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

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OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE

MEMORANDUM

SUBJECT: Risk-Based Clean Closure

FROM: Elizabeth Cotsworth, Acting Director
Office of Solid Waste

TO: RCRA Senior Policy Advisors
Regions I - X

The purpose of this memorandum is to provide guidance on risk-based clean closure and to confirm that, under current regulations, RCRA regulated units may be clean closed to protective, risk-based media cleanup levels.

Closure Requirements and Regulations

Closure is the term used to describe taking a RCRA regulated unit out of service. During closure, facility owners/operators must comply with the closure performance standard at 40 CFR 264.111 or 40 CFR 265.111. According to 40 CFR 264.111 and 40 CFR 265.111. closure must be completed in a manner that: (a) minimizes that need for further maintenance; (b) controls. minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition products to ground or surface waters or to the atmosphere; and, (c) complies with the unit-specific closure requirements of 40 CFR Part 264 or 265. Generally, two types of closure are allowed - closure by removal or decontamination (referred to here as "clean closure") and closure with waste in place.1

The premise of clean closure is that all hazardous wastes have been removed from a given RCRA regulated unit and any releases at or from the unit have been remediated so that further regulatory control under RCRA Subtitle C is not necessary to

[1] On November 8, 1994 EPA requested comment on an approach that would reduce or eliminate the regulatory distinction between cleanup of releases from closed or closing regulated units and cleanup of releases from non-regulated units under the RCRA corrective action program. 59 FR 55778. If promulgated. this approach would essentially create a third type of closure by allowing some closing units to take advantage of the additional flexibility provided by the corrective action program. The Office of Solid Waste plans to address this issue further in the final post-closure rule.

protect human health and the environment. As part of meeting the closure performance standard referenced above, for clean closure, facility owners/operators must remove ail wastes from the closing unit and remove or decontaminate all waste residues, contaminated containment system components. contaminated soils (including ground water and any other environmental media contaminated by releases from the closing unit), and structures and equipment contaminated with hazardous waste and hazardous waste leachate. (See, for example, 40 CFR Sections 264.178, 263.197, 264.228, 264.258 and 264.575 and corresponding interim status closure standards in 40 CFR Part 265.)

EPA's expectation is that, with the exception of landfills and most land treatment units, well designed and well operated RCRA units (i.e., units that comply with the unit-specific minimum technical requirements) will generally be clean closed. Units that are not clean closed remain subject to the requirements for post-closure care, including post-closure permitting.

Reaffirming Risk-Based Clean Closure Standards

Since 1987, EPA has interpreted the regulations governing closure by removal and the term "remove or decontaminate" to require complete removal of all hazardous waste and liners and removal or decontamination of leachate and other materials contaminated with hazardous waste or hazardous constituents to the extent necessary to protect human health and the environment. (52 FR 8704, March 19, 1987.) As the Agency explained in the 1987 notice, this interpretation means that, except for hazardous waste and liners, for clean closure, the regulations do not require one to completely remove all contamination, i.e., to background, at or from a closing unit. Rather, some limited quantity of hazardous constituents might remain in environmental media after clean closure provided they are at concentrations below levels that may pose a risk to human health and the environment. In the 1987 notice, EPA took the position that the amount of hazardous constituents that might remain in environmental media after clean closure should be identified through appropriate application of risk information either by using available constituent-specific limits or factors that had undergone Agency review (e.g., MCLs or health-based limits calculated using a verified reference dose), or, when such limits or factors were not available, by using toxicity information submitted by a facility owner/operator and approved by EPA, or by using background concentrations.

EPA continues to interpret the regulations governing closure by removal and the "remove or decontaminate" standard as described above. In addition, EPA today is providing additional guidance on identifying the amount of hazardous constituents that might remain in environmental media after clean closure.

Since the 1987 notice, EPA and the states have gained considerable experience in

making protective, risk-based cleanup decisions under the RCRA corrective action and CERCLA cleanup programs. EPA's position is that the procedures and guidance generally used to develop protective, risk-based media cleanup standards for the RCRA corrective action and CERCLA cleanup programs are also appropriate to define the amount of hazardous constituents that may remain in environmental media after clean closure. In other words, site-specific. risk-based media cleanup levels developed under the RCRA corrective action and CERCLA cleanup programs are appropriate levels at which to define clean closure.

