseeing agency (the authorized State or an EPA Region) is also reduced. Most of the commenters to the 1995 HWIR proposal, including a majority of States, favored self-implementation.

Self-implementation would not prevent the overseeing agency from having a role in the HWIR exemption. As a condition of claiming an HWIR exemption, you would be required to provide specific information to the overseeing agency (see Section IX.D). In addition, you would be required to keep and retain records in order to maintain an exemption (see Section XI.C). This information would be available to the overseeing agency in an inspection and for an enforcement action, if needed. Because HWIR waste would be some of the lowest-risk industrial wastes, and the overseeing agency would still have authority to enforce against an improperly claimed exemption, we believe that there would be little benefit to requiring prior governmental approval before the exemption takes place.

In addition, your waste would only become exempt upon your receiving written confirmation that the notification package had been received by the overseeing agency. Examples of confirmation include certified mail return receipt, or written confirmation of delivery from a commercial delivery service. Upon receipt that the notification package has been delivered successfully, you would be allowed to manage the HWIR waste as nonhazardous. Confirmation that the overseeing agency has received the package would not imply, however, that the package has been reviewed or approved.

As noted above, since our preferred option is to make the HWIR exemption self-implementing, the overseeing agency would not be required to make a decision regarding the waste prior to exemption. We do not believe that requiring a waiting period (for example, 30 or 60 days) before the exemption becomes effective is necessary. Most of the commenters to the 1995 HWIR

proposal, including representatives of industry, federal and state government agencies, utility associations, industry associations and waste management associations opposed the idea of a waiting period. They felt that such a waiting period could create undue expense, administrative burden, and numerous legal and practical complications (such as storage space issues).

Some of the commenters on the 1995 HWIR proposal, including some State governments, favored having the option of requiring prior approval and a waiting period. One possible approach would to require a waiting period which could be used by the overseeing authority to review the notification package. This review would be discretionary. If the overseeing authority takes no action during this waiting period, then the exemption would be approved. Commenters on the 1995 HWIR proposal who favored a waiting period felt that it would allow the overseeing agency time to screen notifications and obtain additional information as necessary. Waiting period recommendations ranged from 30 days to 90 days.

We request comment on whether HWIR should be self-implementing, and whether there should be a waiting period before the exemption take effect.

IX. For the Generic HWIR Exemption, What Steps Would I Follow Before My Waste Could Be Exempted?

You would be required to complete the following steps before your waste could be exempted:

(a) Determine which HWIR exemption chemicals of concern your waste is reasonably expected to contain. (see Section IX.A below)

(b) Develop a waste sampling and analysis plan (see Section IX.B.1).

(c) Determine that the concentrations of the chemicals reasonably expected to be present in your waste are at or below the appropriate exemption levels (see Section IX.B.1).

(d) Determine that the waste does not exhibit any of the hazardous waste characteristics of Subpart C of 261.

(e) Notify the overseeing agency that you are claiming an exemption under this Subpart for your waste (see Section IX.D).

Once you receive confirmation that your notification was received by the overseeing agency, then your waste is exempt. Figure 1 provides an overview of this process, which is described in more detail in the sections that follow.

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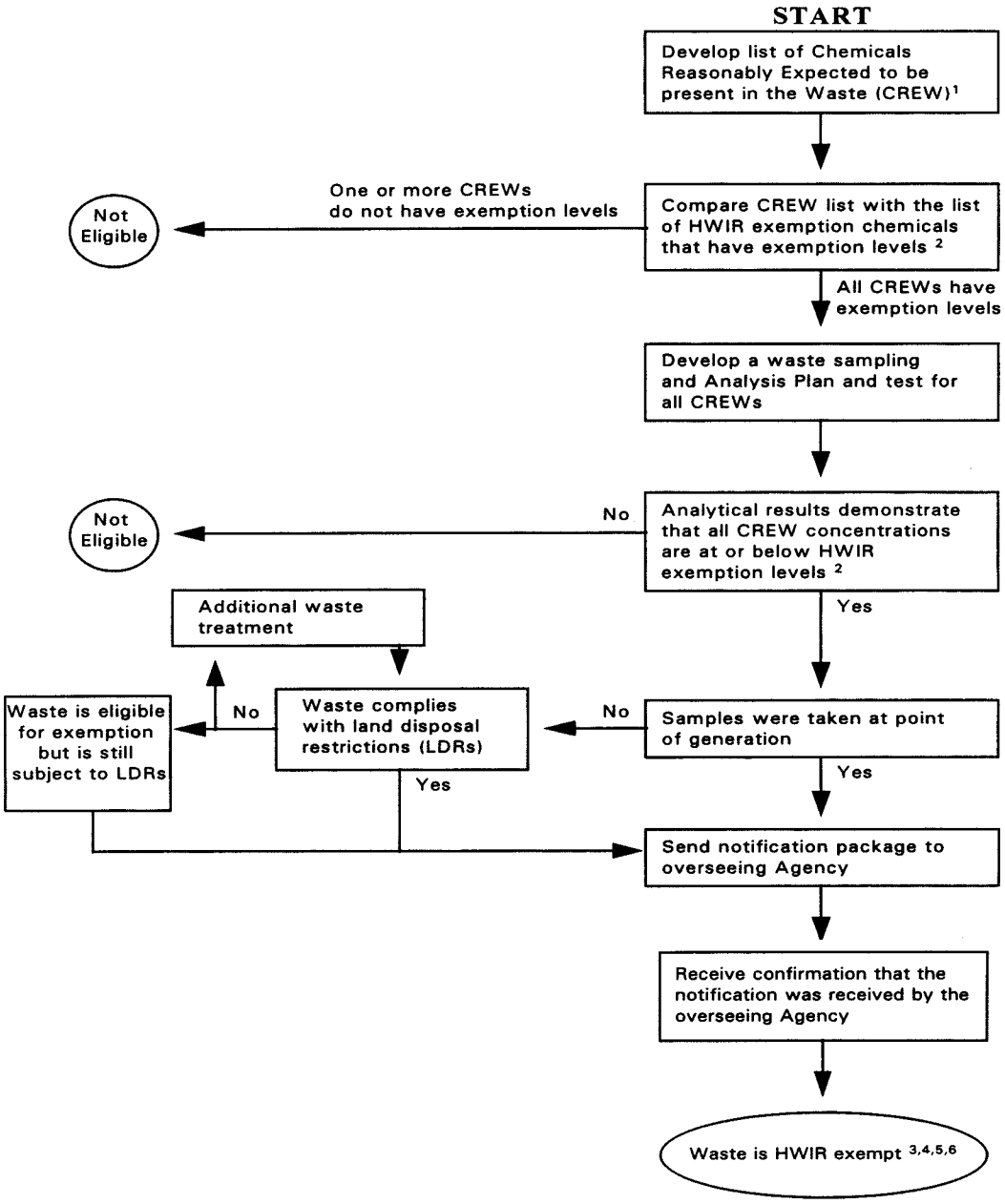
Figure 1. Obtaining an HWIR Exemption for a Listed Hazardous Waste



[1] CREWs include: (1) chemicals identified as the basis for the listing, (2) chemicals requiring LDR treatment for that waste, (3) chemicals detected in any previous analysis of the waste; (4) chemicals introduced into the process that generates the waste; and (5) chemicals that are known to result from side reactions or are byproducts of the process that generates the waste.

[2] There are two sets of exemption levels, one representing the "generic" exemption and the other representing the "landfill-only" exemption. Note that although you only have to analyze for CREW, all chemicals from Appendix X must be at or below the HWIR exemption levels.

[3] The waste is not exempt if it exhibits any of the hazardous waste characteristics.

[4] The HWIR exempt waste must be managed in accordance with the State non-hazardous waste program.

[5] Waste that exited Subtitle C under the "landfill-only" exemption are prohibited from placement on the land before disposal, must be disposed in a landfill, and must be tracked to ensure that the wastes are received by a landfill.

[6] Periodic sampling and analysis are required in order to maintain the HWIR exemption.

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A. For Which Chemicals Would I Have To Analyze To Obtain an HWIR Exemption?

To claim the HWIR exemption for your candidate waste (''HWIR waste''), you would have to determine for which chemicals listed in the new 40 CFR Part 261 Appendix X (found in Table 2, in Section XIV of this preamble) you would have to analyze. You would have to test your HWIR waste for all chemicals reasonably expected to be present, which includes the following:

1. Chemicals identified as the basis for listing the waste. (For F and K listed waste, these chemicals are found in Appendix VII of 40 CFR 261. For P and U listed waste, these are the chemicals named in the specific listings found in 40 CFR 261.33);
2. Chemicals listed in the table ''Treatment Standards for Hazardous Wastes'' contained in 40 CFR 268.40 as regulated hazardous chemicals for LDR treatment of the waste;
3. Chemicals detected in any previous analysis of the waste;
4. Chemicals introduced into the process that generates the waste; and
5. Chemicals that are known to result from side reactions or are byproducts of the process that generates the waste.

You would not be required to test for every chemical found in the new 40 CFR Part 261 Appendix X (which contains the broad set of chemicals ''of concern'' discussed in XVII.A of this preamble). You could use process knowledge to determine if a chemical other than those included in the five categories referenced above might be present in the waste. If you were to determine that the chemical is not reasonably expected to be present in the waste, you do not need to test for it. However, you would be responsible for ensuring that the waste meets all HWIR exemption levels. If at any time the waste fails to meet the levels, then the waste stream is not exempt. Additionally, you would be also responsible for determining whether your waste exhibits one of the hazardous waste characteristics set out in Subpart C of part 261.

We request comment on the above guidance for determining which chemicals are ''reasonably expected to be present.'' In particular, we request comment on whether and how to adjust this definition for some of the broader waste listings, such as electroplating operations (RCRA waste code F006) or spent solvents (RCRA waste codes F001–F005). These listings represent multiple processes, and any particular process would not necessarily contain all the chemicals for which the broad waste code was listed. For example, a chrome plating waste might not necessarily contain nickel, even though nickel is one of the chemicals associated with F006 wastes.

In addition, as discussed in Section XVII of this preamble, we might not develop exemption levels for all HWIR chemicals. If your waste would reasonably be expected to contain HWIR exemption chemicals that do not have levels, that waste would not be eligible for the exemption even if that chemical is not detected in your waste. The reason we believe that such wastes should be ineligible is that chemicals can pose risk below analytical method detection limits.

If a chemical does not have a risk-based HWIR level to compare against, we cannot evaluate whether a waste poses a risk below its analytical detection limit. Therefore, any waste that would be reasonably expected to contain an HWIR chemical that does not have an exemption level would not be exempted, regardless of test results. Unlike the 1995 HWIR proposal, under this approach you would only be required to test chemicals that are or have historically been associated with the waste (either through the original listing, the LDR requirements, or generator knowledge). Therefore, we believe it is reasonable that for those chemicals, an absence of a risk-based standard would prevent the associated waste from becoming exempt.

We did not encounter this issue in our 1995 HWIR proposal because we assigned every chemical an exemption level either through modeling or through an extrapolation methodology. We have subsequently discarded the extrapolation methodology because both the public comments and our own internal review indicated that it did not have a firm enough scientific basis. We request comment on this policy to exclude from HWIR eligibility those wastes are reasonably expected to contain chemicals that do not have HWIR exemption levels.

B. How Would I Have To Sample and Analyze My Waste Stream When Seeking an Exemption Under HWIR?

Under today's approach, you would have to sample and analyze for all chemicals that you determined are reasonably expected to be present in your waste stream. In addition to the initial testing described below, you would also be required to retest your waste stream after it is exempted to ensure ongoing compliance. It remains your responsibility to ensure that a waste stream always meets the exemption requirements for all HWIR exemption chemicals, regardless of which chemicals you would be required to test, how many samples you consider, or how often you retest.

The discussion that follows explores, in some depth, a number of issues related to the characterization of your waste stream and the determination of compliance with the HWIR exemption's testing requirements. For each waste stream that you seek to exempt, you would have to develop and follow a written plan for sampling and analyzing your waste stream. This plan is discussed in Section IX.B.1. You must analyze at least four samples and must document the results from all samples analyzed. Waste stream characterization and appropriate methods are discussed in the remaining parts of Section IX.B. For every chemical tested, each sample must show that the total concentration is at or below the exemption level. This standard of compliance is discussed in Section IX.B.2. Possible alternatives to this standard of compliance are discussed in Section IX.C. Together, these elements form the core testing requirements for a generator initially seeking exemption. Subsequent testing requirements and the frequency of such testing are discussed later in Section XI.A of this preamble.

1. *Waste sampling and analysis plan.* The waste sampling and analysis plan is a planning document used to define the necessary criteria and quality control requirements for sampling, analysis, and data assessment. We recommend that these plans be developed consistent with the guidance provided in the applicable sections of ''Test Methods for Evaluating Solid Waste, Physical/Chemical Methods'' (SW–846). More specifically, chapters within this document that should be helpful to you include Chapter One that describes basic quality assurance and quality control procedures, Chapter Nine which provides guidance on sampling strategy, and sampling techniques, and Chapter Two that identifies appropriate methods for samples based upon sample matrix and the analytes to be analyzed.

You would be required to develop a waste sampling and analysis plan prior to testing your hazardous waste stream for compliance with the HWIR exemption levels. Your waste sampling and analysis plan would be required to contain the following information:

a. The chemicals for which each waste stream will be analyzed and the rationale for the selection of those chemicals;

b. Sampling strategy, and methods used to obtain representative samples of the waste stream to be analyzed;

c. The sample preparation, clean-up, if necessary, and test determinative

methods used to analyze for these chemicals; and

d. Sufficient sampling procedures and locations to characterize the entire waste stream.

You might already have a waste sampling and analysis plan in place because of general facility standards for treatment, storage or disposal facilities (see 40 CFR 264.13 and 265.13), or because of land disposal requirements (see 40 CFR 268.7(a)). The key elements of an HWIR waste sampling and analysis plan are consistent with these other waste analysis plans (See *Waste Analysis at Facilities that Generate, Treat, Store and Dispose of Hazardous Waste*, U.S. EPA April 1994). You can create a separate waste sampling and analysis plan for your HWIR exemption or you could modify existing plans to fulfill both HWIR and LDR requirements. Be aware that a modification to your existing waste sampling and analysis plan could require a permit modification.

2. *Waste stream characterization and demonstration of compliance with the HWIR exemption levels.* You would have to obtain representative samples and analyze your waste stream to ensure that it is properly characterized. Such samples should be collected in an unbiased manner, that is, one which gives all samples an equal chance of appearing to represent the population. Analysis of such samples should statistically represent concentrations in the waste stream in terms of averages and variation. Finally, such samples should preserve the waste's composition and to prevent contamination or changes in concentration of the parameters to be analyzed.

You would also have to evaluate your waste stream using the maximum detected concentrations based upon the complete extraction of HWIR exemption chemicals. If any sample contains a chemical at a concentration greater than its specified exemption level, then the waste stream would be ineligible for the HWIR exemption.

The specific exemption levels your waste must meet depend on the regulatory option under which you seek to exempt your waste (generic and landfill-only options). The two regulatory options, which are discussed in Section VI, would have separate exemption levels. In addition, the different waste form categories within the generic option (liquid, semi-solid, solid) would have separate exemption levels. (See Section XIX.C for a discussion of this waste form categories). The format of the exemption levels table is presented in Table 3 found in Section XIV of this preamble. Meeting the appropriate exemption level requires that the concentration of each sample be at or below that exemption level.

Because any sample above the HWIR exemption levels would disqualify the waste stream from the exemption, this could provide an incentive to take as few samples as possible. To have adequate confidence that the waste stream is properly exempt, today's approach would require a minimum number of samples. In constructing this requirement, we do not want to overprescribe sampling in cases in which you seek to exempt a homogeneous waste stream whose true average concentrations are substantially below the exemption level.

We believe that a minimum of four samples at each testing event is reasonable. This minimum number of samples conforms to the requirements developed for the delisting program and established in its guidance (see *Petitions to Delist Hazardous Wastes: A Guidance Manual*, U.S. EPA March 1993). In addition, at least four samples are often used to characterize your waste stream using common statistical measures of average concentration (sample mean) and variability (standard deviation), and can be used to determine if additional samples are appropriate.

This minimum number of samples should not be assumed to be the same as an appropriate number of samples. The appropriate number of samples should be consistent with the characterization of the waste stream and the distribution of concentrations recorded as a result of the samples taken. As specific requirements for the HWIR exemption, you would have to take at least four samples and to characterize your waste stream.

The number of samples you would have to take would have to be sufficient to represent variability throughout the waste stream and across time. We recognize that solid wastes are often not homogeneous and are by nature generally heterogeneous. Solids are also frequently difficult to completely mix. Thus, more than four samples might be needed. You should use your knowledge of the process generating the waste stream to help determine the appropriate number of samples. The greater the variability within the waste, the more difficult it is to determine whether your samples are representative of the entire waste stream. One way to improve sampling precision is to increase the number of samples. In addition, you can improve your information on the variability of chemical concentrations within the waste stream by analyzing grab samples.

Because generators of many different kinds of waste streams might seek exemption under HWIR, we have no preconceived notions on how variable your particular waste stream might be. Sampling of a heterogeneous waste with highly variable concentrations would require a greater number of samples, as contrasted with relatively homogeneous wastes with mean concentrations well below the exemption levels. In addition, the longer the time period over which you might need to establish the variability of the waste stream, the greater the number of samples you should take. For waste streams that experience wide variability in chemical concentrations over time, you should discuss, in your waste sampling and analysis plan, how your sampling strategy addresses such variability.

You still would continue to be responsible for ensuring that your waste streams always meet the appropriate exemption levels. We discuss, in a background document, estimates regarding numbers of samples. This document explores sample sizes for different waste streams, for the not-to-exceed compliance standard (the preferred approach) as well as alternative compliance standards discussed later under subsection C of this part of the preamble (see *Estimates of Sample Sizes Required for a Generator to Demonstrate a Waste Qualifies for Exemption Under HWIR*, U.S. EPA, May 1999).

We request comment on both the need for a minimum number of samples and what that minimum number should be.

Allowing no samples to exceed the HWIR exemption level provides a clear standard against which both you and the overseeing authority can refer for compliance and enforcement purposes. Such clarity is especially important in the context of a self-implementing regulatory mechanism, because the overseeing agency would not scrutinize the waste sampling and analysis plan in advance to determine if such methodologies were chosen and applied correctly.

As noted in the 1995 HWIR proposal, enforcement authorities prefer the practicality of a strict maximum standard. Inspectors seek to independently collect samples for analysis over a short time span. An exceedance by any sample during an inspection could constitute a violation.

In some cases, you might also be required to demonstrate compliance with LDR sampling and analysis requirements. For example, wastes that become exempt after the point they are generated would have to still fulfill LDR requirements. To demonstrate

compliance for the LDR program, ''all portions of the waste must meet the applicable treatment standards, that is, no portion may exceed the regulatory limit.'' (63 FR 28556, 28567 (May 26, 1998)). Thus requiring that all samples be at or below the exemption levels would be consistent with the approach used in the LDR program.

We recognize limitations to the strict maximum standard. As noted by commenters to the 1995 proposal, you would have to effectively meet a much lower average concentration level to maintain confidence that no sample would exceed the HWIR exemption level. However, as the purpose of HWIR is to exempt only waste streams that are clearly nonhazardous, imposing a strict maximum makes continued compliance more certain for wastes with chemical concentrations far below the exemption levels. Wastes with chemical concentrations near the exemption level, especially wastes with some significant degree of variability, may not be the most appropriate candidates for a self-implementing HWIR exemption.

However, unlike the development of the LDR regulatory standards and its implementation of a strict maximum, the HWIR model as designed would not incorporate variability into the exemption levels. Within the LDR standards, we set a maximum acceptable chemical level for a particular waste treatability group, based on the performance of the Best Demonstrated Available Technologies (BDAT). This maximum incorporates fluctuations in performance for well-designed and well-operated treatment systems and thereby ''builds in'' variability into the standard itself. This maximum is calculated as the mean of individual performance values multiplied by variability and recovery factors.

In developing LDR concentration based treatment standards, we did not believe that incorporating variability relaxed the requirements of Section 3004(m), but rather represented a response to ''normal variations in treatment processes. As a practical matter, facilities will have to incorporate variability factors into process design to ensure performance that is more stringent than the standard to ensure continuous compliance with the standard.'' (see BDAT Background Document for QA/QC Procedures and Methodology dated October 23, 1991). In contrast, for the purposes of the HWIR exemption levels, there were no data or estimates of concentration variability within wastes. Therefore, adjustments to the HWIR exemption levels would not have the same informational basis available for incorporating variability into the regulatory standard.

We request comment on the strict maximum standard against which to evaluate a waste stream for an HWIR exemption. Alternatives to the strict maximum are discussed in Section IX.C below.

3. Selection of a reliable analytical method to test your waste stream. We would not specify which method you would use to evaluate chemical concentrations in waste; you may select any reliable analytical method. However, you would have to establish and document that the performance of the selected method demonstrates that the HWIR exemption level was achieved.

You would also have to demonstrate that the analysis could have detected the presence of a chemical at or below the specified exemption level. We would consider that the HWIR exemption level was achieved if you indicate that the chemical concentration of a spiked sample is at or below some fraction of the exemption level within analytical method performance limits (for example, sensitivity, bias and precision). To determine the performance limits for a method, we recommend following the quality control (QC) guidance provided in Chapters One and Two of SW–846, and the additional QC guidance provided in the individual methods. As discussed in the 1995 HWIR proposal, detection at, but not below, the exemption level may not be sufficient to establish a reliable method, because such detection would not demonstrate the absence of the chemical with sufficient confidence (60 FR 66377). At a method's limit of quantitation, results may be obtained with a specific degree of confidence, generally with an uncertainty of plus or minus 30% in the measured value (see Keith, L.H., *Environmental Sampling: A Practical Guide,* 1992). The relative uncertainty would be expected to be much lower as the concentrations increase above a method's quantitation limit. Again, quality control guidance found within SW–846 and associated with the individual methods should assist in identifying the necessary performance.

Your method would also have to attain acceptable recovery for the chemicals under analysis. Such recovery is dependent upon the waste matrix being analyzed and has ranged from 80–120% for method development activities, volatile organics (using relative recoveries), and for inorganics in almost all matrices. Analyses of certain other chemicals (extractable organics) can achieve slightly smaller recoveries (70%+), and for a few ''difficult'' matrices, we have considered sample preparation appropriate if it generates recovery of 50% or greater. These issues are discussed within a recent Agency memorandum (see *Appropriate Selection and Performance of Analytical Methods for Waste Matrices Considered to be 'Difficult to Analyze',* U.S. EPA memorandum, January, 1996). In the development of LDRs, methods with less than 20 percent recovery have been discarded from the calculation of treatment standards (see *BDAT Background Document for QA/QC Procedures and Methodology,* U.S. EPA, October 23, 1991).

If you have trouble meeting these acceptable levels of recovery, you may be using an inappropriate method, may not have pursued appropriate alternative methods (consistent with guidance on method modification), or may be faced with the lack of an existing, validated method. In the case in which an existing method or appropriate alternative will not achieve acceptable recoveries, we request comment on correcting such analyses for the bias introduced by these deficiencies in recovery. Bias introduced by partial recoveries refers to the systematic deviation of analytical results due to matrix effects. It can be assessed by comparing measurements to an accepted reference value in a sample of known concentration or by determining the recovery of a known amount of contaminant spiked into a sample (that is, a matrix spike). Given the potential for using different methods, adjustments with respect to recovery can make the results from different methods more comparable.

We specifically request comment on the option of requiring that analytical protocols achieve a minimum of 20% recovery, and that analytical results with analytical spike recovery of less than 100% be corrected for the percent recovery determined for that waste before being compared to the HWIR exemption level. This adjustment would allow the greatest flexibility in the choice of analytical procedures, provide equivalency between different procedures, and allow those matrices that are difficult to analyze to be considered for exemption.

Finally, we seek to address potential technical limitations of analytical methods in quantitating to concentrations identified through the HWIR risk modeling. In the 1995 HWIR proposal, we suggested the use of detection limits to serve as exemption levels in cases where the exemption

levels fell below proposed ''exemption quantitation criteria'' or EQCs. Such EQCs were defined as the lowest levels that can be reliably measured within acceptable limits of precision and accuracy during routine laboratory operating conditions using appropriate methods (60 FR 66377). For chemicals that had modeled or extrapolated levels below their EQCs, we set the exemption level for these chemicals at the EQC and required the application of LDR treatment standards, regardless of whether the waste was to be land disposed. We also discussed the alternative of making wastes containing chemicals with analytical limitations ineligible for an exemption, but expressed concerns about the impact such a policy would have on eligible waste volumes.

We continue to harbor concerns about the impact that technical limitations might have on waste eligibility, but are equally interested in creating continuing incentives for generators to improve their analytical methods and quantitate to levels selected on the basis of risk. We have historically noted and continue to recognize increased sensitivity of analytical methods over time. Levels of quantitation are also driven by market demands, and by setting exemption levels on the outer reaches of current methods, we seek to have the market modify and develop methods to reach these levels. Commenters to the 1995 rule encouraged the continued pursuit of analytical methods, possibly through revisiting such EQC determinations over time.

We are also interested in bolstering the relationship of the exemption levels to the underlying risk assessment and therefore, seek to avoid the adoption of levels not related to risk; established quantitation levels (for example, EQCs) and LDR treatment standards are not based on risk assessment and therefore are not ideal for identifying HWIR waste as non-hazardous. Therefore, in seeking exemption under HWIR, you would have to use and modify, as necessary, reliable analytical methods to determine if concentrations in your waste meet the exemption levels.

In 1995, we received comments both supporting our application of EQCs as exemption levels and rejecting such usage as not associated with risk. Under another alternative, we could use the detection limit in place of the risk-based level, if the risk associated with the detection level concentration is judged to be within an acceptable range of risk (even if not meeting the primary risk objectives). We request comment on the option of using the detection limit in place of the HWIR exemption level when the detection limit is higher, but still within an acceptable level of risk.

C. What Alternatives Has EPA Considered for Demonstrating Compliance With the Exemption Levels?

1. *EPA requests comment on alternative standards for compliance.* As explained previously, we would require all samples to have concentrations at or below the HWIR exemption level. However, we did consider alternative standards for compliance. These alternative standards would allow the mean chemical concentration within the HWIR waste to be closer, yet still at or below the HWIR exemption level. Such alternatives would allow greater variability in sample concentrations near the exemption level and, to a modest extent, allow chemical concentrations from individual samples to exceed the HWIR exemption level, while maintaining the mean to be below the exemption level.

We believe that it might be appropriate to consider alternatives that would allow chemical concentrations from individual samples to exceed the HWIR exemption level because of the nature of the risk assessment used to set those levels. The HWIR risk assessment considers only chronic risk. Therefore, the levels are based on average exposure to a chemical over a lifetime, not on one-time events. In addition, the current version of the risk modeling does not consider variations in waste concentrations within a calendar year.

Specifically, we request comment on three alternative regulatory standards: (1) The upper confidence limit associated with the estimated mean concentration in the waste would have to be at or below the HWIR exemption level at some level of confidence; (2) the estimated mean chemical concentration within the candidate waste would have to be at or below the HWIR exemption levels, and the concentration of individual samples would be required to be at or below some multiple of the exemption level; and (3) the estimated mean concentration would have to be at or below the HWIR exemption level, and the upper confidence limit associated with the estimated mean (at some level of confidence) would have to be at or below some multiple of the exemption level.

Within the upper confidence level approach under alternative (1), you would have to demonstrate that the upper confidence limit around the estimated mean concentration in the waste is below the HWIR exemption level at some specified level of confidence. This approach was used in the comparable fuels rule which required the upper confidence limit at 95% confidence to be below the exclusion level (see 63 FR 33782).

An upper confidence limit approach has advantages in that it allows for a degree of variation in the concentration of individual samples in the waste. The mean would be required to be below the HWIR exemption levels; however, occasional values above the exemption level would be tolerated. The approach is self-implementing in the determination of the number of samples required and it is consistent with the way RCRA wastes are often assessed for the toxicity characteristic.

An upper confidence limit approach also provides continuing incentives to better characterize the wastes. Within the strict maximum approach, the more samples you take, the greater the likelihood that one sample would fail. With an upper confidence limit approach, the more samples that you take, the better that you can establish the upper confidence limit associated with the mean (that is, the more precise your estimate is of the mean). With an upper confidence limit approach, wastes with mean concentrations near but below the exemption level could be exempted by taking enough samples to bring the upper confidence limit below the exemption level. You would need to determine whether the value of the exemption justifies the cost of sampling.

Specifically requiring a minimum number of samples is unnecessary with an upper confidence limit approach. The number of samples is directly calculable from the confidence level chosen, the standard deviation of the distribution, and the distance between the mean and the exemption levels.

An upper confidence limit would provide the maximum flexibility in selecting the sampling, analytical and statistical methods for establishing an HWIR exemption. Although an upper confidence limit is a statistically based performance criterion, that does not mean you would have to perform a large number of chemical analyses nor employ complex statistics.

However, we are concerned about prescribing statistical methods for evaluation of HWIR compliance. Inspectors would still have the right to enforce based on grab samples, and inspectors would find it difficult and resource intensive to replicate the type of sampling needed to construct a statistically based upper confidence limit. Therefore, disagreements between you as the generator and inspectors could engender involved statistical comparisons as well as increased costs in resolving compliance status.

The second alternative requires both the average chemical concentration to be below the HWIR exemption levels, and the concentration of individual samples to be below some multiple of the exemption level. Requiring all individual samples to be below a multiple of the exemption level restricts the potential variability of the waste. Only wastes with modest variation (and/or the ability to maintain lower average levels) are likely to meet HWIR exemption levels.

Consistent with the no exceedance approach, a minimum number of samples would need to be required under this alternative. There would be a similar incentive not to test your waste, because the more samples you take, the greater the probability of finding an individual sample that would fail.

This alternative could be of benefit to both you and enforcement officials. Enforcement officials would have one concentration level against which to evaluate compliance, and you would have a standard that would tolerate some variation in the waste around the exemption level and permit individual samples to exceed the exemption level.

Making assumptions about the underlying distribution and ranges of waste stream concentrations and adopting the same approach that we used to develop variability factors under the LDR program, we suggest a multiple for this evaluative standard of 2.8. Note that we do not adjust the regulatory standard below which the average concentration in the waste stream would have to reside, but rather are suggesting a ceiling for any individual sample be based upon a similar kind of adjustment as the one used in the LDR program. Whereas the LDR adjustment was based on data from specific treatment processes, the multiple applied to the exemption level to derive this ceiling is established based on assumed characteristics of the underlying distribution of concentration in waste. Actual concentrations across a wide range of real waste streams will vary much more considerably. The specific derivation of this multiple can be found in the background document entitled ''Estimates of Samples Sizes Required for a Generator to Demonstrate a Waste Qualifies for Exemption Under HWIR.'' We request comment on the multiple of 2.8 and invite the suggestion of alternatives.

The third alternative combines elements of the first two alternatives discussed. The generator would calculate an upper confidence limit similar to alternative (1), but that limit would be required to be at or below some multiple of the exemption level rather than the exemption level itself. We would need to derive a basis for this multiple, consistent with the discussion of alternative (2).

This third approach would permit greater variability in the waste stream as compared to either the lead option in which no samples may exceed the exemption level and as compared to alternative (1) in which only a few samples falling outside the confidence interval could exceed the exemption level. Similar to alternative (1), we express concerns about prescribing statistical methods for evaluating HWIR compliance—disagreements can ensue in situations where the generator has established a confidence limit below the multiple of the exemption level, and, at the same time, the inspector finds an individual sample above this multiple of the exemption level.

Finally, and as implied by the use of confidence intervals within alternatives (1) and (3), either the generator or EPA would have to establish with what confidence theses statistical measures are evaluated. We believe that we should select the appropriate level of confidence. We recognize, however, that the use of confidence limits could rely on a fixed level of confidence for all waste streams or we could vary the specified level of confidence and require larger waste volumes to have greater confidence in the estimation of the mean than smaller streams. For example, we could require large, medium and small waste streams to achieve 98 percent, 95 percent, and 90 percent confidence, respectively.

We request comment on all three alternative approaches and specifically on the use of statistical measures and their consequences for enforcement, on the basis for establishing limits (for example, multipliers to the exemption levels) to which individual samples or confidence limits would have to comply, and on the selection of confidence limits and the appropriateness of varying such limits based on waste volume.

2. EPA requests comment on the use of grab or composite sampling, where appropriate, to demonstrate compliance. We are also considering whether to allow composite sampling as well as grab sampling for demonstrating compliance; our lead option presumes the use of grab samples. Composite sampling is a strategy in which multiple individual or ''grab'' samples (from different locations or times) are physically combined and mixed into a single sample so that a physical (rather than mathematical) averaging takes place. Composite samples provide average concentrations of a waste stream and, in contrast with grab samples, might reduce the number of samples needed to gain an accurate representation of a waste. Composite samples, though, are difficult for volatile organic compounds (VOCs) where analyte could be lost in the process of compositing.

To the extent that composite sampling achieves the goal of representing average concentrations in the waste, then the evaluation of composite samples for the purposes of HWIR compliance could be appropriate. This position was discussed in the 1995 HWIR proposal (60 FR 66386). In addition, the delisting program guidance suggests the use of composite samples. Both grab and composite sampling are used for the purposes of determining LDR compliance. Grab samples are required for all non-wastewaters and several wastewater streams, while composite samples taken over any one day are used for remaining wastewaters (see 40 CFR 268.40(b)).

Grab sampling is the preference of EPA and State enforcement officials. Grab sampling provides information about a waste's variability and the bounds of a chemical's concentration within a heterogeneous waste, while composite sampling yields information about average concentration. The resources necessary for enforcement to take composites over extended time periods is considered prohibitive. Furthermore, the use of composite samples for the purposes of HWIR compliance could create confusion if an enforcement official finds a grab sample that exceeds the HWIR exemption criteria while you found all composite samples to meet the HWIR levels.

Related to the concept of compositing is the size of each sample you may select for analysis. Currently, there is no specific guidance on the size of each sample to determine compliance with HWIR, and the selection of a very large grab sample would have a similar effect of physically averaging the concentration of a chemical within that sample. Greater physical sample size could also improve precision.

We request comment on the consideration of composite samples, particularly spatial composites, in evaluating a waste stream for HWIR compliance. We also request comment on the need to specify the size of samples taken to evaluate your waste stream.

D. What Information Would I Have To Include In the Notification Package to the Overseeing Authority?

Before managing any waste as exempt under HWIR, you would first have to send a notice to the Director of the State or EPA Regional authority that has jurisdiction over the facility generating the waste. We envision this notice as a tool for the overseeing agency to document and track exemptions, not as a means to review and verify exemption claims.

The overseeing agency would be under no obligation to undertake a review of exemption claims prior to the exemption becoming effective. However, failure to undertake such prior review would not preclude a subsequent enforcement action, should the exemption claim later be determined to be inaccurate or otherwise invalid.

For this reason, we prefer to keep information requirements in the notification package to a minimum and to require that specific information documenting individual exemption claims (such as the sampling and analysis information) be kept on-site at the generating facility.

The notification package would have to be sent by certified mail or other mail service that provides written confirmation of delivery. You would be required to include the following in the notification package:

(a) The name, address, and RCRA ID number of the facility claiming the exemption;

(b) The applicable EPA Hazardous Waste Code of the exempted waste and the narrative description associated with the listing from Part 261, subpart D;

(c) A brief, general description of the process that produces the waste;

(d) An estimate of the average monthly, maximum monthly, and annual quantities of the exempted waste (we are suggesting a simple check box system);

(e) A statement that you are claiming the HWIR exemption for the waste;

(f) A certification—signed by you or your authorized representative—that the information in your notice is true, accurate and complete.

To give you an idea of what this notification package would look like, we have included a sample form in the docket (see *Sample Notification Form for Waste Claiming Exemption Under the Hazardous Waste Identification Rule (HWIR),* U.S., EPA July 1999). We request comment on this form of notification and alternatives such as electronic submission.

We also request comment on whether to require additional information in the notification package, such as the list of chemicals found in the waste and a summary of results for each sample analyzed. The implementing agency could find such summary information helpful in planning and prioritizing inspections.

E. What Is the Role of the Public in the HWIR Exemption Process?

In recognition that issues surrounding hazardous waste management often arouse public sentiments, EPA developed a framework for public participation under RCRA. This public participation framework seeks to both formalize responsibilities of facility owners and operators under RCRA, and to enhance citizen opportunity for involvement in local environmental decision making. Regulations, such as the permit modifications procedures in 40 CFR 270.42 (52 FR 35838) and the changes to 40 CFR Part 124 (procedures for processing permit applications) codified in the ''RCRA Expanded Public Participation'' rule (60 FR 63417–34, December 11, 1995), have made facility owners and operators responsible for a number of public participation activities (such as public notices, public meetings, and information repositories).

In addition to the statutory and regulatory requirements cited above, EPA has published the ''RCRA Public Participation Manual'' (EPA530–R–96–007). This manual outlines public participation procedures and guidance to staff in EPA and RCRA-authorized state programs, to assist them with ensuring that the public has an early and meaningful role in the RCRA permitting process. This manual also provides public participation guidance to regulated industries and the communities that interact with them.

Finally, EPA has also established several mechanisms in addition to the RCRA Information Center (the Docket) for promoting public access to information regarding RCRA, including a citizens' RCRA hotline, an Internet Web site, and a searchable database of all RCRA related policy documents (''RCRA Online'').

In the 1995 HWIR proposal, we proposed requiring the HWIR waste generator to notify the public of exemption claims, through publication of newspaper notices local to facilities that generate and/or dispose of HWIR waste. However, other types of hazardous waste determinations do not require such notices. Because the HWIR exemptions levels would be based upon a nationally protective risk analysis, we do not believe that site-specific public notices of exemption claims are necessary. We believe that the existing mechanisms discussed above provide opportunity for interested parties to become informed and involved and to influence RCRA program development and implementation.

We also understand that on the State level, many environmental agencies have mechanisms in place, such as telephone hotlines, print or electronic media, to answer questions about public safety and environmental issues. State environmental agencies would have the option of making information contained in notification packages from each generating facility in the respective State available to the public. Depending upon the structure of State programs, the State agencies could decide to keep the information available at State offices, or to delegate the information-sharing role down to the local level at public libraries, schools, or fire stations. As discussed in the previous section, today's notice, unlike the 1995 HWIR proposal, does not advocate requiring the submission of testing information as part of the notification package. Under this approach, however, the information that the States could share with the public would not contain the testing results.

Another possible approach to this issue is to keep the exemption self-implementing except when there are adverse public comments on the exemption. Under this approach, you, as the person claiming the exemption, would publish a notice in a local paper explaining the exemption. If you receive no adverse comments, then you would send a certification to this effect to the overseeing agency with the notification package. When you receive the written confirmation that the notification package has been received, then the waste would be exempt.

On the other hand, if you do receive adverse comments, then you would forward those to the overseeing agency with the notification package. The waste would not be exempt until the overseeing agency approved the package. This approach would have the advantage of targeting the overseeing agency's resources toward reviewing those exemptions that are of most public concern, and also giving the person claiming the exemption assurance that the overseeing agency supports the claim.

We are taking comment on these issues of public notification and access to information related to HWIR exemption claims. Specifically, we request comment on (1) whether existing mechanisms for information sharing, including access via the Internet, are sufficient to provide the public with information relative to

individual HWIR exemption claims asserted in each State, (2) whether it is instead appropriate to notify the public of HWIR exemption claims through such mechanisms as newspaper notices at either the waste generating or the disposal facility prior to having the exemption claims become effective, and (3) whether the receipt of adverse public comments should trigger review of the package by the overseeing agency. We also request comment on whether to include testing results information in the notification package for the purpose of greater public access to this information.

X. Once the Waste Becomes Exempt, What RCRA Requirements Might Still Apply?

A. Where Could HWIR Waste Be Treated or Disposed?

Under the generic HWIR exemption, there would be no conditions imposed on the management of the exempted waste. The waste would no longer be subject to regulation as a hazardous waste under Subtitle C, and therefore would be treated and disposed in accordance with State regulations governing the management of other nonhazardous industrial waste.

Under the contingent management HWIR exemption, HWIR waste would have to be disposed of in a landfill. This landfill does not need to be a hazardous waste landfill, but it would be regulated under existing State requirements for nonhazardous waste landfills, which would help ensure that it is protective of human health and the environment.

Under both options, the waste might also have to meet LDR requirements (see Section X.C).

B. Would a Manifest Be Needed To Track Where the HWIR Waste Was Shipped Off-Site?

For exemptions using the generic option, we do not believe that tracking is necessary, since the levels for the exemption are based on modeling destinations for appropriately managed nonhazardous industrial waste. This judgement is consistent with existing State nonhazardous waste programs, which do not require a specific tracking mechanism as nonhazardous waste travels from the generator to its point of disposal. We request comment on whether under the HWIR generic exemption we should require that paperwork accompany the waste in order to track the waste and provide notice to the receiving facility that the waste is HWIR-exempt.

For exemptions using the landfill-only option, we believe that tracking of some sort might be needed to ensure that the waste is, in fact, disposed in a landfill. The landfill-only HWIR exemption levels are based on disposal in a landfill; other destinations might not meet our risk protection criteria. We evaluated a number of options for tracking landfill-only HWIR exempt wastes, including requiring the use of a uniform hazardous waste manifest, which is required for hazardous waste generators shipping waste off-site. However, instead of requiring uniform hazardous waste manifest tracking, we suggest an alternative tracking requirement for the landfill-only exemption (See Section XII.B for further discussion of the alternatives.)

C. How Would Land Disposal Restriction (LDR) Requirements Apply to the HWIR Waste?

Wastes that have been shown to have met the HWIR exemption levels at the point of generation would be considered by EPA to have never been hazardous and, therefore, would have no LDR obligation. Wastes that have met the HWIR exemption levels *after* the point of generation, however, would still be subject to LDRs even after they become exempt from the definition of hazardous waste, because LDRs apply to wastes that are hazardous or have ever been hazardous.

