



The Revised Hazard Ranking System: Evaluating Sites After Waste Removals

Office of Emergency and Remedial Response
Hazardous Site Evaluation Division, OS-290

Quick Reference Fact Sheet

The US. Environmental Protection Agency (EPA) has revised the Hazard Ranking System (HRS) in response to the Superfund Amendments and Reauthorization Act of 1986 (SARA). The HRS is the primary mechanism for placing sites on the National Priorities List (NPL). Under the original HRS promulgated under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), a site was scored based on conditions that existed prior to any removal actions. Under the revised HRS, waste removals may be considered under certain circumstances. The term "waste removal", as used in this fact sheet, refers to the physical removal from the site of hazardous substances or wastes containing hazardous substances. The waste removal policy is designed to provide an incentive for rapid response actions by potentially responsible parties (PRPs), reducing risks to the public and the environment and allowing for more timely and cost-effective cleanups.

This fact sheet provides information for EPA Regional staff, States, and PRPs. It defines the concept of "qualifying removal," explains how to score sites where qualifying removals have been conducted, and discusses some of the management implications of the removal policy. In addition, this fact sheet provides examples of how to score sites where removals have occurred.

WHEN TO CONSIDER A REMOVAL

In the preamble to the HRS final rule (54 FR 51567, December 14,1990), EPA established three requirements that must be met for the results of a removal to be considered in scoring a site for the NPL (Figure 1). This fact sheet pertains only to removal actions that meet all three requirements, that is, "qualifying removals." Procedures for evaluating sites where other types of response actions have occurred are being developed.

Removal of Waste

The first requirement is that all waste subject to the removal must be physically removed from the site. This requirement ensures that removals do not simply move the waste and its associated risks to another portion of the same site. A removal action (or removal) conducted by Superfund's emergency response program does not necessarily involve physical removal of wastes from the site.

FIGURE 1 Requirements for Considering Removal Actions

- The removal action must physically remove waste from the site.
- The removal action must have occurred prior to the cutoff date applicable to the site (see Figure 2).
- The removed waste must be disposed or destroyed at a facility permitted under RCRA or TSCA or by the NRC.

For example, Superfund removal actions, as defined in CERCLA section 101(23), may include stabilizing or containing waste on-site through engineering controls or limiting exposure potential

by erecting fences or providing alternate water supplies. These types of actions do not constitute a qualifying removal for HRS purposes.

A qualifying removal for HRS purposes does not have to remove all the waste at a site or even all the waste in a particular source. Partial removal of waste from a site (meeting all three requirements) will be considered in scoring the site; however, a complete removal generally results in the maximum score reduction.

Timing

The second requirement is that the removal must have occurred prior to the cutoff date applicable to the site. The HRS preamble states that EPA will only consider removals conducted prior to the site inspection (SI). Because of differences in site assessment activities for different types of sites (e.g., EPA-lead, State-lead, Federal facilities), criteria for determining the appropriate cutoff date under this rule differ among sites.

Non-Federal Facility Sites. An SI for non-Federal facility sites begins with development of a workplan, which often includes the sampling strategy for the site. EPA believes that it would disrupt SIs to consider the results of removal actions conducted after this point because to do so could require revising sampling plans, resampling, or rescoring the site. Therefore, the SI cutoff date generally is the date that development of a workplan for the SI begins or whatever date is analogous to workplan development (Figure 2). If no such date is available (i.e., no workplan or analogous event), the cutoff date is the earliest documented date for Superfund SI activities at the site. For example, this date may include, but is not limited to, the date when a Superfund SI report, collating previously collected analytical data, is drafted. The cutoff date is not based on the date of a State or PRP site investigation conducted independently of CERCLA/SARA; the cutoff is based on the date these data are collated for Superfund SI purposes. Consult *Guidance for Performing Site Inspections Under CERCLA* (in preparation) for additional information.