EPA has published numerous documents offering guidance on developing site-specific risk-based media cleanup levels. As discussed in the May 1, 1996 Advance Notice of Proposed Rulemaking for RCRA corrective action, EPA's goal continues to be to clean up sites in a manner consistent with established, protective. risk-based media cleanup levels (e.g., MCLs and many state cleanup standards) or, when such levels do not exist to clean up to protective, risk-based media cleanup levels developed for the site in question (e.g., through a site-specific risk assessment). Both approaches require a site-specific risk-based decision since established media cleanup levels are appropriate only when all exposure assumptions are consistent with site-specific conditions at the facility in question.

EPA generally considers protective media cleanup standards for human health to mean constituent concentrations that result in the total residual risk from any medium to an individual exposed over a lifetime falling within a range from 10-4 to 10-6, with the cumulative carcinogenic risk not to exceed 10-4 and a preference for cleanup standards at the more protective end of the risk range. For non-carcinogenic effects, EPA generally interprets protective cleanup standards to mean constituent concentrations that an individual could be exposed to on a daily basis without appreciable risk of deleterious effect during a lifetime; the hazard index generally should not exceed one (1). See, e.g., the National Contingency Plan (55 FR 8666, March 8, 1990) the1990 Subpart S Proposal (55 FR 30798, July 27, 1990), and the 1996 Subpart S ANPR (61 FR 19432, May 1, 1196). Cleanup to standards that are consistent with these risk-reduction goals (e.g., most Federally promulgated standards such as MCLs and many state cleanup standards) will generally be adequate to satisfy the closure performance standard and the "remove or decontaminate" standard.

In the March 19, 1987 notice, EPA also interpreted the regulations governing closure by removal and the "remove or decontaminate" standard to require consideration of the possibility of cross-media contamination so that, for example, facility owners/operators would have to show that remaining levels of hazardous constituents in soil would not migrate from the soil to air, surface, or ground water in excess of Agency-approved concentrations. EPA reaffirms that interpretation today. In addition, although not emphasized in the 1987 notice, EPA reminds program implementors and facility owners/operators that closures must protect both human

health and the environment. During clean closure, ecological concerns may sometimes require more aggressive decontamination than might be necessary strictly to protect human health.

Clarification of Acceptability of Fate and Transport Modeling

In the 1987 Notice, EPA required that demonstrations of compliance with the regulations governing closure by removal and the "remove or decontaminate" standard be conservative in the sense that they eliminate the uncertainties associated with contaminant fate and transport. (50 FR 8707, March 19, 1987.) EPA recently revised its interpretation of the "remove or decontaminate" standard in a memo from Elliott Laws and Steven Herman to RCRA/CERCLA National Policy Managers (September 24, 1996) to allow limited use of fate and transport modeling during closure. This revision was based on the experience EPA has gained using fate and transport modeling since 1987. Under the new Agency interpretation, fate and transport models may be used to support clean closure determinations by modeling the potential for residual contamination in one medium to migrate to and contaminate other media. For example. under the new interpretation, fate and transport modeling might be used to model the potential for residual contamination in soil to migrate to and contaminate ground water.

Some individuals were confused by EPA's new interpretation. The Agency takes this opportunity to clarify that, when supporting demonstrations of compliance with the "remove or decontaminate" standard, fate and transport modeling is appropriate only for modeling the potential for residual contamination (not waste) to migrate from one medium to another. EPA continues to interpret the closure regulations and the remove or decontaminate standard to require removal of all hazardous waste and liners. As discussed earlier in this memo, following removal of all hazardous waste and liners, media throughout a closing unit and any areas affected by releases from the closing unit must be decontaminated. Decontamination levels must protect human health and the environment and must ensure that remaining levels of hazardous constituents in soil will not migrate from soil and contaminate air, surface, or ground water in excess of Agency-approved concentrations. It is only when identifying the appropriate level of decontamination. by, in part, considering the potential for cross media transfer, that fate and transport modeling may be used.

New interpretation Regarding Non-Residential Exposure Assumptions

In an effort to promote redevelopment of industrial properties, many states have recently developed programs which allow them to consider reasonably expected future land use during cleanups and, in certain situations, apply non-residential exposure assumptions to development of cleanup standards. These programs primarily provide for continued maintenance of non-residential land use and any necessary additional

cleanup should land use change through institutional controls such as deed restrictions.2 EPA did not explicitly consider these types of programs when interpreting the closure regulations and the remove or decontaminate standard in the March 1987 notice.