HWIR wastes that are subject to LDRs are also subject to the ban against using dilution to achieve LDRs (40 CFR 268.3). However, HWIR wastes that are not subject to LDRs would not be subject to this ban. For example, wastewaters managed solely in tanks and discharged under the Clean Water Act (CWA) are not managed on the land and therefore not subject to the LDR dilution ban.

We considered whether to specifically prohibit the use of dilution to achieve the HWIR exemption levels. Our intention in developing HWIR is to exempt wastes that are low risk due to pollution prevention or treatment, not to encourage dilution. Dilution would be inconsistent with the Congressional purpose of encouraging waste minimization. The legislative history of RCRA indicates that a prohibition on dilution ''is particularly important where regulations are based on concentrations of hazardous constituents'' (H.R. Rep. no. 198, Part I, 98th Congress, 1st Session 38 (1983)).

Since HWIR wastes that would be subject to LDRs would also be subject to the ban against using dilution to achieve LDRs, adding a specific dilution ban for HWIR could be redundant for all wastes subject to the land disposal restrictions. However, HWIR wastes that are not subject to LDRs would not be subject to this ban, and are identified as (1) wastes with chemical concentrations below LDR levels but above HWIR levels, and (2) wastes that are not managed or disposed on the land.

For example, wastewaters managed solely in tanks and discharged under the Clean Water Act (CWA) are not managed on the land and therefore not subject to the LDR dilution ban. For such wastewaters managed in tanks, it might be difficult in some cases to determine if intentional dilution is occurring. Combining wastewaters for treatment purposes before discharge under the Clean Water Act is often the most efficient and effective way of treating them.

Generally, we oppose the dilution of waste consistent with stated waste minimization policies to reduce the volume and toxicity of wastes (see Section 1003 of RCRA), but we also recognize that the aggregation of wastes amenable to the same type of treatment is legitimate and desirable, even though chemical concentrations within such wastes might decrease. In promulgating regulations under the LDR program, we provided guidance regarding such aggregation as permissible dilution, despite the overall dilution ban. Aggregation is considered legitimate if all wastes are amenable to the same type of treatment and this method of treatment is utilized for the aggregated wastes (55 FR 22666). Several commenters to the 1995 HWIR proposal, while supportive of an HWIR dilution ban, felt that aggregation for purposes of transfer and treatment in wastewater systems should not be considered impermissible dilution. By adopting similar guidance for HWIR, we could prevent inappropriate dilution, but allow for appropriate aggregation for the purposes of treatment.

We request comment on whether to specifically prohibit dilution as a means of attaining the HWIR exemption levels. We also request comment on the appropriateness of considering as permissible dilution aggregated waste streams directed towards centralized treatment for the purpose of meeting HWIR exemption levels.

XI. For the Generic HWIR Exemption, What Conditions and Requirements Would I Be Required to Fulfill To Maintain the Exemption?

A. Would I Have To Retest the Exempted Waste Stream?

Yes. Unless you only generate one batch of waste, you would have to periodically test the exempted waste stream as a condition of the exemption.

Failure to test and maintain documentation of this testing in accordance with the requirements under 40 CFR 261.57 would revoke the exemption. Post-exemption testing is needed to check for the continued compliance of the waste stream with the HWIR exemption levels and to maintain accurate characterizations of the waste stream. Note that a batch of waste would represent the amount generated prior to the next scheduled testing event (see Section XI.A.2 for discussion of testing frequency).

We would require the same sampling and analysis approach for subsequent testing as that required for the initial exemption (see Section IX.B of this preamble), and we request comment on the advantages and disadvantages of requiring the same testing scheme for both initial and subsequent sampling and analysis.

We also considered methodologies in which the data derived during the course of initial testing could be used as the basis for subsequent testing. A prediction limit derived from initial testing data could be used to evaluate continued compliance with the HWIR exemption. Prediction limits are designed to set an upper bound on the range of individual measurements that you would be likely to observe and still remain in compliance. If, during subsequent testing, any of the individual samples exceeded the prediction limit, there would be statistically significant evidence that the average concentration of the waste stream had changed and now exceeded the exemption level.

Although the prediction limit requires some statistical analysis, such prediction intervals are no more complicated to calculate than upper confidence intervals and are used in other parts of the RCRA program (see RCRA groundwater monitoring program 40 CFR 264.97). The use of prediction limits could also necessitate the collection of fewer samples over time to achieve the same amount of confidence that the waste stream remains appropriately exempt. However, because these prediction limits would be specific to a particular waste stream, compliance determinations would be more difficult and involved for the enforcing Agency.

We request comment on the potential use of prediction limits and other such techniques for the purposes of subsequent testing.

1. *For which chemicals would I have to retest the waste stream?* You would have to retest for all chemicals meeting the criteria for mandatory testing, unless the results of your testing demonstrated that, over the course of a year, the chemical was below the HWIR exemption level by an order of magnitude or more. In other words, if all samples taken during a twelve month period showed that a chemical was below one tenth of the HWIR exemption level, then no further testing for that chemical would be required. You continue to be responsible for the presence of these chemicals in your waste. Also, consistent with the previous discussion on reliable analytical methods, you would have to demonstrate that the analysis could have detected the presence of each chemical at or below one-tenth of the specified exemption levels.

The exception to this approach, as explained in Section XI.A.3 of this preamble, occurs when you have a change in the process generating your waste that introduces a new chemical or changes the concentration of existing chemicals. Then you would be required to test for all chemicals which are likely to be present, as explained in Section IX.A.

We request comment on the appropriateness of removing testing requirements for chemicals consistently detected less than one-tenth of the exemption level and whether this reduced testing obligation should occur after fewer or more testing events than those undertaken in one year. As currently structured, removing the obligation to test for certain chemicals after one testing event could mean as few as four samples having concentrations below an order of magnitude of the exemption level. Finally, we request comment on whether no further testing is appropriate for waste streams in which all chemicals are found to be below one-tenth of their exemption levels.

2. *How often would I have to retest the waste stream?* Retesting frequency would depend on the annual volume of the waste and whether it is a liquid or a non-liquid. Each year, you should document your annual generation of waste becoming exempt under HWIR for the purpose of establishing your retesting frequency.

If your waste is a liquid and it is generated in quantities	Then you would have to test your waste stream
Less than 35,000 tons/year.	Every 12 Months.
Between 35,000 and 500,000 tons/year.	Every 6 Months.
Over 500,000 tons/year.	Every 3 Months.

If your waste is a non-liquid (that is, a solid or semi-solid) and it is generated in quantities	Then you would have to test your waste stream
Less than 2,000 tons/year.	Every 12 Months.
Between 2,000 and 10,000 tons/year.	Every 6 Months.
Over 10,000 tons/year.	Every 3 Months.

We believe it is appropriate to vary the testing frequency based on both form and volume, because liquids are generally more homogeneous and therefore easier to characterize than solids. In addition, liquids are generated in significantly greater quantities. To require the same retesting frequencies for liquids and solids would mean relatively small quantities of liquids being retested often or relatively large volumes of solids becoming exempt without retesting.

Larger amounts of waste have the potential of greater environmental risk than smaller amounts. Therefore, we believe it is reasonable to require generators of larger waste streams to retest more frequently than generators of smaller waste streams. We would require testing at particular time intervals throughout the year, rather than allowing a generator to choose when such tests would be conducted. We do not want to provide a flexibility to generators that they could use to ''game the system,'' that is, choose most favorable sampling times within a calendar year. The development of these particular volume thresholds and their testing frequency is described in a background document to this notice (*see Background Document on Retesting Frequency,* U.S. EPA, July 1999).

Retesting frequency might also vary depending upon whether the generator seeking exemption is a small business. Small businesses and small generators are not necessarily the same '' small businesses, particularly those potentially affected by this exemption, are typically characterized by the number of employees at a firm (less frequently by the firm's annual receipts). To the extent that small businesses are not small generators, diminished retesting frequency based on smaller annual volumes would not apply. In order to reduce burden on small businesses, EPA could also consider reducing testing frequency for small business regardless of whether they produce comparatively small or large volumes of waste. Such reduced requirements would still need to ensure that the generator continues to be

accountable for compliance with the exemption levels.

Suggestions were also made that the retesting frequency be established based either on the variability of the waste stream or on the amount of difference between the exemption levels and the concentrations detected in the waste. Alternatively, retesting could be required after the production of a set amount of waste rather than based on elapsed time. We believe that such alternatives could be made workable for this exemption, but would certainly be more involved. As far as identifying which chemicals to retest, we have relied on the observed concentrations in the waste stream to suggest that chemicals below one-tenth of the exemption level do not require retesting. (See Section XI.A.1 of this preamble).

In the 1995 HWIR proposal, we proposed that the frequency of retesting would diminish over time. In today's notice, however, the frequency remains the same. Instead of diminishing the testing frequency, we would require retesting for those chemicals that are within an order of magnitude (above one-tenth) of the exemption levels. We believe this formulation will help reduce the burden of retesting and focus on those chemicals that are most likely to exceed the exemption levels due to waste stream variability. We request comment on these retesting provisions and particularly on whether retesting frequency should be diminished because of lower annual volumes or less variability in the waste stream. EPA also requests comments on whether to reduce testing frequency for generators who are small businesses that may or may not generate large annual volumes of waste.

3. *If the process generating my waste stream changes, would I have to retest?* If a significant process change occurs, then you would have to retest the waste stream. A significant process change is one that has the potential to change the exempt status of the HWIR waste. Establishing retesting for process change is consistent with other EPA guidance and regulation (examples include recommendations within our Ash Sampling Guidance, July 1995 and within the LDR program as discussed at 51 FR 40597). We request comment on whether to require retesting after a significant process change.

B. What Would Happen If My Waste Stream No Longer Meets the Exemption Levels?

If your waste stream no longer meets the HWIR exemption levels, it would no longer be exempt under this regulatory provision and would be a hazardous waste, subject to all hazardous waste management requirements. Once the waste is determined to be hazardous, it would remain hazardous until the waste stream met the exemption levels and the notification package requirements were fulfilled again. Compliance with HWIR exemption levels would be determined from the last available test data or from the latest sample taken from the waste in question. Testing which shows chemical concentration levels above exemption levels would not affect wastes previously generated under a valid claim of exemption.

One issue is whether there should be additional requirements if a wastestream loses its HWIR exempt status because it no longer meets the exemption levels or does not meet one of the other conditions of the exemption. For example, should there be a mandatory waiting period before the exemption can be reinstated? Such a waiting period would give the overseeing agency a chance to inspect the documentation of the original exemption and would prevent a generator from exempting a wastestream shipment by shipment (instead of determining if the entire wastestream is clearly nonhazardous). We request comment on whether we should require such a waiting period or impose other requirements needed before a waste stream can regain its exempt status.

C. What Records Would I Have To Maintain On-Site and for How Long?

You would have to maintain, on-site, a copy of the notification package sent to the overseeing agency, and a copy of the waste sampling and analysis plan for as long as the HWIR exemption continues to be active, and for the three years that follow. You would also have to maintain a record of all test results for three years after each waste testing event occurs. In addition, you would be required to maintain any specific documentation relied on in making process knowledge determinations, such as the Material Data Safety Sheet (MSDS), product labels, or information provided by manufacturers of the processing equipment. You would have to be able to explain any process knowledge determinations if requested by the overseeing agency.

D. How Would the Overseeing Agency Access These Records?

You would be required to make all records relating to the HWIR exemption, including any information claimed as Confidential Business Information, immediately available to an overseeing agency during an inspection. In addition, you would have to provide a copy of the records directly to the overseeing agency within five business days of receiving a written request.

E. What Would Happen If the Information I Submitted in the Notification Package Changes?

If any of the information in your notification package changes, you would have to provide a revised package to the overseeing agency within 30 days of that change.

XII. What Would Be the Conditions and Requirements for the Landfill-Only HWIR Exemption?

A. Which Conditions and Requirements Would Be the Same for the Generic HWIR Exemption and the Landfill-Only HWIR Exemption?

The landfill-only HWIR exemption would include all the same implementation conditions and requirements as the generic HWIR exemption, including waste sampling and analysis plans, notification, follow-up testing and recordkeeping and reporting.

B. What Additional Conditions and Requirements Would I Have to Meet for the Landfill-Only HWIR Exemption?

Because the exemption levels for the landfill-only HWIR exemption would be conditioned on disposal of this waste in a landfill, we believe that additional conditions and requirements are needed to ensure that the waste arrives at the landfill in a timely manner. The landfill-only exemption levels could not be considered protective of other waste management scenarios (including storage in a waste pile, which was modeled separately). The following three additional conditions and requirements for the landfill-only exemption would help address these concerns.

(1) You would have to dispose of this waste in a landfill.

(2) You would not be allowed to place this waste on the land, prior to disposal in a landfill. We are concerned about the temporary placement of these wastes in waste piles or other such intermediate land-based destinations, because exemption levels for the landfill-only option (unlike the levels for the generic option) would not consider such risks. We are particularly concerned about the potential of significant releases of particulate releases to air, as well as releases through erosion and runoff, since risks from these pathways are either not applicable or significantly reduced for the landfill scenario, but could be considerable for other scenarios.

To ensure that the HWIR waste exempted under the landfill-only option is eventually disposed in a landfill, we are requesting comment on whether to restrict storage time of these wastes to one year. You would also only be allowed to store the waste in non-land-based units, such as tanks, containers or containment buildings. This storage requirement is similar to one imposed on restricted wastes under the LDR program (40 CFR 268.50). 40 CFR 268.50(b) allows waste handlers to store restricted wastes for up to one year, unless EPA demonstrates that such storage is not solely for the purpose of accumulation for proper recovery, treatment, or disposal.

(3) You would have to track the arrival of your HWIR exempt waste at a landfill, and keep records of the shipments. Since the exemption levels for the landfill-only HWIR exemption would be based solely on assessing risks associated with disposal of this waste in a landfill, we want to ensure that the waste is, in fact, disposed at such a destination in a timely manner. We are asking for comment on three alternatives for tracking the landfill-only exempted waste.

Under the first alternative, you would have to directly notify the designated landfill of the shipment of landfill-only HWIR exempt waste. Specifically, this notification would include the date of shipment, the carrier(s) used, the destination facility, and volume and general description of the waste. This notification does not need to accompany the waste, since you notify the disposal facility directly.

You should receive a certification from the landfill operator that the waste arrived. You would have to keep a copy of this certification for three years. We also request comment on whether to require the destination landfill owner/operator to keep copies of this certification for three years as well. If you have not received a certification that the waste shipment arrived at the landfill 45 days after the date of shipment, then you would have to report this to the overseeing agency. If the waste has not reached the landfill within 60 days after the date of shipment, then on the 61st day, the waste stream would not be exempt from RCRA Subtitle C and is now a hazardous waste. You (the generator), as the person identified on the HWIR notification form, would be the generator of this hazardous waste and must comply with 40 CFR Part 262.

A second alternative, which we would like to receive comment on, would use the existing manifest system to track the conditionally exempt HWIR waste. The uniform hazardous waste manifest (40 CFR 262.20 and 49 CFR 172.205) is prepared and signed by the waste generator and accompanies the waste shipment as it moves among the waste carriers, until it reaches the designated facility that is permitted to receive the waste. The receiving facility must sign the manifest and return it to the hazardous waste generator. The generator, carrier(s), and receiving facility must retain copies of the signed manifests for three years. This cradle-to-grave tracking system is intended to ensure that hazardous waste is properly managed and to allow generators and their overseeing agencies the ability to track their hazardous wastes.

However, we are concerned that requiring nonhazardous materials transporters and waste management facilities to comply with manifest requirements could create considerable burden for nonhazardous facilities that become subject to these requirements. Furthermore, in many States, regulations prohibit Subtitle D facilities from receiving manifested wastes, and current federal regulations limit the use of the manifest to handlers that have EPA RCRA identification numbers.

On the other hand, we are planning in a separate action to propose revisions to the Uniform Hazardous Waste Manifest regulations in response to many requests for a streamlined, up-to-date, and less burdensome hazardous waste tracking system. Under the proposed revisions to the existing manifest system, we are developing a standard manifest form with fewer State optional boxes and are proposing to automate the manifest paperwork. Therefore, although we are not proposing to require uniform hazardous waste manifest tracking, we recognize that the revised manifest system might be perceived by industry and the states as a less burdensome alternative than creating an entirely new tracking system for HWIR exempt wastes. We request comment on using the revised manifest system for HWIR exempt wastes.

Under a third alternative, which we would like to receive comment on, we considered using Department of Transportation (DOT) shipping papers (49 CFR 173 Subpart C) to track the waste. Under this option, the shipping papers would need to include additional information, including the date of the shipment, the carrier used, and the destination facility. The generator would be required to provide the transporter with a copy of the shipping papers, which would identify the destination facility. The initial transporter, and any subsequent transporters, would be required to return to you a copy of each shipping paper, with a notation indicating the identification of the disposal facility (and/or the subsequent transporter). There would be no record keeping requirements placed upon the transporter or disposal facility, however, you would be required to keep copies of these records for three years.

However, the representatives from DOT were uncomfortable with this option for a number of reasons. First, although it serves to reduce burden on the landfill owner/operator, it increases the burden on the transporter in terms of having to send copies to generators with each change of custody. In addition, some wastes would fall out of DOT's jurisdiction without manifest coverage. DOT regulates ''hazardous materials,'' and waste accompanied by a hazardous waste manifests are automatically defined as a hazardous material. If the manifest is no longer required, then some wastes would no longer meet the definition of hazardous material. Therefore, we believe that the benefits provided by this option might be outweighed by the complexity of implementation. However, we would be interested in receiving public comment on this notion of using shipping papers or other alternative documents to track HWIR exempt wastes.

Regardless of which option we pursue, interstate transport of HWIR wastes would be an issue. If your State were to adopt an HWIR exemption, your HWIR waste would be nonhazardous only within your State or other States with the HWIR exemption. Thus, HWIR exempt wastes shipped to or through a State where the HWIR exemption had not been adopted would have to comply with the applicable hazardous waste requirements. Commentors to the 1995 HWIR proposal remarked on this patchwork of State programs as an important HWIR issue, but offered little way of specific guidance or suggestions for resolving this issue. We request further comment on this issue in today's notice.

XIII. What Would Happen if I Do Not Comply With the Conditions and the Requirements of the HWIR Exemption?

A. What Is the Difference Between an HWIR Condition and a Requirement?

A condition is an obligation you or your waste must meet in order for your waste to become and to remain exempt from hazardous waste regulations. If a condition is not fulfilled, then the waste is hazardous and subject to RCRA Subtitle C requirements. A requirement is an obligation whose violation would not affect the exempt status of the HWIR

waste, but would be a violation under RCRA.

B. What Are the Conditions for the Two HWIR Options, and What Would Happen if I Do Not Meet Them?

We are considering three conditions for meeting the generic HWIR waste exemption: (1) meeting the appropriate HWIR exemption levels (2) testing and retesting of the waste, which documents that exemption levels have been met; and (3) notification to the overseeing agency that you are managing the waste as exempt. The landfill-only alternative has four conditions: (1) meeting the appropriate HWIR exemption levels (2) testing and retesting of the waste, which documents that exemption levels have been met; (3) notification to the overseeing agency that you are managing the waste as exempt; and (4) waste arrival at the landfill facility within the 60 day time period.

Failure to meet any of these conditions would have the effect of rendering the waste back into regulation under RCRA Subtitle C. For example, under the landfill-only alternative, if a waste no longer met the exemption levels, or if the overseeing agency was not properly notified, or if the required testing was not performed, or if the waste did not arrive at the designated landfill within 60 days of shipment, then the waste stream would be considered hazardous and subject to all provisions of RCRA Subtitle C.

C. What Would HWIR Tracking Requirements Be, and What Would Happen if I Do Not Meet Them?

The HWIR tracking requirements would only apply to waste exempted under the landfill-only alternative. HWIR waste tracking requirements would be imposed on both generators and landfill operators.

As discussed in Section XII.B of this preamble, HWIR waste generators would have to notify the designated landfill of the shipment of conditionally exempt HWIR waste. The landfill operators receiving the waste must certify in writing to the generator confirming that the waste arrived at the landfill. The HWIR generator must keep copies of these records for three years from the shipment date, and we are requesting comment on whether the landfill operator must also keep copies of these records.

These tracking requirements would be under the authority of Sections 3007 and 2002 of RCRA Subtitle C and therefore are not conditions of the exemption. Section 3007 gives us the authority to compel anyone who generates, stores, treats, transports, disposes of or otherwise handles or has handled hazardous wastes to ''furnish information related to such wastes'' and make such information available to the government for ''the purposes of...enforcing the provisions of this chapter.'' Section 2002 gives the Administrator the authority to promulgate such regulations as are necessary to carry out the functions of the statute. Failure to comply with these tracking requirements would not affect the exempt status of the waste, but the landfill's failure to send back the certification would constitute a violation of RCRA.

Although the paperwork that tracks the arrival of the waste shipment at the landfill is a requirement, the arrival of the waste at the landfill within 60 days would be a condition. Thus if the waste arrived at the landfill within 60 days, but the landfill did not send back the certification of arrival, the waste would maintain its exempt status. (Although, as noted above, the landfill's failure to send back the certification would be a violation of RCRA). However, if the waste did not arrive at the landfill within 60 days of shipment, it would lose its exempt status and would be subject to all RCRA Subtitle C requirements.

XIV. What Might the Regulatory Language for the HWIR Exemption Look Like?

Below is draft language that shows what the HWIR exemption regulatory language might look like. As explained in Section XVII, , we are not proposing the HWIR exemption because of technical difficulties in developing chemical-specific exemption levels from the model. Before we would go final with an HWIR exemption, we would first publish an HWIR proposal that would include specific exemption levels and give the public an opportunity to comment. We are including this draft language for discussion to help you give us more targeted comments on the implementation provisions that we have discussed in previous preamble sections.

Purpose and Scope of the HWIR Exemption

A. What Is the Purpose of This Exemption?

(1) The HWIR exemption outlines the conditions and procedures that a facility can use to exempt a listed hazardous waste from the requirements of 40 CFR Parts 262–266, 270, and under certain circumstances, also from 40 CFR Part 268. A waste may be exempted when—preferably through pollution prevention or otherwise through treatment—the chemicals in the waste are at or below the exemption levels listed in Table 2.

(2) The rule sets exemption levels for two disposal alternatives. One allows unrestricted management of exempted wastes. The other requires exempted wastes be disposed only in a landfill.

B. What Is the Scope of This Exemption?

(1) Wastes meeting all requirements of the HWIR exemption are exempt from all requirements of 40 CFR Parts 262–266 and 270.

(2) Wastes meeting the requirements described in Section are not subject to the land disposal restrictions of 40 CFR Part 268.

(3) Wastes containing a chemical listed in Table 2 for which there is no exemption level in Table 3 are ineligible for this exemption.

C. What Definitions Apply?

Chemicals reasonably expected to be present means:

(1) Chemicals identified as the basis for listing the waste you wish to exempt. (For F and K listed waste, these chemicals are identified in Appendix VII of 40 CFR Part 261. For P and U listed waste, these are chemicals are found in 40 CFR 261.33),

(2) Chemicals listed in the table ''Treatment Standards for Hazardous Wastes'' contained in 40 CFR 268.40 as regulated hazardous chemicals for land disposal restriction (LDR) treatment of the waste,

(3) Chemicals detected in any previous analysis of the same waste,

(4) Chemicals introduced into the process that generates the waste, and

(5) Chemicals that are byproducts of the process that generates the waste.

Overseeing agency means the state or EPA regional authority that administers the exemption.

Waste form means at the point of exemption, the waste form is liquid, semi-solid, or solid, as defined below (for the purposes of the HWIR exemption only):

(1) *Liquid* means a waste contains total suspended solids less than 1% by weight.

(2) *Semi-solid* means a waste contains total suspended solids of 1% or more by weight but no more than 30% by weight.

(3) *Solid* means a waste contains total suspended solids more than 30% by weight.

Obtaining an Exemption

D. What Steps Must I Follow To Establish My Waste as Exempt?

You must take the following steps to establish that your waste meets the requirements of the HWIR exemption:

(1) Determine whether your waste is reasonably expected to contain any chemical listed in Table 2, using the criteria described in Section XIV.E.

Note: If your waste is reasonably expected to contain any chemical listed in Table 2 for which there is no exemption level in Table 3, your waste cannot be exempt under the HWIR exemption even if you do not detect the chemical.

(2) Determine the form of your waste (liquid, semi-solid, or solid) and under which regulatory alternative (unrestricted management or landfill-only) you will be claiming the exemption (see Section XIV.F).

(3) Determine the concentration of each Appendix X chemical reasonably expected to be present in your waste (see Sections XIV.G, H, and I).

(4) Determine whether the concentrations of all the Appendix X chemicals in your waste are at or below the exemption levels established for your waste form and disposal alternative (see Section XIV.J).

(5) Notify the overseeing agency that you are claiming an exemption under the HWIR exemption for your waste (see Section XIV.K).

(6) For the landfill-only alternative, notify the receiving landfill (see Section XIV.M).

E. What Wastes Are Eligible for this Exemption?

To be eligible for this exemption, your waste must meet the following conditions:

(1) Your waste must exhibit none of the characteristics of hazardous waste set out in subpart C of 40 CFR Part 261. If your waste does exhibit a hazardous waste characteristic, it must be de-characterized before it can be exempt.

(2) Your waste must meet one or more of the following descriptions:

(a) Any listed hazardous waste described in 40 CFR 261.31 (non-specific sources), 40 CFR 261.32 (specific sources), and 40 CFR 261.33 (discarded commercial chemical products).

(b) Any mixture of a listed hazardous waste with a solid waste under 40 CFR 261.3(a)(2)(iii) or (iv).

(c) Any waste derived from the treating, storing, or disposing of a listed hazardous waste under 40 CFR 261.3(c)(2)(i).

(d) Any media or debris contaminated with a listed hazardous waste, a mixture containing a listed hazardous waste, or a waste derived from a listed hazardous waste.

(3) All chemicals reasonably expected to be present in your waste must have exemption levels listed in Table 2, and be at or below those exemption levels. Chemicals reasonably expected to be present in your waste are those chemicals in Table 3 that meeting the following:

(a) Chemicals identified as the basis for listing the waste you wish to exempt. (For F and K listed waste, these chemicals are identified in Appendix VII of 40 CFR Part 261. For P and U listed waste, these are chemicals are found in 40 CFR 261.33).

(b) Chemicals listed in the table ''Treatment Standards for Hazardous Wastes'' contained in 40 CFR 268.40 as regulated hazardous chemicals for land disposal restriction (LDR) treatment of the waste.

(c) Chemicals detected in any previous analysis of the same waste.

(d) Chemicals introduced into the process that generates the waste.

(e) Chemicals that are byproducts of the process that generates the waste.

F. What Chemical Concentration Levels Must My Waste Meet To Become Exempt?

To become exempt your waste must meet the chemical concentration levels specified in Table 3. These exemption levels depend on the form of your waste (liquid, semi-solid, or solid) and the type of exemption you intend to pursue (unrestricted management or landfill only).

(1) To use the unrestricted-management alternative, the chemicals in your waste must be at or below the exemption levels in Table 3 for unrestricted management. Under this alternative, you must determine your waste form and meet the exemption level for that form. The waste form depends on the total suspended solids (TSS) in the waste (see definitions, Section XIV.C):

If your waste contains TSS in a concentration of	Then it is defined as a
Less than 1%	Liquid.
Between 1% and 30% ..	Semi-solid.
Greater than 30%	Solid.

(2) To use the landfill-only alternative then the chemicals in your waste must be at or below the exemption levels in Table 3 for landfill only.

G. For Which Chemicals Must I Test in My Waste?

(1) You must test your waste for each chemical reasonably expected to be present in your waste, as identified in Section XIV.E.

(2) For chemicals listed in Table 2 other than those reasonably expected to be present in your waste, you may either test for any such chemical or use your knowledge of the production process that generated the waste to determine that it is not present.

H. At What Point Must I Sample My Waste?

You may sample your waste at any point between its point of generation and its point of disposal. However, your waste will be subject to land disposal restrictions in 40 CFR Part 268 unless your waste meets all applicable concentration levels at its point of generation.

I. How Must I Sample and Analyze My Waste?

(1) For each waste you seek to exempt you must develop and follow a written plan for sampling and analyzing wastes. The plan must contain the following:

(a) The chemicals for which you will analyze each waste and the rationale for choosing those chemicals.

(b) Your methods for collecting a representative sample of the waste to be analyzed.

(c) Your preparation and test methods for analyzing these chemicals.

(d) Sampling procedures and locations for characterizing the waste stream.

(2) You must analyze at least 4 samples. You must also document the results from all samples analyzed.

J. What Must My Analysis Show?

(1) For every chemical tested, each sample must show that the total concentration in the waste is at or below the exemption level appropriate to your waste form and type of exemption.

(2) You must document your ability to analyze a sample spiked at or below the exemption level. Such documentation would consist of analytical results from a sample spiked at or below exemption level concentrations.

K. What Information Must I Submit to the Overseeing Agency?

Before managing any waste as exempt under the HWIR exemption, you must send a notice to the overseeing agency by certified mail or other mail service that confirms delivery in writing. This notice of your exemption claim must include all of the following:

(1) Your facility's name, address, and RCRA ID number.

(2) The applicable EPA hazardous waste code of your exempted waste and the narrative description associated with the listing from subpart D of 40 CFR Part 261.

(3) A brief, general description of how you manufactured, treated, or otherwise produced the waste.

(4) An estimate of the annual quantities of the exempted waste.

(5) A statement that you are claiming the HWIR exemption for the waste.

(6) A certification—signed by you or your authorized representative—that the information in your notice is true, accurate, and complete.

L. When Does the Exemption Take Effect?

The exemption—whether unrestricted management or landfill only—takes effect when you receive written confirmation of delivery to the overseeing agency. At that time you may begin managing your waste under this exemption.

M. Must I Track My Waste Exempted Under the HWIR Exemption?

(1) Waste meeting the exemption levels for unrestricted management require no tracking.

(2) For waste meeting the exemption levels for landfill-only:

(a) You must send written notice to the landfill receiving your waste and include the following:

(i) The date of the shipment.

(ii) The volume and form of the waste.

(iii) A general description of the exempt waste.

(iv) The shipper(s) used to transport the waste.

(v) A signed certification that your waste meets the exemption levels for landfill-only.

(b) You must receive a certification from the landfill owner or operator that the waste shipment reached the landfill within 60 days of shipment. If you do not receive this certification within 45 days of the shipment date, you must notify the overseeing agency in writing that you have not received the certification.

(c) You must keep a copy of the notification you sent to the landfill and a copy of the certification you received from the landfill (and/or the notification you sent to the overseeing agency that you did not receive the certification from the landfill) for three years.

(d) If your waste does not arrive at the landfill within 60 days of shipment, the waste that you claimed as exempt is no longer exempt on the 61st day and is now a hazardous waste. You, as the person identified on the HWIR notification form, are the generator of this hazardous waste and must comply with 40 CFR Part 262.

N. Must my waste meet 40 CFR Part 268—Land Disposal Requirements?

Your waste must meet all applicable requirements in 40 CFR Part 268, unless each waste sample is at or below the exemption levels at the point of generation.

O. Where May I Dispose of My Exempt Waste?

(1) For the unrestricted management alternative, you may dispose of this waste in any destination that can legally accept nonhazardous waste.

(2) For the landfill-only alternative, you must dispose of this waste directly in a landfill licensed or permitted by the state or federal government under Subtitle C or D of RCRA. The waste must not be placed on the land before final disposal.

Maintaining an Exemption

P. What If the Information I Submitted Changes?

You must submit to the head of the overseeing agency any change in any information submitted as describe in Section XIV.K within 30 business days of learning of the change.

Q. What Retesting Must I Do?

(1) You must retest for all chemicals reasonably expected to be in your waste on the following schedule, based on waste form and annual quantity of the waste produced. However, you do not need to retest for the chemical if after twelve months of testing, your analysis has shown concentrations uniformly below one-tenth of the applicable exemption level.

If you generate the following annual quantity of liquid waste (tons):	Then you must retest
0–35,000	Every 12 months.
35,000–500,000	Every 6 months.
Over 500,000	Every 3 months.

If you generate the following annual quantity of semi-solid or solid waste (tons)	Then you must retest
0–2,000	Every 12 months.
2,000–10,000	Every 6 months.
Over 10,000	Every 3 months.

(2) You must follow a waste sampling and analysis plan meeting the requirements described in Section XIV.I for retesting.

(3) If at any time the process generating the exempt waste changes significantly, you must retest the waste for all chemicals reasonably expected to be present. A significant change is one that could affect the exempt status of the waste under consideration. For example, a change that adds new chemicals or increases chemical concentrations is a significant change.

R. What Records Must I Maintain On-Site, and for How Long?

You must keep records of the following in your files on-site for three years after the date of the relevant test:

(1) The waste sampling and analysis plans for initial testing (as described in Section XIV.I) and retesting (as described in Section XIV.Q).

(2) Results from the waste sampling and analysis including quality control analyses from initial testing or retesting.

(3) All volume determinations made to decide on the frequency of retesting as described in Section XIV.Q.

(4) Any information submitted to the overseeing agency either as part of the initial notice (see Section XIV.K) or for later changes (see Section XIV.P).

(5) Any specific documentation relied on in making process knowledge determinations, such as the Material Data Safety Sheet (MSDS), product labels, or information provided by manufacturers of the processing equipment.

(6) Documentation of compliance with the LDR requirements of 40 CFR 268.

(7) For the landfill-only alternative, notification that the waste was shipped to a landfill and certification that the waste shipment reached the landfill (see Section XIV.M).

Consequences of Not Meeting the Exemption

S. How Will the Overseeing Agency Verify an Exemption?

(1) The overseeing agency may conduct inspections and audits to verify your exemption claim. Such inspections could include sampling of the exempt waste stream. Exceedances of the exemption levels determined by single grab samples would be sufficient to demonstrate non-compliance with the requirements of the exemption.

(2) You must make all records relating to the exemption immediately available to the overseeing agency performing an inspection. You must provide a copy of the records to the overseeing agency within 5 business days of receiving a written request.

(3) You must be able to explain any process knowledge determinations if requested by the overseeing agency.

(4) In an enforcement action, the burden of proof to establish compliance

with the requirements of the HWIR exemption is on the person claiming the exemption.

T. What Is the Status of My Waste if I Don't Meet or Maintain the Exemption?

Failure to satisfy any of the exemption conditions [except those described in Sections XIV.M(2)(a)–XIV.M(2)(c)] voids the exemption and requires that you manage the exempted waste stream has hazardous waste.

Failure to satisfy the requirements described in Sections XIV.M(2)(a)–XIV.M(2)(c) for the landfill-only alternative (in other words, the tracking requirements) would not affect the exempt status of the waste, but would constitute a violation of RCRA.

TABLE 2.—APPENDIX X HWIR EXEMPTION CHEMICALS

Chemical name [alternate names]	CASRN	Note
A2123 [Ethanimidothioic acid, 2-(dimethylamino) -N-hydroxy-2-oxo-,methyl ester]	30558–43–1	
Acenaphthene	83–32–9	b
Acenaphthylene [Acenaphthalene]	208–96–8	b
Acetaldehyde [Ethanal]	75–07–0	
Acetone [2-Propanone]	67–64–1	
Acetonitrile [Ethanenitrile]	75–05–8	
Acetophenone	98–86–2	
2-Acetylaminofluorene [2-AAF]	53–96–3	b
Acrolein [2-Propenal]	107–02–8	
Acrylamide [Propenaminde]	79–06–1	
Acrylic acid	79–10–7	
Acrylonitrile [2-Propenenitrile]	107–13–1	
Aldicarb	116–06–3	
Aldicarb sulfone	1646–88–4	
Aldrin	309–00–2	
Allyl alcohol	107–18–6	
Allyl chloride [3-Chloropropylene] [3-Chloropropene]	107–05–1	
4-Aminobiphenyl	92–67–1	
5-Aminomethyl-3-isoxazolol [Muscimol]	2763–96–4	
4-Aminopyridine	504–24–5	b
Amitrole	61–82–5	
Ammonium picrate	131–74–8	
Aniline	62–53–3	
Anthracene	120–12–7	b
Antimony [Antimony, total]	7440–36–0	b, c
Aramite	140–57–8	
Arsenic [Arsenic, total]	7440–38–2	b, c
Auramine	492–80–8	
Azaserine	115–02–6	
Barban	101–27–9	
Barium [Barium, total]	7440–39–3	b, c
Bendiocarb	22781–23–3	
Bendiocarb phenol	22961–82–6	
Benomyl	17804–35–2	
Benz[c]acridine	225–51–4	b
Benz[a]anthracene	56–55–3	b
Benzene	71–43–2	
Benzenesulfonyl chloride	98–09–9	
Benzidine	92–87–5	
Benzo[b]fluoranthene	205–99–2	b
Benzo[j]fluoranthene	205–82–3	b
Benzo[k]fluoranthene	207–08–9	b
Benzo[g,h,i]perylene	191–24–2	b
Benzo[a]pyrene	50–32–8	b
Benzyl alcohol	100–51–6	
Benzyl chloride	100–44–7	
Beryllium [Beryllium, total]	7440–41–7	b, c
Bromoacetone	598–31–2	
Bromodichloromethane [Dichlorobromomethane]	75–27–4	b
Bromoform [Tribromomethane]	75–25–2	b
Bromomethane [Methyl bromide]	74–83–9	b
4-Bromophenyl phenyl ether [p-Bromodiphenyl ether]	101–55–3	
Brucine [2,3-Dimethoxy strychnidin-10-one]	357–57–3	
n-Butyl alcohol [n-Butanol]	71–36–3	
Butylate	2008–41–5	
Butyl benzyl phthalate	85–68–7	b
Cadmium [Cadmium, total]	7440–43–9	b, c
Carbaryl	63–25–2	
Carbendazim	10605–21–7	
Carbofuran	1563–66–2	
Carbofuran phenol	1563–38–8	
Carbon disulfide	75–15–0	
Carbon tetrachloride	56–23–5	b

TABLE 2.—APPENDIX X HWIR EXEMPTION CHEMICALS—Continued

Chemical name [alternate names]	CASRN	Note
Carbosulfan	55285–14–8	
Chlorambucil	305–03–3	
Chlordane [Chlordane, alpha and gamma isomers]	57–74–9	a
Chlornaphazin	494–03–1	
Chloroacetaldehyde	107–20–0	
4-Chloroaniline [p-Chloroaniline]	106–47–8	
Chlorobenzene [Monochlorobenzene]	108–90–7	b
Chlorobenzilate	510–15–6	
p-Chloro-m-cresol	59–50–7	b
Chloroethane [Ethyl chloride]	75–00–3	b
bis-(2-Chloroethoxy) methane [Dichloromethoxy ethane]	111–91–1	
bis-(2-Chloroethyl) ether [Dichloroethyl ether] [1,1′-Oxybis(2-chloroethane)]	111–44–4	b
Chloroform [Trichloromethane]	67–66–3	b
bis-(2-Chloroisopropyl) ether [2,2′-Oxybis(1-chloropropane)] [Bis-(2-Chloro-1-methylethyl) ether]	108–60–1	b
Chloromethane [Methyl chloride]	74–87–3	b
bis-(Chloromethyl) ether [Dichloromethyl ether]	542–88–1	b
2-Chloronaphthalene [beta-Chloronaphthalene]	91–58–7	b
2-Chlorophenol [o-Chlorophenol]	95–57–8	b
4-Chlorophenyl phenyl ether [p-Chlorodiphenyl ether]	7005–72–3	b
1-(o-Chlorophenyl) thiourea	5344–82–1	
Chloroprene [2-Chloro-1,3-butadiene]	126–99–8	
3-Chloropropionitrile	542–76–7	
4-Chloro-o-toluidine hydrochloride	3165–93–3	
Chromium [Chromium, total]	7440–47–3	b, c
Chrysene	218–01–9	b
Citrus red No. 2	6358–53–8	
Cobalt [Cobalt, total]	7440–48–4	e
Copper [Copper, total]	7440–50–8	c
Copper dimethyldithiocarbamate	137–29–1	
o-Cresol [2-Methyl phenol]	95–48–7	a
—Cresol [3-Methyl phenol]	108–39–4	a
p-Cresol [4-Methyl phenol]	106–44–5	a
Crotonaldehyde [trans-2-Butenal] [beta-Methylacrolein]	4170–30–3	
Cumene [Isopropyl benzene]	98–82–8	
—Cumenyl methylcarbamate	64–00–6	
Cyanides, amenable	57–12–5	b, d
Cyanides, total	57–12–5	b, d
Cycasin	14901–08–7	
Cycloate	1134–23–2	
Cyclohexane	110–82–7	
Cyclohexanone	108–94–1	
2-Cyclohexyl-4,6-dinitrophenol	131–89–5	b
Cyclophosphamide	50–18–0	
2,4–D [2,4-Dichlorophenoxyacetic acid]	94–75–7	d
Daunomycin	20830–81–3	
Dazomet	533–74–4	
o,p′-DDD	53–19–0	a
p,p′-DDD	72–54–8	a
o,p′-DDE [o,p′ TDE]	3424–82–6	a
p,p′-DDE [p,p′-TDE]	72–55–9	a
o,p′-DDT	789–02–6	a
p,p′-DDT	50–29–3	a
Diallate	2303–16–4	
Dibenz[a,h]acridine	226–36–8	b
Dibenz[a,j]acridine	224–42–0	b
Dibenz[a,h]anthracene	53–70–3	b
7H-Dibenzo[c,g]carbazole	194–59–2	b
Dibenzofuran	132–64–9	
Dibenzo[a,e]pyrene	192–65–4	b
Dibenzo[a,h]pyrene	189–64–0	b
Dibenzo[a,i]pyrene	189–55–9	b
Dibromochloromethane [Chlorodibromomethane]	124–48–1	b
1,2-Dibromo-3-chloropropane	96–12–8	
Di-n-butyl phthalate	84–74–2	b
1,2-Dichlorobenzene [o-Dichlorobenzene]	95–50–1	a, b
1,3-Dichlorobenzene [m-Dichlorobenzene]	541–73–1	a, b
1,4-Dichlorobenzene [p-Dichlorobenzene]	106–46–7	a, b
3,3′-Dichlorobenzidine	91–94–1	
cis-1,4-dichloro-2-butene	1476–11–5	a
trans-1-4-Dichloro-2-butene	110–57–6	a
Dichlorodifluoromethane [CFC–12]	75–71–8	b
1,1-Dichloroethane [Ethylidene dichloride]	75–34–3	b