Federal Facility Sites. Federal facility sites undergo a different site assessment process than private sites. Assessments and evaluations of Federal facility sites are expected to be conducted within 18 months of placement on the Federal

FIGURE 2 Determining Cutoff Date

Non-Federal Facility Sites: Date that development of workplan for first SI began or analogous date, such as:

- SI start date in CERCLIS;
- Date of technical directive document or memorandum (TDD or TDM) issued for work assignment to develop SI workplan; or
- Date of an SI reconnaissance to develop SI workplan.

If no such date is available, the cutoff date is the earliest documented date of Superfund SI activities at the site.

Federal Facility Sites: 18 months after placement on Federal facilities docket.

facilities docket. Therefore, the cutoff date for Federal facility sites is 18 months after the site is placed on the Federal facilities docket.

Sites with Multiple SIs. For sites with more than one SI, the cutoff date for most sites will be keyed to the first SI; however, the Agency may establish a later cutoff date under certain circumstances:

- If a second SI implementing a completely new sampling strategy is conducted, the Agency may consider basing the cutoff date on workplan development for the second SI. Considering removals in these cases is not likely to unduly disrupt the site assessment process.
- For sites where the first SI was conducted more than 4 years prior to HRS scoring, the Agency may consider, on a case-by-case basis, changing the cutoff date to a later date. (CERCLA Section 116, added by SARA, mandates that EPA conduct site assessment work within 4 years.)

However, the transition to the revised HRS may mean that some site evaluations will exceed 4 years

because sites will require follow-up sampling. Follow-up sampling will not be used to determine a new cutoff date even if more than 4 years have elapsed since the first cutoff date because the bulk of sampling generally will have been conducted previously.

Proper Destruction or Disposal

The third requirement for a qualifying removal is that all waste removed must be disposed or destroyed at a facility permitted under the Resource Conservation and Recovery Act (RCRA) or the Toxic Substance Control Act (TSCA) or by the Nuclear Regulatory Commission (NRC). This requirement encourages proper disposal of the removed wastes and discourages simply moving waste and associated hazards to another location.

SCORING HAZARDOUS WASTE QUANTITY

Hazardous waste quantity (HWQ) is scored as follows for sites where waste has been removed:

- Do not count the amount of waste removed in any qualifying removal when scoring HWQ. (Certain minimum HWQ factor values may apply, however.)
- Score HWQ as if the waste was not removed for all non-qualifying removals.

For partial qualifying removals, the scorer generally may subtract the amount of waste removed from the total amount of waste deposited in a source, if the same tier can be used for scoring. That is, the total (pre-removal) and removed HWQs must be determined using the same HWQ tier. For example, if HWQ for a source is scored using Tier B (hazardous wastestream quantity), but only Tier C (volume) of the removed waste is known, the HWQ for the removed waste cannot be subtracted from the HWQ for the entire source. If both the source and removed waste are scored using Tier C, HWQ for the removed waste can be subtracted. In addition, where HWQ is estimated as the once-filled volume and the total volume of waste deposited is known to be many times this volume (e.g., surface impoundments), the amount of waste removed cannot be subtracted.

The accuracy of scoring sites with qualifying

removals depends on being able to determine with reasonable confidence the quantity of hazardous substances remaining in sources at the site and the quantity already released into the environment. Consequently, minimum factor values (MFV) for HWQ apply in the absence of sufficient information to adequately determine the quantity remaining and the quantity released. Figure 3 explains how to determine appropriate minimum HWQ factor values for migration pathways (i.e., ground water, surface water, and air pathways).

