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EPA

The Revised Hazard Ranking System: Qs and As

Office of Emergency and Remedial Response
Hazardous Site Evaluation Division (OS-230)

Quick Reference Fact Sheet

The U.S. Environmental Protection Agency (EPA) revised the Hazard Ranking System (HRS) in response to the Superfund Amendments and Reauthorization Act (SARA). These revised HRS Qs and As address the SARA requirements for the revised HRS, specific revisions to the HRS, the impact of the revised HRS on the site assessment and remedial processes, and selection of the cutoff score.

General

What is the Hazard Ranking System?

The Hazard Ranking System (HRS) is a scoring system the U.S. Environmental Protection Agency (EPA) uses to evaluate relative risks to human health and the environment posed by uncontrolled hazardous waste sites. The HRS was originally adopted in 1982 to meet the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), commonly known as Superfund. The HRS is designed to be a simple, numerically-based scoring system that uses information obtained from the initial, limited investigations conducted at a site -- the preliminary assessment and the site inspection. Using this information, the HRS assigns each site a score ranging from 0 to 100 based on:

- The likelihood that a site has released or has the potential to release contaminants into the environment.
- The characteristics of the waste (toxicity and waste quantity).
- The people or sensitive environments affected by the release.

In the near future, the Superfund program will issue other Fact Sheets on technical and policy issues that may arise during the implementation of the revised HRS.

How does EPA use the HRS?

EPA uses the HRS as a screening mechanism to determine whether a site should be placed on the National Priorities List (NPL). Sites receiving HRS scores of 28.50 and above are eligible for the NPL.

What is the purpose of the NPL?

The NPL informs the public of sites that EPA has decided require further detailed investigations. These investigations determine whether the sites represent a long-term threat to public health or the environment and, therefore, need remedial action. A site must be on the NPL to undergo remedial action financed by CERCLA's Trust Fund. Remedial action may involve activities such as containment, treatment, and disposal of wastes that will bring site conditions to the point that human health and the environment are protected.

How does the HRS relate to the National Contingency Plan (NCP)?

The HRS is Appendix A to the NCP (40 CFR Part 300). The HRS is the mechanism used to evaluate whether releases should be on the NPL. Sites on the NPL undergo further investigation and remedial action if necessary, according to the NCP.

SARA Requirements

Why wasn't the revised HRS completed by April 1988, as suggested by SARA?

The complexity and scope of the issues involved in revising the HRS required EPA to get widespread input to provide a broad spectrum of technical and policy expertise. EPA sought information from a number of sources such as EPA's Science Advisory Board and the public. On three separate occasions, EPA requested public comment on the revisions, to permit consideration of public input at various stages in the development of the revised HRS. The Advance Notice of Proposed Rulemaking (52 FR 11513, April 9, 1987) gave the public the opportunity to participate in the design of the revisions. The Proposed Rule (53 FR 51962, December 23, 1988) requested comment and input on the proposed revisions. Finally, the Availability Notice for the Field Test Report on the HRS Proposed Revisions (54 FR 37949, September 14, 1989) gave the public the opportunity to reevaluate the proposed rule against its performance in the field test. EPA received over 2,500 comments (from approximately 145 commenters). The analysis and careful consideration required to evaluate all these inputs contributed to the delay in meeting the SARA-suggested deadline. The Agency feels, however, that the delay was necessary to satisfy the SARA requirements in developing a regulation of such significance.

What specific revisions does SARA require?

Section 105 requires:

- EPA to amend the HRS to assure "to the maximum extent feasible, that the Hazard Ranking System accurately assesses the relative degree of risk to human health and the environment, posed by sites and facilities subject to review."
- The HRS to assess human health risks associated with contamination or potential contamination of surface waters, either directly or as a result of runoff, taking into account the use of these waters for recreation and the potential migration of any contaminant through surface water to downstream sources of drinking water.
- The HRS to take into account:
  - Damage to natural resources that may affect the aquatic human food chain.
  - Contamination or potential contamination of ambient air.

Section 118 requires EPA to:

- Give a high priority to sites where contamination has resulted in the closing of drinking water wells, or has contaminated a principal drinking water supply.

Section 125 requires EPA to:

- Revise the HRS to assure appropriate consideration of sites that contain substantial volumes of fly ash and other wastes generated primarily by combustion of coal or other fossil fuels. The assessment must consider:
  - Quantity, toxicity, and concentrations of hazardous constituents present in such wastes.
  - Extent of, and potential for, release of such constituents into the environment.
  - Degree of risk to human health and the environment posed by such constituents.