TABLE 2.—APPENDIX X HWIR EXEMPTION CHEMICALS—Continued

Chemical name [alternate names]	CASRN	Note
1,2-Dichloroethane [Ethylene dichloride]	107–06–2	b
1,1-Dichloroethylene [Vinylidene chloride]	75–35–4	b
cis-1,2-Dichloroethylene	156–59–2	a, b
trans-1,2-Dichloroethylene	156–60–5	a, b
2,2′-Dichloroisopropyl ether [2,2′-Oxybis(2-chloropropane)]	39638–32–9	b
2,4-Dichlorophenol 120–83–2 b 2,6–Dichlorophenol	87–65–0	b
1,1-Dichloropropane [Propylidene chloride]	78–99–9	a, b
1,2-Dichloropropane [Propylene dichloride]	78–87–5	a, b
1,3-Dichloropropanol	26545–73–3	a, b
Dichloropropene [Dichloropropylene] [Dichloro-1-Propene]	26952–23–8	b
cis-1,3-Dichloropropene [cis-1,3-Dichloropropylene]	10061–01–5	a, b
trans-1,3-Dichloropropene [trans-1,3-Dichloropropylene]	10061–02–6	a, b
Dieldrin	60–57–1	
1,2,3,4-Diepoxybutane [2,2′-Bioxirane]	1464–53–5	
Diethylene glycol, dicarbamate	5952–26–1	
O,O-Diethyl-S-methyl dithiophosphate	3288–58–2	b
Diethyl-p-nitrophenyl phosphate	311–45–5	
Diethyl phthalate	84–66–2	b
Diethylstilbestrol	56–53–1	
Dihydrosafrole	94–58–6	
Dimethoate [O,O-Dimethyl S-methylcarbamoylmethyl phosphorodithioate]	60–51–5	b
3,3′-Dimethoxybenzidine	119–90–4	
Dimethylamine [N-Methyl methanamine]	124–40–3	
p-Dimethylaminoazobenzene [4-Dimethylaminoazobenzene]	60–11–7	
7,12-Dimethylbenz[a]anthracene	57–97–6	b
3,3′-Dimethylbenzidine	119–93–7	
2,4-Dimethyl phenol	105–67–9	b
Dimethyl phthalate	131–11–3	b
Dimethyl sulfate	77–78–1	
Dimetilan	644–64–4	
1,3-Dinitrobenzene [m-Dinitrobenzene]	99–65–0	b
1,4-Dinitrobenzene [p-Dinitrobenzene]	100–25–4	b
4,6-Dinitro-o-cresol [4,6-Dinitro-2-methyl phenol]	534–52–1	d
2,4-Dinitrophenol	51–28–5	b
2,4-Dinitrotoluene	121–14–2	
2,6-Dinitrotoluene	606–20–2	
Dinoseb [2-sec-Butyl-4,6-dinitrophenol]	88–85–7	b
Di-n-octyl phthalate	117–84–0	b
1,4-Dioxane [1,4-Diethylene dioxide]	123–91–1	
Diphenylamine [N,N-Diphenylamine]	122–39–4	
1,2-Diphenylhydrazine	122–66–7	
Di-n-propylamine [Dipropylamine]	142–84–7	
Disulfiram [Tetraethylthiuram disulfide]	97–77–8	
Disulfoton [O,O-Diethyl S-(2-(ethylthio)ethyl)phosphorodithioate]	298–04–4	b
Dithiobiuret	541–53–7	
Endosulfan I [alpha-Endosulfan]	959–98–8	a
Endosulfan II [beta-Endosulfan]	33213–65–9	a
Endosulfan sulfate	1031–07–8	
Endothall	145–73–3	
Endrin	72–20–8	
Endrin aldehyde	7421–93–4	b
Endrin ketone	53494–70–5	b
Epichlorohydrin [1-Chloro-2,3-epoxypropane]	106–89–8	
Epinephrine	51–43–4	
2-Ethoxyethanol [Ethylene glycol monoethyl ether] [Cellosolve]	110–80–5	b
Ethyl acetate	141–78–6	
Ethyl acrylate	140–88–5	
Ethyl benzene	100–41–4	
Ethyl carbamate [Urethane] [Carbamic acid, ethyl ester]	51–79–6	
S-Ethyl dipropylthiocarbamate [EPTC]	759–94–4	
Ethylenebisdithiocarbamic acid	111–54–6	d
Ethylene dibromide [1,2-Dibromoethane]	106–93–4	
Ethylene oxide	75–21–8	
Ethylene thiourea [2-Imidazolidinethione]	96–45–7	
Ethyl ether [Ethane 1,1′ oxybis]	60–29–7	
bis-(2-Ethylhexyl) phthalate [Di-2-ethylhexyl phthalate]	117–81–7	b
Ethyl methacrylate	97–63–2	
Ethyl methanesulfonate	62–50–0	
Ethyl Ziram	14324–55–1	
Famphur	52–85–7	
Ferbam	14484–64–1	
2-Fluoracetamide	640–19–7	

TABLE 2.—APPENDIX X HWIR EXEMPTION CHEMICALS—Continued

Chemical name [alternate names]	CASRN	Note
Fluoranthene	206–44–0	b
Fluorene	86–73–7	b
Fluoride	16984–48–8	c
Fluoroacetic acid, sodium salt [Sodium fluoroacetate]	62–74–8	
Formaldehyde	50–00–0	
Formetanate hydrochloride	23422–53–9	
Formic Acid	64–18–6	
Formparanate	17702–57–7	
Furan	110–00–9	
Furfural [2-Furancarboxaldehyde]	98–01–1	
Heptachlor	76–44–8	
Heptachlor epoxide, alpha, beta, and gamma isomers	1024–57–3	a
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	35822–46–9	a
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562–39–4	a
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673–89–7	a
Hexachlorobenzene	118–74–1	b
Hexachloro-1,3-butadiene [Hexachlorobutadiene]	87–68–3	
alpha-Hexachlorocyclohexane [alpha-BHC]	319–84–6	a
beta-Hexachlorocyclohexane [beta-BHC]	319–85–7	a
delta-Hexachlorocyclohexane [delta-BHC]	319–86–8	a
gamma-Hexachlorocyclohexane [gamma-BHC] [Lindane]	58–89–9	a
Hexachlorocyclopentadiene	77–47–4	
1,2,3,4,7,8 Hexachlorodibenzo-p-dioxin	39227–28–6	a
1,2,3,6,7,8 Hexachlorodibenzo-p-dioxin	57653–85–7	a
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	19408–74–3	a
1,2,3,4,7,8 Hexachlorodibenzofuran	70648–26–9	a
1,2,3,6,7,8 Hexachlorodibenzofuran	57117–44–9	a
1,2,3,7,8,9 Hexachlorodibenzofuran	72918–21–9	a
2,3,4,6,7,8-Hexachlorodibenzofuran	60851–34–5	a
Hexachloroethane	67–72–1	b
Hexachlorophene	70–30–4	
Hexachloropropene [Hexachloropropylene]	1888–71–7	
Hexaethyl tetraphosphate	757–58–4	
2-Hexanone	591–78–6	
Indeno[1,2,3-cd]pyrene	193–39–5	b
Iodomethane [Methyl iodide]	74–88–4	b
3-Iodo-2-propynyl N-butylcarbamate	55406–53–6	
Isobutyl alcohol [isobutanol]	78–83–1	
Isodrin	465–73–6	
Isolan [Isopropyl methyl pyrazolyl dimethylcarbamate]	119–38–0	
Isophorone	78–59–1	
Isosafrole	120–58–1	
Kepone [Chlordecone]	143–50–0	
Lasiocarpine	303–34–1	
Lead [Lead,total]	7439–92–1	b, c
Maleic hydrazide	123–33–1	
Malononitrile [Propanedinitrile]	109–77–3	
Manganese dimethyldithiocarbamate	15339–36–3	
Melphalan	148–82–3	
Mercury [Mercury, total]	7439–97–6	b, c
Metam Sodium	137–42–8	
Methacrylonitrile [2-Methyl-2-propenenitrile]	126–98–7	
Methanol [Methyl alcohol]	67–56–1	
Methapyrilene	91–80–5	
Methiocarb	2032–65–7	
Methomyl	16752–77–5	
Methoxychlor	72–43–5	
3-Methylcholanthrene	56–49–5	b
4-Methylene bis-(2-chloroaniline)	101–14–4	
Methylene bromide [Dibromomethane]	74–95–3	b
Methylene chloride [Dichloromethane]	75–09–2	b
Methyl ethyl ketone [2-Butanone] [MEK]	78–93–3	
Methyl isobutyl ketone [Hexone] [4-Methyl-2-pentanone]	108–10–1	
2-Methyllactonitrile [Acetone cyanohydrin]	75–86–5	
Methyl methacrylate	80–62–6	
Methyl methanesulfonate	66–27–3	
2-Methylnaphthalene	91–57–6	b
Methyl parathion [O,O-Dimethyl O-p-nitrophenyl phosphorothioate]	298–00–0	b
2-Methyl pyridine [alpha-Picoline] [2-Picoline]	109–06–8	b
Methylthiouracil	56–04–2	
Metolcarb	1129–41–5	
Mexacarbate	315–18–4	

TABLE 2.—APPENDIX X HWIR EXEMPTION CHEMICALS—Continued

Chemical name [alternate names]	CASRN	Note
Molinate	2212–67–1	
Naphthalene	91–20–3	
1,4-Naphthoquinone	130–15–4	
1-Naphthylamine [alpha-Naphthylamine]	134–32–7	
2-Naphthylamine [beta-Naphthylamine]	91–59–8	
1-Naphthyl-2-thiourea [alpha-Naphthylthiourea]	86–88–4	
Nickel [Nickel, total]	7440–02–0	b, c
Nicotine	54–11–5	d
2-Nitroaniline [o-Nitroaniline] [2-Nitrobenzenamine]	88–74–4	
3-Nitroaniline [m-Nitroaniline] [3-Nitrobenzenamine]	99–09–2	
4-Nitroaniline [p-Nitroaniline] [4-Nitrobenzenamine]	100–01–6	
Nitrobenzene	98–95–3	
Nitroglycerine	55–63–0	
2-Nitrophenol [o-Nitrophenol]	88–75–5	b
4-Nitrophenol [p-Nitrophenol]	100–02–7	b
2-Nitropropane	79–46–9	
4-Nitroquinoline-1-oxide	56–57–5	
N-Nitrosodi-n-butylamine	924–16–3	b
N-Nitrosodiethanolamine	1116–54–7	b
N-Nitrosodiethylamine	55–18–5	b
N-Nitrosodimethylamine	62–75–9	b
N-Nitrosodiphenylamine [Diphenylnitrosamine]	86–30–6	b
N-Nitrosodi-n-propylamine [Di-n-propylnitrosamine]	621–64–7	b
N-Nitroso-N-ethylurea	759–73–9	b
N-Nitroso-N-methylethylamine	10595–95–6	b
N-Nitroso-N-methylurea	684–93–5	b
N-Nitroso-N-methylurethane	615–53–2	b
N-Nitrosomethylvinylamine	4549–40–0	b
N-Nitrosomorpholine	59–89–2	b
N-Nitrosonornicotine	16543–55–8	b
N-Nitrosopiperidine	100–75–4	b
N-Nitrosopyrrolidine	930–55–2	b
N-Nitrososarcosine	13256–22–9	b
5-Nitro-o-toluidine [2-Methyl-5-nitroaniline]	99–55–8	
Octachlorodibenzo-p-dioxin [OCDD]	3268–87–9	a
Octachlorodibenzofuran [OCDF]	39001–02–0	a
Octamethylpyrophosphoramide	152–16–9	
Osmium	7440–04–2	c
Oxamyl	23135–22–0	
Paraldehyde	123–63–7	
Parathion [O,O-Diethyl O-p-nitrophenyl phosphorothioate]	56–38–2	b
Pebulate	1114–71–2	
Pentachlorobenzene	608–93–5	b
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	40321–76–4	a
1,2,3,7,8-Pentachlorodibenzofuran	57117–41–6	a
2,3,4,7,8-Pentachlorodibenzofuran	57117–31–4	a
Pentachloroethane	76–01–7	b
Pentachloronitrobenzene [PCNB] [Quintobenzene] [Quintozene]	82–68–8	
Pentachlorophenol [PCP]	87–86–5	b, c
1,3-Pentadiene	504–60–9	
bis-(Pentamethylene) thiuram tetrasulfide	120–54–7	
Phenacetin	62–44–2	
Phenanthrene	85–01–8	b
Phenol	108–95–2	b
Phentermine [alpha,alpha-Dimethylphenethylamine]	122–09–8	
1,2-Phenylenediamine [o-Phenylenediamine]	95–54–5	a
1,3-Phenylenediamine [m-Phenylenediamine]	108–45–2	a
1,4-Phenylenediamine [p-Phenylenediamine]	106–50–3	a
Phenylthiourea	103–85–5	
Phorate [O,O-Diethyl S-(ethylthio)methyl phosphorodithioate]	298–02–2	b
o-Phthalic acid	88–99–3	
p-Phthalic acid [Terephthalic acid] [1,4-Benzenedicarboxylic acid]	100–21–0	
Physostigmine	57–47–6	
Physostigmine salicylate	57–64–7	
Polychlorinated biphenyls, total [PCBs, total]	1336–36–3	e
Potassium dimethyldithiocarbamate	128–03–0	
Potassium N-hydroxymethyl N-methyldithiocarbamate	51026–28–9	
Potassium N-methyldithiocarbamate	137–41–7	
Promecarb	2631–37–0	
Pronamide	23950–58–5	
Propanenitrile [Propionitrile] [Ethyl cyanide]	107–12–0	
1,3–Propane sultone	1120–71–4	

TABLE 2.—APPENDIX X HWIR EXEMPTION CHEMICALS—Continued

Chemical name [alternate names]	CASRN	Note
Propargyl alcohol [2-Propyn-1-ol]	107–19–7	
Propham	122–42–9	
Propoxur [Baygon] [2-(1-Methylethoxy)-phenol, methylcarbamate]	114–26–1	
n-Propyl amine [1-Propanamine]	107–10–8	
1,2–Propyleneimine [2-Methylaziridine]	75–55–8	
Propylthiouracil [6-Propyl-2-thiouracil]	51–52–5	
Prosulfocarb	52888–80–9	
Pyrene	129–00–0	b
Pyridine	110–86–1	b
Quinone [p-Benzoquinone]	106–51–4	
Reserpine	50–55–5	
Resorcinol [1,3-Benzenediol]	108–46–3	
Saccharin	81–07–2	d
Safrole	94–59–7	
Selenium [Selenium, total]	7782–49–2	b, c
Selenium, tetrakis(dimethyldithiocarbamate) [Selenium dimethyldithiocarbamate]	144–34–3	
Silver [Silver, total]	7440–22–4	b, c
Silvex [2,4,5-Trichlorophenoxypropionic acid] [2,4,5-TP]	93–72–1	b
Sodium azide	26628–22–8	
Sodium dibutyldithiocarbamate	136–30–1	
Sodium diethyldithiocarbamate	148–18–5	
Sodium dimethyldithiocarbamate	128–04–1	
Streptozotocin	18883–66–4	
Strychnine	57–24–9	d
Styrene [Vinyl benzene] [Phenylethylene]	100–42–5	
Sulfallate	95–06–7	
Sulfide	18496–25–8	c
Sulfotepp [Tetraethyldithiopyrophosphate]	3689–24–5	b
Tetrabutylthiuram disulfide	1634–02–2	
Tetramethylthiuram monosulfide [Bis-(dimethylthiocarbamoyl)sulfide]	97–74–5	
1,2,4,5-Tetrachlorobenzene	95–94–3	a, b
2,3,7,8-Tetrachlorodibenzo-p-dioxin [2,3,7,8–TCDD]	1746–01–6	a
2,3,7,8-Tetrachlorodibenzofuran [2,3,7,8–TCDF]	51207–31–9	a
1,1,1,2-Tetrachloroethane	630–20–6	a
1,1,2,2-Tetrachloroethane	79–34–5	a, b
Tetrachloroethylene [Perchloroethylene]	127–18–4	
2,3,4,6-Tetrachlorophenol	58–90–2	a, b, c
Tetrahydrofuran	109–99–9	
Tetranitromethane	509–14–8	
Thallium [Thallium, total]	7440–28–0	b, c
Thioacetamide	62–55–5	
Thiodicarb	59669–26–0	
Thiofanox	39196–18–4	
Thiomethanol [Methyl mercaptan] [Methanethiol]	74–93–1	
Thionazin [O,O,-Diethyl O-pyrazinyl phosphorothioate]	297–97–2	b
Thiophanate-methyl	23564–05–8	
Thiophenol [Benzenethiol]	108–98–5	
Thiosemicarbazide	79–19–6	
Thiourea	62–56–6	
Thiram [Thiuram] [Tetramethylthiuram disulfide]	137–26–8	
Tin [Tin, total]	7440–31–5	e
Tirpate	26419–73–8	
Toluene [Methylbenzene]	108–88–3	
2,4-Toluene diisocyanate	584–84–9	a
2,6-Toluene diisocyanate	91–08–7	a
2,4-Toluenediamine [2,4-Diaminotoluene] [Toluene-2,4-diamine]	95–80–7	a
2,6-Toluenediamine [2,6-Diaminotoluene]	823–40–5	a
3,4-Toluenediamine [3,4-Diaminotoluene]	496–72–0	a
o-Toluidine [2-Methylaniline]	95–53–4	c
p-Toluidine [4-Methylaniline]	106–49–0	
Toxaphene [Chlorinated camphene]	8001–35–2	
Triallate	2303–17–5	
2,4,6-Tribromophenol	118–79–6	
1,2,4-Trichlorobenzene	120–82–1	a, b
1,1,1-Trichloroethane [Methyl chloroform]	71–55–6	a, b
1,1,2-Trichloroethane [Vinyl trichloride]	79–00–5	a, b
Trichloroethylene	79–01–6	
Trichlorofluoromethane [Trichloromonofluoromethane] [CFC-11]	75–69–4	b
Trichloromethanethiol	75–70–7	
2,4,5-Trichlorophenol	95–95–4	a, b
2,4,6-Trichlorophenol	88–06–2	a, b
2,4,5-Trichlorophenoxyacetic acid [2,4,5,-T]	93–76–5	b

TABLE 2.—APPENDIX X HWIR EXEMPTION CHEMICALS—Continued

Chemical name [alternate names]	CASRN	Note
1,2,3-Trichloropropane	96–18–4	a
1,1,2-Trichloro-1,2,2-trifluoroethane [Freon 113]	76–13–1	b
Triethylamine	121–44–8	
O,O,O-Triethylphosphorothioate	126–68–1	b
1,3,5-Trinitrobenzene [sym-Trinitrobenzene]	99–35–4	
Tris-(1-azridinyl) phosphine sulfide	52–24–4	
Tris-(2,3 -dibromopropyl) phosphate	126–72–7	
Trypan blue	72–57–1	
Vanadium [Vanadium, total]	7440–62–2	c
Vernolate [Vernam]	1929–77–7	
Vinyl chloride [Chloroethylene] [Ethylene chloride]	75–01–4	
Vinyl acetate	108–05–4	
Warfarin	81–81–2	d
o-Xylene	95–47–6	a
m-Xylene	108–38–3	a
p-Xylene	106–42–3	a
Zinc [Zinc,total]	7440–66–6	c
Ziram	137–30–4	

(a) These chemicals are isomers that have been chosen to represent either mixtures of isomers or where isomers were not specified (e.g., ortho-, meta-, and para-Xylene are all isomers and therefore, represent Xylenes, isomers not specified). These chemicals may be used in industry as single isomers or as a mixture of isomers. While the CASRN for mixtures of isomers are not the same as those for the individual isomers, the mixtures are regulated by inclusion of these isomers on the list.

(b) These chemicals have been chosen to represent the various classes of chemicals that are regulated as ''multi-chemical classes'' under RCRA (e.g., Endrin aldehyde and Endrin ketone have been chosen as representatives of Endrin Metabolites, which is regulated under RCRA.) Other chemicals with this note specifically represent those ''multi-chemical classes'' that are regulated under RCRA using an ''N.O.S.'' designation. N.O.S. stands for ''Not Otherwise Specified'' (e.g., 2-Chloronaphthalene has been chosen to represent Chlorinated naphthalene, N.O.S.) For some chemicals all the isomers were already listed in RCRA regulations, for others only the commercially available isomers were listed.

(c) These chemicals have been chosen to represent specific RCRA-regulated chemical salts or compounds that cannot be measured directly. By analyzing for the chemicals listed with this footnote, the other RCRA-regulated chemicals are therefore covered (e.g., Arsenic acid, Arsenic Trioxide, and other arsenic compounds can be measured in wastes by measuring for Arsenic, total.)

(d) These chemicals have been chosen to represent RCRA-regulated ''groups'' of chemicals (e.g., salts) that are directly derived-from the chemical on the list (e.g., Nicotine salts are derived-from Nicotine.) The salts are typically converted back to the parent compound or a related compound during analysis of wastes. The individual salts can not typically be measured directly. All salts, esters, and other compounds that are measured by analyzing for this chemical are also regulated by this rule; i.e., one can not escape regulation by claiming that the salt is not listed on Appendix X for the chemicals with this footnote.

(e) All compounds with PCBs, Cobalt and Tin are covered when present in RCRA listed wastes (i.e., F, K, U and P wastes) as therefore, are considered to be part of the HWIR Exemption List.

TABLE 3.—APPENDIX X HWIR EXEMPTION LEVELS
[Example]

CASRN	Chemical Name [Alternate Names]	Unrestricted Management Exemption Levels			Landfill-Only Exemption Levels (mg/kg)
		Liquid (mg/l)	Semi-solid (mg/kg)	Solid (mg/kg)	
00–000–00	Chemical A	0.00X	0.00X	0.0X	0.0X

HWIR Risk Assessment

XV. What Is the Goal of the HWIR Risk Assessment?

The goal of the HWIR risk assessment is to identify wastes currently listed as hazardous that could be eligible for exemption from hazardous waste management requirements. The HWIR risk assessment estimates chemical-specific potential risks to human and ecological receptors living in the vicinity of industrial nonhazardous waste sites that could manage HWIR exempted wastes. We would use these risk estimates, along with other information, to identify the chemical-specific concentrations for exempted waste that would be protective of human health and the environment according to selected sets of risk protection criteria. As explained in Section XIX of the preamble, we developed four protection measure scenarios to capture the likely range of public protection measures.

We are not proposing exemption levels based on the results of the current version of the risk assessment. As explained in Section XVII, we believe that the model requires further evaluation before it can be used to generate regulatory levels. We are describing our methodology in detail, and we request comment on our risk assessment approach. We remain committed to the modeling effort, and hope that these comments will help us to revise our model and produce risk-based exemption levels. Before we would promulgate an HWIR exemption, we would first publish an HWIR proposal that would include specific exemption levels and give the public an opportunity to comment.

XVI. How Did EPA Develop the Current Version of the HWIR Risk Assessment?

A. What Is the Basic Approach of the Risk Assessment Used To Set Risk-Based Levels?

The risk assessment developed for the HWIR exemption is an integrated, multimedia, multipathway, and multireceptor risk assessment (3MRA) that evaluates impacts to human and ecological receptors. The national scale assessment evaluates risks that might occur from the long-term, multimedia

release of a chemical from HWIR exempted waste that is managed in facilities typically expected to handle exempted waste. We designed the assessment to provide flexibility in producing a distribution of risk outputs to describe the range of individual risks across the nation from potential exposures to HWIR exempt waste. The HWIR risk assessment has three principle components: (1) The assessment strategy, (2) the 3MRA model, which includes the chemical release, fate, exposure, and risk modules, and (3) the input data for the modules (for example, environmental setting, chemical, and meteorological data).

1. *Assessment Strategy.* The 3MRA strategy (U.S. EPA, 1999–b) describes the overall direction for the assessment. The assessment is a forward-calculating analysis that evaluates the multiple exposure pathway risks to human and ecological receptors. A forward-calculating analysis starts with a chemical concentration in a waste management unit, estimates the release and transport of the chemical in various environmental media, and predicts the exposure and risk that result from those concentrations. The strategy describes several different analytical levels that the assessment could follow depending on available resources and the amount and quality of available data. However, because of resource and data constraints, we did not implement the strategy to its fullest extent. The strategy describes the probabilistic approach to the assessment and explains how the results provide an estimate of risk on a national scale. A probabilistic analysis calculates risk or hazard by allowing some of the parameters to have more than one value, consequently producing a distribution of risk or hazard for each receptor. A parameter is any one of a number of inputs or variables (such as food ingestion rates and soil characteristics) required for the model that we developed to assess risk.

The assessment begins with a range of concentrations for a chemical in waste (five concentrations for HWIR) and estimates the associated hazards and risks to human and ecological receptors. By evaluating a range of waste concentrations and using a probabilistic approach to select many of the input parameters, we would be able to identify chemical-specific concentrations in waste that match our risk protection criteria (that is, our chosen level of protectiveness to human health and the environment). The risk protection criteria we selected are: cancer risk level, human health and ecological hazard quotients, population protection, and probability of site protection. The results would represent national distributions of receptor impacts near the waste management units typically expected to manage exempted waste over a 10,000 year period. For more information on the risk assessment approach, see the 3MRA background document (U.S. EPA, 1999–b).

2. *The 3MRA Model.* The 3MRA model automates the assessment strategy. The model consists of 18 media-specific pollutant fate, transport, exposure, and risk modules; six data processors to manage the information transfer within the system; and three databases that contain the data required to estimate risk.

The modeling protocol looks at the movement of a chemical in the environment from a variety of chemical and physical processes: release from a waste management unit; transport of the chemical through the environment; exposure to the chemical from multiple pathways to humans, animals, and plants; and estimates the resulting risks or hazards posed by the exposures. Modules evaluate a chemical's release from aerated tanks, landfills, land application units, surface impoundments, and waste piles; movement through the air, groundwater, soil, watersheds, rivers, lakes, and wetlands; concentration at drinking water wells, residential soils, and farms; bioaccumulation in plants and animals (both on land and in waterbodies); and exposures and risks to humans and animals through ingestion of contaminated materials such as food and soil, inhalation of air (human only), and direct contact with contaminated media (ecological only). We invite comment on the approach used in the risk assessment that integrates the direct and indirect exposure pathways leading to a receptor.

The 3MRA model application will assess risks to receptors temporally over a 10,000 year period. This will be accomplished by selecting each year from the present until 10,000 years from now, and assessing risks associated with constituent releases from a randomly selected waste unit at a randomly selected waste site location. Thus, 10,000 model runs will occur, with each model run representing a different year in the future. As discussed in Section XVI.A.3, each waste management unit is assumed to have different operational lifetimes (between 20–50 years) and different lengths of time during which constituents are assumed to be released from the unit (between 30–200 years). The model continues simulating releases until less than one percent of the initial mass is left or for the maximum time constituents are assumed to be released from the unit, whichever occurs first. The model balances chemical mass across exposure pathways, and reports a total chemical-specific concentration in waste that meets our protection criteria.

The model assesses risks to human and ecological receptors who might live within 2 kilometers of a waste management unit. At each location where there is a receptor, the model calculates the simultaneous exposures and resulting risks for that receptor, by adding the appropriate series of pathway-specific risks. Some of the modeled receptors might be exposed through several pathways, some might only be exposed through one pathway, and some might not be exposed at all to any pathway. From this information, the model generates, for each chemical across all sites, a distribution of risk for each receptor type (and also for all receptor types). This distribution of risk is also calculated for each of three radial distances (500 meters, 1000 meters and 2000 meters) from the center of the waste management units. An overview of the 3MRA Model is provided in U.S. EPA (1999–c). EPA directive #2182 (U.S. EPA, 1997-b) provides the system design development guidance.

Under this site-based approach, the chemical-specific distributions of risks or hazards would include all of the receptors living in the vicinity of industrial waste sites that are exposed through one or more exposure pathways as well as any receptors not exposed. For example, the distributions present the risk and hazard estimated for all receptors using groundwater at a site for drinking or showering. This includes receptors using groundwater from both wells located within the contaminated plume and the receptors outside of the plume. The receptors located outside of the contaminated plume have no risk or hazard through the groundwater pathway.

We have also designed the model to have the capability to estimate risk and hazard to only those receptors that are exposed to a chemical through one or more pathways. With respect to receptors using groundwater for drinking or showering, the distributions would reflect only the risk and hazard to the receptors located within the groundwater plume. The receptors using groundwater as a source of drinking or showering and located outside of the plume would not be included in the distribution of risk and hazard in this additional analysis.

The number of wells within the groundwater plume will vary

significantly by site, by chemical, and by waste management unit type. For the chemical (acrylonitrile) that we are providing results in the Risk Characterization Background Document (US EPA, 1999-as), we estimate that nationally up to about a quarter of the groundwater wells would be located inside the plumes at industrial Subtitle D landfill sites. It is possible that some chemical and waste management combinations would have no wells within the groundwater plume.

The extent of a plume depends on the concentration and mass of a chemical constituent in the waste management unit, physical and chemical properties of the waste, characteristics of the waste management unit, site hydrogeological characteristics and the site climate. Because these are variable factors, the extent of the plume for the contaminant varies. We estimated the number of wells inside a contaminant plume for a chemical constituent at a site by first estimating the extent of the plume at that site. The plume extent is characterized by approximate stream surfaces that separate the fluid emanating from the waste management unit and the ambient ground-water flow field, and the transverse dispersion normal to the stream surfaces.

For a given distance from the source (or the waste management unit), the lateral extent of the plume is defined as a cross-section normal to the flow field where the receptor well concentration has the probability of more than 99.74 percent of being greater than 0.001 of the maximum concentration at the center of the plume at that longitudinal distance from the waste management unit. We estimated the extent of the plume based on the assumption that the ground-water flow field is steady-state. The derivation of the plume's extent are described in Appendix D of the background document for the vadose zone and aquifer modules (US EPA, 1999–aa). We request comment on the estimates of wells inside and outside the plume of contamination developed to date, and our approach in calculating these estimates. We also request comment on our approach in measuring the degree of risk posed at receptor wells located within the modeled plume of contamination and at those wells located outside the plume.

3. *Input data.* The 3MRA Model requires over 700 input parameters covering a wide range of general data categories including: waste management unit characteristics; meteorological data, surface water and watershed characteristics; soil properties; aquifer properties; food chain or food web characteristics; human and ecological exposure factors; types and locations of human and ecological receptors and habitats surrounding the waste management unit; and chemical-specific properties and toxicity values. We implemented the assessment on a national scale but based the analysis on a regional, site-based approach. In this approach, site-based data are used when available as inputs to the model. When site-based data are not available, then data collected on a regional level, followed by data collected on a national level, are used for the evaluation. We collected a large amount of data to better describe and model plausible exposure scenarios from chemical-specific releases from the waste management units. Examples of the types of data collected to identify site-based characteristics include facility location and the physical and environmental characteristics of the sites and surrounding areas (for example, land use, human receptor locations, and ecological habitats). Examples of regional data we collected were meteorological data, soils characteristics, aquifer data, and types of ecological receptors. Data collected at the national level included human exposure factors, ecological exposure factors, human health toxicity values, and ecological toxicity values. We have made available what data were collected, where the data were obtained, how the data were collected and processed, and issues and uncertainties associated with the data collected for the database of the 3MRA model in the docket (U.S. EPA, 1999–d through –r).

We assessed the potential human health and ecological impacts at 201 individual nonhazardous industrial waste management sites. The sites were selected to be representative of the management sites found in EPA's *Screening Survey of Industrial Subtitle D Establishments* (U.S. EPA, December, 1987). We selected the 201 sites from a survey of approximately 2,700 facilities representing a total population of nearly 150,000 facilities across 17 industrial sectors that managed waste on-site and had one or more of four types of waste management units (landfill, waste pile, land application unit, and surface impoundment). We drew a simple random sample of 201 facilities from each of the 17 industrial sectors in the same proportion as each sector in the Subtitle D survey. For example, if the organic chemicals industry sector had three percent of the facilities in the survey, we randomly selected three percent (that is, six facilities) of the 201 facilities to be from the organic chemicals industry sector. The methodology for the selection of the 201 sites is explained in a background document (U.S. EPA, 1999–s). The 201 sites were used to collect site, regional, and national data to parameterize the model. We request comment on the selection methodology for the 201 sites to represent the national population of industrial Subtitle D facilities and whether to use sampling weights in future efforts.

We used measured, calculated, and estimated chemical-specific data to generate all relevant chemical-specific thermodynamic and kinetic data for the HWIR assessment. The lack of reliable measured thermodynamic data necessitated the use of data generated by computational methods. The SPARC (System Performs Automated Reasoning in Chemistry) model, which is a computational method based on fundamental chemical structure theory, was the primary tool for calculating the thermodynamic constants. The process of assembling kinetic constants for degradation pathways (hydrolysis, anaerobic biodegradation and aerobic biodegradation) focused on finding, evaluating, and summarizing measured data. Due to the complex nature of biodegradation processes, only a limited amount of measured kinetic constants were available for chemicals and are included in the HWIR chemical database. We grouped these kinetic data according to reaction conditions (that is, pH, temperature, and redox conditions). However, because the rate constant for metabolism is unavailable for most constituents given the general paucity of data on metabolic rate constants in fish, the metabolic rate constant was set to a default of zero until data can be developed for a larger universe of hydrophobic organic chemicals. We have provided the information on chemical properties in a database placed in the docket (U.S. EPA, 1999–ai) and we request comments on the information contained in the chemical database. We also request any additional information on the chemicals.

We have incorporated anaerobic biodegradation in the model for simulating the fate and transport of chemicals through the saturated zone. We conducted a workshop on the use of available anaerobic biodegradation rates and also invited industrial groups to provide available information. We reviewed all available information on the anaerobic biodegradation rates for organic chemicals in the saturated zone. The criteria used for the review and results of our review are presented in the background document (U.S. EPA, 1998–b). We invite comments on the inclusion of these data, our criteria for

evaluating the data, and any additional data on anaerobic biodegradation of organic chemicals.

We used several types of human health toxicity values for the purpose of describing the toxicological dose-responses for the chemicals evaluated. For human health effects, the toxicity values include: cancer slope factors (CSFs), in units of $(mg/kg/day)^{-1}$ for oral exposure to carcinogenic chemicals; reference doses (RfDs), in units of mg/kg/day, for oral exposure to noncarcinogenic chemicals; inhalation CSFs, derived from Unit Risk Factors (URFs), in units of $(mg/kg/day)^{-1}$ for inhalation exposure to carcinogenic chemicals; and reference concentrations (RfCs), in units of mg/m^3 for inhalation exposure to noncarcinogenic chemicals.

There are a number of sources available for toxicity values that attempt to determine the most sensitive health effects associated with the chemicals and express the relationship between dose and effect in quantitative terms. We established an order of preference for the sources of health toxicity values as follows (from most preferred to least preferred): (1) the Integrated Risk Information System (IRIS) online database of verified health benchmarks (U.S. EPA 1998–g); (2) the Health Effects Assessment Summary Tables (HEAST; U.S. EPA 1997–e); and (3) EPA's National Center for Environmental Assessment (NCEA) provisional values.

Although we used only these three sources for the toxicity values in the analysis, we received toxicity data submitted during the 1995 HWIR proposal for 32 chemicals that we evaluated in the 1995 HWIR proposal. These data included data that were peer-reviewed and published as well as data that were neither peer-reviewed nor published. EPA summarized and evaluated all of these comments with respect to their potential impact on the current toxicity values. A complete description of the comments and EPA's preliminary recommendations can be found in *Report on Consistency of Hazardous Waste Identification Rule (HWIR) Benchmarks With Current Agency Values and Guidelines* (U.S. EPA, 1997–e) and *Response to Comments on Hazardous Waste Identification Rule (HWIR) Benchmarks* (RTI, 1998). In addition, we developed a tiered approach for developing interim human toxicity values that includes using peer-reviewed, published toxicity data submitted to us and other toxicity data used by other Federal agencies in the development of their benchmarks. The methodology is described in *Conceptual Approach to Establishing Interim Human Health Benchmarks* (U.S. EPA, 1999–aw). We request comment on the use of toxicity data from other Federal agencies' benchmark development, our preliminary recommendations to use peer-reviewed, published data submitted in comments, and the draft methodology to develop interim benchmarks.

RfDs and RfCs are defined as ''an estimate (with uncertainty spanning perhaps an order of magnitude or greater) of a daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects during a lifetime'' (U.S. EPA, 1998–g). RfDs and RfCs are developed using a methodology that is designed to generate protective exposure estimates of indeterminate probability. CSFs are used to evaluate cancer risks for ingestion and inhalation exposures, respectively. Unlike RfDs and RfCs, CSFs do not represent ''safe'' exposure levels, rather, they are derived mathematically as the 95% upper confidence limit of the slope of the linear portion of the dose-response curve. That is, they relate levels of exposure with a probability of effect or risk.

We developed at least one ecological toxicity value for 35 chemicals. We gathered the data to develop these benchmarks from peer-reviewed literature and Agency-developed criteria (for example, Ambient Water Quality Criteria). The data sources for the ecological benchmarks developed for each of the chemicals are available in the technical background document (U.S. EPA, 1999–p).

We developed two types of toxicity values for this analysis. The first values are population-level values and are expressed as an applied dose in mg/kg-day. The ecological benchmarks are relevant to mammals, birds, amphibians, and reptiles. The second set of toxicity values are chemical stressor concentration limits (CSCL) that are expressed as media concentrations (for example, mg/L). These are community-level benchmarks and are relevant for terrestrial and aquatic plants, aquatic organisms, benthos, and soil organisms.

In identifying appropriate studies to develop ecological benchmarks, we developed a series of study selection criteria to ensure consistency in the interpretation of ecotoxicological data and to satisfy relevant data quality objectives. The study selection criteria address the desire for consistency across EPA programs, the appropriateness of the study data given the management goals and assessment endpoints for HWIR, and the quality of the study with respect to endpoint selection, dose-response information, and appropriate use of extrapolation techniques (*e.g.*, tools for statistical inference). In order of importance, the study selection criteria included the following: (1) relevance of study endpoints to population-level effects, (2) adequate data to demonstrate the dose-response relationship, (3) appropriateness of study design with respect to the exposure route (*e.g.*, gavage versus dietary exposure) and exposure duration, (4) quality of the study as determined by the use of appropriate dosing regimes, and statistical tools and (5) consistency with other EPA programs such as the Office of Water and Superfund.

With the exception of amphibian populations, the CSCLs are intended to represent de minimis levels of effect to communities of organisms. For amphibians, the extensive database on acute and subchronic aqueous exposures to developing organisms was used to derive CSCLs for surface water contact. For other receptor groups such as the soil and sediment communities, the study selection criteria included the following: (1) Acceptance of a benchmark by other EPA programs (*e.g.*, Great Lakes Water Quality Initiative), (2) consistency with EPA guidelines on study selection for aquatic toxicity data, (3) relevance of study to species presumed to be key functional elements of the community, (4) relevance of study endpoints to address community-level effects (*e.g.*, growth, survival), (5) adequacy of data to demonstrate dose-response relationship, and (6) quality of the study data with respect to the design (*e.g.*, field versus laboratory) and appropriate use of statistical tools to characterize effects (for example, confidence levels). The methodology for the development of these benchmarks is described in *Data Requirements and Confidence Indicators for Ecological Benchmarks Supporting Exit Criteria for the Hazardous Waste Identification Rule (HWIR99)* (U.S. EPA, 1999–ax).

B. How Does This Effort Compare With Past HWIR Risk Assessments?

Unlike previous HWIR risk assessment efforts (57 FR 21450 and 60 FR 66344), which considered groundwater and non-groundwater pathways separately, the HWIR99 3MRA Model evaluates simultaneous exposures across multiple media and pathways to estimate the resulting health and environmental effects. For example, instead of looking at the risks of a person drinking contaminated groundwater, breathing contaminated air, and eating contaminated food

separately, and at potentially different points in time, we estimated the risk from the simultaneous exposure from multiple pathways, where appropriate, across time.

To estimate the integrated and simultaneous exposures to receptors, we developed the 3MRA Model that balances chemical mass across pathways, and reports a total chemical-specific concentration in waste that meets our protection criteria over time. This approach is unlike the 1995 HWIR proposal, which modeled each pathway separately and assumed for each that all the mass went to that pathway. As a result, the 1995 HWIR proposal reported regulatory levels as both as total concentration (for the non-groundwater pathways) and as leach levels (for the groundwater pathways). Because we integrate the pathways in the 1999 HWIR risk assessment, the revised levels would be reported only as the total concentration of the chemical in the waste. We request comment on the revised approach to establish regulatory levels based only on the chemical-specific total concentration in the waste, rather than regulating on both total and leachate levels.