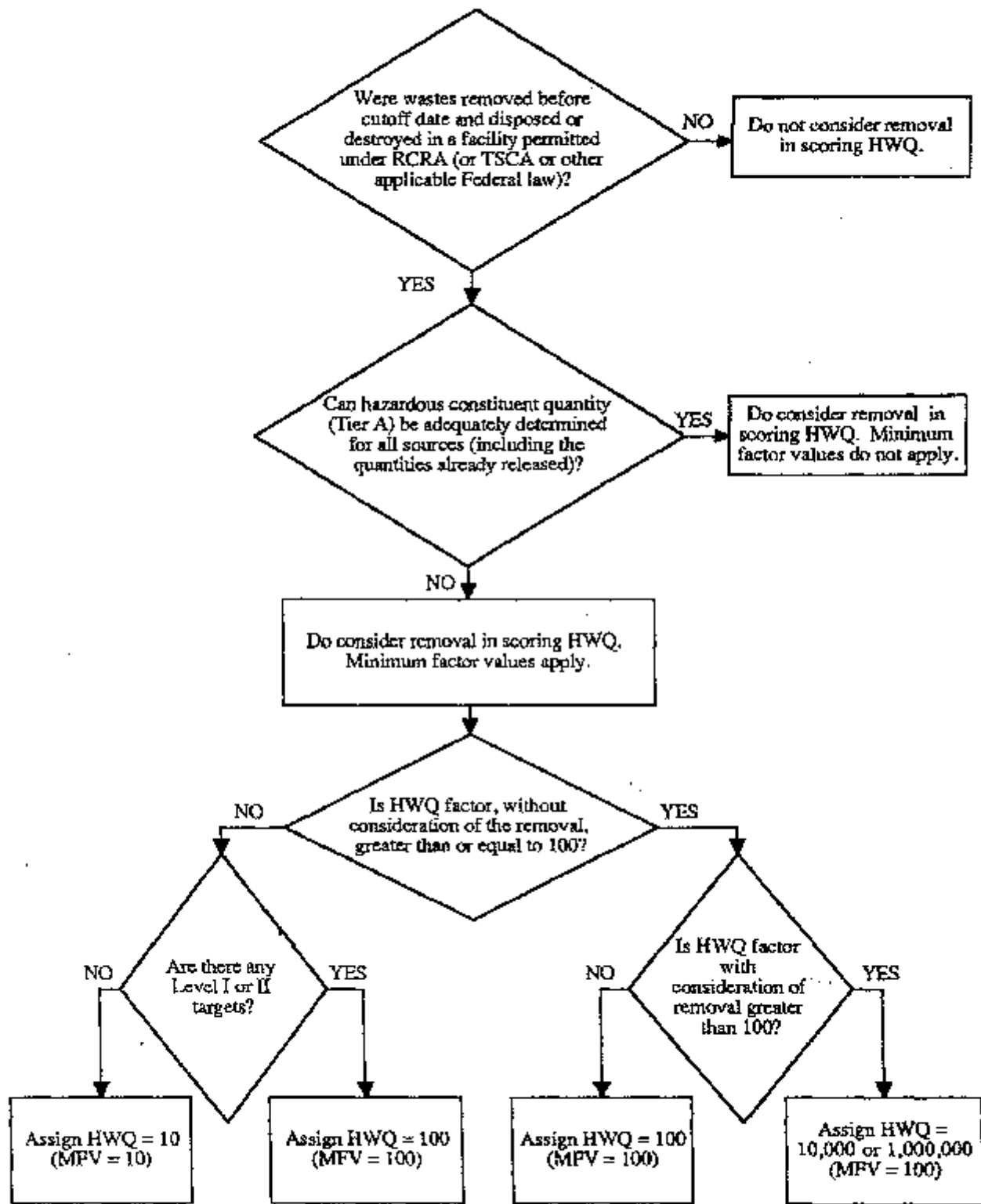
HWO for Migration Pathways

Tier A (hazardous constituent quantity) of the HWQ evaluation involves determining the quantity of CERCLA hazardous substances remaining in the sources and in releases to the environment. To score HWQ completely using Tier A, the total mass of all CERCLA hazardous substances in all sources and in releases from the sources to the environment for that pathway must be known or estimated with reasonable confidence. If Tier B (hazardous wastestream quantity), C (volume), or D (area) is evaluated for any source for the pathway, the HWQ factor value for that migration pathway is subject to minimum values.

For migration pathways, a pathway-specific minimum factor value applies to all sites where hazardous constituent quantity cannot be adequately determined. At sites where no qualifying removal has taken place and there are no Level I or II targets in a given pathway, the HWQ factor for that pathway is subject to a minimum value of 10; if there are Level I or II targets, the minimum value is 100. At sites where a qualifying removal has occurred, the minimum HWQ factor value for a given migration pathway depends on several considerations:

- If a target in that migration pathway is subject to Level I or II concentrations, the minimum HWQ factor value for that pathway is 100.
- If no targets in that migration pathway are subject to Level I or Level II concentrations, then:
 - If the HWQ factor value would be 100 or greater without considering the removal, then the minimum HWQ factor value for that pathway is 100.