Specific Revisions

Is the revised HRS a risk assessment?

No. As required by CERCLA, EPA's Superfund program focuses its resources on the highest priority sites. Consequently, initial studies like preliminary assessments (PAs) and site inspections (SIs) are modest in scope and performed on a large number of sites. This has placed certain constraints on the HRS.

While not a risk assessment, the HRS does provide a measure of relative risk among the universe of potential NPL sites. The HRS is used as a screening tool to identify those sites that represent the highest priority for further investigation and possible cleanup

under CERCLA. Its purpose is not to fully characterize the source and the extent of the contamination. Rather, its purpose is to evaluate the potential of uncontrolled hazardous substances to cause damage to human health or to the environment. Uniform application of the HRS nationwide enables EPA to evaluate sites relative to each other with respect to actual or potential hazards.

EPA uses risk assessments to provide a better overall indication of potential threats. Such evaluations are performed on NPL sites during the remedial phase of the Superfund program. This evaluation serves to characterize the actual threat posed by the site in order to plan the appropriate remedial action to be undertaken at the site.

How extensive are the revisions in the HRS?

In general, it is fair to say that every factor has been revised in some way. Some of the most important changes are:

- A fourth pathway, the soil exposure pathway (named onsite exposure in the proposed HRS), has been added to address direct contact problems.
- The food chain threat has been added to the surface water pathway.
- Extra emphasis is placed on those sites that result in actual human exposure, as opposed to potential exposure.
- The toxicity factors have been revised to include consideration of chronic noncarcinogenic, carcinogenic, and acute effects. (The original HRS considered only acute toxicity.)
- Targets are now weighted according to their distance from a site or the amount of dilution likely to occur.
- Environmental targets are given a more comprehensive evaluation and greater weight.
- The air pathway can be scored for potential release. (The original HRS scored only observed releases.)

How has EPA addressed the requirements of SARA Section 125?

EPA addressed the requirements as follows:

- *Waste quantity:* The revised HRS incorporates a tiered approach for calculating the waste quantity factor. This approach uses the best data available at a site to calculate waste quantity, including constituent concentration data, if adequate.
- *Extent of and potential for release:* The revised HRS provides criteria for determining when an observed release is significantly above background, and adds factors that improve the way the HRS evaluates the potential for hazardous substances to be released.
    - *In the ground water pathway,* such factors include the revised depth to aquifer and mobility factors.
    - *In the surface water pathway,* potential-to-release by overland flow and flooding is assessed. In addition, the persistence factor is revised to include mechanisms for attenuation other than biodegradation, providing a more accurate assessment of the potential for hazardous substances to migrate.
    - *In the air pathway,* a potential-to-release mechanism is added, which takes into account source type, source size, and mobility.
- *Degree of risk:* The revised HRS improves the toxicity factor, improves calculation of waste quantity, adds the mobility factor, revises the potential-to-release criteria, uses health-based and ecological benchmarks, and adds dilution and distance weighting.

What pathways does the revised HRS consider?

The revised HRS continues to consider risks in the ground water, surface water, and air pathways. A new pathway, soil exposure (called onsite exposure pathway in the proposed HRS), has been added to account for ingestion, dermal contact, and other

exposures related to materials at the surface that contain hazardous substances.

Does the revised HRS give more weight to one pathway (for example, ground water) than others?

No. The maximum possible number of points is the same for each of the four pathways.

Does the revised HRS consider hazards to the environment as well as hazards to public health?

Yes. The revised HRS takes a more comprehensive approach to evaluate sensitive environments. The revised HRS expands the list of sensitive environments considered to include lands and waters that have been legally designated as protected areas by either the Federal government or the States.

Potentially contaminated sensitive environments are distance weighted; in the surface water environmental threat, actual contamination of sensitive environments is evaluated based on ecological benchmarks. The weight assigned to sensitive environments has been capped at 60 percent of the weight assigned to human targets, to reflect that human health threats receive a higher priority. However, serious environmental problems can score above the HRS cutoff.

How does the revised HRS take into account people who are actually being exposed to contaminants, as opposed to those potentially exposed?