The model incorporates interacting modules that include:

- The source modules, which estimate the simultaneous chemical mass losses to the different media and maintains chemical mass balance of the releases from the waste management unit into the environment over time;
- The fate/transport modules that receive calculated releases from waste management units and distribute the mass through each of the media to determine the chemical concentrations in air, groundwater, soil and surface water across space and time;
- The food chain modules that receive the outputs from the fate and transport modules and estimate the uptake of chemicals in various plants and animals;
- The exposure modules that use the media concentrations from the fate and transport modules to determine the exposure to human and ecological receptors from inhalation (for humans only), direct contact (for ecological receptors only) and ingestion (for both receptor types); and
- The risk module that predicts the risk/hazard quotient for each receptor of concern.

The HWIR99 risk assessment uses a probabilistic approach to develop chemical-specific national distributions of risks. The ''Data Collection'' background document (U.S. EPA, 1999–d through r) discusses which parameters were probabilistically assessed and the quality of the data associated with each probabilistic distribution. We implemented the analysis focusing on evaluating inter-site variability across waste management unit and environmental setting characteristics. For the input parameters with probabilistic distributions, we randomly selected a value from the distribution corresponding to each parameter for each setting. The model generates a distribution of risk outputs that describe the range of individual risks across the nation. Additional discussion of the probabilistic approach can be found in the 3MRA document (U.S. EPA, 1999–b).

Another difference between the HWIR99 risk assessment and previous efforts is the use of an integrated and tiered approach for using site-based, regional, and national data to operate the 3MRA Model. We collected a large amount of data to better describe and model plausible exposure scenarios from chemical-specific releases from the waste management units. Examples of the types of data collected to identify site-based characteristics include facility locations; the physical and environmental characteristics of the sites and surrounding areas (for example, land use, human receptor locations, and ecological habitats). Examples of regional data we collected were: meteorological data, soils characteristics, aquifer data, and types of ecological receptors. Data collected at the national level included human exposure factors, ecological exposure factors, human health toxicity values, and ecological toxicity values.

In addition, our approach to the ecological risk assessment has evolved considerably since the 1995 proposal. Since the 1995 proposal, we have published a document titled *Guidelines for Ecological Risk Assessment* (U.S. EPA, April 1998–a) that provides a framework for conducting ecological risk assessments. A key component of these guidelines is the problem formulation phase of the assessment in which the assessor and manager discuss the goal of the risk assessment. Based on this guidance, we have better defined our objectives for the ecological risk assessment and more clearly stated our management goal and assessment endpoints. These objectives are further discussed in Section XVI.F.2 of this preamble.

C. What Peer Review Has EPA Conducted on the HWIR Risk Assessment and What Were the Results?

We are pursuing two separate levels of peer review activities to support the development of the HWIR risk assessment. The first level of peer review activity involved the *ORD/OSW Integrated Research and Development Plan for the Hazardous Waste Identification Rule* or simply the ''Research Plan'' (U.S. EPA, 1998–f). The Research Plan defines the overall risk assessment strategy. The second level of peer review activity addresses internal supporting databases and modules (for example, the chemical properties database, certain fate and transport modules). We have not completed the independent peer review of all support databases and modules and have not yet addressed all of the comments received for those modules peer reviewed. The peer review comments received to date are in the docket for today's proposed rule. When we publish a revised risk assessment for public notice, we will also give notice of any further peer review comments and how we address those comments.

Peer Review of the Research Plan. The Research Plan was prepared in part as a response to comments on the HWIR 1995 risk assessment. The plan responded to comments from the Science Advisory Board (SAB) (SAB, 1996), comments from the U.S. EPA's Office of Research and Development (ORD) and other internal EPA commenters, and the public. A joint task force between the Office of Solid Waste (OSW) and ORD was formed in order to build a ''good science'' HWIR assessment strategy and implementation technology. The Research Plan is the embodiment of six guiding principles:

1. Requiring a risk-based assessment strategy;
2. Requiring a site-based multimedia, multipathway, and multireceptor risk model;
3. Requiring the necessary assessment databases;
4. Requiring a computer-based technology;
5. Requiring a sound science foundation; and,
6. Conducting the necessary peer reviews.

We sought to particularly address comments resulting from the HWIR95 SAB review. In addition, we conducted a peer review of the Research Plan through an independent evaluation by national experts outside of EPA (Small, Cohen, and Deisler, 1998).

In general, the comments on the Research Plan were favorable. All the reviewers indicated that we had made many improvements recommended by the SAB, resulting in a product superior to that of HWIR95. The reviewers were also pleased with the layout and detail presented in the documentation. The reviewers, however, did have comments

on the current effort. One set of comments was directed at the complex nature of the multi-module system and suggested that a simpler system might be the more appropriate tool, in light of varying model sophistication and data quality. While the reviewers applauded the efforts for the establishment of parameter distributions through Monte Carlo, they expressed their concern as to its transparency to both the scientific and public communities. A complete set of peer review comments on the Research Plan is available in the docket.

As we implemented the strategy set out in the Research Plan, we found that practical limitations forced us to simplify the approach laid out in the plan. A discussion of some of those limitations is found in Section XVII of this preamble and in the technical background document (U.S. EPA, 1999-at).

Peer Review of the HWIR99 3MRA Model. The HWIR99 Model is an integrated system of databases, system processors, and modules. The three databases and six processors that were developed are new and specific to the HWIR99 rulemaking effort. The modules used are a combination of existing models (for example, ISCST3, an air dispersion model) and newly developed models. An extensive external peer review is planned to review all 27 model components (18 modules, three databases, and six processors). As with the Research Plan peer review, each model component was or will be reviewed by a group of independent experts in that respective field. These reviewers are charged with specific scientific concerns unique to each component. Because of the large number of components developed and the timing of their development, this activity has been phased over time and is on-going. Copies of the peer review charges that we have sent out and the peer review comments we have received are available in the docket.

In response to the peer review comments received so far, we have made specific technical modifications to many of the model components, and have worked to improve the transparency and clarity of the documentation. We will continue to review and address the peer review comments and comments from the public as we refine the model in preparation for the final HWIR rulemaking.

D. Which Waste Management Units Did EPA Model?

We modeled five waste management units that represent typical management scenarios that are likely disposal destinations for exempted wastes. The modeled units include landfills, waste piles, land application units, surface impoundments, and aerated tanks. For the landfill, waste pile, land application unit, and surface impoundment, we extracted data related to the location and size of each of these units from the EPA survey of industrial Subtitle D establishments in the U.S. (U.S. EPA, 1987). For the aerated tanks, we extracted size data from *Hazardous Waste TSDF—Background Information for Proposed RCRA Air Emission Standards* (U.S. EPA, 1991-b). Because we had no location data for aerated tanks, we assumed that aerated tanks could be located at any location where a surface impoundment currently exists. Each of the units is discussed below and the release pathways are summarized in Table 4.

Within each type of waste management unit, we sought to maintain mass balance. We begin with a total mass of chemical and partition the mass among volatile, liquid, and sorbed phases. Mass released via each phase is no longer available for partitioning to and release through other phases. The partitioning algorithms and media coefficients that we used are described in the two technical background documents for the modules for the sources (U.S. EPA, 1999–t and –u) and module verifications are described in U.S. EPA (1999-ad and -ae).

We are presenting an approach in the HWIR 3MRA model to address the physical relationship between waste concentrations and leachate concentrations, and mass limitations in the leachate. In the 3MRA model we start with a specified concentration of a chemical constituent and the total mass in a waste management unit, partition the constituent in the waste unit into various environmental media. The partitioning takes into consideration the physical and chemical characteristics of the chemical and the characteristics of the media. The relationship in the model, between the concentration of a chemical constituent in the waste and its concentration in the leachate, depends on these physical and chemical characteristics. The initial chemical mass in the waste management unit depletes with time due to partitioning, degradation and transport. The 3MRA model assumes the initial mass to be finite and then depletes. The concentration of a chemical constituent in a downgradient well is initially zero, gradually reaches a maximum and then declines as the mass released from the waste management unit passes the receptor well area. The details of the partitioning of the chemical mass based on the relationships between the waste and the leachate depend on the physical characteristics of the chemical constituent and the environment. For example, the relationship for organic chemicals depends on the fraction of organic carbon in the waste and other factors. For metals, the relationship depends on the pH, the presence of other inorganic and organic species, temperature, and other factors. This is further described in the various waste management units being modeled in the 3MRA model for HWIR99 (U.S. EPA, 1999–t and –u). We request comments on this approach for establishing an association between the chemical concentration in the waste, the chemical concentration in the leachate, and mass limitations in leachate.

Landfill: We designed the landfill module to simulate the gradual filling of an active landfill and the long-term releases from the active and closed landfills. The design assumes that the landfill is composed of a series of vertical cells of equal volume that are filled sequentially. We assumed that each cell requires one year to be filled. The formulation of the landfill module is based on the assumption that the contaminant mass in the landfill cells might be linearly partitioned into the aqueous, vapor, and solid phases. The partitioning coefficients are based on those reported in the literature (U.S. EPA, 1999–aq). The model simulates the active lifetime of the landfill (30 years) and continues simulating releases until less than one percent of the initial mass is left or for a total of 200 years, whichever occurs first.

We assumed the landfill had minimal controls and was constructed below grade. In particular, we assumed that the unit has no liner; the cover at closure is a soil cover that still permits volatilization and particle emissions; and the below grade design prevents runoff and erosion.

Based on the design assumptions above, we simulated the annual release of chemical mass by leaching to the unsaturated zone underneath the landfill, volatilization to the air pathway, and particle emissions to the air pathway during the active lifetime. Because we assumed the unit was designed below grade, we did not simulate releases through runoff and erosion. In addition, we simulated losses of mass through anaerobic biodegradation and hydrolysis within the landfill.

The module incorporates other assumptions intended to improve the efficiency of the model and are described in the technical background document (U.S. EPA, 1999–t). These

include the lack of lateral transport between cells, simulation of only a single cell and then aggregation of results based on the time each cell is filled, and the assumption that waste is added at a constant concentration at a constant rate.

Waste pile: We designed the waste pile module to simulate the management of wastes in a pile situated above grade, with the releases of chemicals occurring during the operating lifetime of the pile. The unit is described fully in the technical background document (U.S. EPA 1999–t). We assume that the waste pile is a set height and constant area, and that waste in the waste pile is refreshed on an annual basis. At the end of the active period, which is 30 years in this simulation, the waste pile is removed.

Based on the design assumptions, we simulated annual releases of leachate to the unsaturated zone underneath the pile, volatiles to the air, particles to the air, particles through erosion and runoff, and dissolved chemicals through runoff. In addition, we simulated losses through hydrolysis and aerobic degradation in the surface layer and hydrolysis and anaerobic degradation in the subsurface waste pile layers.

The waste pile design did not incorporate management controls. However, we assumed the waste pile was situated in a local watershed basin, such that run-on of uncontaminated soil to the management unit did not occur and soil released from the waste pile mixed with the surficial watershed runoff.

Land application unit: We designed the land application unit module to simulate the disposal of wastes in an open field for the purpose of degradation or treatment of chemicals. This module is described fully in the technical background document (U.S. EPA, 1999–t).

The model assumes that waste is applied to the surface soil periodically and then tilled into the top layer of the soil. Waste is applied during each of the 40 years of operation. We simulated releases during the active phase and up to 200 years after the land application unit is closed or when less than one percent of the total mass remains. The waste is applied on a wet weight basis and the water content of the waste is used to calculate the total infiltration to the unsaturated zone. We also assumed that the characteristics of the waste did not alter the characteristics of the native soil. Other than tilling into the soil, we did not assume management controls were present that might limit releases from the land application unit.

Based on the design assumptions, we simulated annual releases of leachate to the unsaturated zone, volatiles to the air, particulate matter to the air, particles through runoff and erosion, and dissolved chemicals in runoff. In addition, we considered chemical losses through hydrolysis and aerobic biodegradation. Also, because these waste management units are on the land surface, they are integral land areas in their respective watersheds and, consequently, are not only affected by runoff and erosion from upslope land areas, but also affect downslope land areas through runoff and erosion. Indeed, after some period of time during which runoff and erosion have occurred from a waste management unit, the downslope land areas will have been contaminated and their surface concentrations could approach (or conceivably even exceed) the residual chemical concentrations in the waste management unit at that point in time. Thus, after extensive runoff and erosion from a waste management unit, the entire downslope surface area can be considered a ''source'' and it becomes important to consider these ''extended source'' areas in the risk assessment. It is for this reason that a holistic modeling approach was taken with the waste pile and land application unit source models to incorporate them into the watershed of which they are a part.

The land application unit is fully integrated in the local watershed and is simulated as one part of the local watershed. Thus, soils from watershed areas above the land application unit might run-on to the source and mix with the surficial soils of the land application unit. Surface impoundment: We designed the surface impoundment module to simulate the disposal of liquid wastes in an earthen material pit and the releases of chemicals during the lifetime of the unit. The module is described fully in the technical background document (U.S. EPA, 1999–u). We assumed that the impoundment was a sink in the watershed. We assumed that no liner other than native soils was present, no cover was present, and that the unit was comprised of two well-mixed phases: liquid and sediment. We also simulated the changes at the bottom of the impoundment over time as settled solids fill pore space in native soils and impact chemical transport to underlying soils and groundwater. In addition, a fraction of each surface impoundment is aerated, which enhances biodegradation and increases volatilization of some chemicals. The surface impoundment is assumed to operate 50 years and then undergo clean closure (that is, all waste is removed from the unit).

Based on the design assumptions, the surface impoundment module simulates annual release of leachate to the unsaturated zone and volatile emissions to air. Because the surface impoundment is assumed to be a sink, overland runoff was not modeled. Also, the redeposition of volatiles into the unit through precipitation was not simulated. The model accounts for several biological, chemical, and physical processes including hydrolysis, volatilization, sorption as well as settlement, resuspension, growth and decay of solids, activated aerobic biodegradation in the liquid phase (that is, a higher rate based on the amount of biomass present) and hydrolysis and anaerobic biodegradation in the sediments.

The migration of contaminants from the surface impoundments to the subsurface has not been addressed rigorously in the past versions of this module. This is primarily due to lack of understanding on the processes related to bottom sediment layers in surface impoundments. We enhanced the surface impoundment module for the HWIR99 analyses by adding the formation and characterization of the bottom layers.

Aerated Tank: We designed the aerated tank module to simulate releases from aerated tanks used for the treatment of wastewaters during the operating lifetime of the aerated tank. We chose to focus on aerated tanks because such aerated tanks would have more rapid volatilization and therefore present more air risks. The module is described fully in the technical background document (U.S. EPA, 1999–u).

We selected aerated tanks from the *Hazardous Waste TSDF—Background Information for Proposed RCRA Air Emission Standards* (U.S. EPA, 1991–b) to populate the database of unit characteristics. We further limited the aerated tanks in our database by not including aerated tanks that were the size of a drum or smaller because such units are more likely to be short-term units and would also present lower risks. We also assumed that an aerated tank would operate as long as the surface impoundment and therefore selected 50 years as the operating time for an aerated tank. However, we assumed each aerated tank only had a maximum lifetime of 20 years, and therefore, the operating lifetime would include the replacement of the aerated tank every 20 years. Finally, we assumed that the aerated tanks did not

fail or leak for the purposes of the long-term exposure scenario.

Based on the design assumptions, we simulated annual volatile emissions to air. Because we did not model failures of the aerated tanks, we did not simulate leaching to the unsaturated zone or overland runoff. We did estimate losses through hydrolysis and activated aerobic biodegradation. Finally, we did not estimate redeposition of contaminants in to the aerated tank from rainfall. We request comments and suggestions on the methodologies used for modeling the environmental releases for HWIR99, and the data and methodologies used to support the overall modeling framework.

TABLE 4.—HWIR UNIT TYPES AND RELEASE MECHANISMS

	Leaching to groundwater	Volatilization	Wind-blown dust	Runoff and erosion
Landfill	X	X	X	
Waste Pile	X	X	X	X
Land Application Unit	X	X	X	X
Surface Impoundment	X	X		
Aerated Tanks		X		

E. What Types of Environmental Releases Did EPA Consider When Determining How Chemicals Move Through the Environment?

We modeled four environmental media into which chemicals could enter after release from a waste management unit : (1) Atmosphere, which includes modeling of dispersion of volatiles and particles from waste management units, (2) watershed, which includes modeling the response of watersheds to runoff from waste management units, (3) surface water, which includes modeling of migration of chemicals in surface water, and (4) groundwater, which includes modeling of the migration of chemicals in the subsurface. We also modeled three food chain pathways that could contribute to a receptor's exposure. These were the farm food chain for human receptors, the terrestrial food web for the ecological receptors, and the aquatic food web for human and ecological receptors.

We have attempted to use state-of-the-science procedures to model the fate and transport of chemicals. However, because of the national scale of the assessment and the complexity of probabilistic multimedia modeling, we had to select or simplify our modules to make them computationally efficient yet maintain a strong science-based assessment. The modules described here are presented in more detail in the technical background documents that are cited. We request comments and suggestions on the methodologies used for modeling the environmental fate and transport for HWIR99, and the data and methodologies used to support the overall modeling framework. The uncertainties associated with each of the modules of 3MRA are described below, and additional uncertainties are discussed in Section XVII of this preamble.

1. Atmospheric Modeling: The HWIR99 atmospheric modeling provides an annual average estimate of air concentration of dispersed chemicals and annual deposition rate estimates for vapors and particles at various receptor points in the area of interest. The area of interest is defined by a 2 km radius measured from the edge of the largest area source at the site. The chemicals are assumed to be in the form of volatilized gases or fugitive dust emitted from area sources. The atmospheric module simulates the transport and diffusion of the chemical. The simulated air concentrations are used to estimate biological uptake from plants and human exposures due to direct inhalation. The predicted deposition rates are used to determine chemical loadings to watershed soils, farm crop areas, and surface waters. The details of the atmospheric modeling are presented in the atmospheric modeling background documents (U.S. EPA, 1999–v through –x).

The atmospheric concentration and deposition of chemicals were determined through a steady-state Gaussian plume modeling approach using the Industrial Source Complex-Short Term (ISCST3) model. This model, which was tailored to the HWIR99 risk assessment, uses hourly meteorological data and provides estimates of contaminant concentration, dry deposition (particles only) and wet deposition (particles and gases) for user-specified averaging periods (annual for HWIR99).

Our preliminary model runs indicated that it was not computationally feasible to run ISCST3 on an hourly basis for the lifetime of the unit. To reduce the computational burden, we made several simplifications to air modeling. One simplification was to use a long-term estimate of the concentration and deposition. We ran ISCST3 using normalized emissions from the units to produce annual average concentration and deposition estimates. These estimates were converted to yearly estimates by multiplying the normalized-concentration and annual deposition predictions by the emission rate for each year. Annual averages were then divided by 365.25 to provide predictions in the required daily average units.

A second simplification was to model a fraction of the hours in a year. We used the Sampled Chronological Input Model (SCIM) to sample the long term meteorological record at regular, user-specified intervals and scale the model results at the end to produce the annual average estimates. We conducted a study to determine the optimum sampling interval (U.S. EPA, 1998–c). The study showed that for dry deposition, sampling every 193rd hour from a 5-year database produced results essentially the same as those obtained when using the full meteorological record. However, this simple sampling scheme significantly underestimated wet deposition, particularly at sites with infrequent precipitation. For wet deposition, we included an additional sampling interval (every eighth hour) during hours with precipitation. This resulted in estimates that were not significantly different than those obtained from the full record.

A third simplification involved deposition of gases. Currently, there are no air models that contain algorithms specifically designed to model the dry deposition of gases. In place of algorithms, we used a transfer coefficient to model the dry deposition of gases. A concern with this approach is that deposition would be calculated outside the model, which precludes the consideration of the deposition in the amount of material depleted from the plume. This results in non-conservation of the mass in the system.

A final simplification is the use of a scavenging coefficient for all gases that is based on approximating the gases as

very small particles. This approach eliminates the need for running ISCST3 for each specific chemical, thus reducing the overall runtime. This simplification might lead to under-prediction of wet deposition for some gases and over-prediction for others depending on the Henry's Law coefficient for the gas.

2. *Watershed modeling:* The watershed module is based on conceptual and mathematical models that are very similar to those used for the land application unit and waste pile sources, that is, the combined ''local watershed/soil column'' algorithm described in Section 3.4 of U.S. EPA (1999–y). As implemented in the watershed module, the model is a dynamic, one-dimensional (vertical), fate and transport model that also includes hydrological functionality. Each watershed is independent of other watersheds and is simulated individually. Each watershed is conceptualized as a ''soil column'' with chemical loads being deposited on its surface from aerial deposition. The deposited loads are in the form of a varying annual average time series. The vertical distribution of the chemical as a function of time is then simulated by the model.

Fate and transport processes simulated by the watershed module are volatilization, leaching, runoff, erosion, infiltration and biological and/or chemical degradation. Hydrological functionality includes storm event-specific runoff estimates, based on the Soil Conservation Service's ''curve number'' method, storm event-specific soil erosion losses, based on the (modified) Universal Soil Loss Equation, and infiltration/recharge estimates based on daily runoff, evapotranspiration, and soil moisture modeling. The theoretical background and the implementation of the watershed module are presented in the background document (U.S. EPA, 1999–y).

The chemical loads to a waterbody simulated by the watershed module are indirect loads only. The sole source of chemical is aerial deposition. Chemical loads to the waterbody resulting from *direct* runoff and erosion from a waste management unit are simulated by the appropriate source module (land application unit or waste pile). Similarly, if a receptor is located in a buffer area between a waste management unit and the downslope waterbody (that is, in the ''local watershed''), the *total* surficial soil concentration that the receptor is exposed to is the aerial deposition-related concentration simulated by the watershed module *plus* the runoff/erosion-related concentration simulated by the relevant source module.

Because the surface-transport processes in the watershed module are hydrologically related, the land areas surrounding the waste management unit are disaggregated on a watershed basis, and each watershed delineated is modeled independently. A watershed can vary in size from a sheet flow-only ''hillside,'' similar to the ''local watershed'' construct of the land application unit and waste pile, to much larger areas encompassing regional stream or river networks. In all cases, a given watershed is modeled as a single, homogeneous area with respect to soil characteristics, runoff and erosion characteristics, and chemical concentrations in soil. No spatial disaggregation below the watershed level is made, that is, no spatial chemical concentration gradients are simulated across the ground surface of a given watershed.

There are a number of limitations of the watershed module that are imposed by the overall HWIR objectives and system design, for example, the practical inability to calibrate models to site-specific data. In addition, the hydrology submodels (the curve number method for runoff and the use of the Universal Soil Loss Equation) are relatively simplistic methodologies intended to yield planning-level estimates.

Another limitation is the possibility of spatial dilution of hot spots from atmospheric deposition. Because each watershed is modeled as a single, homogeneous area with an annual atmospheric loading based on the overall watershed average, any relative hot spot falling in a much larger watershed will become spatially diluted, and associated risks to humans or ecological receptors will be underestimated if those receptors spend most or all of their exposure duration within the hot spot itself.

Uncertainties of the watershed module pertain both to uncertainties in assumed functional forms of submodels (for example, first order reaction kinetic assumptions, relationship of runoff to precipitation) as well as uncertainties in parameter values. Parameter uncertainties are mitigated by the use of probabilistic sampling methods for these parameters. However, given the very limited number of realizations that are available, these parameter uncertainties are not completely quantified.

3. Groundwater modeling: The groundwater pathway consists of two components: flow and transport in the vadose zone (that is, the unsaturated zone directly below the unit), and flow and transport in the saturated zone. The modules for these two components are based on the flow and transport modules in EPA's Composite Model for Leachate Migration with Transformation Products (EPACMTP) (U.S. EPA, 1996–a and –b and 1997–c). The vadose-zone module (VZM) simulates moisture migration and transport of contaminants between the waste management unit and the water table. The saturated zone module (SZM) simulates flow and transport of contaminant in the aquifer over which the waste management unit is located, and determines contaminant concentrations at receptor wells, and mass fluxes to nearby downgradient surface water bodies. Details of the two modules are provided below.

Vadose Zone Module (VZM). Flow in the vadose zone is modeled as steady-state and one-dimensional (vertical) from underneath the source and the surficial soil outside the unit toward the water table. The lower boundary of the vadose zone is the water table. The flow in the vadose zone is predominantly gravity-driven, and therefore the vertical flow component accounts for most of the fluid flux between the source and the water table. The flow rate is determined by the long-term average infiltration rate through the waste management unit. Contaminant is transported in the vadose zone by advection and dispersion. Initially, the vadose zone is assumed to be contaminant-free and contaminants are assumed to migrate vertically downward. The technical details on the VZM are provided in the background documents for the vadose zone (U.S. EPA, 1999–aa and –ac).

The VZM receives the net rate of vertical downward percolation from the waste management unit through the unsaturated zone and to the water table. Infiltration rates and contaminant mass fluxes emanating from the unit are provided as a time series of annual average rates. The VZM require an effective steady state infiltration rate and annual average contaminant concentrations. In calculating the effective infiltration rate, the VZM conserves mass and uses the full time series of annual average rates.

The output of the VZM are a time series of contaminant concentrations, the times at which the concentrations are reported, the effective infiltration rate, and the duration of the source boundary condition.

The module includes the following limitations:

- Transient effects of the flow are not considered.

Multi-phase flow and transport are not permissible. Non-Aqueous Phase Liquid (NAPL) flow and transport are not permissible. (For more information on NAPLs please see Section XVII.D.3.)

- Vapor-phase diffusion is not allowed.
- Fingering effects in the vadose zone are excluded.
- Clay lenses or potential flow and transport barriers in the vadose zone are not considered.
- Decay is limited to first-order. Lag time for decay is not considered.
- The transport domain in the saturated zone is kept constant. Effects due to mounding caused by infiltration from waste management units are not considered. These effects would decrease the depth of the flow and transport domain in the vadose zone.

Saturated Zone Module (SZM). For HWIR 99, the SZM simulates groundwater flow using a one-dimensional steady-state solution for predicting hydraulic head and Darcy velocities. The aquifer is assumed to be of uniform thickness, subject to recharge along the top of the aquifer with a regional hydraulic gradient. The saturated zone transport module simulated the advective-dispersive transport of dissolved one dimension with the other two dimensions added analytically (pseudo three dimensional). The technical details on the SZM are provided in the background document for the saturated zone (U.S. EPA, 1999–aa, U.S. EPA, 1999–ab).

In implementing, the SZM we set the initial contaminant concentration to zero. The concentration gradient along the downstream boundary is zero, and the lower aquifer boundary is taken to be impermeable. A zero concentration condition is used for the upstream aquifer boundary. Contaminants enter the saturated zone through a patch source on the upper aquifer boundary directly beneath the source. Recharge of contaminant-free infiltration water occurs along the upper aquifer boundary outside the patch source. Transport mechanisms considered are advection, dispersion, linear or nonlinear equilibrium adsorption, and first-order decay.

The major simplifying assumptions used to simulate contaminant transport in the saturated zone are:

- The flow field is at steady state.
- The aquifer is homogeneous and initially contaminant free.
- Adsorption onto the solid phase is described by an equilibrium isotherm.
- Chemical and/or biochemical degradation of the contaminant can be described as a first-order process.
- The contaminants exist in two phases: solids and liquids. The liquid phase is considered a dilute solution of the contaminant.
- The flow field is not affected by traversing streams, nor by extraction wells.
- Mass lost to streams located between the wells and the waste management units is assumed to be small compared with the bulk of the contaminant mass in the saturated zone. All the surface waters are assumed to be gaining surface waters; in other words, groundwater is always assumed to flow from the aquifer into the stream or other surface water body. Down-gradient wells beyond the streams or surface waters are assumed to be unaffected by the presence of surface waters.

The module requires the input of an effective, steady-state recharge rate from the VZM. The primary outputs of the SZM are annual average concentrations at observation/receptor well locations for all chemicals and annual average mass fluxes to surface waters or all chemicals.

Although we did not implement this feature because of time constraints, the saturated zone module (SZM) can factor the effects of fractures in porous media into the modeling. Similarly, we also have the ability to incorporate effects of heterogeneity in aquifers (U.S. EPA–ag), but did not implement this feature due to time constraints. Both of these capabilities are discussed further in the technical background document (U.S. EPA, 1999–aa) We request comments on implementing these features in the future.

The uncertainties in the modeling results are associated with the following limitations of the SZM module.

- Transient effects of the flow, recharge, and infiltration are not considered.
- Spatially varied recharge is not considered.
- Source geometry is limited to an idealized square, with two opposite sides parallel to the flow direction.
- Multi-phase flow and transport are not modeled. Non-Aqueous Phase Liquid (NAPL) flow and transport are not modeled (For more information on NAPLs, please see Section XVII.D.3.)
- Contribution of contaminant to the saturated zone via vapor-phase diffusion above the water table is not modeled.
- Karst conditions are not modeled.
- Decay is limited to first-order. Lag time for decay is not considered.
- The presence of different hydrogeologic zones in the flow and transport domain is not considered.
- The transport domain in the saturated zone is kept constant. Effects due to significant mounding caused by infiltration from waste management units are not considered.
- Domain geometry is limited to the idealized rectangular shape. Other geometries are not considered.
- Only flow to the gaining surface waters, with axes normal to the groundwater flow direction, is modeled. Effects of streams on the flow field are not considered.
- Only receptor wells with small extraction rates are considered. Effects of extraction on the groundwater flow field are not considered.

Metals Transport. The mobility of metals in the subsurface is dependent on the geochemical properties of the soil and groundwater. To account for the metal-specific interactions with various subsurface environments, we used national distributions of key geochemical parameters. In this methodology, we used the MINTEQA2 metals speciation code to generate non-linear adsorption isotherms for each metal. We produced a set of isotherms for each metal reflecting the range of geochemical environments that is expected to be encountered at waste sites across the nation. We then used this set of isotherms to generate two subsets of isotherms for each metal: one for the vadose zone, the other for the saturated zone. Within the Generalized Soil Column Model within the source models for non-wastewater waste management units, adsorption isotherm values were approximated by treating the input adsorption isotherms for metals as a random variable in the sampling scheme. We recognize that this ignores the possible dynamic effects of aqueous phase contaminant concentration, precipitation, dissolution, adsorption/desorption, and the geochemistry of media (*e.g.*, oxidation-reduction conditions) on the value of the adsorption isotherms and the fate and transport behavior of metals in general.

There are many sources of uncertainty associated with the distribution coefficients generated by MINTEQA2. These can be categorized as: (1) Uncertainty arising from model input parameters, (2) uncertainty in database equilibrium constants, and (3) uncertainty due to application of the model. The details of methodology and data used are provided in the technical background documents on metals transport (U.S. EPA, 1991–a; 1996–a; 1998–d; 1998–e and 1999–ah).

4. *Surface Water Modeling:* Chemical mass released from a waste management unit can enter the local surface waterbody network in runoff and erosion directly from the waste

management unit, from atmospheric deposition to the water surface, in runoff and erosion from adjoining watershed subbasins, and by interception of contaminated groundwater. The chemical is then subject to transport and transformation processes occurring within the waterbody network, resulting in variable chemical concentrations in the water column and in the underlying sediments. These chemical concentrations are the basis for direct exposure to ecological receptors and indirect exposure through uptake in the aquatic food web.

The HWIR Surface Water Module takes the loadings calculated by the source, atmospheric, watershed, and groundwater modules, along with data on meteorology, hydrology, environmental conditions, and chemical reactivity, and calculates the dissolved and suspended chemical concentrations throughout the waterbody network over time. The Surface Water Module consists of the core model EXAMS II (U.S. EPA, 1982 and 1997–a) and the interface module EXAMSIO (U.S. EPA, 1999–au). EXAMS is a general surface water fate model for organic chemicals. This compartment model has been used routinely by both EPA and industry analysts for the analysis of expected pesticide concentrations in generically defined environments, such as farm ponds. It has also been used for site-specific analysis of pesticide concentrations in various waterbodies around the world. The interface module EXAMSIO was developed specifically for HWIR. It reads data from other HWIR modules and databases, and builds EXAMS input files describing the waterbody environment and chemical properties, along with the command file that specifies the chemical loading history and controls the EXAMS simulation. Control is passed to EXAMS, which conducts the simulation and produces intermediate results files. EXAMSIO then processes the intermediate files and passes the output data back to the proper HWIR databases.

The surface water module as implemented by EXAMSIO and EXAMS employs several simplifications in order to meet HWIR project requirements and constraints. The project design calls for repeated long simulations (200 to 10,000 years) executed quickly (seconds to minutes). This requirement limits the temporal resolution at which simulations can be conducted. Another important constraint is limited site-specific surface water data. This constraint limits the accuracy with which a particular site can be described. The major model simplifications made in response to these project constraints include the use of annual average hydrological and loading inputs, the use of national distributions to specify some site-specific environmental conditions, and the use of a simple solids balance with no settling and burial. For sites that experience periodic drying, a small positive flow equivalent to 5 mm/year of direct precipitation onto the waterbody surface was assumed in order to keep the model functioning.

These simplifications could lead to a degree of model error in the calculated concentrations. Using annual average loadings and flows rather than daily loadings and flows will lead to calculated annual average concentrations that are biased somewhat high, depending on the correlation between flow and loading at a particular site. This bias is somewhat mitigated for reactive and volatile chemicals where the loss rate is proportional to the concentration. The use of national distributions rather than site-specific environmental data could cause calculated concentrations to be low or high at a given location, with no known general bias. The simple solids balance will overestimate suspended solids concentrations slightly in streams and more significantly in ponds, wetlands, and lakes. Calculated total water column chemical concentrations will be high, while the dissolved chemical fraction will be low. The net result for dissolved water column chemical concentrations, which are used for fish exposure, is not expected to be biased significantly high or low.

The effect of assuming a small positive flow equivalent to 5 mm/year of direct precipitation onto the waterbody in order to prevent drying is more difficult to evaluate. This procedure conducts chemical loads downstream within a remnant aquatic reach rather than within runoff over a dry bed. While the mass balance is maintained, the chemical and solids concentrations will tend to be elevated within the remnant reach. These elevated concentrations are probably realistic for years in which evaporation exceeds all hydrologic inflows.

Organic chemical simulations account for ionization and sorption as equilibrium reactions, and volatilization, hydrolysis, biodegradation, and reduction as first-order kinetic reactions. Metals are simulated as conservative chemicals that partition to suspended and benthic solids; partition coefficients are based on a literature survey that summarizes metals partitioning behavior in surface water and sediments. Mercury is simulated as three interacting components subject to methylation, demethylation, reduction, and volatilization, as well as partitioning to suspended and benthic solids.

5. Food chain modeling: We estimated chemical concentrations in fruits and vegetables, beef and dairy products, and fish (for human receptors) and in prey and plant food items (for ecological receptors) by simulating uptake from the air, water, and/or soil and transport in these food items. This uptake and transport modeling uses empirical biotransfer factors. These factors are based on the methodologies and equations in the April 1997 internal review draft of the *Methodology for Assessing Health Risks Associated with Multiple Exposure Pathways to Combustor Emissions* (U.S. EPA, 1997–f), commonly referred to as the Indirect Exposure Methodology (IEM). The food chain methodologies and equations as implemented for HWIR99 are described in the docket (US EPA, 1999–al, 1999–am, and 1999–ap).

F. Which Receptors Did EPA Model When Assessing Exposure to the HWIR Exempt Waste?

1. *Which human receptors did EPA model?* We modeled four receptor types: residents, home gardeners, farmers (beef and dairy) and recreational fishers. Some of these receptor types overlap; a resident, gardener, or farmer could also be a recreational fisher, and the farmer could be a beef farmer, dairy farmer, or both. For each receptor type, we evaluated exposures to four age cohorts: ages 1–5; ages 6–12; ages 13–19; and older than age 19.

Some of the modeled receptors might be exposed through several pathways, some might only be exposed through one pathway, and some might not be exposed at all to any pathway. Receptor are evaluated for exposures with respect to chemicals present in ambient air (both vapors and particles), soils, groundwater, fruits and vegetables, beef and dairy products, and fish. Annual exposures are chemical and environmental setting specific and are estimated to occur for up to 10,000 years or when the chemical concentration in a particular media (for example, groundwater) decreases to less than one percent of the maximum concentration for that media.

Residents breathe contaminated air and ingest contaminated soil (as an incidental contamination of hands or foods). A subset of residents have private drinking water wells and are exposed to contaminated groundwater through both direct drinking water ingestion and inhalation through showering. Those on public water

supply are assumed to have treated water that meets all drinking water standards. We used the 1990 U.S. Census block survey data to estimate the number of residents and their ages within two kilometers of each of the 201 sites evaluated.

Home gardeners are residents who are also exposed to contaminated homegrown fruits and vegetables. We estimated the percentage of the entire population within two kilometers of the waste management unit that are home gardeners based on national data presented in EPA's *Exposure Factors Handbook (EFH)* (U.S. EPA, 1997–d).

Farmers are exposed through inhalation of ambient air, inhalation of shower air, ingestion of groundwater, ingestion of soil, and ingestion of fruits and vegetables. In addition, beef farmers are exposed through ingestion of beef and dairy farmers are exposed through ingestion of milk. We estimated the numbers and types of farms and farmers within the two-kilometer area of interest from a combination of the 1990 Census data (U.S. Bureau of the Census, 1990), Geographic Information Retrieval and Analysis System (GIRAS) land use data, and county-level census agricultural data (U.S. EPA, 1994). We averaged the 1987 and 1992 Census of agricultural data to approximate 1990 (for consistency with the population census).

Recreational fishers have the same exposures as either the resident, the home gardener or the farmer, but are also exposed through fish ingestion. The number of recreational fishers at each site was estimated from the 1990 Census data (U.S. Bureau of the Census, 1990) and state-level information from the U.S. Fish and Wildlife Service National Wildlife Survey (U.S. F&WS, 1991).

Infants are assumed to be exposed through mother's contaminated breastmilk. For infant exposure through breastmilk, the maternal exposure through all pathways was summed. The mother is assumed to be an adult (as opposed to a teenager) for the purpose of calculating maternal dose in the infant breastmilk pathway. The current methodology for infant exposure would apply only to dioxin and dioxin-like chemicals. We invite comment on this approach and whether it should be applied to other chemicals in the assessment.

For each of the receptor types, we estimated carcinogenic risks assuming a nine-year exposure duration based on average exposure during this period. Nine years is the median residence duration of the distribution for all ages as reported in the Exposure Factors Handbook (U.S. EPA, 1997–d). That is, half the population would be exposed for less than nine years and half for greater than nine years. Aging of cohorts into subsequent cohort age classes, and their differing exposures, is included. For each receptor location, human risk is estimated by aggregating exposure pathways, when appropriate. The aging of a cohort into the subsequent cohort age category(s), and the resulting differences in exposure, is included in this average calculation. For non-cancer risk calculations, exposure is assumed to vary annually; we did not use a longer averaging period. Therefore, a single high year of maximum exposure would not be ''diluted'' by a multi-year averaging period. That is, we estimated non-cancer hazard quotients based on the maximum annual average concentration. This is a conservative approach which might overestimate risks. The exposure and risk methodologies are described in the *Background Document for the Human Exposure Module for the HWIR99 3MRA Model* (U.S. EPA, 1999–aj) and *Background Document for the Human Risk Module for the HWIR99 3MRA Model* (U.S. EPA, 1999–ak), respectively.

The use of the maximum one year concentration for estimation of non-cancer hazard quotients introduces a potential bias when exposure to the constituent is associated with chronic effects from long-term exposure. The annual average concentration will tend to overestimate risk, as RfDs and RfCs for chronic effects are based on lifetime average exposure. On the other hand, use of the annual average concentration will tend to underestimate risk for developmental toxicity. In this case, annual average concentrations might mask higher short-term peak exposures resulting in an underestimation of the effective HQ (primarily for women of child-bearing age). EPA's noncancer toxicity assessment methodology, however, tends not to attach a great deal of significance to specific endpoints observed in test animals, as a general concordance of effects among species has not been demonstrated. The entire body of evidence must be evaluated in each case in order to determine whether specific effects are likely in humans.

We estimated exposures for residential receptors (residents and home gardeners) at a single location in each of the census blocks in the 2-kilometer study area, and for farmers at a single farm in each of the census block groups in the 2-kilometer study area. Recreational fisher exposures are calculated and averaged across up to three randomly selected waterbodies over the entire study area. The random selection of waterbodies is made once for recreational fishers who are residential receptors, and once for recreational fishers who are farmers. We assumed that human receptors both reside and work at the receptor location identified for them during site characterization. This assumption might overestimate or underestimate exposure to an unknown degree and bias, because it is possible that individuals might reside at the identified location within the study area, but commute to work areas outside of the study area, or could commute to more highly contaminated areas within the study area.

For each receptor type, we estimated only the incremental exposures, risks, and hazards quotients for a chemical. We did not consider background exposures from natural or other man-made sources. For cancer risks, we assumed lifetime exposure risks are in direct proportion to the fraction of a lifetime actually exposed (that is, 350 of 365 days per year (15 days away per year) for each year of the exposure duration. We did not consider additive, synergistic, or antagonistic effects among multiple chemicals. This assumption might overestimate or underestimate exposure to an unknown degree and bias. In addition, we did not consider age-specific differences in exposure responses; that is, we did not vary cancer slope factors with cohort age.

TABLE 5.— HWIR RECEPTOR TYPES AND EXPOSURE PATHWAYS

	Resident	Home gardener	Farmer	Fisher	Infants
Inhalation	X	X	X	X.	
Soil Ingestion	X	X	X	X.	
Groundwater Ingestion	X (subset)	X (subset)	X (subset)	X (subset).	
Inhalation during showering	X (subset)	X (subset)	X (subset)	X (subset).	
Fruit and vegetable ingestion		X	X	X (subset).	

TABLE 5.— HWIR RECEPTOR TYPES AND EXPOSURE PATHWAYS—Continued

	Resident	Home gardener	Farmer	Fisher	Infants
Beef and/or milk Ingestion			X	X (subset).	
Fish ingestion				X.	
Breast milk ingestion					X.