FIGURE 3
Determining Minimum Factor Values (MPV) for Hazardous Waste Quantity (HWQ)
at Sites with Removals (Migration Pathways Only)



Note: Minimum HWQ factor values are pathway-specific.

If the HWQ factor value would be less than 100 without considering the removal, then the minimum HWQ factor value for that pathway is 10.

The minimum HWQ factor value of 10 (i.e., final bullet above) ensures that a site will not receive a higher score simply because a removal has been conducted. Under no circumstances will a party be penalized for conducting a qualifying removal.

HWQ for Soil Exposure Pathway

HWQ is evaluated differently for the soil exposure pathway than for the migration pathways. In the soil exposure pathway, HWQ is always based on conditions at the time of the SI. Only the first 2 feet of areas of observed contamination plus tanks, drums, and other container sources are included in evaluating HWQ. The HWQ factor is subject to a minimum value of 10 (if hazardous constituent quantity cannot be adequately determined), regardless of whether there has been a qualifying removal. Section 5.1.2.2 of the HRS rule provides further information on evaluating HWQ for the soil exposure pathway.

DETERMINING QUANTITY OF HAZARDOUS SUBSTANCES REMAINING

EPA's removal policy is meant to encourage the PRP conducting the removal to determine the quantity of CERCLA hazardous substances remaining in sources at the site and the full extent of the associated releases to the environment. If a release to the environment has occurred or is suspected, the PRP must determine with reasonable confidence the total quantity of all CERCLA hazardous substances in releases to all media to receive the maximum reduction in score (i.e., to avoid use of the minimum factor value). This requires determining HWQ for all sources completely using Tier A (Figure 4). As discussed previously, if the total mass of all CERCLA hazardous substances in all sources and in releases to the environment (or in areas of observed contamination for the soil exposure pathway) cannot be adequately determined for a pathway, the HWQ factor for that pathway is subject to minimum values.

At sites where surface soils or wastes have been removed, Regions are encouraged to collect a reasonable number of additional soil and/or

FIGURE 4
Adequately Determining Hazardous Constituent Quantity

Hazardous constituent quantity can be calculated for a source using the following equation:

$$HCQ = \sum_{i=1}^n C_i \times D_m \times V_s$$

where:

- HCQ = hazardous constituent quantity for source S (mass)
- C_i = average concentration of constituent i (mass/mass)
- n = total number of CERCLA hazardous substances
- D_m = density of source medium (mass/volume)
- V_s = volume of source S (volume)

To use this equation to adequately determine hazardous constituent quantity for a source:

- the equation must be applied to each medium;
- the volume of the source must be known with reasonable confidence;
- representative values for the average concentration of each hazardous substance deposited in the source must be known; and
- there, must be no release from the source.

The key to using concentration data to estimate hazardous constituent quantity is determining a representative value for the average concentration of each hazardous substance in the source or portion of the source. This can be very difficult for sources where the distribution of hazardous substances shows high spatial or temporal variability. In addition, if a release from the source has occurred, then the total mass of all hazardous substances released to the environment must also be adequately determined.

Hazardous constituent quantity also can be adequately determined if complete data are available on the quantity of hazardous substances deposited (e.g., manifest data). The procedure described above does not apply to RCRA wastes or radionuclides.

subsurface samples to verify the PRP's evaluation of hazardous constituent quantity for the remaining waste. SIs are not intended to address the full extent of contamination at sites; therefore, EPA generally will rely on PRPs to quantify the extent of releases to all media, so that they can receive the maximum possible reduction in HWQ factor value. If subsequent Regional sampling reveals that HWQ is greater than that estimated by the PRP during the removal, the HWQ factor value is calculated based on these new data.

SCORING OTHER FACTORS

For the migration pathways, a number of factors other than HWQ can be affected by the removal of waste and, in some cases, are scored to reflect a qualifying removal (Figure 5).