The target factors for all pathways are assigned a higher value if contaminants are found in drinking water wells or intakes, school playgrounds, residences, etc. For example, if a contaminant's concentration exceeds a health-based benchmark such as a Federal drinking water standard in a drinking water well, then greater weight is assigned to those persons drinking the water, regardless of their distance from the site. Potentially exposed populations are evaluated based on their distance from the site, or the dilution expected to occur at the point of exposure within the target distance limit. This is because, under most circumstances, the concentration of hazardous substances declines as contaminants migrate from a site.

What new types of sites will the revised HRS add to the NPL?

The revised HRS considers contamination of natural resources that can affect the aquatic human food chain, making it likely that sites that may be contaminating aquatic organisms will be listed. Also, certain direct contact problems, especially those involving contamination of residential and school property, are likely to have higher scores under the revised HRS. Serious environmental impacts are likely to score above the cutoff score. Sites that result in high levels of known exposure, even if only small populations are involved, should score relatively higher on the revised HRS.

Does the revised HRS consider direction of ground water flow?

Not directly. The revised HRS considers flow direction indirectly in the method used to evaluate target populations. If wells have not been contaminated by the site, as might be assumed of upgradient wells, the wells are scored for potential contamination, rather than actual contamination, and the population drawing from those wells is distance weighted. Conversely, if wells have been contaminated, as might be assumed of downgradient wells, the wells are scored for actual contamination and receive the higher observed contamination score. Under this scoring scenario, the populations drawing from the upgradient wells would receive a lower score than those with observed contamination downgradient of the site, and with target distance weighting, the upgradient population would have to be substantial before it could receive a large number of scoring points.

Site Assessment Process

Does the revised HRS affect any sites currently on the NPL?

No. CERCLA Section 105(c)(3), added by SARA, specifically states that it is not necessary for EPA to rescore sites that were placed on the NPL using the original HRS.

Will EPA rescore sites that have already been scored on the original HRS, but did not meet the 28.50 cutoff?

Not necessarily. Sites scoring below the cutoff

using the original HRS will not be systematically evaluated with the revised HRS. However, if either EPA's Regional Offices or the States receive additional information, they may elect to rescore sites that they consider threats to public health and/or the environment, but that did not qualify for listing under the original HRS. This may be the situation with sites that have problems the original HRS did not address, but which the revised HRS does -- for example, human food chain impacts or the potential for contamination of ambient air.

When will the first sites be proposed for the NPL under the revised HRS?

The first update under the revised HRS is scheduled for early 1991.

How will EPA gather information to score a site using the revised HRS?

In general, EPA will follow the same steps as it did with the original HRS, although the information gathered may differ. The site assessment portion of the Superfund program (the portion before the sites are proposed for the NPL) is intended to identify sites representing the highest priority for cleanup. The process begins with site discovery, or the notification of EPA of possible releases of hazardous substances. These potential sites are then entered into CERCLIS, EPA's inventory of potential hazardous waste sites.

A preliminary assessment (PA) is performed on all sites entered into CERCLIS to determine whether a site merits further action. The PA identifies hazardous substances related to the site, potential pathways (ground water, surface water, air, and soil exposure), the likelihood of release, target populations, and sensitive environments. The PA is a low-cost review of existing reports and documentation about the site to determine whether the site potentially poses a problem.

If the site warrants further investigation, a site inspection (SI) is performed. The SI involves collecting additional information to better understand the extent of the problem at the site, screen out sites that will not qualify for listing, and obtain data necessary to calculate an HRS score. The SI usually includes collection and analysis of environmental and waste samples to determine what substances are present at the site and whether they are being released.

How many sites will be added based on revisions to the HRS?

The number of sites to be listed is a function of several variables, such as resources, site characteristics, and Regional priorities, among others. Some of these variables are independent of the revisions to the HRS. Historically, 5-10 percent of the sites evaluated are eventually placed on the NPL. Currently, approximately 33,000 sites are included in CERCLIS, EPA's inventory of potential hazardous waste sites. To date, approximately 31,000 sites have received a preliminary assessment. At 19,000 of these sites, the Agency has decided that further Federal action is not appropriate. Approximately 12,000 sites are still being evaluated. The Agency has placed over 1,200 on the NPL and will continue to list sites expeditiously using the revised HRS. Based on past rates of listing, the Agency expects to list approximately 100 sites per year.

Does the revised HRS retain its usefulness as a screening tool?