2. *How were human exposures estimated?* We estimated the contaminant exposure that human receptors incur (mass of contaminant per mass of body weight) based on simulated concentrations in the various environmental media or food items, pathway-specific ingestion or inhalation rates, and receptor cohort-specific body weights. Exposure factors (for example, intake rates, residence duration) were fixed for all receptors of a given type and age at each site. With the exception of the shower inhalation exposure, the methodologies and equations used for the exposure calculations are from the *Methodology for Assessing Health Risks Associated with Multiple Exposure Pathways to Combustor Emissions* (U.S. EPA, 1997–f). The shower inhalation algorithm was adapted from McKone (McKone, 1987). All methodologies and equations as implemented for HWIR99 are fully described in the technical background document: *Human Exposure Module: Background and Implementation for the HWIR99 Multimedia, Multipathway and Multireceptor Risk Assessment (3MRA) Model* (U.S. EPA, 1999–aj).

3. *Which ecological endpoints did EPA model?* We defined several ecological assessment endpoints to evaluate, based on the management goal of protecting terrestrial and aquatic ecosystems from HWIR exempted waste. The assessment endpoints that we chose to evaluate are shown in Table 6. These endpoints represent the general trophic levels within a food web and are broad enough to characterize the functionality and trophic level interactions within most habitats. In addition, these assessment endpoints generally capture the significant biota of most habitats.

TABLE 6.—ASSESSMENT ENDPOINTS CONSIDERED FOR THE HWIR ECOLOGICAL ASSESSMENT

Ecological significance	Assessment endpoints	Example	Characteristic	Measure of effect
Upper trophic level consumers; Top recipients of bioaccumulative chemicals; Represent species with large foraging ranges; Represent species with longer life spans.	Viable mammalian wildlife populations.	Deer mouse, meadow vole, red fox.	Reproductive and developmental success.	Chronic or subchronic NOAEL(s) or LOAEL(s) for developmental and reproductive effects.
	Viable avian wildlife populations.	Red-tailed hawk, northern bobwhite.	Reproductive and developmental success.	Chronic or subchronic NOAEL(s) or LOAEL(s) for developmental and reproductive effects.
Species represent unique habitat niches (e.g., partially aquatic and terrestrial); Some species are sensitive to contaminant exposure.	Viable amphibian and reptile wildlife populations (''herps'').	Frog, newt, snake, turtle.	Reproductive and developmental success.	Chronic or subchronic NOAEL(s) or LOAEL(s) for developmental and reproductive effects.
Represents base food web in terrestrial systems; Habitat vital to decomposers and soil aerators; Proper soil community function related to nutrient cycling.	Sustainable soil community structure and function.	Nematodes, soils mites, springtails, annelids, arthropods.	Growth, survival, and reproductive success.	95% of species below no effects concentration at 50th percentile confidence interval.
Primary producers of energy in ecosystems; Act as food base for herbivores; Able to sequester some contaminants; Can act as vectors to bioaccumulation; Constitute a large fraction of the earth's biomass.	Maintain primary terrestrial producers (plant community).	Soy beans, alfalfa, rye grass.	Growth, yield, germination.	10th percentile from LOEC data distribution.
Highly exposed receptors from constant contact with contaminated media Act as vectors to transfer contaminants to terrestrial species.	Sustainable aquatic community structure and function.	Fish (salmonids), aquatic invertebrates (daphnids).	Growth, survival, reproductive success.	Ambient water quality criteria (AWQC) for aquatic life (95% species protection).
Provide habitat for reproductive lifestages (e.g., eggs, larval forms); Habitat for key invertebrate species; Act to process nutrients and decompose organic matter.	Sustainable benthic community structure and function.	Protozoa, flat worms, ostracods.	Growth, survival, reproductive success.	10th percentile from LOEC data distribution.
Primary producers of energy in the aquatic system; Base food source in the aquatic system; Can act to sequester contaminants from the water column; Act as substrate for other organisms in the water column (e.g., periphyton).	Maintain primary aquatic producers (algal & plant community).	Algae and vascular aquatic plants.	Growth, mortality, biomass, root length.	EC_{20} for algae; lowest LOEC for aquatic plants.

Our first step for selecting ecological receptors was to identify the habitats that might exist near a site. We collected GIRAS land use maps, National Wetland Inventory maps, and National Wildlife Refuge maps to plot the types of land uses around the sample sites. We then delineated habitats within two kilometers of the waste management unit to identify the habitats around the site. We identified subclasses of terrestrial habitats, aquatic habitats, and wetlands based on the regional location of the site. A detailed description of the subclasses considered is found in the background document (US EPA, 1999–an). We then used the habitat description and regional location to identify potential receptors for each site-based habitat.

The second step in the process was to assign receptors. Based on the ecological assessment endpoints, we sought to capture the range of organisms that might reside in a specific habitat and represent the functions and trophic levels typically present in that habitat. Thus, we modeled a suite of receptors that represent various trophic levels within terrestrial, aquatic, and wetland habitats. The receptors that we evaluated included: soil communities, terrestrial plant communities, mammalian populations, and avian populations for terrestrial habitats; and sediment communities, aquatic plant communities, aquatic communities, amphibian populations, mammalian populations, and avian populations for aquatic habitats. For wetlands, we assigned groups of these aquatic and terrestrial receptors based on the type of wetland present at a site. In an effort to make the assessment site-based, we used information on the location of the site to identify the receptors that might occupy different functions or trophic levels. The list of receptors by habitat is found in the background document (U.S. EPA, 1999–an). The description of the ecological risk methodologies are described fully in the *Background Document for the Ecological Risk Module for the HWIR99 3MRA Model* (U.S. EPA, 1999–ao).

4. *How were ecological exposures estimated?* Similar to estimating human receptor exposures, we estimated ecological receptor exposures based on simulated contaminant concentrations in the various environmental media and food items, pathway-specific ingestion rates, and receptor type-specific body weights. An inhalation pathway was not considered for ecological receptors. The methodologies and equations used for exposure estimates are fully described in the technical background documents: *Ecological Exposure Module: Background and Implementation for the HWIR99 Multimedia, Multipathway and Multireceptor Risk Assessment (3MRA) Model* (U.S. EPA, 1999–an).

XVII. What Are the Results of the Current Version of the Risk Assessment?

The risk assessment is designed to produce chemical-specific distributions of cancer risks or hazards to humans and ecological receptors living in the vicinity of industrial waste sites that could manage HWIR exempted wastes throughout their operating life. For each site and waste concentration, the model can generate risks for each receptor location and then sums the number of receptors that fall within a specified risk range (bin) to get the distribution of risks for the population at each site. We can use the distribution of risks at a site to determine whether a site is protected based on the percentage of the population protected, a specified cancer risk or hazard level, and the initial concentration in waste. The model then uses these data to generate a percentile distribution based on the number sites protected at a specified risk level for each waste concentration to generate the national distribution.

These results are evaluated over a 10,000 year period of exposure. This time frame applies mainly to the groundwater pathway, since receptors are exposed to chemicals via other pathways much sooner. Evaluating peak doses over this time horizon allows the model to capture the slow movement of certain chemicals through the subsurface. Although the time frame for such travel might be long, such contamination could be a serious problem when the chemical reaches the receptor wells (see, for example, the discussion at 63 FR 42157).

Many of the commenters to the 1995 HWIR proposal felt that it would be more reasonable to use a 1,000 year time frame because of the uncertainty involved in modeling so far into the future. Land use patterns, climate, environmental, other exposure assumptions and technology would be expected to change over 10,000 years, but we cannot predict what the world will be like then.

Other commenters to the 1995 proposal felt that uncertainty surrounding the modeling effort should lead EPA to choose a time period on the order of 10,000 years to ensure that human health is protected. Particularly for chemicals that do not degrade, the issue is less which generation would bear the risk of exposure to a chemical than the magnitude of risk that would be experienced once the contamination does reach a drinking water well. A comparison of results from the 1995 modeling effort suggests, for certain chemicals, a difference in exemption concentrations of over an order of magnitude depending upon whether 1,000 or 10,000 years was chosen (60 FR 66373). Modeling for other hazardous waste identification purposes has found peak concentrations of dioxin and arsenic to occur 1,500 and 8,800 years after the assumed operating life of the disposal unit (64 FR 46492 and 64 FR 46507). There might also be some uncertainty regarding when the peak concentration occurs, and the selection of a longer time frame increases the chance that peaks are considered in the assessment. We request comment on the time period over which exposure at a receptor should be evaluated.

The risk assessment is also designed to generate results that allow risk managers the flexibility to consider the results based on several risk descriptors. The risk descriptors for the human health risk and ecological risk are discussed below.

For the human health assessment, the model calculates the aggregate risk or hazard from multiple exposure pathways that occur simultaneously at the receptor location to generate the distribution of individual risks. For carcinogenic effects, we chose seven risk bins ranging from less than 1×10^{-8} to greater than 1×10^{-4} to generate the distribution. For human health hazard quotients, we chose four hazard bins ranging from less than 0.1 to greater than 10. The model can generate results for three distance rings, including within 500 meters, within 1000 meters, and within 2000 meters. The model can also generate results for 12 exposure pathways, including total ingestion and inhalation, total ingestion, total inhalation, total groundwater ingestion and shower inhalation, air inhalation, shower inhalation, groundwater ingestion, soil ingestion, crop ingestion, beef ingestion, dairy ingestion, and fish ingestion. In addition, the model can disaggregate the results by five receptor types: all receptors, residents, gardeners, farmers, and fishers. Finally, the results can be queried by three age cohorts: all ages, children 12 and under, and adults 13 and over.

For the ecological assessment, we calculate impacts to ecological receptors using the same general methodology, but we evaluate impacts to populations or communities of ecological receptors rather than to individuals. For each site, the model generates a distribution of hazard quotients (HQ) by receptor and sorts the receptors into one of four hazard bins, ranging from less than 0.1 to greater than 10. The model uses the

receptor results to evaluate impacts to several attributes of habitats, including three habitat groups (terrestrial, aquatic, and wetland), 11 habitat types (for example, forest, lake, river), nine receptor groups (for example, mammals, aquatic biota, terrestrial plants), and five trophic levels (for example, producers, top predators). The model generates results for each of the attributes by three distance categories: within 1000 meters, between 1000 and 2000 meters, and within 2000 meters. In addition, the model also generates results for the evaluation of some combinations of these attributes, including impacts by habitat group and trophic level, and by habitat group and receptor group.

Numerical results for acrylonitrile are presented in the risk characterization technical background document as an example of the types of results the model will generate (U.S. EPA, 1999-as). At this time, we have not completed final testing of the software system. Therefore, the use and interpretation of the results must be limited. The results should be viewed as representing the capabilities of the model with respect to the types of information that the model can produce. The numbers are likely to change after additional diagnostic testing and final testing of the software system.

The software system has been designed and implemented with a strong focus on Quality Assurance and Quality Control (QA/QC). The software system is comprised of three primary components; the site-based databases, the system software, and the modules for performing the required exposure and risk assessments. The system software organizes the waste site information and prepares individual datasets that are used to simulate contaminant release, multimedia fate and transport, and human and ecological exposure and risk. The system software also manages the execution of the numerous modules that simulate specific steps in the risk assessment process (e.g., source release, surface water fate and transport, ecological risk). The software development steps that we followed (and that address QA/QC) include:

- Software system design is based on detailed and peer reviewed HWIR Assessment Methodology.
- Software system is designed using object-oriented design principles and utilizing existing EPA models (ISCST, EXAMS, EPACMTP).
- Detailed system specifications are documented and reviewed before software coding is initiated.
- Data dictionaries are developed to fully define (and constrain) each data item that is shared within the system.
- Database development is designed and executed in close coordination with software system development.
- Individual developers design and conduct first level testing of all code before assimilation into the larger software system.
- System software and component modules are assimilated into a unified system with extensive testing of information flow and related data integrity.
- Execution of an initial ''technical'' verification (i.e., tracking the actual numbers through the system) of the software system using a single combination of waste site, chemical, and waste unit type.
- Execution of limited ''production'' runs using a subset of the total number of waste site/chemical/waste unit type combinations. Production runs are oriented toward producing exemption levels.
- Execution of initial full scale production runs (i.e., using all site/chemical/waste unit type) combinations.
- Execution and documentation of final tests for individual components of the software system. (This step has been delayed due to the extended nature of the development process and overall project schedule.)
- Execution of second full scale production runs (i.e., the runs that would produce the exemptions levels).

We are providing the entire software system (with documentation) and a list of software errors that we have identified in the docket. We request comment on the system, including the specifics of any errors that are identified.

A. What Are The Major Strengths of the Risk Assessment?

The HWIR risk assessment has several major strengths. These strengths are associated with the development of the 3MRA Model and associated components, the data collection approach selected to implement the regional site-based approach, and the testing and quality assurance process followed during both the developmental and implementation phases of the assessment in order to ensure the accuracy and usefulness of the information produced.

A key strength of the risk assessment is the 3MRA Model. The model, when fully operational, will represent a state-of-the-art software system designed to implement our assessment strategy. The model is an integrated, multimedia, multiple exposure pathway, and multiple receptor risk assessment tool that evaluates impacts to human and ecological receptors. The model addresses concerns raised with earlier efforts in the following ways: implementing a probabilistic approach to develop chemical-specific national distributions of risks; maintaining mass balance partitioning within each source; incorporating fate and transport components that manage chemical loadings simultaneously from multiple environmental media; evaluating a receptor's exposure through multiple pathways simultaneously; evaluating ecological impacts at a suite of representative habitats for terrestrial, aquatic, and wetland systems; and accounting for various degradation losses, including hydrolysis, aerobic, anaerobic, and activated solids biodegradation.

In selecting the fate and transport models incorporated into the 3MRA Model, we considered which state-of-the-science models would be appropriate for this national scale assessment. For example, the air models that we considered ranged in complexity from regional-scale to simple, local-scale, box models. Currently available regional-scale models do not provide estimates at a fine enough scale for use in our assessment. On the other hand, box models tend to be sensitive to the size of the box and do not provide any spatial resolution in the estimates. The air model we ultimately selected, the Industrial Source Complex-Short Term (ISCST3) model, is a steady-state, Gaussian plume model with an area source algorithm appropriate for the types of sources included in the analysis. This model has undergone peer review and various versions have been used in a large number of our regulatory analyses. Similar decisions were made for the groundwater and surface water modules.

In addition to existing state-of-the-science media transport models, we developed new modeling approaches for the sources included in our analysis. These models were designed to address comments received from the public and the SAB on the HWIR95 source models. We believe the models provide a more accurate simulation of contaminant release to all media. For example, we incorporated the following features into our models: estimating chemical mass losses through different pathways simultaneously, which allows a true, multipathway exposure and risk estimate; maintaining mass balance; estimating chemical concentrations as a function of time and depth; including

chemical mass losses such as volatilization, leaching, biodegradation, and hydrolysis; and simulating the effects of sediment accumulation on the infiltration rate in surface impoundments is modeled.

We also developed a set of food chain models that reflect the current state-of-the-science in plant uptake and bioaccumulation of chemicals in plants and animals. Although the farm food chain and terrestrial food web are similar to those used in HWIR95, each has been updated to reflect the current thinking with regard to specific chemical classes. The aquatic food web model is also newly developed and reflects the latest thinking with regard to bioaccumulation and biomagnification of different types of chemicals in aquatic systems.

Some of the major improvements made in the area of the human exposure and risk include: GIS applications for receptor locations and characteristics; management of exposure time series including discontinuous exposures across multiple pathways; aging across cohorts based on exposure durations; and determination of critical risk time periods. These areas have improved our ability to characterize national scale risks.

We have also made improvements in our ecological assessment. The resolution of the assessment goes beyond the generic systems used in HWIR95 and now includes a suite of representative habitats for terrestrial, aquatic, and wetland systems. The habitats are intended to reflect the variability of ecological systems across the United States and provide a context for selecting appropriate receptors at each site. Each habitat is characterized by site-based data such as habitat boundaries and ''common'' species and communities associated with that habitat. Over 50 representative species of birds, mammals, amphibians, and reptiles are included. In addition, simple food webs are constructed that indicate the major trophic levels and functional groups expected in each type of habitat.

Also, although the comments from the independent expert peer reviewers of the HWIR 3MRA model have not yet been addressed, EPA has reviewed those comments and they appear to be generally supportive of the overall modeling methodology and approach. The independent expert peer reviewer comments received to date are in the docket for today's proposed rule. Both the peer review comments and the public comments will be addressed prior to a final rulemaking.

Another strength for HWIR99 is the use of an overall database that provides site-based and regional specific data for a statistically representative set of industrial sites across the U.S. By selecting a statistical sample, we can use this subset of facilities to extrapolate our results to all the industrial facilities that have the types of the waste management units we evaluated. These data provide us a more realistic, rather than hypothetical, insight with respect to location of human and ecological receptors in the vicinity of the facilities. For humans, we also have data on the number of people at various locations, their age distribution, and a variety of other characteristics. However, as noted in the preamble discussions on data uncertainties (Section XVII.B) and the surface water module (Section XVI.E.4), we recognize that we were not able to directly measure many facility/site characteristics (for example, depth to groundwater; aquifer thickness; hydraulic conductivity; location of wells; type of ecological receptors; behavioral characteristics of receptors) at each representative site to estimate risk. We addressed these limitations by using regional and national data that might underestimate or overestimate a chemical's movement through the environment and the resulting exposures and risks, with no known general bias.

We undertook a number of steps during the development and implementation phases of the model and examined supporting data to ensure the model would produce useful information. We developed the model under a documented quality assurance process beginning with an understanding of how the model must perform to meet the needs of the risk assessment, and continuing through the design of the model, its testing, and implementation. We ensured that all components of the model interacted appropriately by specifying requirements that each component had to meet, including consistency of assumptions and data transfer between components. Each component was thoroughly tested and documented by the developer. We revised program code, documentation, and design specifications to resolve issues found during testing. We had or will have each component, as well as the overall model, independently tested to ensure that the model functions as the developer intended. Finally, all of the databases and underlying data went through a quality assurance protocol to ensure that data were correctly obtained from the original source, entered in the appropriate database, and properly transferred to the 3MRA model prior to implementation.

B. What Are the Major Limitations of The Risk Assessment?

The risk assessment has inherent limitations because of the complexity associated with simulating the behavior of a chemical moving through the environment from disposal in a management unit, to exposure media, and subsequent impacts on receptors. As explained below, limitations also result from the amount, type, and quality of the data used in our assessment, the set of exposure pathways evaluated, and the types of waste management units considered. In addition, both computational and resource constraints experienced during the development and implementation of the assessment limited our effort. We did not evaluate the impacts from either one-time or intermittent disposal of a waste, or the catastrophic release of potentially exempt waste from the failure of a management unit. We were not able to directly measure facility/site characteristics (for example, unit area and volume; depth to groundwater; aquifer thickness; hydraulic conductivity; location of wells; type of ecological receptors; behavioral characteristics of receptors) at each representative site to estimate risk. Finally, we were not able to calibrate or validate our model with known data sets. We present below the major limitations related to resource constraints, risk modeling, and the data used for the modeling.

1. *What are the major limitations resulting from computational and resource constraints?*

During the implementation phase of the 3MRA Model, we were limited to running a single ''iteration'' of the model for each chemical at a waste management unit/site combination to develop the distribution of protected populations and sites over a range of five waste concentrations. This means that for parameters for which we had distributions, we selected a random value for each parameter for each setting. The combination of the selected values defined what the characteristics of the setting were for the estimation of the hazard and risk distributions. Each parameter value at the setting remained fixed during the iteration over the range of concentrations evaluated. While only a single calculation was performed at each setting, we evaluated multiple settings for each chemical. In this manner, we account for uncertainty and variability across the representative

settings of possible waste management units and sites.

Because of computational constraints (that is, the limited amount of time to run the model during the implementation phase of the risk assessment), we had to limit the duration of the chemicals release from a waste unit to a maximum of 200 years. (However, once released from the unit, the chemicals are modeled for 10,000 years or until the chemical concentration decreases to one percent of the maximum concentration in each media, whichever comes first.) This constraint affects only the landfill and land application units. The waste pile is assumed to be removed after 30 years, surface impoundments are assumed to be clean closed after 50 years (that is no further release after closure) and aerated tanks are assumed to be properly maintained to prevent any leakages from occurring during their operation.

We believe that this assumption would have little impact on the potential hazard and risk results for most chemicals that are highly mobile in environmental media and do not bioaccumulate in the food chain. For less mobile chemicals, for example most metals, we would likely underestimate the amount of the chemicals released from the unit. Based on preliminary sensitivity analyses for a less mobile chemical (arsenic), less than one-quarter of the peak mass in a landfill or land application unit is predicted to move from the unit after 1,000 years. For a land application unit, the peak surface water load was not attained even after 1,000 years, even though the surficial soil concentration in the unit begins to decrease immediately after the end of the operating life (40 years).

2. What are the major uncertainties of the risk modeling? Uncertainty analysis is very complicated when conducted on multimedia assessment modeling efforts. The issues associated with how to conduct such analyses, whether to conduct quantitative vs. qualitative uncertainty analyses, and other related issues are currently being debated within the scientific community.

Sources of uncertainty in toxicological benchmarks include one or more of the following: extrapolation from laboratory animal data to humans, variability of response within the human population, extrapolation of responses at high experimental doses under controlled conditions to low doses under highly variable environmental conditions, and adequacy of the database (number of studies available, toxic endpoints evaluated, exposure routes evaluated, sample sizes, length of study, *etc.*). Toxicological benchmarks are designed to be conservative (that is, overestimate risk) because of the uncertainties and challenges associated with condensing toxicity data into a single quantitative expression.

Another important area of uncertainty involves estimates of risks to children from carcinogenic compounds. We estimated the risk of developing cancer from the estimated lifetime average daily dose and the slope of the dose-response curve. A cancer slope factor is derived from either human or animal data and is taken as the upper bound on the slope of the dose-response curve in the low-dose region, expressed as a lifetime excess cancer risk per unit exposure. However, individuals exposed to carcinogens in the first few years of life might be at increased risk of developing cancer. We modified the exposure factors for children to account for differences between adult and child receptors (for example, body weight, exposure duration). We did not adjust the cancer slope factors to account for age-specific differences in exposure assumptions (*e.g.*, body weight). However, we recognize that significant uncertainties and unknowns exist regarding the estimation of lifetime cancer risks in children. Methodologies for estimating environmental threats to children's health are relatively new. They are currently being debated within the scientific community, and will continue to evolve. The underlying assumption in our assessment that cancer risks for children can be calculated the same as cancer risks for adults has not been peer reviewed.

Non-cancer effects in children is also an area of uncertainty. Non-cancer reference doses and reference concentrations for children are based on comparing childhood exposure, for which we have age-specific data, with adult toxicity measures, where adequate age-specific dose-response data is lacking. This mismatch results in a large amount of uncertainty in the estimation of hazard quotients for children. This would sometimes result in an overestimation of children's risk and sometimes in an underestimation. This issue is still under investigation in the scientific community and no consensus has been reached.

The use of the highest annual average concentration for estimation of non-cancer hazard quotients introduces a potential upward bias on the hazard quotient, as most non-cancer toxicity benchmarks are based on lifetime average exposure. The HWIR methodology should be considered to be conservative in this respect. An exception is when exposure to the chemical is associated with developmental effects, which can result from very short-term exposure. In this case, annual average concentrations might mask higher short-term peak exposures resulting in an underestimation of the effective HQ (primarily for women of child-bearing age). The EPA's non-cancer toxicity assessment methodology, however, tends not to attach a great deal of significance to specific endpoints observed in test animals, as a general concordance of effects among species has not been demonstrated. The entire body of evidence must be evaluated in each case in order to determine whether specific effects are likely in humans.

Another uncertainty is the impact of inter-individual variability in exposure. Exposure variables (for example, media intake rates, residence duration) are fixed for all receptors of a given type and age and are not allowed to vary. These variables do vary across waste sites. Preliminary simulations suggest that this variability might not be too large given the large variability of media concentrations nationally. However, with further regionalization and refinement of environmental fate and source characterization model inputs, inter-individual variability in exposure could become a significant factor in model output in the future.

Another important area of uncertainty is the transformation of chemicals and the changes in the species of metals that can occur either in the waste management unit or in environmental media. Once chemicals are placed in a waste management unit or released to the environment, various processes such as biodegradation and hydrolysis act to change the chemical. These changes result in what we call transformation products. Often the transformation from one chemical to another results in a less toxic chemical; however, for a few chemicals, the resultant transformation products can be more toxic. For metals, an analogous transformation takes place as the pH of the waste or media can change the state of the metal, sometimes to a less toxic form and sometimes to a more toxic form. The HWIR99 analysis does not model transformation products or changes in metal species except for mercury in surface water.

Also, because the rate constant for metabolism is unavailable for most constituents given the general paucity of data on metabolic rate constants in fish, the metabolic rate constant was set to a default zero until data can be developed for a larger universe of hydrophobic organic chemicals.

The 3MRA model does include hydrolysis, aerobic biodegradation,

anaerobic biodegradation, and activated aerobic biodegradation. Each of these processes result in lower concentrations of the parent chemical and results in the formation of daughter products. Although the 3MRA can simulate the formation and transport of daughter products, we did not implement this capability in today's risk assessment because of the technical difficulties. To evaluate daughter products, we would need to track the ratio of the amounts of daughter product to parent chemical in the waste management unit. This ratio would vary considerably depending on the age of the waste management unit. Such data are not readily available. Alternatively, we could model the parent and daughter products separately assuming the waste management unit contains only the parent chemical or daughter product and select the lower waste concentration of these two numbers.

We request comment on (1) our decision to model degradation processes, including hydrolysis, aerobic biodegradation, anaerobic biodegradation, and activated aerobic biodegradation, (2) our approach for considering the daughter products in the regulatory framework, (3) the toxicity, if any, of the daughter products that might be generated, and (4) the physical conditions under which each of these degradation processes occurs. We also request information that might be available to help us factor the ratios of parent chemical to daughter product in the modeling in order to address the issue of the toxicity of daughter products.

Although we used a regional, site-based approach for this analysis, two features related to complex terrain were not modeled. First, in modeling the dispersion and deposition of chemicals in ambient air, the surrounding terrain was assumed to be relatively flat. We made this assumption to simplify the modeling and data collection effort. The area of interest for the analysis was limited to 2 kilometers from the waste management unit. We did not think it unreasonable to assume the 2 km study area was relatively flat. Complex terrain is quite important for stack sources where emissions are coming out of elevated stacks and being widely dispersed. However, all of the units in this analysis are either in the ground or slightly elevated such as a waste pile. Generally, the plumes will be close to the ground and those living closest to the waste management unit will receive the highest air exposures. By not using complex terrain in areas that are complex, the model might slightly under or overestimate exposures from these sources. A second type of feature we did not address is complex hydrogeology such as karst or highly fractured aquifers. Some fraction of the groundwater settings in this analysis have fractured flow. In general, fractured flow in groundwater can channel the contaminant plume, thus allowing it to move faster and more concentrated than in nonfractured flow environment. This would result in higher concentrations in the groundwater.

However, this analysis is conducted using site-based receptor information. Thus, even though the groundwater plume might move faster and be more concentrated, whether this would result in higher risk to receptors depends on where the receptors are located. For example, there might be no wells in the plume. By not modeling fractured flow in this analysis, additional uncertainty is added but the magnitude of this uncertainty cannot be described at this time.

Another uncertainty in the modeling methodology involves assessing risks to receptors temporally over a 10,000 year period. There are significant uncertainties regarding how exposure and environmental assumptions will change over time, and the modeling methodology does not change these assumptions over this 10,000 year period.

In addition, the modeling methodology itself is another source of uncertainty, because models and their mathematical expressions are simplifications of reality that are used to approximate real-world conditions and processes, and their relationships. The sources of model uncertainty include relationship errors and modeling errors. Models do not include all parameters or equations necessary to express reality because of the inherent complexity of the natural environment, and the lack of sufficient data to describe the natural environment. Consequently, models are based on numerous assumptions and simplifications, and reflect an incomplete understanding of natural processes.

We selected the models used in this risk assessment based on science, policy, and professional judgment. These models were selected because they provide the information needed for this analysis and because we generally consider them to be state-of-the-science. Even though some of the models used in the risk analyses are used widely and have been accepted for numerous applications, they each retain significant sources of uncertainty. Section XVI.E of this preamble, and each of the background documents associated with the different models, discuss some examples of these uncertainties. Evaluated as a whole, the sources of model uncertainty in our analysis could result in either an overestimation or underestimation of risk.

Also, EPA did not conduct a sensitivity analysis which would identify the most sensitive parameters in the model. Sensitivity analyses and the identification of the most important parameters, such as certain source term assumptions, would allow us to better characterize the uncertainty in the risk assessment. EPA recognizes that the source term assumptions associated with each waste management unit are likely to be uncertain, because the data associated with developing these assumptions were generally limited.

In addition to the uncertainties discussed here, there are also uncertainties associated with each of the risk assessment modules, as discussed in Section XVII.E.

3. What are the limitations of the data collected to support the risk assessment? Under ideal conditions, the risk assessment would be based on actual site data using measured input data at every facility for all the site-specific variables needed, including facility location, waste management unit area, waste volume, location of drinking water wells, depth to groundwater, groundwater flow direction, meteorological conditions, number and location of receptors, land use patterns and types of ecological habitats. However, we did not consider this approach because of the time and high costs associated with its implementation. Instead, we collected only a part of the model input data at the site level. We were not able to directly measure many of the facility/site characteristics (for example; depth to groundwater; aquifer thickness; hydraulic conductivity; location of wells; type of ecological receptors; behavioral characteristics of receptors) at each representative site to estimate risk. The model inputs that did not have site-based data were characterized through regional and national databases. As a result, the data used have several limitations. Overall, the use of regional and national input data rather than site-based facility and environmental data could cause estimated concentrations to be low or high at a given location, with no known general bias. Below is an overview of some of these limitations. A more detailed discussion on the limitations of the data types used in the risk assessment are presented in U.S. EPA, 1999–a through –r.

a. Site-Based Data

We used a variety of data sources with differing ''snapshots in time'' to describe the waste management unit and the surrounding environment. We relied on the survey of RCRA Subtitle D industrial waste management units (U.S. EPA, 1987) to represent potential facilities that would manage and dispose HWIR exempted waste. Although over 10 years old, this survey represents the largest consistent set of data available on facility locations and waste management unit dimensions. A sample of 201 facilities was selected from the survey to represent the types and geographical locations of waste management units at which exempt waste could be disposed. We then used other data sources for other site-based data needs, such as the environmental conditions and the number and types of human receptors in the vicinity of these 201 facilities. For example, facility location and land use patterns were from the late 1970's to mid-1980's (U.S. EPA, 1994) and human receptor type and location data were from the 1990 Census Data. It is likely that at some of the 201 facilities there have been waste management unit additions or closures, land use pattern shifts, or demographic changes since the surveys were conducted. However, we consider using relatively current land use and population data to be preferable to developing and evaluating hypothetical exposure scenarios.

To identify wetlands in the vicinity of the 201 facilities, EPA used the 1995 National Wetlands Inventory (U.S. FWS, 1995). Complete nationwide coverage is not yet available using this data source. Therefore, we also used other data sources (U.S. EPA, 1994–a, U.S. EPA, 1994–b) to help identify wetland habitats in the vicinity of the 201 sites.

b. Regional Data

Due to limited computational times for which we had to generate risk-based concentration levels, we modeled only a fraction of the hourly meteorological data at regular intervals rather than the complete period of record for the meteorological stations (for example, 30 years). This method, the Sampled Chronological Input Model (SCIM), allowed the model to run more quickly while producing long-term averages comparable to those obtained from the full data set. Different SCIM levels were applied for dry deposition (1 hour of data selected for every 193 hours) and wet deposition (1 hour of data selected for every 8 hours).

Another parameter for which we had limited data was the hourly precipitation at the meteorological stations found in the Solar and Meteorological Surface Observation Network (SAMSON), which we used for inputs to the ISCST3 air model. We developed a method in which the amount of daily precipitation was scaled from a separate climatological data set to hourly levels.

c. National Data

The 1985 survey of RCRA Subtitle D industrial waste management units (U.S. EPA 1987) only included information on landfills, land application units, surface impoundments and waste piles. The survey contained no information on the presence or design of aerated tanks, which are the fifth type of units included in today's risk assessment. We assumed that aerated tanks were located at the same facilities that operated surface impoundments. We used specific design and operating parameters for uncovered aerated tanks developed in the *Hazardous Waste TSDF—Background Information for Proposed RCRA Air Emission Standards* (U.S. EPA, 1991–b). We assumed that the characteristics of aerated tanks managing hazardous waste would be similar to aerated tanks that will manage HWIR exempted waste.

Site-based and regional datasets are not available for many of the human exposure inputs, and in those cases we used national datasets. However, some inputs, such as food ingestion rates and exposure duration data, are available by regions of the country. We decided that national exposure data were appropriate for the national scale assessment and did not expend additional time and resources on developing these data in to regional-level distributions. Rather we relied on national-scale data available in the *Exposure Factors Handbook* (EFH) (U.S. EPA, 1997–d) for the input parameters. In developing distributions for today's assessment, we fit selected statistical models to the percentile data presented in the Exposure Factors Handbook and used goodness-of-fit techniques to select distribution types rather than collecting and using all of the raw data for each exposure parameter.

d. Uncertainty in the Chemical Database

The HWIR assessment tracks individual chemicals from specific waste streams disposed of in a waste management unit into the surrounding multimedia environment at a series of locations around the country. A variety of transport processes, including volatilization, leaching, runoff, erosion, advection, dispersion, and deposition, move chemicals from the waste management units through the multimedia environment to locations where human and ecological receptors are likely to be exposed. A set of chemical-specific data are required for the environmental simulation models that are used to calculate chemical fate and characterize the resulting exposures and risks.

Some of the chemical properties such as the ionization constants are not expected to vary among the sites. Values for these properties are entered into the HWIR database (U.S. EPA, 1999–ai) as constants, and are reported as such to the environmental models for all sites. Other chemical properties such as solubility and effective hydrolysis rate constants will vary with temperature and pH. We used regression techniques or chemical equations to provide proper values for given temperature and pH conditions. Values for the regression coefficients or chemical constants are entered into the HWIR database as constants. The values for these properties reported to the environmental models vary with the temperature and pH assumed for a particular medium at a particular site. Still other chemical properties are expected to vary among sites in response to a host of unknown or unmeasured environmental conditions. Examples include biodegradation and reduction rate constants and metals partition coefficients. These properties are entered into the HWIR database as distributions with minima, maxima, and sometimes central-tendency values. The values for these properties reported to the environmental models are random functions of the specified distributions.

The uncertainties associated with the chemical database clearly vary with chemical property. For some properties, the uncertainty is associated with the thermodynamic and kinetic constants for each specific chemical. For other properties, the total uncertainty includes not only the uncertainty in the specification of the basic constants, but also the uncertainty in the equations and classification schemes used in the application of these constants to various environmental conditions (for example, temperature, pH, and redox conditions). The uncertainty associated with the thermodynamic and kinetic constants will of course be dependent on the specific chemical and the nature of constants (measured versus calculated). The uncertainty resulting from the assumptions concerning environmental conditions results from a paucity of data describing conditions at hazardous waste sites and the requirement to conduct the HWIR assessment on a national basis.

All of the data needs cannot be satisfied with measured values because the environmental conditions within which the contaminants find themselves are simply too varied and have not been studied sufficiently to enable known values to be used. Thus, we used other means of developing the required data (for example, chemical modeling and expert judgment leading to simplifying yet environmentally protective assumptions). To generate all relevant chemical-specific data needed for the HWIR assessment, we used a combination of measured, calculated and estimated data. Although measured data were preferred, the absence or scarcity of reliable measured data required the use of data that had been generated by computational methods. The SPARC computational method, which is based on fundamental chemical structure theory, was the primary tool for calculating the thermodynamic constants in the HWIR chemical database (Karickhoff et al, 1991). Although rigorous testing for SPARC's Chemical Reactivity Models is still in progress, comparison of SPARC calculated pK_as with measured values for a large number of chemicals demonstrates the reliability of this computational approach.

The process of assembling kinetic constants for degradation pathways (that is, hydrolysis, anaerobic biodegradation, and aerobic biodegradation) focused on finding, evaluating, and summarizing measured data. Measured hydrolysis rate constants were found for most of the compounds of interest. When hydrolysis data were not available, a team of expert scientists provided rate constants based on the team's experience with similar compounds, their knowledge of the theory of these processes, and their understanding of structure-activity relationships. Due to the complex nature of biodegradation processes, only measured kinetic constants for a select group of high-volume chemicals were entered into the HWIR chemical database. These kinetic data were grouped according to reaction conditions (that is, pH, temperature, and redox conditions). Each study for a particular chemical was given equal weight despite differences in how the study was carried out. As a consequence, the uncertainty associated with the range of kinetic data in the database is expected to vary by chemical.

4. *What situations are not covered in the risk modeling?* a. Combustion. In the development of the HWIR exemption, we did not model combustion scenarios. We considered possible risk introduced into the environment from the combustion of already exempted waste and concluded that such risks were more appropriately considered under regulations promulgated or to be promulgated under the Clean Air Act.

More specifically, we recognize that the technological basis of the Maximum Achievable Control Technology (MACT) standards currently being developed under the Clean Air Act (particularly under Sections 112 and 129) will help reduce risk from air emissions at nonhazardous combustors. Because the risks associated with combustion have as much to do with combustor unit design, emissions controls and unit operation as they do with the concentration of chemicals in the feed, we did not believe it practical or even possible to develop a methodology for predicting smokestack emissions, in particular the formation of products of incomplete combustion, based solely on the chemical composition of wastes that could be combusted. This judgement is consistent with our discussion in the comparable fuels exclusion, which considered a much narrower universe of waste than the wide variety of waste being considered for exemption under HWIR (63 FR 33784).

In addition, we do not believe that there will be much incentive for HWIR exempt waste to be combusted, although a few commenters to the 1995 proposal suggested otherwise. Waste meeting HWIR exemption levels should have a low Btu value, and, therefore, such waste would not be particularly attractive for fuel use. Conceivably, a generator seeking an exemption after the point of generation could, through combustion, avoid land disposal requirements, although combustion is generally more expensive than land disposal. Also, such treatment savings presume that the exemption concentration levels would be higher than LDR levels. Under such circumstances, as discussed in Section XX of this preamble, we discuss raising these LDR standards to conform with the HWIR exemption levels. The adoption of this minimize threat approach could decrease any incentive to combust HWIR exempt waste.

Some commenters requested that we consider the exemption of hazardous waste contingent upon the combustion of these wastes in a nonhazardous waste combustor. We believe that the design of such a regulatory option would require not only the specification of concentration levels of chemicals in the feed, but also operational parameters associated with the combustor. Such requirements would either make the incoming waste approach waste that could become exempt under the generic option or make the operational design associated with the combustor approach requirements for hazardous combustors. Again, limitations in our ability to precisely model and track the transformation, creation and destruction of chemicals through the combustion process would severely limit our ability to construct such an option.

We ask for comment on our consideration of risks from combustion and alternative regulatory provisions related to the HWIR exemption. One alternative is an absolute prohibition on combustion of already exempt HWIR waste. A second alternative is a more targeted restriction based on chemical content. Some persistent, bioaccumulative and toxic chemicals such as mercury are of special concern for combustion, even at levels that might allow such waste to become exempt under HWIR. Under this second alternative, HWIR wastes containing such chemicals could not be combusted.

A third alternative would structure a prohibition on combustion similar to the one designed to prevent the combustion of metal-bearing waste within the LDR program (40 CFR 268.3(c)). Such restrictions generally require the wastes to have some appreciable organic content or heating value, unless the waste is co-generated with a waste requiring combustion or unless other Federal or State requirements necessitated the reduction of organics. Having met HWIR exemption levels for organics might reduce waste eligible for post-exemption combustion, under this alternative, to practically zero. We request comment on these alternatives, including information that might trigger a combustion prohibition, and on any other alternatives for addressing risks from the combustion of HWIR wastes.

b. Beneficial uses. We selected the landfill, waste pile, surface impoundment and land application units to model because according to an EPA industrial waste screening study, these are the most likely destinations for industrial nonhazardous waste (EPA 1987). We also modeled aerated tanks because, since the screening study was done, there has been a shift away from surface impoundment to aerated tanks for managing hazardous waste. If an aerated tank-based hazardous waste becomes exempt, it is likely that it would still be managed in that aerated tank.

However, there are many other possible management destinations besides these five units, such as using the wastes as road bed, construction fill, and cement aggregate. These practices are often collectively referred to as

beneficial use. See the background document entitled *Consideration of Beneficial Use as an HWIR Waste Management Scenario* (EPA, 1999) for a discussion of beneficial uses of industrial waste.

State programs that regulate beneficial use of industrial waste would provide some protection against risks posed by this practice. However, State regulatory programs vary greatly regarding the level of regulation for these wastes. See the background document entitled *States' Use of Waste and By-Product Materials* (ASTSWMO, 1996) for a survey of states' beneficial use programs.

Some of these beneficial uses, particularly uses that involve direct exposure to the waste, could pose a greater risk than management in the five units that we modeled. We request comment which beneficial uses are especially problematic, and whether to prohibit beneficial uses of HWIR exempted wastes.

c. Non-aqueous phase liquids (NAPLs). Fate and transport modeling embedded in the HWIR risk assessment does not account for the potential of non-aqueous phase liquids (NAPLs) to migrate to the groundwater beneath the waste units. NAPLs in the groundwater provide a source of contaminants which might move away from the original release location. Even if the migrating NAPL phase contains insufficient organic liquid to reach a receptor in the free phase, the groundwater zone will still contain a zone of laterally distributed NAPL. This zone of NAPL can exist substantially beyond the bounds of the waste unit and can act as a new source of contamination beyond the unit boundaries, effectively reducing the distance between the source and the receptors.