Likelihood of Release Factors

The results of a qualifying removal may be taken into account in scoring several factors in the likelihood of release factor category for the source subject to the removal. These factors include:

- observed release (or observed contamination);
- containment; and
- source type.

An observed release to one of the migration pathways documented before or after a qualifying removal can be used to score likelihood of release. That is, a qualifying removal does not negate the fact that the source already has released to the environment. However, areas of observed contamination in the soil exposure pathway are intended to reflect continuing risks at the site. Therefore, soil exposure pathway factors should be documented by sampling that represents conditions at the time of the SI.

Changes in source containment should be considered only when:

- the change results from a qualifying removal;
- no observed release of a hazardous substance associated with that source is established for a given pathway; and
- the containment factor value for the affected source is equal to 0 for that pathway after the removal.

FIGURE 5 Scoring Other Factors

Changes in factors other than HWQ should be considered in scoring a migration pathway only if:

- the change in that factor was a direct result of a qualifying removal;
- No observed release of a hazardous substance associated with the source is established for that pathway, and
- The removal completely eliminated a source (and its associated releases) or resulted in a containment factor value of 0 for that source in that pathway.

If changes in containment result in a lower -- but non-zero -- containment factor value, then that source is assigned a containment factor that does not reflect the changes that resulted from the qualifying removal. Similarly, changes in source type that result in a non-zero source type factor value are not considered in scoring. Changes that result in a source type factor value of 0 are considered.

Substance-specific Factors

Some substance-specific HRS factors can be affected if a qualifying removal completely eliminates a hazardous substance from a pathway (i.e., all sources of that hazardous substance are completely removed or have containment factor values of 0 and there is no observed release or observed contamination of that substance). These factors include:

- toxicity;
- mobility;
- persistence;
- bioaccumulation potential; and
- gas migration potential.

None of these factors can be based on a hazardous substance that was completely eliminated from a pathway by a qualifying removal. Such a removal must include all sources of that hazardous substance, and no releases of that substance to the environment may have occurred. EPA generally

will be unable to obtain such information and will rely on PRPs to produce these data. If a portion of a source is eliminated in a qualifying removal, the remaining portion of that source is assumed to contain the same hazardous substances as the removed portion, unless the PRP can document otherwise (e.g., provide analytical results or manifest data that convincingly demonstrate a given hazardous substance is not present in the remaining portion of the source). For the soil exposure pathway, toxicity should be based only on hazardous substances meeting the criteria for observed contamination at the time of the SI.

Targets Factors

Site-specific target distance limits or distance rings in migration pathways may change if a qualifying removal eliminates a source or changes a source in such a way that it is not available to a pathway (i.e., containment factor value of 0).

For a migration pathway:

- If an observed release (or observed contamination) is associated with a source, include that source when measuring target distances, regardless of whether a qualifying removal has occurred or whether the containment factor value is 0.
- If a source is completely eliminated or the characteristics of the source are changed such that the source's containment factor value for a given pathway is 0, and no observed release of a hazardous substance associated with that source to that pathway has occurred, do not include that source in measuring target distances for that pathway.
- If the characteristics of a source are changed, but that source is still available to a given pathway (i.e., non-zero containment factor value), then include that source when measuring target distances for that pathway.

For the soil exposure pathway:

- If all or part of an area of observed contamination is removed, do not include the removed area when determining the target distance limits.

EPA generally will not be able to document the complete removal of a source within the normal SI field sampling. EPA will rely on PRPs to provide the additional information that is needed to document complete removal of a source.

MANAGEMENT IMPLICATIONS

Site managers should be aware of the changes in site scores that may occur under the waste removal policy and understand the need to document releases at removal sites. In addition, EPA's removal and site assessment programs must coordinate at sites where the removal program is considering taking action.