EPA now interprets current closure regulations to allow appropriate use of non-residential exposure assumptions when identifying the amount of decontamination necessary to satisfy the "remove or decontaminate" standard. Using non-residential exposure assumptions to identify the amount of decontamination necessary to satisfy the "remove or decontaminate" standard does not affect any other closure requirement. This means, for clean closure, facility owners/operators must still remove all hazardous wastes and liners. In addition, just like for any other clean closure, a decontamination level based on non-residential exposure assumptions must be achieved throughout the closing unit and any areas affected by releases from the closing unit. It also must ensure that environmental receptors are adequately protected and that no unacceptable transfer of contamination from one medium to another (e.g., soil to ground water') will occur. Issues associated with protecting environmental receptors and preventing unacceptable cross-media transfer may prohibit approval of clean closure based on non-residential exposure assumptions when such closure might otherwise he appropriate. Moreover. although some additional increment of contamination may be allowed to remain in media through application of non-residential exposure assumptions, as during any other clean closure, owners and operators may not rely on physical barriers. (such as fences or slurry walls) to ensure protection of human health and the environment. When a facility is also undergoing RCRA corrective action or another type of site-wide cleanup, non-residential exposure assumptions used during clean closure must be consistent with the exposure assumptions being applied in the corrective action (or other) cleanup.

The Agency emphasizes that non-residential exposure assumptions should not be used unless there is a reasonable degree of confidence that future land use will conform to those assumptions. EPA believes this confidence would typically be based on the existence of long-term controls over land use. For example, in some cases. a local authority may have imposed zoning restrictions. In other cases a land owner may have agreed to convey an easement to another party and the easement may impose limits on how the land owner can use the property. When non-residential exposure assumptions are used, the area covered by the non-residential land use assumptions should be clearly delineated and procedures established to alert future users to the presence of contamination and risks presented and to provide for periodic evaluations of actual land use. EPA is currently developing additional guidance on land use controls and restrictions. When completed, this guidance may be used to implement the policies

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[2] Some states are also developing systems for ground water classification using the comprehensive state groundwater protective plan (CSGWPP) process.

in this memorandum.

Program implementors and facility owners/operators should be careful to distinguish clean closures based on non-residential exposure assumptions from other clean closures, by for example, referring to them as "non-residential clean closure" or "closure by removal and decontamination based-on non-residential exposure assumptions." Care should especially be taken to ensure that the public is aware of the exposure assumptions which are being applied and the associated land use restrictions which must be maintained in order for the assumptions to remain valid. At a minimum this information should be clearly included in public notices of tentative closure decisions. EPA'S current guidance on incorporating considerations of reasonably anticipated future land use in remedial decision making is entitled, "Land Use in the CERCLA Remedy Selection Process" (OSWER Direction No. 9355.7-04. May 25, 1995).

All but a few states are currently authorized to implement the RCRA closure requirements in lieu of EPA; therefore, implementation of this policy will largely be at the discretion of state RCRA program managers. EPA does not view this change in policy to allow appropriate use of non-residential exposure assumptions during clean closures as requiring re-authorization. or re-evaluation, of authorized state programs. If EPA were asked to evaluate an individual clean closure decision made using non-residential exposure assumptions, the Agency would likely consider factors such as: the methods used to identify the reasonably expected future land use; the amount of community involvement in the land use decision: the probability that the covered property will be actively used (as opposed to abandoned); the enforceability of a land use control (with more weight given to programs that have a mechanism in place to review and ensure continued validity of non-residential exposure assumptions); the specific non-residential exposure assumptions which are applied; the potential for trespassers. especially children; and, the range of circumstances under which a state could compel further cleanup if land use were to change.

EPA notes that in situations where, because of a change in land use, additional cleanup is needed after clean closure, EPA would retain authority to take action, under appropriate circumstances, using RCRA Section 7003, CERCLA Section 106, and other authorities. In addition, of course, until clean closed facilities undergo final administrative disposition of a RCRA permit application (i.e., through permit issuance or permit denial) they would remain subject to corrective action under RCRA Section 3008(h).

Additional Information

Reliance on risk-based approaches during clean closure will complement EPA's other ongoing efforts to encourage coordination of cleanup requirements and eliminate duplication of effort. Guidance on coordination of RCRA closure requirements with

other cleanup activities was provided in the September 26, 1996 memo on RCRA/CERCLA integration, referenced above.

I encourage you to use risk-based approaches to develop site-specific clean closure requirements and to continue in your efforts to eliminate duplication of effort among cleanup programs. For additional information please contact Elizabeth McManus, of my staff, on (703) 308-8657.

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