The NAPL will dissolve into groundwater flowing through it. This could lead to chemical concentrations in the groundwater zone that are higher than the scenarios modeled in the HWIR risk assessment. The combination of reduced distance between receptors and source and the higher initial concentrations can significantly increase chemical concentrations at receptor locations.

To augment the analysis and assumptions in the HWIR risk assessment, we developed a methodology to consider the potential for HWIR exempt waste to form free phase liquids. This methodology involved comparing the exemption levels derived for chemicals of specific concern for NAPL formation with a calculated ''saturation level'' of the chemical to see if a free phase could form. In the case of aqueous wastes, this is a simple comparison of the exemption levels to chemical specific water solubility limits. Where the exemption level exceeds the solubility limit, a separate organic liquid phase could be anticipated. The case of free phase flow from waste in a semi-solid or a solid form is somewhat more complicated. See *the Analysis of NAPL Formation Potential and Cosolvency Effect* (EPA, 1999–ar) for data, calculations and methodology for these comparisons. We request comment on how to minimize the potential for NAPL contamination of groundwater due to the formation of free-phase liquids in landfills.

The subject of co-solvency and facilitated transport is a considerably more difficult phenomenon to predict and regulate. A co-solvent is an organic chemical that is partially or completely miscible in water, and can change the properties of other chemicals, increasing their mobility. Facilitated transport is a chemical or physical process that has the potential of improving the transport of a chemical in soil or groundwater. Facilitated transport can be significant at co-solvent concentrations above a few percent. See *Analysis of NAPL Formation Potential and Cosolvency Effect* (EPA, 1999–ar) for more information. EPA is soliciting comment on how to minimize the possible impacts of co-solvency on the migration of contaminants.

d. Sludges generated from HWIR-exempted liquid wastes. In modeling the risk posed by liquid wastes, we only looked at the risks posed by the liquid itself as it is managed in an aerated tank or surface impoundment. Because of the complexity of the processes involved, we did not estimate the risk posed by the sludges that would be generated from the post-exemption management of these liquid wastes. These sludges, which would normally be regulated as hazardous due to the derived-from rule, would no longer be subject to the listing code because the parent waste had met the HWIR exemption. This would be true even when the sludges themselves did not meet the HWIR exemption levels, which might happen due to the concentrating effects of de-watering.

However, if the sludges retained a high level of metals or other regulated chemicals, they might be hazardous due to the toxicity characteristic and, therefore, would continue to be regulated under RCRA Subtitle C. We request comment on whether sludges from HWIR exempted liquids would exceed the HWIR exemption levels, and whether the toxicity characteristic is adequate to capture the risks from wastes derived from exempt liquids.

e. Surface impoundments with wastes left in place. In modeling surface impoundments, we assumed that at the time of closure, all the remaining waste in the surface impoundment is removed, and therefore no source of contamination remains (beyond the chemicals that had already left the unit). If HWIR waste were to be disposed in a surface impoundment that was closed with the waste left in place, then the risk assessment could underestimate the risk posed by such waste, especially for slow-moving chemicals. We request comment whether the assumption that surface impoundments have waste removed at the time of closure is likely to have a significant impact on the risk assessment.

XVIII. How Was the HWIR Exemption List of Chemicals Developed?

A. How Did EPA Select the Chemicals That Might Be of Concern in HWIR Waste?

We focused on those chemicals that are likely to be found in listed hazardous waste, to be toxic, and to be of concern if released to the environment. This list of chemicals was gathered from Appendices VII and VIII of 40 CFR 261, Appendix IX of 40 CFR 264, the chemicals listed in 40 CFR 261.33 (e) and (f) (the P and U listings) and the chemicals listed in 40 CFR 268.40 (LDR treatment standards).

Part 261 Appendix VII contains the chemicals that were used as the basis of listing wastes from specific and nonspecific sources (F and K listings). However, it is not meant to be a complete list of hazardous chemicals found in those wastes. Part 261 Appendix VIII is a more comprehensive list of hazardous chemicals that could be used as a basis for listing a waste [see 40 CFR 261.11(a)(3)]. Part 264 Appendix IX is the list of chemicals to be analyzed for groundwater monitoring purposes. It includes hazardous chemicals that have been found at contaminated sites under the Superfund program, and could, therefore, be of concern in mismanaged industrial wastes. 40 CFR 261.33 lists chemical products that are hazardous when discarded. 40 CFR 268.40 includes a list of chemicals with treatment requirements for each hazardous waste code.

From these sources, EPA created a ''master list'' of over 600 chemicals. This list is larger than the one developed in 1995 because of the inclusion of chemicals contained in 40 CFR 261.33 and 40 CFR 268.40, and because of chemicals added to Appendix VIII as a result of the carbamate listing (62 FR 32978).

To derive the list of chemicals that we would include in the HWIR exemption (referred to as HWIR Exemption Chemicals), a number of chemicals were deleted from the master list. Some entries were deleted because they are analyzed as a different chemical (for example, lead compounds are analyzed as lead, therefore only lead is included). Other chemicals were deleted because they represented a chemical class where a specific chemical within that class was already on the list (for example, the class of tetrachlorobenzenes is represented by 1,2,4,5 tetrachlorobenzene). Finally, some chemicals, although they might pose an immediate hazard, were thought to degrade rapidly in the environment due to hydrolysis or other processes. Other efforts within the Office of Solid Waste could enhance our ability to identify additional chemicals that do not persist in the environment and should not necessarily be evaluated for the HWIR exemption (for example, ongoing waste minimization efforts on chemical persistence have evolved from a draft list of chemicals made available in a recent **Federal Register** notice (see 63 FR 60332)).

Removing chemicals from the master list for the reasons stated above reduces the number to 442, which comprises the list of HWIR exemption chemicals. This list of chemicals is not the list of chemicals for which you would be required to test as described in Section IX.A of this preamble; however, this list represents chemicals that you would have to certify are not present in your waste. These chemicals would be listed in a new appendix to 40 CFR Part 261 that can be found in Table 2 in Section XIV. For more information on how this list was developed and on the lists of chemicals removed from consideration, see *Background Document on HWIR Exemption Chemicals*, U.S. EPA, July 1999–as.

We request comment on the chemicals considered for the HWIR exemption.

B. What Chemicals Has EPA Modeled Using the 3MRA Model?

In developing the model , we selected a limited group of chemicals to produce exemption levels. Two primary factors influenced our selection of which chemicals and how many chemicals to model in the risk assessment: (1) Adequate chemical-specific toxicity data and (2) computational limitations. Our criterion for adequate toxicity data was that each chemical had at least one human health toxicological benchmark. We relied primarily on toxicity values available on EPA's Integrated Risk Information System (IRIS) and presented in the Office of Research and Development's Health Effects Assessment Summary Tables (HEAST). In addition, we evaluated other Agency toxicity information and toxicity information submitted in comments on the HWIR 1995 proposal. (see Section XVI.A.3) The list of these chemicals with benchmarks and criteria for evaluating other information is found in *Report on the Consistency of HWIR Benchmarks with Current Agency Values and Guidelines*, (U.S. EPA, 1997–e) and *Response to Comments on Hazardous Waste Identification Rule (HWIR) Benchmarks* (RTI, 1998). We request comment on the use of these sources of toxicity data.

The second factor, computational limitations, further reduced the list to 42 chemicals which we attempted to model. These 42 chemicals are listed in Table 7 below. This number of chemicals was based on our decision to design the software system for assessing multi-media, multiple pathway, and multiple receptor risk on a PC-based platform. We chose this platform rather than more advanced computers to maximize the public dissemination of the risk assessment model and results that underlie the risk-based concentration levels. This PC-based platform limited the number of chemicals EPA was capable of evaluating for this notice due to computer processing speed and data storage limitations. To provide an example of the model outputs, the results for acrylonitrile managed in a landfill are present in a background document (U.S. EPA, 1999–as).

C. How Did EPA Choose the Initial Subset of the 42 Chemicals to Model?

To select the initial set of chemicals to evaluate, we developed criteria to select chemicals from the list of chemicals with at least one benchmark. The chemicals with benchmarks were sorted into 16 groups of similar chemical and/or physical properties. The specific properties used to establish these groups included: (1) The degree of aromaticity (the number and arrangement of benzene rings); (2) similarities in volatility (for example, low molecular weight hydrocarbons all tend to be relatively volatile); (3) the presence of halogens, such as bromine and chlorine; (4) the presence of other key elements such as oxygen, nitrogen, sulfur and/or phosphorus; (5) commonalities in the use of the chemical (for example, pesticides); (6) the presence of organic functional groups such as phenols and carbamates; and (7) similarities in ionic behavior (for example, anionic metals).

We then selected candidate chemicals from each of these 16 groups. A team of EPA scientists with collective experience in toxicology, fate and transport modeling, waste chemistry and programmatic policy then reviewed the candidates and selected 42 representative chemicals. The chemical selection process involved considerations such as: (1) The total number of chemicals within a group (for example, some groups had up to 50 chemicals within the group and therefore more candidates were examined); (2) the range of expected toxicity of the chemicals within the group (for example, benzene is considered to be more toxic than toluene); (3) whether the chemical and physical property data and analytical methods for each candidate were readily available and verifiable; (4) whether there were significant differences in chemical structures within the group; (5) the differences in degree or type of halogenation (chlorinated or brominated); (6) whether the toxicity data represented a mix of isomers; (7) whether the chemical was a common and relatively toxic degradation product; (8) whether the chemicals were significant to other EPA programs or were traditionally chosen as representatives (for example, 2,3,7,8-TCDD is typically chosen as the representative for all the isomers of halogenated dioxins and furans); and (9) the frequency or expectation of finding the chemical in many process waste streams rather than for just one listing. Further details on the chemicals groupings and the specific factors used to select each representative chemical can be found in the *Background Document on the Selection of Initial Chemicals*. U.S. EPA, October 1999–at. Based on these criteria, we selected 42 chemicals to evaluate within the HWIR risk assessment model and to develop risk-based levels (see Table 7).

TABLE 7.—INITIAL LIST OF 1999 HWIR CHEMICALS SELECTED FOR EVALUATION

Chemical name [alternate name]	CASRN	Representative class
Acetonitrile	75–05–8	organonitrogen.
Acrylonitrile	107–13–1	organonitrogen.
Aniline	62–53–3	organonitrogen.
Antimony	7440–36–0	oxoanion metal.
Arsenic	7440–38–2	oxoanion metal.
Barium	7440–39–3	cationic metal.
Benzene	71–43–2	aromatic hydrocarbon.
Benzo[a]pyrene	50–32–8	polynuclear aromatic.
Beryllium	7440–41–7	cationic metal.
Bis-(2-ethylhexyl)phthalate [Di-(2-ethylhexyl)phthalate]	117–81–7	carbon/hydrogen/oxygen.
Cadmium	7440–43–9	cationic metal.
Carbon disulfide	75–15–0	organosulfur.
Chlorobenzene	108–90–7	chlorinated aromatic.
Chloroform	67–66–3	chlorinated hydrocarbon.
Chromium	7440–47–3	oxoanion metal.
Dibenz[a,h]anthracene	53–70–3	polynuclear aromatic.
2,4-Dichlorophenoxyacetic acid	94–75–7	chlorinated pesticide.
Ethylene dibromide [1,2-Dibromoethane]	106–93–4	brominated hydrocarbon.
Hexachloro-1,3-butadiene	87–68–3	miscellaneous halogenated.
Lead	7439–92–1	cationic metal.
Mercury	7439–97–6	cationic metal.
Methoxychlor	72–43–5	chlorinated pesticide.
Methyl ethyl ketone	78–93–3	carbon/hydrogen/oxygen.
Methylene chloride [Dichloromethane]	75–09–2	chlorinated hydrocarbon.
Methyl methacrylate	80–62–6	carbon/hydrogen/oxygen.
Nickel	7440–02–0	cationic metal.
Nitrobenzene	98–95–3	organonitrogen.
Pentachlorophenol	87–86–5	chlorinated phenol.
Phenol	108–95–2	nonhalogenated phenolic.
Pyridine	110–86–1	organonitrogen.
Selenium	7782–49–2	oxoanion metal.
Silver	7440–22–4	cationic metal.
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746–01–6	dioxin/furan.
Tetrachloroethylene	127–18–4	chlorinated hydrocarbon.
Thallium	7440–28–0	oxoanion metal.
Thiram	137–26–8	carbamate group.
Toluene	108–88–3	aromatic hydrocarbon.
1,1,1-Trichloroethane	71–55–6	chlorinated hydrocarbon.
Trichloroethylene	79–01–6	chlorinated hydrocarbon.
Vanadium	7440–62–2	oxoanion metal.
Vinyl chloride	75–01–4	chlorinated hydrocarbon.
Zinc	7440–66–6	cationic metal.

All but one of the 42 chemicals have available toxicological data in developing HWIR exemption levels through the HWIR risk assessment. In the case of lead, we would not develop a human health-based number from the HWIR '99 risk assessment because lead does not have the same type of toxicological value used for the other chemicals. Instead, we would refer to levels developed for other regulatory programs within EPA, which include the Superfund program, the Safe Drinking Water Program and the Lead Hazard Control Program.

Over the past four years, we developed a ''no action'' concentration for lead in soil of 400 mg/kg for three separate programs: Superfund Site Cleanup under CERCLA (Comprehensive Environmental Response, Compensation and Liability Act), Corrective Action under RCRA and Lead Hazard Control under TSCA (Toxic Substance Control Act). This level is based on protecting children from neuro-behavioral toxicity effects from multi-media exposures of lead. Historically, we have been particularly concerned about lead poisoning in children between the age of six months and seven years, and therefore have focused on these effects for our regulations. For the soil lead guidance determination under these programs, we considered risks to children from exposure to lead in air, in soil and dust, in their diet and in their drinking water (see OSWER directives #9200.4–27P and #9355.4–12 regarding RCRA and CERCLA and *Risk Analysis to Support Standards in Lead in Paint, Dust, and Soil,* (EPA 747–R–97–006), June 3, 1998, regarding TSCA). These determinations are based on the Integrated, Exposure, Uptake and BioKinetic (IEUBK) Model and assume that the child lives amongst the contamination (that is, on-site exposure).

We also considered lead levels considered safe under the Safe Drinking Water Regulations (40 CFR 141). Although we have not set a Maximum Contaminant Level (MCL) for lead in drinking waste systems, we have required water systems to reduce the levels of lead at the tap to as close to zero as possible (see the Lead and Copper Rule (LCR) under 40 CFR 141.80). In addition to requiring water systems to optimize corrosion control, the LCR also requires that water systems that exceed 15 ug/L lead in more than 10% of the taps tested meet certain other treatment requirements where appropriate. Also, guidance from EPA's Office of Drinking Water strongly recommends that source water treatment be installed if the concentrations of lead in source water exceeds 5 ug/L.

We are considering the 400 mg/kg as an appropriate and protective human health limit to exempt waste under HWIR. This level considers multiple exposures, not just exposures from drinking contaminated water, and even for the groundwater ingestion pathway, the 400 mg/kg level is based on a default value of 4 ug/L, more stringent than both the 15 ug/L and 5 ug/L levels considered within the drinking water regulations.

Hence, we request comment on setting the exemption level for lead as the lower of two values: the 400 mg/kg level for human health risks and the modeled ecological risk results. (See Section XVI for additional discussion of ecological risk assessment performed for HWIR). We request comment on this approach for developing an exemption level for lead.

Although we intended to model all 42 chemicals listed above, we identified several errors within the system during initial production runs. These errors included exceeding solubility limits for one or more waste concentrations, failing to account for sites in the results for one or more waste concentrations, and generating the distribution of results for only the exposed population. The time required to diagnose the errors and reprogram the potential fixes to the system and modules resulted in a limited time frame for generating the results for this notice. Therefore, we included the results for acrylonitrile managed in a landfill as an example.

These results are presented in the technical background document *Risk Characterization Report for the HWIR99 Multimedia, Multipathway and Multireceptor Risk Assessment (3MRA),* U.S. EPA, July 1999-as. We plan to update the model to address system errors. In addition, we expect to place in the docket results for additional chemicals and waste management unit combinations from an updated model.

Because we have not fully tested recent revisions to the model, we are not proposing these results as HWIR exemption levels at this time. For further discussion please see Section XVII of this preamble.

D. Which Additional Chemicals Might We Model in the Future?

To help us prioritize possible future exemption level development beyond the 42 chemicals in Table 5, we first focused on chemicals reasonably expected to be present in major waste streams. For a waste stream to be eligible for this exemption, those chemicals reasonably expected to be present in the waste stream would have to have exemption levels. Developing exemption levels for these chemicals would therefore allow more waste to become eligible for an HWIR exemption. For listed waste from specific and non-specific sources (that is, F and K wastes found in 40 CFR 261.31 and 261.32), this set of chemicals would include those chemicals found in Appendix VII of 40 CFR Part 261 (hazardous chemicals for which the waste was listed) and those chemicals found in 40 CFR 268.40 (regulated hazardous constituents under the LDR program).

We also focused our prioritization efforts on waste streams most likely to take advantage of the HWIR exemptions. By analyzing data on historic cost savings and the prevalence of chemicals within both large and small waste streams, we identified an additional 29 chemicals that with exemption levels could greatly increase the number of RCRA waste codes, facilities and volumes of waste eligible for the HWIR exemption. (The identification of these 29 chemicals is discussed further in *Background Document on Additional HWIR Chemicals,* U.S. EPA, October 1999–au). These chemicals are listed in Table 8.

TABLE 8.—CANDIDATES FOR ADDITIONAL HWIR EXEMPTION LEVEL DEVELOPMENT

	CAS No.	Chemical name
1	67–64–1	Acetone [2–Propanone]
2	98–86–2	Acetophenone
3	79–06–1	Acrylamide
4	79–10–7	Acrylic Acid
5	56–23–5	Carbon tetrachloride
6	7440–50–8	Copper
7	108–94–1	Cyclohexanone
8	95–50–1	Dichlorobenzene [ortho-Dichlorobenzene], 1,2-
9	107–06–2	Dichloroethane [Ethylene dichloride], 1,2-
10	110–80–5	Ethoxyethanol [Ethylene glycol monoethyl ether][Cellosolve], 2-
11	141–78–6	Ethyl acetate
12	100–41–4	Ethylbenzene
13	60–29–7	Ethyl ether [Ethane, 1,1′-oxybis]
14	64–18–6	Formic Acid
15	118–74–1	Hexachlorobenzene
16	67–72–1	Hexachloroethane
17	78–83–1	Isobutyl alcohol [2-methyl-1-propanol] [isobutanol]
18	108–39–4	meta-Cresol [3-Methyl phenol]
19	67–56–1	Methanol [Methyl alcohol]
20	108–10–1	Methyl isobutyl ketone [Hexone][4-Methyl-2-pentanone]
21	71–36–3	n-Butyl alcohol [n-Butanol]
22	79–46–9	Nitropropane, 2-
23	95–48–7	ortho-Cresol [2-Methyl phenol]
24	106–44–5	para-Cresol [4-Methyl phenol]
25	109–99–9	Tetrahydrofuran
26	76–13–1	Trichloro-1,2,2-trifluoroethane [Freon 113], 1,1,2-
27	79–00–5	Trichloroethane [Vinyl trichloride], 1,1,2-
28	75–69–4	Trichlorofluoromethane [Trichloromonofluoromethane][CFC-11]
29	1330–20–7	Xylenes, mixed isomers (ortho-, meta-, para-) [Xylenes, total]

Just as there are good candidates for additional exemption levels, there are other chemicals that are less attractive for exemption level development. The following types of chemicals might be of lower priority simply because they are

not found in most process wastes generated today. These chemicals include: (1) Chemicals no longer produced in the United States; (2) chemicals produced infrequently or in small quantities; (3) chemicals used exclusively as pesticides or herbicides; and (4) chemicals found exclusively within discarded chemical products (that is, many of the RCRA P and U listed wastes found in 40 CFR 261.33). Consistent with this prioritization, we do not believe that we need to develop exemption levels for all chemicals listed in Section XIV, to make the HWIR exemption available to a broad segment of the waste universe.

These lower priority chemicals are unlikely to be prevalent in newly generated wastes, although they can appear in site clean-up wastes or contaminated media (for example, contaminated soil). While clean-up wastes and contaminated media may become exempt under HWIR by meeting the stated requirements, the main focus of today's rule is process wastes. Other regulatory mechanisms exist within the RCRA and CERCLA programs to direct the appropriate management of these wastes.

Another consideration for the development of exemption levels for chemicals is whether we have sufficient toxicological data and they do not present any other technical issues. Many chemicals, because of a lack of human health benchmarks or other technical difficulties, are problematic for developing exemption levels. Such technical difficulties include analytical challenges in measuring chemical concentrations in waste matrices or difficulties representing the behavior of the chemical through our modeling framework.

One such chemical with toxicological information, but which presents other technical difficulties is cyanide. Cyanide has traditionally been of particular interest because of its high prevalence in hazardous waste streams. We have not pursued the development of cyanide numbers for generic waste streams using the HWIR risk assessment model because of technical concerns that include: (1) The presence of cyanide in various forms, which change with waste matrix pH, the presence of metals and cyanide concentration; (2) the complex chemistry of cyanide, both in the waste and in its environmental transport; and, (3) cyanide degradation, such as its oxidation to carbon dioxide, nitrogen and water. Further, the chemical analysis of cyanide is complicated by significant interferences and the reporting of various cyanide forms, including total, free and weak acid dissociable forms. We ask for comment on which wastes would be impacted by the absence of an HWIR exemption level for cyanide, and for comments on how to set HWIR exemption levels for cyanide, given its complex chemistry.

We also request comment on which particular chemicals and waste streams are especially suited to an HWIR exemption. We believe that direct input from waste generators specifically identifying candidate waste streams would be the most useful and targeted means of selecting additional chemicals for exemption level development.

XIX. How Would EPA Use the Results of the Risk Assessment To Set HWIR Exemption Levels?

As discussed in Section XVII, we have identified an inconsistency in the model results, which we believe demonstrates that the model is not performing as designed. In addition, we have not completed final testing of the software system. Therefore, we are not proposing HWIR exemption levels based on these modeling results. This section explains the methodology we would use to set HWIR exemption levels when the final modeling results are available. Before we would promulgate an HWIR exemption, we would first publish an HWIR proposal that would include specific exemption levels and give the public an opportunity to comment. We request comment on this methodology for generating HWIR exemption levels from the risk assessment results.

A. What Risk Protection Criteria Would EPA Use To Generate HWIR Exemption Levels?

The HWIR exemption levels would be generated based on five different types of risk protection criteria: (1) Cancer risk level, (2) human health hazard quotient (HQ), (3) ecological hazard quotient, (4) population percentile, and (5) probability of protection. By setting a value for each of these criteria, we would identify the chemical-specific waste concentrations that would be protective at those values. Each risk criterion is explained in more detail below and summarized in Table 9. For each of the risk protection criteria, we would select specific levels from a range of values for each protection criterion from which we developed HWIR exemption levels. We invite comment on which values we should select for each of the risk protection measures.

1. *Cancer Risk level.* The cancer risk level refers to a person's increased chance of developing cancer over a lifetime due to potential exposure to a specific chemical. A risk of 1×10^{-6} translates as an increased chance of one in a million of developing cancer during a lifetime. EPA generally sets regulations at risk levels between 10^{-6} and 10^{-4} (in other words, from one in a million to one in ten thousand increased chance of developing cancer during a lifetime). In the RCRA hazardous waste listing program, a 10^{-6} risk is usually the presumptive ''no list'' level, while 10^{-5} is often (used to determine which wastes are considered initial candidates for listing (see, for example, the petroleum listing at 63 FR 42117). For HWIR, we would evaluate the exemption levels that result from both the 10^{-6} and the 10^{-5} risk levels.

We do not intend to evaluate a risk higher than 10^{-5} for an HWIR exemption, because using higher levels would mean that waste could exit the RCRA hazardous waste regulatory system at a higher risk than it typically enters the system. In the 1995 HWIR proposal, we did consider using higher risk levels for our modeling under the State-based contingent management approaches, but this was contingent on having in place a State nonhazardous waste program approved by EPA, which would reduce the overall risk to 10^{-6} or 10^{-5}. Given that the HWIR exemption discussed today is designed to be self-implementing, with no direct governmental oversight of the exemption claims and no EPA review of State nonhazardous waste programs, we believe that using a cancer risk level of 10^{-4} or higher would be inappropriate.

2. *Hazard Quotient (HQ).* The HQ refers to the likelihood that exposure to a specific chemical would result in a non-cancer health problem (for example, neurological effects). The hazard quotient is developed by dividing the estimated exposure to a chemical by the reference dose (RfD) for oral ingestion pathways or reference concentration (RfC) for inhalation pathways. The RfD and RfC are estimates of the highest dose or concentration that might be considered safe. An HQ of one or lower indicates that the given exposure is unlikely to result in adverse health effects. Some programs, such as the drinking water program, set the HQ target at less than one to provide a safety factor against exposure to a chemical from other sources. For example, the drinking water program has used 20% of the RfD in setting drinking water standards (see, for example, 57 FR 31776). Within the Office of Solid Waste, we have used 25% of the RfD in setting standards for Boilers and Industrial Furnaces (BIFs) (56 FR 7134). For HWIR, we would evaluate the exemption levels that result

from both an HQ of 0.1 and an HQ of one.

3. *Ecological hazard quotient.* The ecological hazard quotient is analogous to the human health HQ, except that the estimated exposure is compared with an ecological toxicity value rather than the human health RfD or RfC. For this analysis, we developed two types of toxicity values: (1) an ecological benchmark that is analogous to the human health HQ using a RfD; and (2) chemical stressor concentration limit (CSCL) that is analogous to the human health HQ using an RfC. The ecological hazard quotient protects ecological health at the population or community level, and therefore focuses on reproductive and developmental effects, rather than the mortality of individual organisms. In developing ecological toxicity values for this risk assessment, we used the geometric mean between a No Observed Effects Level (NOEL) and a Lowest Observed Effects Level (LOEL). (Human health reference doses are based on NOELs.) This approach is similar to the approach used for developing Ambient Water Quality Criteria, where the assumption is that most, but not all, of the aquatic species and animals are protected (U.S. EPA, 1985). For HWIR, we would evaluate the exemption levels that result from both an ecological hazard quotient of one and ten.

4. *Population percentile.* The population percentile is the percentage of the population protected at the specified risk levels and hazard quotients for a single environmental setting. A setting is a specific unit at a specific site, and is defined by combining site-based information (such as unit size, and unit placement) with variable environmental information (such as rainfall and exposure rates) generated from regional and national data. For HWIR, we would evaluate the exemption levels that result from population protection percentiles of 99% and 95%.

Although the risk percentiles are meant to represent the proportion of the population protected (or, conversely, at risk), the data used to define population variability and to interpret the 99th individual risk percentile may be both quantitatively and qualitatively limited. First, there might not be a sufficient number of observations for a given input for adequately defining an upper percentile (for example, the 99th percentile) within the range of observations, which introduces uncertainty when extrapolating in the tails. Second, efforts to describe the variability are often confounded by uncertainties introduced as a bias. The bias may over-or underestimate the results to an unknown degree.

5. *Probability of protection.* The probability of protection is defined as the percentage of settings that meet the population percentile criteria. These distributions reflect the uncertainty and the variability of the model and underlying data required by the model. We generally describe a probability of protection as ''high end'' when it focuses on individual risk to those people at the upper end of the distribution, generally above the 90th percentile (%). For HWIR, we would evaluate the exemption levels that result from both 95% and 90% probabilities of protection.

By evaluating different values for each risk protection criteria, we would generate potential HWIR exemption levels for four different risk protection groups (See Table 9) . The risk protection groups are two-dimensional in nature. For example, with respect to the Group 2 criteria the interpretations for cancer and non-cancer risks are respectively:

—99% of the population are subject to cancer risks of less than 10^{-6} across 90% of the environmental settings;

—99% of the population experience exposure levels below an HQ of 1 across 90% of the environmental settings.

The combinations in Table 9 capture a range of protection levels, from most conservative (Group 1) to least conservative (Group 4). These groups are not an exhaustive look at all possible combinations of potential risk protection criteria; we could choose a different combination altogether. These groups were chosen to help bound the possible values. We request comment on which risk protection criteria to use, and in which combination.

TABLE 9.—RISK PROTECTION COMBINATIONS EVALUATED FOR HWIR RISK ASSESSMENT

	Group 1 (most conservative)	Group 2	Group 3	Group 4 (least conservative)
Risk Level	10^{-6}	10^{-6}	10^{-5}	10^{-5}
Human Health HQ	0.1	1	1	1
Eco HQ	1	1	1	10
Population Percentile	99	99	99	95
Probability of Protection	95	90	90	90

B. How Would EPA Aggregate the Human Health and Ecological Risk Information?

The risk assessment produces separate results for the protection of human receptors and the protection of ecological receptors. We would select the lower (more conservative) of these values. Thus, the resulting number would be protective of both sets of receptors.

C. How Would EPA Aggregate the Chemical Concentrations at Each Waste Management Unit Into HWIR Exemption Levels?

The risk assessment produces separate results for each of the five waste management units being modeled (surface impoundment, aerated tank, land application unit, waste pile, and landfill). To apply these results to real-world practices under the generic HWIR exemption, we defined the categories of wastes that would most likely match the scenarios we modeled.

To match the HWIR exempted wastes to their likely destinations, we would tailor the HWIR exemption levels to three broad waste form categories: (1) Liquids; (2) semi-solids; and (3) solids. These categories are identified by a waste's total suspended solids (TSS) content, which is defined as the particles that can be removed from a solution by filtration. Liquids are wastes that have less than 1% TSS by weight; semi-solids are wastes with a TSS content between 1 and 30%; and solids are waste with a TSS content greater than 30%.

We chose the 1% and 30% thresholds by examining available data on wastewater treatment and sludge processing and by considering water saturation for a ''typical'' waste passing

the paint filter test. More detailed discussion of these data sources can be found in the background document entitled *Correlation between Liquid, Sludge, and Solid Waste Forms and Surface Impoundment, Land Application Unit, and Landfill Disposal Options* (U.S. EPA, 1999-a).

We would group the unit-specific results to construct HWIR exemption levels for each waste category as follows:

TABLE 10.—HWIR EXEMPTION LEVEL CATEGORIES

	Liquids (TSS < 1%) (mg/l)	Semi-Solids (1%≤TSS≤30%) (mg/kg)	Solids (TSS > 30%) (mg/kg)
Surface Impoundment	Evaluate	Evaluate.	
Aerated Tank	Evaluate	Evaluate.	
Land Application Unit		Evaluate.	
Waste Pile			Evaluate.
Landfill			Evaluate.

As Table 10 suggests, HWIR exemption levels for liquids would be derived from releases evaluated at surface impoundments and aerated tanks. Exemption levels for semi-solids would be based on releases evaluated at surface impoundments, aerated tanks and land application units. Solids use risk-based numbers would be based on the releases evaluated at waste piles and landfills.

The exemption levels for each waste form would be determined for each waste management unit by selecting the lowest (most stringent) chemical concentration from the units evaluated. For example, the liquid exemption level would be based on the lower of the surface impoundment and aerated tank results. In developing the semi-solid numbers, we would convert the surface impoundment and aerated tank results, which are in mg/l, to mg/kg based on an assumed density of one kg/l (the density of water).

These categories of waste forms group wastes that are expected to be managed in similar ways. Some waste forms will not realistically be managed in certain management units. For example, it is unlikely that a true solid would be managed in an aerated tank system, or that a true liquid would be managed in a landfill. The liquid and solid definitions distinguish wastes that are clearly and intuitively liquid and clearly and intuitively solid from the rest of the waste universe. Creating separate exemption levels for these two waste forms should not affect the protectiveness of the exemption, and might allow for more appropriate exemption levels and greater regulatory relief.

The semi-solid category, on the other hand, represents a broad and varied universe of waste. Wastes between 1% and 30% TSS could in theory be managed in any of the five waste management units, although the more liquid wastes (for example, 1%–10% TSS) would be less likely to go to landfills and waste piles and the more solid wastes (for example, 20–30% TSS) would be less likely to go to surface impoundments or aerated tanks. Wastes going to land application units, however, could contain anywhere from 1% to 30% TSS.

We considered assigning to the category of semi-solids the lowest concentration of the results from any of the five waste management units. This approach would ensure that the concentration would be protective no matter which of the units is the ultimate destination. However, after additional consideration, we decided that the risk levels derived from the landfill and waste piles were not directly comparable to the other units. Risk values for surface impoundments, aerated tanks and land application units are derived on a wet basis (that is, they consider the volumes of water contained in the waste form), whereas the levels derived for landfill and waste piles are derived on a dry basis.

Our approach groups the risk results from surface impoundments, aerated tanks and land application units to produce the semi-solid exemption levels. To the extent that semi-solids could be disposed in a landfill or waste pile, then this formulation does not explicitly evaluate such risk. However, for many chemicals, particularly organics, risks from a land application unit would be expected to be generally greater than risks from a landfill or a waste pile, although such a judgement would be case specific. Applying the land application unit results to wastes that contain up to 30% TSS should therefore be more protective than lowering the 30% TSS threshold and applying the landfill or waste pile results.

In the 1995 HWIR proposal, we pursued a different characterization of waste form categories (see 60 FR 66388). In 1995, we distinguished between ''wastewaters'' and ''nonwastewaters'' and offered three alternatives to define the two categories. These three alternatives were based on the LDR definition of wastewaters, a 15% solids threshold, and a distinction for free liquids made on the basis of the paint filter test.

Commenters on the 1995 proposal were split in their support of these three options for defining wastewaters and nonwastewaters. Many commenters supported a distinction at 15% solids, because this threshold would, among the three proposed, best identify the way in which waste is actually managed and the way in which the results from the risk analysis were used in developing the 1995 HWIR exemption levels. Equally strong were opinions advocating consistency with the LDR definition. Commenters were concerned about multiple definitions of waste forms within the RCRA program and the complexity and confusion such differences would cause. We believe that the creation of three waste form categories will produce categories with appropriate and corresponding exemption levels, while at the same time maintaining general consistency with the LDR definitions.

A few commenters suggested the creation of three waste form categories at 1% and 15%, labeling waste less than 1% as wastewaters, wastes greater than 15% as non-wastewaters, and allowing the generator to classify wastes between these thresholds based on how they are actually managed. In today's notice, we have adopted this notion of three waste categories; however, as explained earlier we have increased the upper threshold to 30% in order to protect against risks of land applying wastes with 15–30% solids.

The concept of ''solids'' based on the 30% threshold is intended to conform with the historic consideration of wastes that do not have free liquids as defined under 40 CFR 260.10. Conceptually, these wastes would also pass the paint filter test developed to determine the presence of free liquids in either

containerized or bulk wastes (see 50 FR 18370) that established the paint filter test as well as a subsequent **Federal Register** notice (57 FR 54454) that retained the paint filter test over a proposed liquid release test. Therefore, as an alternative to the threshold of 30% TSS, we request comment on the use of the paint filter test to distinguish solids without free liquids from other solids for the purpose of the HWIR exemption.

We also do not believe it appropriate in the generic option to allow you to choose which of the three exemption levels (liquid, semi-solid, or solid) should apply to your wastes. Because there are no constraints or requirements that waste exempted under the generic option be disposed in a particular unit, there would be no way to verify that the waste ended up in the destination for which exemption levels were evaluated under the risk assessment.

As discussed in Section X.C. of this preamble, waste becoming exempt after the point of generation must comply with LDR requirements. The relationship of the waste categories for HWIR and LDR is therefore especially important. We believe that although the HWIR definition of liquids is different from the LDR definition of wastewater, these definitions are appropriate to their respective programs.(See discussion of LDR requirements for HWIR exempted waste in Section X of this preamble.)

We sought to conform the HWIR definition of liquids with the 1% threshold for TSS found in the LDR definition of wastewaters (see 40 CFR 268.2(f)). The overlap is especially useful when making any comparisons of HWIR and LDR concentration levels (for example, for the purposes of meeting treatment standards established to minimize threats to human health and the environment (see Section XX of this preamble).

HWIR, however, did not adopt the 1% total organic content criterion used in the LDR program. We thought it unnecessary to cap organic content for the purposes of selecting appropriate exemption levels. We presume that liquids exempted under HWIR would be managed in surface impoundments and aerated tanks independent of the organic content of the waste.

In contrast, the LDR program sought to distinguish wastes on the basis of treatment. By instituting a 1% cap on organic content, the LDR program could distinguish wastes likely to be treated by distillation or combustion from waste containing minimal organics less suited to these treatment technologies and more suited to more typical treatments for wastewaters (for example, biological degradation) (51 FR 1726). Therefore, the criteria based on organic content is more appropriate for the consideration of treatment technologies than for disposal destinations.

As a result of these two sets of definitions, there will be wastes that would be identified as ''liquid'' for the purposes of the HWIR exemption, and as ''nonwastewaters'' for the purposes of LDRs. However, ''liquid nonwastewaters'' is a meaningful term, representing organic liquids, and is generally recognized as a waste category distinguishable from more traditional wastewaters, both in terms of treatment alternatives and environmental concerns. Once understood, we do not believe that the presence of these two sets of terms will create difficulties for the regulated community.

We request comment on the waste form categories discussed for the HWIR generic option. Specifically, we request comment on the definition of (1) liquid (TSS<1%), (2) semi-solid (1%≤TSS≤30%) and (3) solid (TSS>30%); on the grouping of risk results based on specific waste management units that correspond to the three waste forms; and on the use of a conversion factor of one kg/L to convert the aerated tank and surface impoundment results (mg/L) for comparison to the land application unit results (mg/kg) in the semi-solid category.

In contrast to the generic option, wastes exempted under the landfill-only option would require exemption levels based only on the landfill destination and there is no need to segment the waste universe. HWIR implementation provisions would require that such waste be managed in a landfill. In addition, acceptance criteria at the landfill (such as the general prohibition against managing liquids in a landfill) combined with adequate waste representation for landfills in the HWIR modeling, help ensure that the landfill specific risk levels would be appropriate for these waste forms.

Possible Revision to LDR Treatment Standards

XX. How Might EPA Use the Results of the HWIR Model To Revise the Hazardous Waste LDR Treatment Standards?

A. What Is the Statutory Basis for the RCRA LDR Treatment standards?

The statutory requirement for LDR treatment standards is to ''substantially diminish the toxicity of the waste or substantially reduce the likelihood of migration of hazardous constituents from the waste so that short term and long term threats to human health and the environment are minimized.'' [RCRA Section 3004(m)]. Before we could use the risk-based results of the HWIR model to revise the hazardous waste treatment requirements under the RCRA land disposal restrictions (LDR) program, we would have to determine if the results ''minimize threat'' to human health and the environment as required by the statute.

Our implementation of this requirement has evolved through a long series of rulemakings (51 FR 1611). The first LDR treatment standards were largely based on what technology could achieve. To avoid unnecessary treatment, however, we had also proposed to ''cap'' the technology based standards with risk-based screening levels. These levels were based on human health toxicity thresholds for individual hazardous constituents and modeling of the groundwater route for exposure. (51 FR 1611–13.)

In the final initial LDR rule, we promulgated only the technology-based standards. We explained that although we believed we had the authority to promulgate risk-based standards, we were not promulgating the proposed risk-based caps, because of extensive comments raising concerns about the scientific uncertainties of the risk analyses performed to date (51 FR 40578). Members of industry challenged the final standards, claiming that they required treatment to concentrations below ''minimize threat'' levels. On review, the Court held that section 3004(m) authorized both technology-based and risk-based standards, but remanded the rule to EPA for a fuller explanation of our decision to rely on technology-based standards alone. (*Hazardous Waste Treatment Council* v. *EPA*, 886 F. 2d 355 (D.C. Circ. 1989). (''HWTC III'').) The court also held that EPA was not obligated to adopt either the RCRA characteristic test levels or the Safe Drinking Water Act Maximum Contaminant levels (MCLs) as ''minimize threat'' levels, because neither ''purports to establish a level at which safety is assured or 'threats to human health and the environment are minimized'.'' (886 F. 2d at 363.)

In our response to the remand, we stated that the best way to fulfill the requirements of section 3004(m) would be to ensure that technology-based treatment standards did not require treatment of hazardous chemicals that posed only insignificant risks. (55 FR 6641, Feb. 26,1991). We explained, however, that we were not yet able to promulgate such levels. We believed that we lacked a reliable predictive model for groundwater exposure; needed to assess exposure scenarios for

air pathways; needed to consider impacts on ecological receptors; needed to develop additional analytic methods for hazardous chemicals; and needed to develop an approach for chemicals with threshold effect levels lower than detection limits. (Id. at 6642.)

In the same notice, we noted that the ''minimize threat'' language of section 3004(m) could reasonably be interpreted to require more protection than the ''normal subtitle C command that standards be those necessary to protect human health and the environment.'' (Id. at 6641.) We found that the many portions of the 1984 amendments stressing the inherent uncertainties of land disposal buttressed this interpretation. [See RCRA sections 1002(b)(7), 3004 (d)(1)(A), 3004 (e)(i)(A), 3004(g)(5)]. We also found support in the LDR legislative history. For example, the Senate amendment containing the ''minimize threat'' standards replaced a committee bill that only would have required treatment to be ''protective of human health and the environment.'' [See S. 757, Section 3004(b)(7), printed at S. Pep. No. 284, 98th Cong., 2nd Session 86].

Further, we noted that the levels we had been using in site-specific and waste stream specific contexts, such as clean closures, delistings, and no-migration petitions, would not necessarily be appropriate for generally applicable standards required to minimize threats to human health and the environment. (55 FR 6641, note 1.) We took the position that section 3004(m) does not require the elimination of every conceivable threat posed by land disposal of hazardous waste, citing a statement by Senator Chaffee that ''[i]t is not intended that every waste receive repetitive levels of treatment, nor must all inorganic constituents be reclaimed.'' 130 Cong. Rec. S.9179 (daily ed., July 25, 1984). (55 FR 6641, note 1.) Clearly we did not interpret the minimize threat language to require the elimination of all threats.