Yes. While requiring more data and more calculations than the original HRS, the revised HRS still remains within the scope of the site assessment process. The Agency revised the proposed HRS to make it simpler. The amount of data and the number of calculations required to score a site will vary among sites. Most sites do not require calculating all factors, because all four pathways are not always affected. EPA is developing a software package that will perform these calculations. This package will not only facilitate scoring sites, but also significantly lessen the possibility of errors.

Remedial Process

Are sites cleaned up according to their HRS scores?

No. The HRS does not determine whether cleanup is possible or necessary, or the amount of cleanup needed; these issues are considered in the more detailed investigations EPA undertakes to assess the nature and extent of the public health and environmental risks associated with the site. In planning these remedial investigations, EPA considers the HRS score, along with State priorities, further site data, other response alternatives, and other appropriate factors.

Who pays for cleaning up an NPL site?

Site cleanup can be financed in several ways:

- The individuals or companies responsible for the problems can clean up voluntarily with EPA or State supervision.
- The responsible party or parties can be ordered to clean up by Federal or State legal action.
- A State or local government can choose to assume the responsibility to clean up without Federal dollars.
- The Trust Fund can pay for the cleanup, then seek to recover the costs later from the responsible party or parties.

How does the cleanup proceed once a site is on the NPL?

The cleanup process generally involves these steps:

- Take any measures necessary to stabilize conditions, which might involve, for example, fencing the site or removing aboveground drums or bulk tanks.
- Undertake initial planning activities to scope out a strategy for collecting information and analyzing alternative cleanup approaches.
- Conduct a remedial investigation to characterize the type and extent of contamination at the site and assess the risks posed by that contamination.
- Conduct a feasibility study to analyze various cleanup alternatives. The feasibility study is often conducted concurrently with the remedial investigation as one project.
- Recommend a cleanup alternative. The public is given the opportunity to comment on the recommended alternative.
- Design the remedy.
- Implement the remedy.

Consideration of Removals

If EPA or a private party removes waste from a site, will EPA include the removed waste in the waste quantity score?

The Agency will consider response actions done prior to the site inspection. EPA believes that considering response actions in HRS scores will provide increased incentives for rapid response action. However, where EPA cannot adequately determine the amount of hazardous constituents remaining onsite, a minimum value will be assigned to the hazardous waste quantity factor.

Cutoff Score

How did EPA originally select 28.50 as the cutoff score for including sites on the NPL?

The HRS score of 28.50 was chosen as a management tool because it would yield an initial NPL of at least 400 sites as suggested by CERCLA.

After analyzing data from 110 sites where the revised HRS was tested, EPA has decided not to change the cutoff score at this time.

Why is EPA keeping the same cutoff score for the revised HRS?

Because the HRS is intended to be a screening system, the Agency has never attached significance to the cutoff score as an indicator of a specific level of risk from a site, nor has the Agency intended the cutoff to reflect a point below which no risk was present. EPA does not mean to imply that the score of 28.50 precisely distinguishes between a "risky" site and a "nonrisky" site. Nevertheless, the cutoff score has allowed the Agency to set priorities and to move forward with studying and, where appropriate, to clean up hazardous waste sites. The vast majority of sites scoring above 28.50 in the past have been shown to present risks.

What kinds of analyses did EPA perform to support its cutoff score decision?

As outlined in the December 1988 proposed HRS, the following three basic approaches were used to

obtain some estimate of equivalence between the original and revised HRS scores. The approaches used to define "equivalent to 28.50" included:

- A statistical analysis to determine what revised HRS score best correlates to 28.50.
- A determination of what percentage of potential sites in CERCLIS (EPA's inventory of potential hazardous waste sites) that score above 28.50 on the original NPL and the settting of a cutoff that yields the same percentage.
- An examination of the risk levels that correspond to the original HRS score of 28.50 and a determination of what revised HRS score corresponds to that risk level.

These analyses indicate that there is not sufficient information to conclude that any change in the current cutoff score of 28.50 is needed at this time.

Will keeping the HRS cutoff score at 28.50 reduce the number of sites added to the NPL?

Historically, the Agency has added 100 to 125 sites per year to the NPL. The Agency expects to list a similar number of sites each year using the revised HRS.

Will the HRS cutoff score be re-evaluated and revised?

EPA will continue to evaluate the effectiveness of the cutoff score to ensure it is serving its purpose as a management tool to identify the top priority hazardous waste sites.

For Further Information, Contact:

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