Changes in Site Scores

The waste removal policy is intended to provide an incentive for timely and thorough removals by potentially lowering the HRS score for sites where a qualifying removal is conducted. This score lowering may be major or minor, depending on the characteristics of the site and the extent of the removal action:

- Because the HWQ factor values are grouped in two-order-of-magnitude ranges (100, 10,000 and 1,000,000), large changes in the HWQ factor value may occur for two types of sites: (1) sites where very large quantities of waste have been removed and (2) sites where the HWQ factor prior to removal was slightly above the lower boundary of a HWQ range.
- Likelihood of release could be affected for migration pathways where no observed release has been detected and a source is completely eliminated from a pathway by a qualifying removal (or is changed such that the containment factor value now equals 0).
- Large changes in target factor values could occur if surface soil contamination is removed from areas occupied by resident individuals or if source elimination significantly changes the targets evaluated.

Documenting Releases

At sites where the PRP claims to have completely eliminated a source (including any associated releases), the PRP must confirm this claim through adequate sampling. A source will be

evaluated on the basis of SI sampling unless the PRP can produce additional information that documents complete removal. Furthermore, if Regions believe that hazardous constituent quantity for the remaining source and its releases is not adequately determined, the minimum HWQ factor values for removal sites apply. At sites where a PRP has calculated hazardous constituent quantity for a source, Regions are encouraged to conduct sampling, to the extent practicable, to verify this information.

QUESTIONS AND ANSWERS

Q. How are multiple removals at the same site treated?

A. The number of individual removals does not matter as long as each removal considered in scoring is a qualifying removal. All qualifying removals should be considered and all non-qualifying removals should not be considered when calculating the HRS score.

Q. Whose removals are considered?

A. The waste removal policy applies to all sites, regardless of the identity of the party conducting the removal. EPA, State, and PRP removals are subject to the same requirements under the HRS removal policy.

Q. Does the waste removal policy apply to Federal facility sites?

A. Yes. The only difference in applying the removal policy to Federal facilities is the difference in determining the cutoff date.

Q. Are SIs conducted by States under cooperative agreements considered EPA SIs for the purposes of the HRS removal policy?

A. Yes.

Q. If a qualifying removal eliminates the only drums in a group for which data concerning the contents are available, how should substance-specific factors be scored for this source?

A. In the absence of information to the contrary,

Regions may assume that the remaining portion of a source contains the same hazardous substances as the removed portion. If a PRP can produce convincing evidence that the hazardous substances in the removed portion of a source are not present in the remaining portion, these substances should not be used to score any substance-specific factors for that source. Regions should not, however, assume that hazardous substances present in one source (e.g., a group of drums) are present in a different source (e.g., a landfill) without supporting information.

Q. Prior to the cutoff date for a site, the PRP removed all of the waste from a pile and transferred it to an on-site containment system that would be assigned a containment factor of 0 for all pathways. Should the pile still be considered a source in scoring the site?

A. Yes. The pile should be considered when scoring this site. This response action did not physically remove waste from the site; therefore, it is not a qualifying removal.

Q. A site had an SI three years ago, but a number of additional samples were taken subsequently to support HRS scoring. Which investigation should be used to assign the cutoff date?

A. Because the overall sampling strategy is developed in the first SI, the cutoff date is based on the first SI.

Q. What if the cutoff date falls in the middle of a waste removal that was conducted over an extended period of time?

A. Those wastes that were removed prior to the cutoff date (in compliance with all three requirements) are not considered in scoring the site.

Q. Can a removal assessment conducted by the EPA removal program be used to determine the cutoff date?

A. No. SIs conducted under the aegis of Superfund's site assessment program are used to determine the cutoff date for qualifying removals.

FIGURE 6 -- EXAMPLES

Example 1

A site has a large landfill as its only source. The top 4 feet of the Landfill were excavated and replaced with uncontaminated soil that is now heavily vegetated. The excavated materials were removed from the site and were properly disposed prior to the cutoff date. An observed release to ground water was established prior to the removal using data from an on-site monitoring well.

Qualification: This is a qualifying removal because it meets all three requirements, Consider the removal in scoring the source.