Since the outset of the LDR program, we have continued to develop and refine the risk assessments that are the basis of our regulatory decisions with respect to waste identification. In addition, the increased sensitivity of analytical methods has lowered achievable detection limits and more extensive biological data are available for development of benchmark criteria for assessing ecological risk. As a result, the universe of available health-based and ecological data has grown significantly, and the reliability of this information has improved. In developing the HWIR risk assessment, we now believe that, for some chemicals, we might soon have enough data and the necessary tools to establish risk-based levels on a national level that minimize threats to human health and the environment.

B. Why Do We Believe That the HWIR Risk Assessment Results Could Be Used To Revise the Waste Treatment Standards?

The HWIR risk assessment could be used to develop risk-based LDR levels for several reasons. First, the HWIR risk assessment significantly expands our ability to evaluate human and ecological risk as compared to our historic capability. For example, unlike previous analyses that focused solely on groundwater, the HWIR risk assessment evaluates the potential for waste chemical migration through the most significant environmental fate and transport pathways. Second, the 1999 HWIR risk assessment looks at the total impact of all those pathways, not just at each pathway individually. Finally, the HWIR risk assessment also includes the greatest number of ecological benchmarks ever used in regulatory development under RCRA. These factors suggest that the tools and analyses now exist to properly evaluate when threats to human health and the environment are minimized.

C. How Might the Risk-Based LDR levels Be Implemented?

Generally, an HWIR exemption level would replace an LDR numerical treatment standard (''LDR level'') if it is less stringent than the existing LDR level. In this case, we could directly use the new risk-based levels to replace existing LDR levels found in waste-specific treatment requirements listed in the table at § 268.40 and the Universal Treatment Standard (UTS) levels listed in the table at § 268.48. Setting risk-based LDR levels could help simplify the HWIR exemption. For those chemicals for which HWIR exemption levels replace LDRs, meeting the HWIR exemption would simultaneously satisfy LDR treatment requirements for those chemicals. This does not necessarily mean, however, that all of the applicable LDR treatment requirements would have been met for that waste code. LDRs could regulate more chemicals than those with revised risk-based standards. Before a waste can be land disposed, all chemicals identified in the LDR standards for that waste code must meet applicable LDR treatment standards.

For some chemicals, however, the HWIR exemption levels might be more stringent than the existing LDR numerical standards. In this situation, the LDR standards would not be replaced by the HWIR level. Otherwise, if HWIR exemption levels were mandated, generators would have to treat their waste below levels that are achievable using the best demonstrated and available technology, which is the basis for the LDR standards. If the waste meets the LDR levels but not the HWIR exemption levels, then LDR requirements would be satisfied, but the waste would remain hazardous.

This section reviews and addresses key issues within the LDR program that will influence how the HWIR risk assessment results would be specifically integrated with the LDR waste treatment standards. For instance: (1) HWIR identifies liquid, semi-solid, and solid exemption levels while the LDR program identifies wastewater and nonwastewater treatability groups; (2) HWIR risk numbers are based on totals analysis while LDR levels are based on totals analysis and the Toxicity Characteristic Leaching Procedure, or TCLP; and (3) HWIR exemption levels that replace existing LDR levels for certain chemicals might potentially impact other wastes subject to LDRs.

Waste Treatment Standards—Treatability Groups. When prohibiting a waste stream from land disposal, the LDR program identifies chemicals of concern that potentially pose a threat to human health and the environment. The LDR numerical treatment standards represent wastewater and nonwastewater [1] chemical levels that technologies can achieve when treating specific waste streams. As discussed in section XIX of this preamble, HWIR numbers apply to liquids, semi-solids, and solids, which is a related but not identical scheme of classification.

To attempt to resolve this potential difference and to simplify implementation, we could use the HWIR ''liquid'' number for the LDR wastewater number, and the lower of the ''semi-solid'' and ''solid'' numbers for the nonwastewater LDR number. As discussed in more detail below, this type of simple substitution scheme assumes that the HWIR exemption levels are higher than the current numerical LDR waste treatment standards to which they would be compared.

Some methodological issues will need to be addressed in pursuing this type of approach (or potentially in any similar

[1] For purposes of implementing the LDR treatment standards, as defined in § 268.2, wastewaters are wastes that contain less than 1% by weight total organic carbon (TOC) and less than 1% by weight total suspended solids (TSS). Nonwastewaters are wastes that do not meet the criteria for wastewaters.

approach). For example, the LDR definition of ''wastewater'' (less than 1% Total Suspended Solids (TSS) and less than 1% Total Organic Content (TOC)) does not precisely match the HWIR definition of ''liquid'' (less that 1% TSS). This means that some wastes with less than 1%TSS and greater than 1%TOC would be liquids under the HWIR definition but nonwastewaters under the LDR definition. We would need to resolve this type of translational issue and others that might arise during detailed analysis. We note, for this particular case, that ''liquid nonwastewater'' is a meaningful term that describes certain types of existing waste—organic liquids.

Waste Treatment Standards—Totals and TCLP Analysis. HWIR risk numbers are based solely on totals analysis while the LDR levels are based on both totals analysis (most organics) or the TCLP (metals). In cases where the current LDR levels and the results of the HWIR model are directly comparable (in other words, both sets of numerical standards are based on total concentrations), an existing LDR numerical standards could be replaced by the appropriate HWIR number if it is less stringent than the existing LDR standard. As discussed above, this change would be reflected in tables § 268.40 and § 268.48.

For the chemicals (such as metals, cyclohexanone, methanol, carbon disulfide) that have LDR requirements based on the TCLP, the comparison of HWIR exemption levels and LDR numerical treatment standards involves another level of complexity. This arises because the HWIR exemption levels would be based on total chemical concentrations in the waste, whereas the LDR treatment standards are based only on what leaches out of the treated waste matrix using the TCLP test. For metals treatment standards that are based on stabilization, the TCLP test is typically used because the chemicals are not destroyed by treatment; they are only immobilized. The route of exposure is via leaching over time, which is measured by the TCLP. A totals test is not valuable for determining the leaching potential of these metals because it would also measure the chemicals that are immobilized.

To address this issue, we could give the hazardous waste generator the choice of meeting either the current leachate or the new totals number to satisfy LDRs. If a waste meets current leach numbers, but cannot meet the totals number, then it would meet LDRs, but it would not be eligible for an HWIR exemption. Table 11 below summarizes how we would integrate HWIR exemption levels (totals analysis) with LDR waste treatment standards (totals and TCLP analysis). We request comments on this suggested approach.

TABLE 11.—INTEGRATING HWIR EXEMPTION LEVELS WITH LDR WASTE TREATMENT STANDARDS

If the existing LDR treatment requirement for a particular chemical is based on	And if the HWIR exemption level for that chemical is	Then the LDR treatment requirement for that chemical
Totals analysis	More stringent than existing LDR level	Would remain the existing LDR level.
	Less stringent than existing LDR level	Would be revised to the HWIR exemption level.
TCLP	Either more or less stringent (that is, it doesn't matter which).	Would be satisfied if either the existing LDR level (TCLP) or the HWIR risk level (totals) is met.

Waste Treatment Standards—Applying Risk-Based LDR Levels. In cases where the current LDR levels and the results of the HWIR model are directly comparable, the appropriate HWIR number would become the LDR treatment standard for a chemical if it is less stringent than the existing LDR treatment standard. As stated earlier, this change would be specified in the waste-specific treatment requirements at § 268.40 as well as the UTS table at § 268.48. Therefore, these chemical-specific, risk-based LDR levels would apply to all hazardous wastes that must meet LDRs before they are land disposed.

This approach would alter treatment requirements for some characteristic wastes and underlying hazardous chemicals whose standards are based on totals analysis and that must meet UTS before land disposal. It would not affect wastes for which the LDR requirements are non-numerical and specify a treatment technology. This approach would also not affect any of the other LDR requirements, such as notification. Because HWIR is being handled on a chemical basis, the resulting suite of LDR numerical treatment standards could be a mix of original UTS and risk-based levels. One implementation question is whether there is a need to indicate which treatment standards have changed due to HWIR (for example, by asterisks in the part 268 tables).

Waste Treatment Standards and HWIR Exemption Requirements—Compliance Issues. We expect that some wastes can be treated to achieve more stringent levels than the existing LDR levels. The numerical UTS standards were calculated with a variability factor to take into account process variability on a national basis (*see* 51 FR 40591, November 7, 1986). We designed the variability factor to ensure that the LDR treatment standard was achievable in a wide variety of settings. However, on a site-specific or waste-specific basis, a generator might be able to achieve more stringent HWIR exemption levels if their own process variability is less than we have presumed in setting national standards. Thus, one issue is whether and how to develop the regulatory scheme when an HWIR level is more stringent than an LDR level for certain chemicals. If a generator could meet the more stringent HWIR exemption levels, and the generator fulfills the other requirements of the HWIR exemption, then the waste would become exempt from RCRA Subtitle C. Table 12 illustrates how a waste stream could satisfy HWIR exemption levels and LDR requirements simultaneously.

TABLE 12.—APPLICATION OF HWIR EXEMPTION LEVELS AND LDR TREATMENT STANDARDS

If all chemicals identified in a listed waste code	And all chemicals regulated in the listed waste code's LDR prohibition	Then the waste
Meet HWIR exemption levels and the generator fulfills the other requirements of the HWIR exemption.	Meet applicable LDR treatment standards	Would be exempt from Subtitle C regulation.

TABLE 12.—APPLICATION OF HWIR EXEMPTION LEVELS AND LDR TREATMENT STANDARDS—Continued

If all chemicals identified in a listed waste code	And all chemicals regulated in the listed waste code's LDR prohibition	Then the waste
Meet HWIR exemption levels and the generator fulfills the other requirements of the HWIR exemption.	Do not meet any applicable LDR treatment standards.	Would not be a hazardous waste but must meet LDR treatment standards before it can be land disposed.
Do not meet HWIR exemption levels or other requirements of the HWIR exemption.	Meet applicable LDR treatment standards	Would satisfy LDR treatment requirements but still be a hazardous waste and would have to be managed in a Subtitle C unit.
Do not meet HWIR exemption levels or other requirements of the HWIR exemption.	Do not meet applicable LDR treatment standards.	Would have to be treated to at least meet LDR treatment standards and be managed in a Subtitle C unit.

This regulatory approach only applies when the HWIR waste does not meet the exemption levels at the point of generation. As explained in section X.C, wastes that meet the HWIR exemption requirements at the point of generation are considered to never have been hazardous and therefore LDR requirements do not apply.

D. What Other Issues Would EPA Consider Before Setting Risk-Based LDR Standards?

Assuming that the methodological issues discussed above can be resolved satisfactorily, several other issues would need to be considered and resolved before we could set risk-based LDR treatment standards. Three issues relate directly to the ''minimize threat'' standard underlying the LDR treatment standards. These issues are: (1) Which risk protection criteria to use, (2) how to consider ecological data, and (3) how to consider inhalation and ingestion data. A fourth issue is how these changes to the UTS would affect the alternative soil LDR treatment standards.

As explained in Section XIX.A. of this preamble, we are evaluating four different combinations of values for the five different risk protection criteria. The five risk protection criteria are (1) risk level, (2) human health hazard quotient (HQ), (3) ecological hazard quotient, (4) population percentile, and (5) probability of protection. The final HWIR numbers could be based on any of the four combinations, or on another combination altogether.

If we were to use the results of the HWIR risk assessment to revise the LDRs, we would have to make sure that the risk protection criteria we choose are appropriate for both purposes, *i.e.*, met the risk protection criteria for HWIR and the minimize threat standard for LDR treatment standards. Although it is technically possible to chose separate criteria for the HWIR exemption and the LDR standards, much of the utility of setting risk-based LDR levels would be lost if they were set at a different level than the HWIR exemption.

The second issue, the need to address ecological risk, is one of the major gaps that we identified in our response to the court remand regarding the choice of risk-based or technology-based treatment standards (55 FR 6641). As explained in Section XVI.F of this preamble, the HWIR risk assessment includes a thorough evaluation of ecological effects for those chemicals with ecological health benchmarks. However, not all chemicals have ecological health benchmarks available. Some of these chemicals, which are not very persistent or bioaccumulative, would probably not be driven by ecological risk, while others would have an unknown effect on ecological receptors. For those chemicals that do not have readily available ecological data, we would need to decide if we should proceed with setting risk-based LDR levels using human health data and then revise them in the future when and if ecological data are available.

The third issue, the need to address risks from the air pathway in addition to the traditional groundwater ingestion pathway, is another gap we identified in our response to the court. As explained in Section XVI.E of this preamble, we have thoroughly evaluated the air pathways, both direct and indirect, for chemicals that have inhalation benchmarks. Unfortunately, not all chemicals have inhalation benchmarks, but some of these chemicals are not volatile, or have data showing negligible inhalation risk. Before setting risk-based LDR levels, we would have to decide how to deal with chemicals that lack inhalation risk benchmarks.

A fourth issue is how a change to the UTS tables to incorporate HWIR exemption levels would affect the alternative LDR soil treatment standards. Our alternative LDR treatment standards for soil allow regulated chemicals in soil to meet either a final concentration of (1) 10 times the current UTS, or (2) 90 percent reduction of the regulated chemical's initial concentration. (See 63 FR 28751, May 26, 1998) These alternative soil treatment standards are not mandatory—contaminated soils may still meet treatment standards developed for process wastes—but they are expected to provide greater flexibility when cleaning up contaminated soils subject to LDRs. For instance, the alternative soil treatment standards take into account (1) the matrix effect of the soil, which makes treatment difficult, and (2) the need to encourage clean-ups, thus minimizing the overall risk of the contaminated soil at the clean-up site. In fashioning this rule, we are seeking to maintain the benefits from the alternative soil standards and to create an implementation scheme that is simple and effective. We request comment on whether and how to use the results of the HWIR model to revise LDR treatment standards for soils, and on any implementation impacts flowing from our suggested approach.

Several issues arise when determining how a change in the UTS table due to HWIR exemption levels would impact the effectiveness and applicability of the alternative soil treatment standards. For instance:

- How should we integrate the HWIR exemption levels with the alternative soil treatment standards if the HWIR risk-based number is (1) greater than the UTS but less than 10xUTS and (2) greater than both the UTS and 10xUTS?
- How should we consider the HWIR exemption levels in for contaminated soil—for example, should we just apply the same 10x multiplication factor to the HWIR risk-based number? If so, is this consistent with the risk basis of the HWIR exemption levels? If not, will the HWIR exemption levels deter clean ups, which itself has the potential to minimize risks in a more global sense?

We would integrate the HWIR exemption levels with the soil treatment standards in a manner that preserves the advantages of the alternative soil treatment standards adopted in the recent Phase IV rule (63 FR 28751, May

26, 1998). We presume, strictly for purposes of presenting this discussion, that existing UTS numerical standards for process waste would be modified by HWIR exemption levels and that the result would be a set of revised UTS levels. Therefore, for purposes of this discussion, ''current UTS'' refers to existing technology-based UTS while ''revised UTS'' refers to UTS levels that would already have been modified to reflect HWIR risk-based exemption levels.

Under this scenario, when applying the soil treatment standards to treat constituents of concern present in contaminated soil, the constituents of concern may meet (1) the revised UTS, (2) 10 times the current UTS, or (3) 90% reduction of initial constituent concentration, whichever is greater.

This would not change implementation of the current soil treatment standards. Rather, it would make the soil treatment standards somewhat more flexible by providing that contaminated soils can meet the revised UTS LDR treatment standard in the case where the revised UTS is higher than 10 times UTS or 90% reduction. To implement this, we would add a table to the soil treatment standards with the chemicals and the specific alternative UTS levels (either the revised UTS or, if higher, 10x current UTS) for those chemicals.

We would not raise the current soil treatment standards to 10 times the HWIR exemption levels because such levels would no longer be minimize threat levels and could be greater than demonstrated performance levels. As mentioned earlier, if the HWIR exemption levels are below *both* the UTS and 10xUTS, we would not consider lowering the UTS. Lowering the UTS in this case would require generators to treat below levels that are achievable using the best demonstrated and available technology, which is the basis for the LDR standards.

Finally, when addressing the potential impacts of HWIR exemption levels on contaminated soils subject to LDRs, we would consider how the HWIR exemption levels could affect (1) the site-specific, contained-in determination, and (2) the site-specific, risk-based treatability variance developed specifically for contaminated soils (referred to as the risk-based soils variance). Both the contained-in determination and the risk-based soils variance apply site-specific risk-based numbers in their decision-making process. The potential might exist to compare national HWIR risk-based exemption levels to the site-specific risk-based numbers generated for a contained-in determination or risk-based soils variance. However, we intend that national HWIR exemption levels should not affect site-specific risk-based levels determined for either the contained-in determination or the site-specific risk-based treatability variance.

The contained-in policy is the basis for EPA's longstanding interpretation regarding application of RCRA Subtitle C requirements to mixtures of contaminated media and hazardous wastes. Under this policy, EPA requires that soil (and other environmental media), although not wastes themselves, be managed as if they were hazardous waste if they ''contain'' hazardous waste. Environmental media may contain hazardous waste if it is contaminated by a listed waste or exhibits a characteristic of hazardous waste. In practice, EPA has applied the contained-in principle to determine, on a site-specific level, that environmental media should no longer be regulated as hazardous waste because it does not ''contain'' hazardous waste.[2] This determination, referred to as a contained-in determination, is made by a regulatory agency and reflects conservative, health-based levels derived assuming direct exposure pathways. (See 63 FR 28621–28622). We expect that this tailored, site-specific determination would have precedence over national HWIR exemption levels.

Similarly, the risk-based treatability variance provides a way to establish alternative LDR treatment standards based on site-specific risk-based levels that are approved through the variance process. These risk-based levels reflect site-specific conditions, including information on (1) constituents of concern, (2) potential human and environmental receptors, and (3) potential routes of exposure. Again, we expect that this tailored, site-specific determination would have precedence over national HWIR exemption levels.

[2] Environmental media (e.g., soil) no longer contains hazardous waste when a site-specific determination is made that concentrations of hazardous constituents in any given volume of environmental media are low enough to determine that the media does not contain hazardous waste. Typically, these ''contained-in'' determinations do not mean that no hazardous constituents are present in environmental media but simply that the concentrations of hazardous constituents present do not warrant management of the media as hazardous waste.

Economic Impacts

XXI. What Are the Economic Impacts of Today's Proposed Regulatory Changes?

A. What Are the Economic Impacts of the Revisions to the Mixture and Derived-From Rules?

Today's proposal involves two revisions to the mixture and derived-from rules. The first applies an existing exemption for mixtures to waste derivatives and any hazardous waste that is listed solely because it exhibits one or more of the characteristics of ignitability, corrosivity, or reactivity. The second involves a conditional exemption for mixed radioactive hazardous waste managed under a new regulation being proposed in a separate Federal Register notice today. The economic impacts of the separate proposed mixed waste regulation are discussed in that Federal Register notice published elsewhere today.

The economic impact of the revision to the mixture and derived-from rules concerning wastes listed solely for a characteristic is discussed here. Additional information can be found in the *Economic Assessment of the U.S. EPA's 1999 Proposed Hazardous Waste Identification Rule (HWIR).* As discussed in Section IV of this preamble, there are currently 29 hazardous waste codes within the RCRA program listed solely for ignitability (I), corrosivity (C), and/or reactivity (R) characteristics. Today's proposed rule would exempt these wastes from RCRA Subtitle C regulation, if such wastes are de-characterized and meet the associated LDR treatment standards.

To estimate the potential economic impact of exempting these 29 characteristically-listed RCRA waste codes, we analyzed the type and quantity of industrial hazardous wastes contained in the two databases that underlie the HWIR Economic Model: the 1986 ''Generator Survey'', and the 1996 ''National Hazardous Waste Constituent Survey''. This model and these two databases are described in the Economic Assessment background document.

This exemption is expected to benefit the relevant segment of the RCRA regulated community by reducing the cost of shipping and disposing these de-characterized wastes. This potential cost savings is modeled in this study as consisting of two components:

(1) The difference between the cost for disposal of treatment residuals from these 29 waste codes in hazardous landfills (i.e., current or ''baseline'' practice), compared to the cost for

disposal in nonhazardous landfills under this exemption.

(2) The reduction in burden hours and associated burden cost for no longer requiring preparation, transmitting and filing of truck shipment hazardous waste manifests (EPA Form 8700–22) for these potentially exempt wastes.

The database extractions, computations and findings of the impact analysis are presented in the Economic Assessment background document. The highlights of U.S. EPA's estimated economic impacts for this HWIR provision are as follows:

—236 applicable industrial hazardous waste streams, totaling 3.6 million tons in annual generation by an estimated 120 US facilities.

—As generated, these waste streams consist of 87% wastewaters and 13% non-wastewaters.

—The 3.6 million annual tons quantity of applicable waste, represents 1.4% of the total RCRA hazardous waste universe (1993 BRS large generator total quantity = 258 million tons).

—Approximately 75% of the potentially exempt waste streams are identified by waste code F003 (spent non-halogenated solvents) plus a characteristic waste code (for example, D001), and 19% are identified by waste code F003 only.

—Applicable waste streams are located in 17 four-digit level SIC code industry sectors. 146 (62%) of the 236 applicable waste streams are generated by industries in SIC 28 (i.e. NAICS code 325).

—There are 51 different hazardous chemical constituents in the wastestreams; prevalent ones include: ethylbenzene, toluene, methyl ethyl ketone, methanol, ethyl acetate, xylenes, acetone, methylene chloride, and n-butyl alcohol.

—After RCRA Subtitle C treatment (mainly incineration), the 236 wastestreams result in the annual disposal of about 57,400 tons of treatment residuals, primarily in the form of incineration ash.

—Potential annual industry waste treatment residual, disposal cost savings is estimated at $4.593 million, while annual reduction in truck shipment manifesting cost is estimated at $0.455 million (i.e. 54,700 tons/yr divided by 20 tons/shipment = 2,870 manifests per year; 1.3 hours per manifest x $122 per hour x 2,870 manifests = $0.455 million). These two cost savings components represent a total annual cost savings estimate of $5.048 million. Applying −15% to +30% cost estimation uncertainty to this point-estimate (as explained in the background document), produces the associated cost savings estimation uncertainty range of $4.29 to $6.56 million per year.

B. How Would EPA Assess the Impacts of the HWIR Exemption?

Because we have not developed exemption levels, we have not estimated the potential economic cost impacts of the HWIR exemption. In addition, because the HWIR exemption is deregulatory by design, it will provide cost savings to industries with HWIR-eligible wastestreams. Before we would go final with an HWIR exemption, we would first publish an HWIR proposal that would include specific exemption levels and give the public an opportunity to comment. We would provide estimates of potential industry cost savings at that time as well.

The Economic Assessment describes a computer-based economic model we developed for the purpose of systematically estimating potential (a) type and quantities of HWIR eligible wastestreams, (b) industry implementation costs, and (c) net industry cost savings, once HWIR exemption levels are developed. [see *Economic Assessment of the U.S. EPA's 1999 Proposed Hazardous Waste Identification Rule (HWIR)*].

The Economic Assessment report describes the databases and decision-rules imbedded in this model, which includes a new database of industrial hazardous waste constituent identities and concentrations, based on 1996 survey questionnaires received from a sample of 156 hazardous industrial waste generator and handler facilities (reporting constituent data on 1,020 waste streams), administered by U.S. EPA's Office of Solid Waste (OSW). The data and findings of this ''National Hazardous Waste Constituent Survey'' (NHWCS) are also described and referenced in the Economic Assessment background document, as well as available for public review from the RCRA Docket in support of this proposal. The model integrates OSW's 1986 National Survey of Hazardous Waste Generators, and Treatment, Storage, Disposal, and Recycling Facilities, containing sample data for 8,016 industrial wastestreams associated with 4,036 facilities, with the new database.

Depending upon the types and number of constituent exemption levels developed, net cost savings are expected from industry switching the current management of low-risk wastestreams as RCRA hazardous wastes, to nonhazardous waste management practices after HWIR exemption, after netting-out industry HWIR implementation costs. Under the specific paperwork preparation and reporting requirements, and waste sampling/testing requirements outlined in this preamble (and as itemized in the Economic Assessment report), we estimate that the cost to industry for implementing HWIR will range from about $6,000 to over $50,000 per facility, depending upon the size and number of hazardous waste streams per facility and the number of HWIR-applicable constituents. This implementation cost estimate is based upon a preliminary average annual burden of 15 hours per facility for HWIR-related paperwork and reporting and a U.S. national average unit cost for waste sampling ranging from $150 to $900 per sampling event and per chemical (cost depends upon the chemical analyzed). These implementation costs would be offset with the potential cost savings and burden reduction of reduced waste management and disposal costs, as well as other RCRA hazardous waste related paperwork burden. As we move forward with HWIR, we will characterize the full economic impacts and Information Collection Request (ICR) burden of that proposal.

C. How Would EPA Assess the Impacts of the Possible LDR Revisions?

In Section XXI of this preamble, we discuss replacing the existing, technology-based LDR standards with HWIR exemption levels. Most of the LDRs prescribe constituent concentration non-exceedance thresholds, while some prescribe allowable treatment technologies (40 CFR 268.40 & 268.48). Without actual HWIR exemption levels to compare with the existing LDR levels, the potential economic effect (i.e. net decrease in average annual waste management costs to industry) is indeterminate. Costs savings from avoided treatment requirements would be highly variable, depending on which treatments are involved. Treatment costs are further discussed in the Economic Assessment document. As we move forward and propose the HWIR exemption, we will characterize the economic impacts of these regulatory provisions.

Relationship to Other Programs

XXII. How Would the HWIR Exemption Relate to Other Programs?

Today's notice discusses specific conditions and exemption criteria that would exempt listed hazardous wastes, including waste mixtures and derived-

from wastes, from RCRA Subtitle C regulation. A discussion of how these changes would affect other relevant RCRA regulatory programs is presented below.

A. Would HWIR Change How You Determine if a Waste Is Hazardous?

No, the HWIR exemption applies to listed hazardous wastes meeting exemption criteria, and it does not change the general requirements that you use to determine if a waste is hazardous. Under current RCRA regulations, if you generate a solid waste, you would have to determine if it is a hazardous waste as explained in 40 CFR 262.11 (Hazardous Waste Determination). You would have to first determine if your waste is excluded from regulation under 40 CFR 261.4 (Exclusions). Then you would have to determine whether your waste is listed in Subpart D of 40 CFR Part 261 (Lists of Hazardous Wastes), and/or the waste exhibits a characteristic defined in Subpart C of 40 CFR Part 261.

B. Could a Characteristic Hazardous Waste Be Exempt Under HWIR?

No. A waste that met all the HWIR exemption levels could nevertheless still be hazardous for a characteristic. You would have to still determine whether the waste exhibits any of the ignitability, corrosivity, reactivity or toxicity characteristics of a hazardous waste as specified in 40 CFR 261.21 through 261.24. If so, your waste continues to be hazardous until it no longer exhibits any hazardous waste characteristic.

C. How Would the HWIR Exemption Differ From the Delisting Process per 40 CFR 260.22?

In the delisting process, you would submit information to the State or Regional authority that your specific listed hazardous waste does not meet the criteria for which it was listed, and that the waste is not hazardous for any other reason (see 40 CFR 260.22). Until the State or Region makes an affirmative decision that your waste is delisted, your waste remains hazardous. In contrast, the purpose of the HWIR exemption is to establish a self-implementing rule where the hazardous waste generator, rather than the State or EPA, determines whether a listed waste would have to continue to be managed as a hazardous waste.

The evaluation criteria used for delisting vary from today's exemption criteria for the following three reasons: (1) Delisting is an interactive process with considerable oversight by us or authorized State agencies. In delisting, we evaluate the processes generating a specific waste stream to determine the chemicals likely to be present, as well as the potential variability in the waste. We closely review sampling procedures, analytical test results, and the accompanying QA/QC data. (2) Delisting is specific to one waste stream. For example, in a delisting petition you will typically provide the annual waste generation volume. Using a specific waste volume as an input to various models could result in delisting levels that are higher than the levels that would be developed with the HWIR model, which is based on a distribution of waste volumes that includes very large waste streams. We believe that it is reasonable to use higher exemption levels for the smaller waste volumes in delisting petitions, since these volumes pose less total risk than larger volumes of waste. (3) Delisting also considers the applicability of available groundwater monitoring data from land-based waste management units that have received the petitioned waste. Such data are typically required under permitting regulations for hazardous waste facilities. If any groundwater contamination appears to be due to chemicals from the petitioned waste, we will consider this as a basis to deny the petition.

We might also require special testing regimes when making delisting determinations to ensure waste consistently meets delisting criteria. A facility that accepts and treats waste from diverse sources would typically have frequent testing requirements. In other cases, the testing requirements for some initial period will be extensive, but the subsequent testing might be reduced.

Delisting petitions for wastes that contain chemical concentrations which exceed HWIR exemption levels, would continue to be accepted and reviewed by us after promulgation of today's rule. We do not anticipate any changes in the current review of delisting petitions as a result of the implementation of today's exemption.

D. How Would HWIR Affect TSDF Closure Requirements for My Facility?

If your TSDF accepts HWIR waste, the closure requirements might change, depending upon the waste management unit and the waste. If your hazardous waste management unit receives only waste that is exempt under today's proposal, it would no longer be receiving hazardous waste upon the effective date of the exemption. Thus, at that point in time, your TSDF would normally become subject to RCRA Subtitle C closure requirements, which are triggered by the final receipt of hazardous waste by the unit. You would be required to complete closure activities within 180 days after receiving the final volume of hazardous waste. (See *Time Allowed for Closure* in 40 CFR 264.113(b) and 265.113(b).)

However, RCRA closure requirements would allow you to delay closure of your waste management units, while continuing to receive HWIR waste, if you meet certain conditions. You may delay closure of landfills, land treatment units, and surface impoundments in cases where your unit stops receiving hazardous waste if you wish to continue using the unit to manage only nonhazardous waste. These requirements are outlined in 40 CFR 264.113(d) and (e) and 265.113(d) and (e). If you wish to delay closure, you would have to request a permit modification at least 120 days prior to final receipt of hazardous wastes, or, if the facility is in interim status, submit an amended part B application at least 180 days prior to the final receipt of hazardous wastes. The request for a permit modification or the amended part B application must include demonstrations that your unit has the existing design capacity to manage nonhazardous wastes, and that the nonhazardous wastes are compatible with any wastes in the unit. In addition, you must update facility information, including the waste analysis plan, groundwater monitoring plans, closure and post-closure plans, cost estimates, and financial assurance demonstrations, as necessary to account for receipt of only nonhazardous waste.

The delay of closure regulations apply only to landfills, land treatment units, and surface impoundments. In the case of other RCRA units such as tanks and waste piles, we do not believe that the delay-of-closure regulations are necessary for these units to receive only nonhazardous wastes. The closure requirements in 40 CFR Part 264 Subpart G (Closure and Post-Closure) for these units include removal or decontamination of waste residues, containers, liners, bases and contaminated soils, equipment, and other containment system components. These closure requirements are compatible with the reuse of these units for receipt of only nonhazardous waste. Once the unit has been emptied of all hazardous wastes and decontaminated, it could receive nonhazardous waste.

Delay of closure regulations do not, however, remove the final obligation for ensuring that a closed unit is protective of human health and the environment. For the 1995 HWIR proposal, we received comments requesting that we

allow units that have received only exempt wastes during the lifetime of the unit, including the time period prior to the effective date of HWIR, to be exempt from RCRA requirements, including closure. In effect, this would retroactively exempt the unit. Applying the HWIR exemption to waste that has already been disposed could, in theory, remove the RCRA Subtitle C closure requirements for that unit, because that unit would no longer contain hazardous waste.

However, we do not feel such an application of the HWIR exemption would be appropriate or practical considering the self-implementing nature of this rule. Ensuring that the already-disposed waste has been properly sampled and analyzed and is below the exemption levels in all cases would be problematic and would best be done with direct government oversight, as is done in delistings. Closure regulations provide important protections, such as evaluation of soil and groundwater contamination, that should not be lost because of a self-implementing waste identification rule.

E. How Would HWIR Affect the Land Disposal Restriction (LDR) Program?

Today's rule contains two important areas of overlap with the RCRA LDR program. First, we are asking comment on whether certain of the HWIR exemption levels should replace existing technology-based LDR standards, if the exemption levels are less stringent than the current LDR values.

Second, if your listed waste is below the HWIR exemption concentrations where the waste is first generated (the point where your waste first meets the listing description), then a hazardous waste is never generated and the LDR requirements do not attach to the waste. In contrast, once a listed waste is generated and managed, the LDR requirements attach, and remain even after the waste is exempted from RCRA Subtitle C under today's exemption.

In addition to these two areas of overlap, there is also the issue of whether you as an HWIR waste generator can ''partially exempt'' your waste, removing one or more waste codes, and thus simplifying LDR treatment while continuing to manage it as a hazardous waste. In concept, you would be able to demonstrate that concentrations for a subset of chemicals within your waste met HWIR exemption levels. By doing so, you would be able to remove one or more hazardous waste codes from your waste. Such ''partially exempted'' waste would continue to be managed as hazardous, but in some cases might have fewer LDR requirements or might have more disposal options (such as disposal in a unit whose permit restricts which waste codes can be accepted).

We have concerns about the feasibility of this approach and believe that the concentration-based exemption as discussed in this notice might not be well-suited to partial exemptions. A ''partial exemption'' would be difficult to implement using the self-implementing HWIR process. We designed the exemption to be a yes/no decision—if all concentrations of HWIR chemicals are at or below exemption levels, only then would waste be nonhazardous. Under this yes/no approach, we would not need a strict accounting of which hazardous chemical in the waste is associated with which waste code. In addition, we did not design the notification and other HWIR implementation requirements to take into account a ''partial exemption'' approach.

We are also concerned about possible confusion with respect to LDR requirements for a waste stream that has become ''partially exempt.'' Such waste is still considered hazardous and must meet LDR requirements if placed on the land. This gives rise to other questions. For example, if an individual waste code is removed, would the LDR treatment requirements associated with that waste code, including Universal Treatment Standards (UTS), continue to apply? Would compliance with LDR be a condition of such partial exemption? These and other implementation questions would need to be addressed.

Finally, we do not believe that any process removing hazardous waste codes should substitute for the exemption process as outlined in this notice. For example, a waste stream with one waste code could not pursue this partial exemption. We would want to ensure that a listed waste stream would still be regulated as hazardous until all the HWIR chemicals of concern were below risk-based concentrations, no matter from which waste stream they originated. We request comments on whether the HWIR exemption process could be adapted to allow the generator to removes specific waste codes from a waste that continues to be hazardous, and how such an adaptation would overcome implementation difficulties.

F. How Would HWIR Relate to the RCRA Air Emission Standards?

Currently, air emissions from units managing hazardous waste are regulated under 40 CFR Parts 264 and 265, Subparts AA, BB and CC. However, once your hazardous waste satisfies the HWIR exemption criteria (including any chemical-specific exemption concentrations for volatile organics, or VOs), it would be exempt from RCRA Subtitle C regulations, including these air emission standards. In other words, once a waste is no longer regulated as hazardous, any unit in which the waste is managed (assuming no other hazardous waste is managed in the unit) is no longer subject to RCRA Subtitle C regulations, including 40 CFR Parts 264 and 265, Subparts AA, BB, and CC.

However, we still would have to ensure that air emissions risks from HWIR wastes are adequately addressed. The final rule establishing air emission controls for tanks, surface impoundments, containers, and miscellaneous units (the ''Subpart CC'' regulations—see 40 CFR 264.1082) contains provisions whereby a hazardous waste is not subject to Subpart CC air emission controls requirements if the facility owner/operator demonstrates that VO concentration of the hazardous waste is below 500 ppmw (parts per million by weight).

Because exemption levels for specific volatile organics could in theory exceed the 500 ppmw threshold of the Subpart CC standards, we are requesting comment on whether the exemption would adequately address the air emission concerns of RCRA Section 3004(n) in allowing waste to become exempt from RCRA Subtitle C. One approach to address this concern would be to include an overall maximum cap for the sum of all VOs. Since Subpart CC doesn't apply to landfills, another approach would be to include a VO cap for the generic HWIR exemption, but not for the landfill-only HWIR exemption. We request comment on whether, to avoid undercutting the requirements of subpart CC, we should require HWIR waste to be below 500 ppmw for VO to address risks from volatile organics, and if so, whether this cap should be applied to the landfill-only HWIR exemption.

G. Would HWIR Affect ''Use Constituting Disposal'' Regulations?

The current 40 CFR 266.20 requirements for wastes used in a manner constituting disposal would not be changed due to the HWIR exemption at this time. Such a change is beyond the scope of our mandate to revise the mixture and derived from rules.

However, we are requesting comment on whether, in the future, we should revise 40 CFR 266.20 to make it more congruent to the HWIR exemption. Currently, 40 CFR 266.20(b) states that hazardous waste-derived products that

are legitimately recycled by being land-applied are exempt from RCRA Subtitle C regulation provided they satisfy three conditions: (1) the recyclable materials undergo a chemical reaction so as not to be separable by physical means, (2) the product must be produced for the general public's use, and (3) LDR standards for every hazardous waste in the hazardous waste-derived product must be satisfied. (The shorthand for this type of recycling is ''use in a manner constituting disposal.'' See 40 CFR 261.2(c)(1).)

The LDR standards, however, are technology-based rather than risk-based, and, for metal hazardous chemicals, only control leachable amounts of the metal. Yet in some situations, total metal levels might be more important than leach levels because of the possibility of direct contact through inhalation of abraded or wind-dispersed contaminants, or surface runoff. On the other hand, HWIR exemption levels would be risk-based and consider some of the exposure pathways similar to those relevant in analyzing uses constituting disposal (for example, inhalation of particles).

We solicit comment as to the appropriateness of applying HWIR exemption levels to hazardous wastes used in a manner constituting disposal. One approach would be to replace the requirement to meet LDR treatment standards with a requirement to meet the HWIR exemption levels. This approach should assure that exemption levels for hazardous wastes used in a manner constituting disposal are never less stringent than exemption levels for hazardous wastes placed in confined units. We request comment on the reasonableness of this approach.

H. Could Hazardous Waste Debris Become Exempt Under HWIR?

Hazardous debris that contains listed hazardous wastes would be eligible for the HWIR exemption. We note, however, that certain exemptions already exist relating to hazardous debris. On August 18, 1992, we published a final rule, Land Disposal Restrictions for Newly Listed Wastes and Hazardous Debris (57 FR 37194). In that rule, we required that hazardous debris be treated prior to land disposal, using treatment technologies from the treatment categories of extraction, destruction, or immobilization specified in 40 CFR 268.45, Table 1. We also added a conditional exemption at § 261.3(f) for non-characteristic hazardous debris (that is, debris that is hazardous solely because it contains listed hazardous wastes). Section 261.3(f)(1) exempts debris from RCRA Subtitle C regulation provided that the debris is treated using one of the extraction or destruction technologies specified in Table 1 of § 268.45. Alternatively, non-characteristic hazardous debris can be exempt under § 261.3(f)(2) if the Regional Administrator determines that it is no longer hazardous, after considering the extent of contamination of the debris, (in other words, after a ''contained-in'' determination is made). However, non-characteristic hazardous debris that is treated by a specified immobilization technology is *not* eligible for the conditional exemption in § 261.3(f)(1) and, therefore, remains subject to RCRA Subtitle C regulation after treatment.

We would not change the current exemption under § 261.3(f). Therefore, non-characteristic hazardous debris that requires LDR treatment by extraction or destruction technologies will be exempt from RCRA Subtitle C regulation, once treated. As was explained more thoroughly in the final rule for hazardous debris, we gave careful consideration to many factors before exempting certain treated debris, including whether each debris/contaminant type would be effectively treated by each BDAT technology to levels that would no longer pose a hazard to human health or the environment (57 FR 37240). We would also not change the contained-in exemption under § 261.3(f)(2) for hazardous debris. That is, the Regional Administrator may continue to determine on an individual basis that hazardous debris no longer contains listed hazardous waste, and should therefore be exempt from RCRA RCRA Subtitle C.

I. Would Contaminated Media Be Eligible for an HWIR Exemption?

Listed hazardous wastes generated from the remediation of contaminated sites are eligible for exemption under this rule. However, due to difficulty in characterizing the origin of these wastes, we request comment whether to require testing of an expanded list of chemicals for these wastes. We feel that generators might not have adequate knowledge of the history of these wastes to apply generator knowledge to determine which chemicals would reasonably be expected to be in such a waste. Also, field screening techniques used to identify contaminants might not detect chemicals at HWIR exemption levels. One option would be to require initial testing for all HWIR exemption chemicals.

J. Does the Final HWIR-Media Rule Impact HWIR?

No, although the HWIR-waste and the HWIR-media rules are often discussed together, and contaminated media are potentially affected by both rules, they are two separate rulemaking efforts on separate schedules. The HWIR-media rule does not address at what point wastes and media should become exempt from the RCRA Subtitle C regulatory system. Instead, HWIR media rule addresses other waste management issues, including permits, the storage of remediation wastes during cleanup and state authorization. The final HWIR-media rule was signed on November 30, 1998 (63 FR 65873).

K. How Would HWIR Impact Actions Under the Superfund Program (CERCLA)?

All RCRA F, K, P and U wastes are included under the definition of hazardous substances in CERCLA Section 101(14)(C). Under CERCLA Section 103(a), any person in charge of a vessel or facility must, immediately notify the National Response Center as soon as he or she has knowledge of the release, within a 24-hour period, of a reportable quantity (RQ) of any CERCLA hazardous substance. (See 40 CFR 302 for a list of these hazardous substances and their RQs.) If your waste met the HWIR exemption criterion, it would not be a hazardous waste and therefore not a hazardous substance as defined in CERCLA 101(14)(C). However, CERCLA does require a person in charge to notify the National Response Center of a release of the RCRA exempted waste if the waste or any of the chemicals of the waste are CERCLA hazardous substances by virtue of CERCLA Sections 101(14)(A), (B), (D), (E), or (F) or 40 CFR 302.4(b), and the waste or any of its chemicals that are hazardous substances are released in amounts greater than their RQs within a 24-hour period.

HWIR exemption levels may also be applicable to the CERCLA program where RCRA listed hazardous waste has been disposed at the site. CERCLA section 121(d) requires that CERCLA actions comply with, or justify a waiver of, applicable or relevant and appropriate requirements (ARARs) under federal and state environmental laws. The HWIR exemption could affect the legal applicability of federal RCRA requirements to remediation wastes generated at Superfund sites. They may also be considered in determining whether RCRA is relevant and appropriate in cases where it is not applicable.

At sites undergoing CERCLA remedial activities where no listed hazardous wastes have been identified, we use a site-specific risk assessment for chemicals that have no ARARs. In some cases, these health-based cleanup levels might be higher than the exemption levels, based on a reasonably conservative exposure scenario. In other cases, the CERCLA health-based clean-up levels might be lower than exemption levels. The CERCLA health-based clean-up levels may also be different from exemption levels based on the consideration of site-specific factors.

L. How Does HWIR Relate to the Draft Industrial D Voluntary Guidance?

EPA's Office of Solid Waste issued for comment the draft *Guide for Industrial Waste Management* (the Guide) in June 1999. The draft Guide is meant to provide decision-makers with recommendations and user-friendly tools to manage nonhazardous industrial waste protectively. The draft Guide contains reference materials and simple-to-use modeling tools to assess potential groundwater and air impacts. It gives stakeholders a common technical framework for planning and implementing a comprehensive industrial nonhazardous waste management system. The draft Guide is intended to be voluntary and non-regulatory. In contrast, HWIR will help determine which wastes are hazardous for the purposes of Federal regulation. Unit design, unit operation, and other aspects of hazardous waste management are mandated under RCRA Subtitle C regulatory oversight.

HWIR-exempt wastes are eligible for disposal in the industrial nonhazardous landfills, surface impoundments, waste piles and land application units discussed in the draft Guide. The draft Guide recommends tailoring protective liner systems to characteristics of the wastes and sites where they are managed, using a three-tiered approach to groundwater modeling and risk assessment. Each successive tier of analysis requires more specific data, from a minimum of waste characteristics to full-blown site assessment. The Guide provides user-friendly models for Tier 1 and 2 analyses. The Tier 1 model evaluates three liner scenarios: no-liner, single liner and composite liner. The Tier 2 model evaluates no-liner and single liner scenarios.

Because HWIR and the draft Guide were designed for different purposes, the modeling approaches also differ. We expect the greatest differences to arise from how the draft Guide handles risk modeling for lined impoundments, landfills, and waste piles. The draft groundwater model in the Guide incorporates assumptions for on-going liner performance that affect movement of leachate from the unit through subsurface soils to groundwater. The Guide also places strong emphasis on quality assurance/quality control for liners during installation, continued operation and maintenance to protect the liner, installation of final covers, and post closure care and monitoring. In the draft Guide, EPA is specifically requesting comment on how we can best model long-term performance of liners and final cover systems to ensure that users design systems that are protective of human health and the environment. The comment period on the draft Guide does not end until December 1999. We have not yet received comments on the draft Guide, as potential users are still reviewing the modeling tools and documentation.

HWIR has a different objective, to determine whether wastes are hazardous or nonhazardous. Since HWIR-exempt waste could be disposed in units without liners or other controls, the units that we model under HWIR are assumed to have no such controls. In addition there is considerable uncertainty about the long-term performance of controls even for units that do have them. Thus our hazardous waste identification policy has been to make the conservative assumption that such controls are not present for the purposes of risk assessment. We believe this is the most appropriate way to determine which wastes are low risk and should exit the Subtitle C regulatory program with this sort of self-implementing regulation. As we learn more about the long-term performance of liner and cover systems, EPA may decide to revisit this approach.

M. How Does HWIR Relate to the Comparable Fuels Exemption?

On June 19, 1998, EPA published air emission standards for hazardous waste combustion units (63 FR 338781). Under this final rule, we excluded, from the regulatory definition of solid waste, hazardous waste-derived fuels that meet specification levels comparable to fossil fuels for concentrations of hazardous chemicals. The exclusion applies to the comparable fuel from the point it is generated and is claimed by the generator of the comparable fuel. Fuel generators must comply with sampling and analysis, notification and certification, and recordkeeping requirements. The exclusion potentially applies to gaseous and liquid hazardous waste-derived fuels, but does not apply to solids or to used oil, which is subject to special standards under 40 CFR Part 279. The only allowable treatment or disposal method for a comparable fuel is burning.

Both the Comparable Fuels Exemption and the HWIR exemption require compliance with specified chemical concentrations levels, and both have similar, although not identical implementation requirements. The Comparable Fuels Exemption, however, is applied only to wastes with fuel value, and the levels were developed to be equivalent to chemical concentrations found in commonly-used fuels. HWIR, on the other hand, applies to all listed hazardous waste, and HWIR exemption levels would be developed based on a multimedia risk model. HWIR exemption levels would represent chemical concentrations that are acceptable to be managed in a nonhazardous waste unit. You may determine which exemption (if any) most fits your waste.

N. How Would HWIR Affect Mixed Waste?

Mixed waste is a combination of hazardous and radioactive wastes, and is simultaneously covered by RCRA and the Atomic Energy Act. Because HWIR would exempt some hazardous wastes from RCRA Subtitle C requirements, it might also, through the same process, exempt some mixed waste from the RCRA hazardous waste regulations (without affecting its status under the Atomic Energy Act) as well.

However, because of the overlap of federal requirements for mixed waste, we are also developing rules specifically related to mixed waste. As mentioned in Section II of this preamble, EPA is proposing a separate **Federal Register** notice to conditionally exempt hazardous waste mixed with low-level radioactive wastes or mixed with Naturally Occurring and/or Accelerator-produced Radioactive Material from the storage, treatment in storage tanks, transportation, and disposal requirements of RCRA when the waste is managed in accordance to the Nuclear Regulatory Commission (NRC) regulations. In addition, we are developing a regulation allowing disposal of mixed waste containing radionuclides at low activity levels at facilities meeting the design requirements for RCRA Subtitle C, with the NRC to be the implementing agency of this rule. More information on this proposal can be found in the most recent agenda of regulatory and deregulatory actions (64 FR 21987).

O. How Does HWIR Relate to the Sewage Sludge Regulatory Program?

Sewage sludge (biosolids) is a material Federally regulated under the authority of Sections 405(d) of the Clean Water Act (CWA), as amended (33 U.S.C.A. 1251, *et seq.*). On February 19, 1993, we published regulations to protect public health and the environment from any reasonably anticipated adverse effects of certain pollutants that might be present in sewage sludge (58 FR 9248). The regulations are codified at 40 CFR Part 503 with conforming amendments codified at 40 CFR Parts 257 and 403. Part 503 allows four means of final use or disposal of sewage sludge: land application, surface disposal, incineration in a sewage sludge incinerator, and disposal in a solid waste landfill. Part 503 establishes requirements for land application, i.e., placing sewage sludge on the land for a beneficial purpose (including sewage sludge or sewage sludge products that are sold or given away for use in home gardens), surface disposal, i.e., by placement on surface disposal sites (including sewage sludge-only landfills), and incineration. The standards for each end use and disposal practice consist of general requirements, numerical limits on the pollutant concentrations in sewage sludge, management practices and, in some cases, operational requirements. The Part 503 Rule also includes monitoring, record keeping and reporting requirements. Parts 257 and 258 govern disposal of sewage sludge in solid waste landfills.

The regulations promulgated under section 405(d) of the Clean Water Act apply to domestic sewage sludge, defined in Part 503 as ''solid, semi-solid, or liquid residue generated during the treatment of domestic sewage in a treatment works. Sewage sludge includes, but is not limited to, domestic septage; scum or solids removed in primary, secondary or advanced wastewater treatment processes; and a material derived from sewage sludge.''

Sewage sludge regulated under section 405 of the Clean Water Act is not hazardous waste. Under section 3001 of RCRA, solid wastes are ''hazardous'' either by being a ''listed'' hazardous waste or by exhibiting a ''characteristic'' of hazardous waste. We have not listed sewage sludge as a hazardous waste, nor has sewage sludge been found to exhibit any hazardous waste characteristic. However, a sewage sludge that met the definition of hazardous waste under 40 CFR Part 261 would be subject to hazardous waste regulations, and would not be within the scope of Part 503. (see 58 FR 9253).

Both the HWIR exemption and the sewage sludge regulations include numerical limits for certain chemicals. However, we do not expect the results of the two efforts to be the same, both because of different assumptions in the risk assessments and the differences in the physical and chemical characteristics of the matrices between sewage sludge and process waste— for example, sewage sludge has a higher organic content than process waste, and that tends to immobilize certain chemicals, such as metals—and because of the fact that the Part 503 program requirements are different. As stated earlier, the sewage sludge regulations consist of other requirements beyond numerical limits, including management practices and monitoring requirements. For additional information on the Part 503 program, the Part 503 regulation, and the multi-pathway exposure/risk assessment that serves as the technical basis of the Part 503 regulation, the reader is directed to the following Internet site: *http://www.epa.gov/owm*.

State Authorization

XXIII. How Would Today's Proposed Regulatory Changes Be Administered and Enforced in the States?

Under section 3006 of RCRA, EPA may authorize qualified States to carry out the RCRA hazardous waste program within the State. Following authorization, we maintain independent enforcement authority under sections 3007, 3008, 3013, and 7003 of RCRA, although authorized States have enforcement responsibility. An authorized State could become authorized for this proposal's regulatory changes by following the approval process described under 40 CFR 271.21. See 40 CFR Part 271 for the overall standards and requirements for authorization.

We are proposing to retain the mixture and derived-from rules. Most states have already received authorization for the mixture and derived-from rules as they currently stand. The rules are already in effect in those authorized States. Those states that are already authorized for the mixture and derived-from rules would not need to obtain authorization for those rules again. We are also proposing to revise those rules under the authority of sections 3001(a), 3002(a), and 3004(a) of RCRA. If promulgated, these revisions would not go into effect in authorized States until they adopt the revisions and receive authorization from us for the revision to their regulations.

None of the proposed revisions are more stringent or broaden the scope of the existing Federal requirements. Authorized States are not required to modify their programs when we promulgate changes to Federal requirements that are less stringent than, or that narrow the scope of, existing Federal requirements. This is because RCRA section 3009 allows the States to impose (or retain) standards that are more stringent than those in the Federal program. (See also 40 CFR 271.1(i)). Therefore, States would not be required to adopt the revisions to the mixture and derived-from rules in today's rule, although EPA would strongly encourage their adoption.

Administrative Requirements

XXIV. How Has EPA Fulfilled the Administrative requirements for this Proposed Rulemaking?

Several statutes and executive orders apply to proposed rulemaking. Below is an explanation of how to address the requirements in those provisions:

A. Executive Order 12866: Determination of Significance

Under Executive Order 12866 [58 FR 51,735 (Oct. 4, 1993)], EPA must determine whether a regulatory action is ''significant'' and, therefore, subject to OMB review and the other provisions of the Executive Order. The Order defines a ''significant regulatory action'' as one that is likely to result in a rule that may:

(1) Have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities;

(2) Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;

(3) Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or rights and obligations or recipients thereof; or

(4) Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in Executive Order 12866.

Pursuant to four term of Executive Order 12866, we have determined that this rule is a ''significant regulatory action'' because there are novel policy issues arising out of legal mandates. As such, this action was submitted to OMB for review. Changes made in response to OMB suggestions or recommendations are documented in the docket to today's proposal.

B. Regulatory Flexibility Act

Pursuant to the Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*, as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996) whenever an agency is required to publish a notice of rulemaking for any proposed or final rule, it must prepare and make available for public comment a regulatory flexibility analysis that describes the effect of the rule on small entities (small businesses, small organizations, and small governmental jurisdictions). However, no regulatory flexibility analysis is required if the head of an agency certifies the rule will not have a significant [adverse] economic impact on a substantial number of small entities.

SBREFA amended the Regulatory Flexibility Act to require Federal agencies to provide a statement of the factual basis for certifying that a rule will not have a significant economic impact on a substantial number of small entities. The following discussion explains our determination.

As discussed in Section XXI, we have prepared an economic analysis of the potential effects of this rule, and have determined that the rule is expected to have a net beneficial effect on eligible entities, in the form of reduced environmental regulatory compliance costs for industrial waste management. The economic analysis evaluates the extent to which both small quantity and large quantity industrial waste generators might be potentially eligible for cost savings under this rule. This proposed rule is voluntary, and the overall economic effect of this regulation for both small and large entities which are eligible to participate, is expected to be a net average annual reduction in industry regulatory burden and compliance costs. Consequently, because the net economic impacts and effects of this rule are beneficial rather than adverse, this rule will not have a significant [adverse] economic impact on a substantial number of small entities. *I hereby certify that this rule will not have a significant economic impact on a substantial number of small entities.* This rule, therefore, does not require a regulatory flexibility analysis.

C. Paperwork Reduction Act (Information Collection Request)

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the Paperwork Reduction Act, 44 U.S.C. 3501 *et seq.* An Information Collection Request (ICR) document has been prepared by EPA (ICR No. 0801.12) and a copy may be obtained from Sandy Farmer by mail at OPPE Regulatory Information Division; U.S. Environmental Protection Agency (2137); 401 M St., S.W.; Washington, DC 20460, by email at farmer.sandy@epamail.epa.gov, or by calling (202) 260–2740. A copy may also be downloaded off the Internet at http://www.epa.gov/icr.

Today's proposed revisions of 40 CFR 261.3 do not include any new record keeping or reporting requirements. However, the proposed revisions could reduce the burden estimate for existing RCRA information collection requirements, such as the Uniform Hazardous Waste Manifest (Form 8700–22A). As discussed in Section XXII of this preamble, today's proposal could exempt approximately 54,700 tons of treated waste residuals (mainly incineration ash) per year. Assuming that these now-exempt wastes are shipped offsite for disposal, and assuming that an average truckload carries about 20 tons (of solids), today's proposal could result in approximately 2,870 shipments per year that would no longer require Uniform Hazardous Waste Manifest. The RCRA Hazardous Waste Manifest System ICR (No. 0801.12.) estimates an annual burden of 1.29 hours per shipment of hazardous waste. Therefore, today's proposal could reduce the total burden associated with manifests by 3,702 hours per year. (The current burden associated with manifests is estimated to be 2,920,383 hours per year).

Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information; search data sources; complete and review the collection of information; and transmit or otherwise disclose the information.

An Agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations are listed in 40 CFR Part 9 and 48 CFR Chapter 15.

Comments are requested on EPA's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques. Send comments on the ICR to the Director, OPPE Regulatory Information Division; U.S. Environmental Protection Agency (2137); 401 M St., S.W.; Washington, DC 20460; and to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th St., N.W., Washington, DC 20503, marked ''Attention: Desk Officer for EPA.'' Please refer to EPA ICR No. 801.12 and OMB Control No. 2050–0039 in any correspondence. Since OMB is required to make a decision concerning the ICR between 30 and 60 days after November 19, 1999, a comment to OMB is best assured of having its full effect if OMB receives it by December 20, 1999. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

D. Unfunded Mandates Reform Act

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA), Pub. L. 104–4, establishes requirements for Federal agencies to assess the effects of their regulatory actions on State, local, and tribal governments and the private sector. Under section 202 of the UMRA, we generally must prepare a written statement, including a cost-benefit analysis, for proposed and final rules with ''Federal mandates'' that may result in expenditures to State, local, and tribal governments, in the aggregate, or to the private sector, of $100 million or more in any one year.

Before promulgating an EPA rule for which a written statement is needed, section 205 of the UMRA generally requires EPA to identify and consider a reasonable number of regulatory alternatives and adopt the least costly, most cost-effective or least burdensome alternative that achieves the objectives of the rule. The provisions of section 205 do not apply when they are inconsistent with applicable law. Moreover, section 205 allows EPA to adopt an alternative other than the least costly, most cost-effective or least burdensome alternative if the Administrator publishes, with the final rule, an explanation why that alternative was not adopted. Before EPA establishes any regulatory requirements that may significantly or uniquely affect small governments, including tribal governments, we must have developed under section 203 of the UMRA a small government agency plan. The plan must

provide for notifying potentially affected small governments, enabling officials of affected small governments to have meaningful and timely input in the development of EPA regulatory proposals with significant Federal intergovernmental mandates, and informing, educating, and advising small governments on compliance with the regulatory requirements.

Today's proposed revision to the mixture and derived-from rules is voluntary, and because is less stringent than the current regulations, State governments are not required to adopt the proposed changes. The UMRA generally excludes from the definition of ''Federal intergovernmental mandate'' duties that arise from participation in a voluntary federal program. The UMRA also excludes from the definition of ''Federal private sector mandate'' duties that arise from participation in a voluntary federal program. Therefore we have determined that today's proposal is not subject to the requirements of sections 202 and 205 of UMRA.

E. Executive Order 13132: Federalism

Executive Order 13132, entitled ''Federalism'' (64 FR 43255, August 10, 1999), requires EPA to develop an accountable process to ensure ''meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications.'' ''Policies that have federalism implications'' is defined in the Executive Order to include regulations that have ''substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.'' Under Executive Order 13132, EPA may not issue a regulation that has federalism implications, that imposes substantial direct compliance costs, and that is not required by statute, unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by State and local governments, or EPA consults with State and local officials early in the process of developing the proposed regulation. EPA also may not issue a regulation that has federalism implications and that preempts State law unless the Agency consults with State and local officials early in the process of developing the proposed regulation.

If EPA complies by consulting, Executive Order 13132 requires EPA to provide to the Office of Management and Budget (OMB), in a separately identified section of the preamble to the rule, a federalism summary impact statement (FSIS). The FSIS must include a description of the extent of EPA's prior consultation with State and local officials, a summary of the nature of their concerns and the agency's position supporting the need to issue the regulation, and a statement of the extent to which the concerns of State and local officials have been met. For final rules subject to Executive Order 13132, EPA also must submit to OMB a statement from the agency's Federalism Official certifying that EPA has fulfilled the Executive Order's requirements.

This proposed rule is not subject to Executive Order 13132 because it will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. This proposed rule will not result in the imposition of any additional requirements on any State, local governments or other political subdivisions within any State. Accordingly, the requirements of Executive Order 13132 do not apply to this proposal.

F. Executive Order 13084: Consultation and Coordination with Indian Tribal Governments

Under Executive Order 13084, we may not issue a regulation that is not required by statute, that significantly or uniquely affects the communities of Indian tribal governments, and that imposes substantial direct compliance costs on those communities, unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by the tribal governments, or we consult with those governments. If we comply by consulting, Executive Order 13084 requires us to provide to the Office of Management and Budget, in a separately identified section of the preamble to the rule, a description of the extent of our prior consultation with representatives of affected tribal governments, a summary of the nature of their concerns, and a statement supporting the need to issue the regulation. In addition, Executive Order 13084 requires us to develop an effective process permitting elected officials and other representatives of Indian tribal governments ''to provide meaningful and timely input in the development of regulatory policies on matters that significantly or uniquely affect their communities.''

Today's proposed rule does not significantly or uniquely affect the communities of Indian tribal governments. Because today's proposed revision to the mixture and derived-from rules is less stringent than the existing program, it would not create any mandate on Indian tribal governments. Accordingly, the requirements of section 3(b) of Executive Order 13084 do not apply to this rule.

G. Executive Order 13045: Protection of Children from Environmental Health Risks and Safety Risks

''Protection of Children from Environmental Health Risks and Safety Risks'' (62 *FR* 19885, April 23, 1997) applies to any rule that: (1) is determined to be ''economically significant'' as defined under E.O. 12866, and (2) concerns an environmental health or safety risk that we have reason to believe may have a disproportionate effect on children. If the regulatory action meets both criteria, we must evaluate the environmental health or safety effects of the planned rule on children, and explain why the planned regulation is preferable to other potentially effective and reasonably feasible alternatives considered by us. This proposed rule is not subject to E.O. 13045 because it is not an economically significant rule as defined by E.O. 12866.

H. National Technology Transfer and Advancement Act of 1995

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (''NTTAA''), Pub L. No. 104–113, § 12(d) (15 U.S.C. 272 note) directs us to use voluntary consensus standards in our regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (for example, materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. The NTTAA directs EPA to provide Congress, through OMB, explanations when we decide not to use available and applicable voluntary consensus standards.

Today's proposals do not involve technical standards. However, the HWIR exemption discussed in this notice does involve sampling and analysis requirements, but does not contemplate the use of specific, prescribed analytical methods. Rather, we would allow the use of any method that meets the prescribed performance criteria, consistent with our Performance Based Measurement System (PBMS). The PBMS approach is intended to be more flexible and cost-effective for the regulated community; it is also intended to encourage innovation in analytical

technology and improved data quality. We would not preclude the use of any method, whether it constitutes a voluntary consensus standard or not, as long as it meets the requirements and performance criteria specified. We welcome comments on this aspect of the notice and, specifically, invites the public to identify potentially-applicable voluntary consensus standards and to explain why such standards should be used.

References

XXV. What Are Some Key Documents Containing Information Supporting This Notice?

The list of references is organized by the following preamble super-headings: (1) Background, (2) Retaining the Mixture and Derived-From Rules, (2) HWIR Exemption, (3) HWIR Risk Assessment, and (4) Economic Impacts. Under each super-heading, the references are listed alphabetically by author and chronologically when there is more than one document by the same author.

These references and other supporting information can be found in the RCRA Docket Information Center (see contact information under ADDRESSES section at the beginning of the preamble).

Background References

Environmental Technology Council v. Browner, C.A. No. 94–2119 (TFH) (D.D.C. 1994).

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U.S. Environmental Protection Agency, *Data on Mixture and Derived-from Wastes from Closures and Corrective Action at Hazardous Waste Management Facilities,* 1992.

U.S. Environmental Protection Agency, *Disposition of Delisting Petitions for Derived-From/Mixture Wastes, memorandum,* 1992.

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HWIR Exemption References

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ASTSWMO, *Overview: State-Based Contingent Management Case Study Project, Discussion Draft for April 1–2, 1998 Joint ASTSWMO Task Force Meeting,* March 9, 1998.

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U.S. Environmental Protection Agency, *Estimates of Sample Sizes Required for a Generator to Demonstrate a Waste Qualifies for Exemption Under HWIR,* May 1999.

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HWIR Risk Assessment References

ASTSWMO, *States' Use of Waste and By-Product Material,* ASTSWMO Solid Waste Subcommittee Resource Recovery Task Force, September 30, 1996

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Request for Comment

XXVI. On What Issues Is EPA Specifically Seeking Public Comment?

In developing this notice, we tried to address the concerns of all our stakeholders. Your comments will help us improve this rule. We invite you to provide different views on options we discuss, new approaches we haven't considered, new data, how this rule may affect you, or other relevant information. We welcome your views on all aspects of this notice.

Your comments will be most effective if you follow the suggestions below:

- Explain your views as clearly as possible and why you feel that way.
- Where possible, provide technical and cost data to support your views.
- If you estimate potential costs, explain how you arrived at the estimate.
- Tell us which parts you support, as well as those you disagree with.
- Provide specific examples to illustrate your concerns.
- Offer specific alternatives.
- Refer your comments to specific sections of the notice, such as the section numbers or page numbers of the preamble, or the proposed regulatory sections.

We welcome comments on any and all aspects of the rulemaking, and we are particularly interested in receiving comments on the issues listed below. For information on how to submit your comments, please see the **ADDRESSES** section towards the beginning of this preamble.

1. What are merits and drawbacks of the five possible revisions to the mixture and derived-from rules submitted to EPA by CMA? Specifically, what are (a) the potential risks to human health and the environment, (b) any special or unique technical considerations, and (c) the economic effects of each of the possible revisions? (Section II.E)

2. Should EPA allow F003 to be eligible for the proposed expansion of the 40 CFR 261.3(a)(2)(iii) exemption (although F003 is listed solely for ignitability, its listing description includes references to solvents that were listed for toxicity as well)? (Section IV.A)

3. Should EPA conditionally exempt low level radioactive hazardous mixed waste from the mixture and derived-from rules, provided the mixed waste is handled in accordance with the requirements of a new Part 266, Subpart N, which is being simultaneously proposed today? (Section IV.B)

4. Should EPA propose and finalize the landfill-only exemption (based on conditions of management) and the generic exemption (not based on conditions of management) from hazardous waste regulation? (Section VI)

5. Should the HWIR exemption be self-implementing? (Section VIII)

6. Should EPA require a waiting period between the receipt of the notification package by the overseeing agency and the time the waste becomes exempt (for example 30 to 90 days)? (Section VIII)

7. Is EPA's definition of ''chemicals reasonably expected to be present'' acceptable? In particular, should the definition be adjusted for some of the broader waste listings such as spent solvents (RCRA waste codes F001–F005)? (Section IX.A)

8. Is EPA's policy to exclude from HWIR eligibility those wastes are reasonably expected to contain chemicals that do not have HWIR exemption levels appropriate? If not, what are other options for dealing with chemicals that do not have HWIR exemption levels? (Section IXA)

9. Should EPA require a minimum number of samples at each sampling event? If so, what should that number be? (Section IX.B.2)

10. Is the use of the strict maximum standard (i.e., no sample is allowed to exceed the HWIR exemption level) appropriate for the evaluation of a waste stream for an HWIR exemption? If not, what is the preferred alternative? (Section IX.B.2)

11. Should EPA require that the bias introduced by partial recoveries of the chemicals under analysis be corrected in order to make results from different

analytical methods more comparable? (Section IX.B.3)

12. If EPA requires correction of the bias introduced by partial recoveries, should EPA require that analytical protocols achieve a minimum of 20% recovery, and that analytical results with analytic spike recovery of less than 100% be corrected for the percent recovery determined for that sample before being compared to the HWIR exemption level? (Section IX.B.3)

13. Should EPA use the detection limit in place of the HWIR exemption level when the detection limit is higher than the exemption level, but still within an acceptable level of risk? (Section IX.B.3.)

14. As an alternative to using the strict maximum standard for compliance, should EPA require that the upper confidence limit (set at some level of confidence, such as 95 percent) associated with the mean concentration in the candidate waste be at or below the HWIR exemption level for the waste to be HWIR exempt? (Section IX.C.1)

15. As a second alternative to using the strict maximum standard for compliance, should EPA require that the estimated mean chemical concentration within the candidate waste be at or below the HWIR exemption levels, and that the concentration of individual samples would have to be at or below some multiple of the exemption level? (Section IX.C.1)

16. As a third alternative to using the strict maximum standard for compliance, should EPA require that the estimated mean concentration be at or below the HWIR exemption level, and the upper confidence limit associated with the estimated mean (at some level of confidence) would have to be at or below some multiple of the exemption level? (Section IX.C.1)

17. For the regulatory alternatives that allowing individual samples to be at or below some multiple of the HWIR exemption levels, how should those limits (for example, multipliers to the exemption levels) be established? Specifically, should EPA use a multiplier of 2.8, consistent with the variability factor used in the LDR program? (Section IX.C.1)

18. Should EPA consider the use of composite samples, particularly spatial composites, in addition to grab samples, in evaluating a waste stream for HWIR compliance? (Section IX.C.2)

19. Should EPA specify the size of samples taken to evaluate a waste stream for HWIR compliance? (Section IX.C.2)

20. Is the sample notification form included in the docket (titled ''Sample Notification Form for Waste Claiming Exemption Under the Hazardous Waste Identification Rule'') adequate for claiming an HWIR exemption? (Section IX.D)

21. What alternatives to the written notification package should EPA consider (such as electronic submissions)? (Section IX.D)

22. Should EPA require additional information in the notification package, such as the list of chemicals found in the waste and a summary of results for each sample analyzed? (Section IX.D)

23. Are existing mechanisms for information sharing, including access via the Internet, sufficient to provide the public with information relative to individual HWIR exemption claims exerted in each respective State? (Section IX.E)

24. If existing mechanisms are insufficient, should EPA require HWIR waste generators to notify the public of HWIR exemption claims through a newspaper notices, prior to having the exemption claims become effective? (Section IX.E)

25. If EPA requires public notification through newspaper notices, should the receipt of adverse comments by the generator trigger review the HWIR exemption package by the overseeing agency? (Section IX.E)

26. Should EPA require HWIR waste generators to include testing results information in the notification package for the purpose of greater public access to this information? (Section IX.E)

27. Should EPA require that paperwork accompany the waste in order to track the waste and provide notice to the receiving facility that the waste is HWIR-exempt? (Section X.B.)

28. Should EPA prohibit dilution as a means of attaining the HWIR exemption levels? If so, should EPA allow aggregation of waste streams for the purpose of treatment in CWA wastewater systems? (Section X.C)

29. What are the advantages and disadvantages of requiring the same testing scheme for both initial and subsequent sampling and analysis of HWIR waste? (Section XI.A)

30. Should EPA allow the use of prediction limits and other such techniques for the purpose of subsequent testing? (Section XI.A)

31. Should EPA allow the removal of testing requirements for chemicals consistently detected in concentrations of less than one-tenth of the exemption level? If so, after how many testing events with levels below one-tenth of the exemption level should this reduced testing obligation occur? (Section XI.A.1)

32. Should the retesting frequency depend on (a) the annual volume of waste generated, and (b) the physical form of a waste (liquid or non-liquid)? Are there other factors EPA should consider when setting retesting frequency? (Section XI.A.2)

33. Should EPA reduce the testing frequency for generators who are small businesses (that may or may not generate large annual volumes of waste)? (Section XI.A.2)

34. Should EPA require retesting after a significant process change? (Section XI.A.3)

35. If a wastestream loses its HWIR-exempt status because it no longer meets the exemption levels or does not meet one of the other conditions of the exemption, should EPA impose additional requirements before the exemption can be reinstated? For example, should there be a mandatory waiting period before the exemption can be reinstated? (Section XII.B)

36. Should EPA prohibit storage of HWIR waste for longer than one year? (Section XII.B.2)

37. For the landfill-only option, should tracking of HWIR waste be limited to: notifying the landfill of the shipment; receiving a confirmation from the landfill that the waste arrived; and keeping a copy of the arrival confirmation for three years (first alternative)? (Section XII.B(3))

38. Under this first tracking alternative, should the landfill also be required to keep a copy of the arrival confirmation for three years as well?(Section XII.B(3))

39. For the landfill-only option, should tracking of HWIR waste consist of: using the existing uniform hazardous waste manifest system (40 CFR 262.20 and 49 CFR 172.205) to track the conditionally exempt HWIR waste (second alternative)? (Section XII.B.3)

40. For the landfill-only option, should tracking of HWIR waste consist of: using modified DOT shipping papers to accompany the waste; receiving a copy of the shipping papers documenting that the waste arrived at the landfill; and keeping a copy of these documents for three years (third alternative)? (Section XII.B.3)

41. How can EPA address the issue of interstate transport of HWIR waste, where waste exempted in one State would still be regulated as hazardous as it travels to or through a State that has not adopted the HWIR exemption? (Section XII.B.3)

42. Is the approach EPA has taken to account for mass balance and to integrate the calculations of the important direct and indirect risk pathways leading to a receptor appropriate? If not, what are alternative approaches? (Section XVI.A.2)

43. Is EPA's approach to evaluating the exposed and unexposed receptors appropriate? (Section XVI.A.2)

44. Is EPA's approach to modeling risk to humans from groundwater, considering the risk posed at receptor wells located within the modeled plume of contamination and outside the modeled plume of contamination reasonable? (Section XVI.A.2)

45. Are EPA's estimates of the fraction of the modeled wells located within and outside of the modeled plume of contamination reasonable? (Section XVI.A.2)

46. Is the methodology for selecting the 201sites to represent the national population of industrial facilities appropriate? If not, what are alternative methodologies? (Section XVI.A.3)

47. Should EPA apply the sampling weights from the Industrial D Survey to the sample of 201 sites? (Section XVI.A.3)

48. Does the information contained in the HWIR chemical database reflect the current state of knowledge for the chemical parameters ? (Section XVI.A.3)

49. Is there any additional information on the chemicals that EPA should consider? (Section XVI.A.3)

50. Is our information on anaerobic biodegradation (for example in the saturated zone) of organic chemicals sufficient? (Section XVI.A.3)

51. Is there any additional data on anaerobic biodegradation of organic chemicals? (Section XVI.A.3)

52. Should EPA use toxicity data, in addition to data contained in EPA's IRIS and HEAST databases, (a) which other Federal agencies have used in establishing regulatory levels or toxicity benchmarks, or (b) which have been otherwise peer-reviewed and published? (Section XVI.A.3)

53. If EPA uses toxicity data other than the data contained in EPA's IRIS and HEAST databases, is EPA's methodology to develop interim benchmarks from this other data appropriate? If not, what are alternative methodologies? (Section XVI.A.3)

54. Is EPA's decision to establish regulatory levels based only on the chemical-specific total concentration in the waste, rather than requiring wastes to meet both total and leachate levels appropriate?

55. In terms of establishing a relationship within the model between the chemical concentration in the waste and the chemical concentration in the leachate, and of mass limitations in leachate, should EPA (for each waste management unit) start with a chemical concentration in a waste and partition it to the various environmental media based on the physical and chemical characteristics of the chemical, the waste management unit characteristics, and the partitioning algorithms? (Section XVI.D.)

56. Are the methodologies used for modeling the environmental releases for HWIR99 appropriate? If not, what are alternative methodologies? (Section XVI.D)

57. Are the methodologies used for modeling the environmental fate and transport for HWIR99 appropriate? If not, what are alternative methodologies? (Section XVI.E)

58. Are the data and methodologies used to support the HWIR overall modeling framework appropriate? If not, what alternatives should EPA use? (Section XVI.E.1)

59. Are the methodologies that EPA plans to implement in the saturated zone module (SZM) in order to factor the effects of fractures in porous media and incorporate effects of heterogeneity in aquifers into the modeling appropriate? (Section XVI.E.3.A)

60. Is EPA's methodology for calculating infant exposure to dioxin and dioxin-like chemicals in breastmilk appropriate? If not, what are alternative methodologies? (Section XVI.F.1)

61. Should EPA model infant exposure to chemicals other than dioxin and dioxin-like? If so, which chemicals should be considered? (Section XVI.F.1)

62. Over which time period should exposure at a receptor be evaluated? (Section XVII)

63. Are there any revisions to the software system that would address identified errors or improve the risk model ? (Section XVII)

64. Is EPA's decision to model degradation processes, including hydrolysis, aerobic biodegradation, anaerobic biodegradation, and activated aerobic biodegradation appropriate? (Section XVII.B.2)

65. Is the toxicity of daughter products that may be generated from the degradation process of significant concern? If so, what methodology should be used to calculate the ratio of parent to daughter product for the purpose of the model? (Section XVII.B2)

66. Under which physical conditions should EPA assume that each of these degradation processes occurs? (Section XVII.B.2)

67. Should EPA either (a) prohibit the combustion of already exempt HWIR waste, or (b) implement a more targeted combustion restriction for HWIR exempt waste based on chemical content? If not, are there any other alternatives for addressing risks from the combustion of HWIR exempt wastes? (Section XVII.D.1)

68. Should EPA allow HWIR exempt wastes to be eligible for beneficial uses? (Section XVII.D.2)

69. Did EPA use adequate data to consider (a) the possibility that wastes with constituent concentrations low enough to qualify for exemption could result in free-phase migration of chemical compounds in groundwater, including the potential NAPL contamination of groundwater due to the formation of free-phase liquids in landfills and (b) the possible impacts of co-solvency on the migration of contaminants adequate? (Section XVII.D. 4.)

70. Is the toxicity characteristic adequate for capturing the risks from wastes derived from exempt liquids? (Section XVII.D.4)

71. Is the assumption that surface impoundments have waste removed at the time of closure likely to affect the results of the risk assessment? (Section XVII.D.5)

72. Are the chemicals in the new 40 CFR Part 261 Appendix X the best set of chemicals to be considered for the HWIR exemption? If not, which set of chemicals should be considered? (Section XVIII.A)

73. Are the sources of toxicity data that EPA considered adequate? If not, what other sources should EPA consider? (Section XVIII.B)

73. Should EPA establish an HWIR exemption level for lead based on the lower of two values: 400 mg/kg soil screening level for human health risks and on the results from the HWIR ''99 risk assessment for ecological risks? If not, what alternative would you recommend? (Section XVIII.C)

74. Which wastes would be impacted by the absence of an HWIR exemption level for cyanide? (Section XVIII.D)

75. How could an HWIR exemption level be set for cyanide, given its complex chemistry? (Section XVIII.D)

76. Which chemicals and waste streams are especially good candidates for HWIR exemptions? (Section XVIII.D)

77. Is the range of values that EPA considered for each of the risk protection measures appropriate? If not, what alternative values should be considered? (Section XIX.A)

78. For each of the risk protection measures (cancer risk level, human health hazard quotient, ecological hazard quotient, population percentile, and probability of protection), which single value is most appropriate? (Section XIX.A)

79. Is the HWIR definition of liquids (i.e., Total Suspended Solids (TSS) less than one percent) appropriate? (Section XIX.C)

80. Is the HWIR definition of semi-solids (i.e., TSS greater than or equal to one percent and TSS equal to or less than 30 percent) appropriate? (Section XIX.C)

81. Is the HWIR definition of solids (i.e., TSS greater than 30 percent) appropriate? (Section XIX.C)

82. As an alternative to defining solids as waste containing greater than 30% TSS, should the paint filter test be used to define the threshold between semi-solids and solids? (Section XIX.C)

83. Is the use of a conversion factor of one kg/L to convert the tank and surface impoundment results (mg/L) for comparison to the land application unit results (mg/kg) in the semi-solid category acceptable in this context? If not, what is an alternative approach? (Section XIX.C)

84. Should EPA use the results of the HWIR model to revise LDR standards? (Section XX.D)

85. Should HWIR exemption levels replace existing technology-based LDR standards, where the exemption levels are less stringent than the current LDR values? (Section XX.E)

86. Are the scope, methodology, assumptions, data sources, and other elements of the Economic Assessment background document for this proposal, adequate for describing and estimating the potential economic effects of HWIR? (Section XXI)

87. Should EPA require HWIR waste to be below 500 ppmw for volatile organics, and, if so, should this cap be applied to waste exempted under the landfill-only HWIR exemption as well? (Section XXII.F)

88. Should EPA in the future revise 40 CFR 266.20 to apply HWIR exemption levels to hazardous waste used in a manner constituting disposal? (Section XXII.G)

89. Should EPA required contaminated media to be tested for a broader list of HWIR exemption chemicals than that required for other wastes? If so, how should this broader list be developed? (Section XXII.I)

List of Subjects in 40 CFR Part 261

Environmental protection, Hazardous waste, Recycling, Waste treatment and disposal.

Dated: October 29, 1999.

Carol M. Browner,

Administrator.

PART 261—IDENTIFICATION AND LISTING OF HAZARDOUS WASTE

1. The authority citation for part 261 continues to read as follows:

Authority: 42 U.S.C. 6905, 6912(a), 6921, 6922, 6924y, and 6938.

2. Section 261.3 is amended by:

A. Removing paragraph (a)(2)(iii);

B. Redesignating paragraphs (a)(2)(iv) through (a)(2)(v) as paragraphs (a)(2)(iii) through (a)(2)(iv);

C. Revising newly designated paragraph (a)(2)(iii) and the first sentence of paragraph (c)(2)(i); and

D. Adding paragraph (g).

§ 261.3 Definition of hazardous waste.

(a) * * *

(2) * * *

(iii) It is a mixture of solid waste and one or more hazardous wastes listed in subpart D of this part and has not been excluded from paragraph (a)(2) of this section under §§ 260.20 and 260.22 of this chapter, paragraph (g) of this section, or under part 266, subpart N of this chapter; however the following mixtures of solid wastes and hazardous wastes listed in subpart D of this part are not hazardous waste (except by application of paragraph (a)(2)(i) or (ii) of this section) if the generator can demonstrate that the mixture consists of wastewater the discharge of which is subject to regulation under either section 402 or section 307(b) of the Clean Water Act (including wastewater at facilities which have eliminated the discharge of wastewater) and;

* * * * *

(c) * * *

(2) * * *

(i) Except as otherwise provided in paragraph (c)(2)(ii) or (g) of this section or in part 266, subpart N, any solid waste generated from the treatment, storage, or disposal of a hazardous waste, including any sludge, spill residue, ash emission control dust, or leachate (but not including precipitation run-of) is a hazardous waste. * * *

* * * * *

(g)(1) A hazardous waste that is listed in subpart D of this part solely because it exhibits one or more characteristics of ignitability as defined under § 261.21, corrosivity as defined under § 261.22, or reactivity as defined under § 261.23 is excluded from regulation, if the waste no longer exhibits any characteristic of hazardous waste identified in subpart C of this part.

(2) The exclusion described in paragraph (g)(1) of this section also pertains to:

(i) Any mixture of a solid waste and a hazardous waste listed in subpart D of this part solely because it exhibits the characteristics of ignitability, corrosivity, or reactivity as regulated under paragraph (a)(2)(iii) of this section; and,

(ii) Any solid waste generated from treating, storing, or disposing of a hazardous waste listed in subpart D of this part solely because it exhibits the characteristics of ignitability, corrosivity, or reactivity as regulated under paragraph (c)(2)(i) of this section.

(3) Wastes excluded under this section are still subject to part 268 of this chapter, even if they no longer exhibit a characteristic at the point of land disposal.

[FR Doc. 99–29067 Filed 11–18–99; 8:45 am]

BILLING CODE 6560–50–P