HWQ: Do not consider the quantity of excavated materials in scoring HWQ. Because it is unlikely that the total mass of all CERCLA hazardous substances in the landfill and releases to environmental media will be known or estimated with reasonable confidence, this site is likely to be subject to a minimum HWQ factor value of either 10 or 100. Calculate the HWQ factor value considering and not considering the removed materials to determine the appropriate minimum value. If the landfill is scored using Tier C (volume), then subtract the removed 4 feet from the total volume of the waste. If the landfill is scored using Tier D (area), then the removal will not change the HWQ factor value.

Other Factors: Soil Exposure. Because this pathway is concerned with potential direct exposures to surface sources and the top 2 feet of soil only, replacing the top 4 feet of contaminated material with clean soil has eliminated the soil exposure pathway for this site. Unless contamination can be found in the top two feet of soil at this site, the soil exposure pathway receives a score of 0.

Air. The changes made in conjunction with the removal result in a containment factor of zero for the air pathway; therefore, the landfill is no longer considered a source for the air pathway and is not considered in any air pathway calculation (e.g., HWQ, target distance). Because the landfill is the only source at this site, the air pathway would receive a score of 0, unless an observed release to air was documented prior to the removal.

Ground Water. The observed release to ground water can still be used to score likelihood of release. Do not consider the effects of the removal in scoring factors other than HWO for the ground water pathway.

Surface Water. The changes made in conjunction with the removal do not result in a containment factor of 0 for surface water. Do not take the effects of the removal into account in scoring factors other than HWQ for the surface water pathway.

Example 2

One of the sources at a site is a waste pile. The wastes in this pile were transferred to drums that currently are stored on-site while plans for their disposition are made. The cutoff date is the date the work assignment for development of the SI workplan was issued (1/15/89); this response action took place on 9/5/89.

Qualification: This is not a qualifying removal. First, this response action did not physically remove wastes from the site. Second, the response action took place after the cutoff date for qualifying removals. Do not consider the removal in scoring the source.

FIGURE 6 -- EXAMPLES (concluded)

Example 3

One of the sources at a site is a group of approximately 20 drums. All were removed and properly treated and disposed off-site prior to the cutoff date. These drums appeared to be intact when removed, and extensive environmental monitoring conducted by the PRP has not demonstrated a release in the area of the drums.

Qualification: This is a qualifying removal because it meets all three requirements. Consider the removal in scoring the source.

HWQ: Do not include the quantity of waste in the removed drums in scoring HWQ. If the Region is convinced that no release to the environment has occurred and if all other sources at the site can be scored completely using Tier A, no minimum HWQ value applies.

Other Factors: If the Region is convinced that the data indicate no release to the environment occurred, do not include the removed drums as a source for any pathway. Do not use the area where the drums were located to determine target distance limits. Do not use hazardous substances that were present only in the removed drums and not in any other sources to score any substance-specific factors.

Example 4

One of the sources at a site is a waste pile containing hazardous substances. Prior to the cutoff date, the waste pile was removed and the contents were properly disposed off-site. The SI indicated that the surface and subsurface soil around the area where the pile was located contains elevated levels of arsenic and chromium, hazardous substances known to be present in the removed wastes.

Qualification: This is a qualifying removal because it meets all three requirements. Consider the removal in scoring the source.

HWQ: Do not include the hazardous substances in the waste pile in scoring HWQ. Unless all sources and releases at this site can be scored completely using Tier A, this site will be subject to a minimum HWQ factor value of either 10 or 100. Calculate the HWQ factor value both considering and not considering the removed materials to determine the appropriate minimum value (i.e., the site should not receive a higher score because of the removal).

Other Factors: This qualifying removal did not reduce the containment factor for this source to 0 for any of the migration pathways. Therefore, do not consider changes related to this source that could affect scoring of other HRS factors (e.g., containment, targets factors) in scoring these factors other than HWQ.

Score the soil exposure pathway using the areas of observed contamination documented at the SI.

NOTICE

The information set forth in this document is intended solely for the guidance of Government personnel. It is not intended, nor can it be relied upon, to create any rights enforceable by any party in litigation with the United States. EPA may decide to follow the guidance provided in this fact sheet, or to act at variance with the guidance, based on an analysis of specific site circumstances. The Agency also reserves the right to change this guidance at any time without public notice.