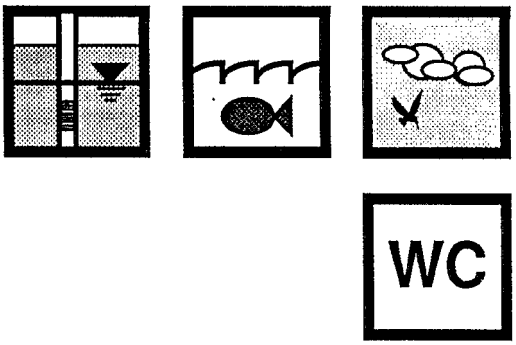
CHAPTER 6
HAZARDOUS WASTE QUANTITY

TIER A	HAZARDOUS CONSTITUENT QUANTITY	POUNDS
TIER B	HAZARDOUS WASTESTREAM QUANTITY	POUNDS
TIER C	VOLUME	CUBIC YARDS
TIER D	AREA	SQUARE FEET

SECTION 6.1 OVERVIEW OF HAZARDOUS WASTE QUANTITY FOR THE THREE MIGRATION PATHWAYS



This section introduces the concept of hazardous waste quantity and provides a flowchart summarizing how to calculate the hazardous waste quantity factor value for the migration pathways. A discussion of possible information sources that may assist in documenting hazardous waste quantity values is also included. Hazardous waste quantity for the soil exposure pathway is discussed in Section 9.2.

The purpose of the hazardous waste quantity factor in the HRS is to represent the quantity of hazardous substances at a site. The hazardous waste quantity factor allows the use of various measures of hazardous waste quantity depending on data availability and adequacy. The factor has a hierarchical structure of four tiers:

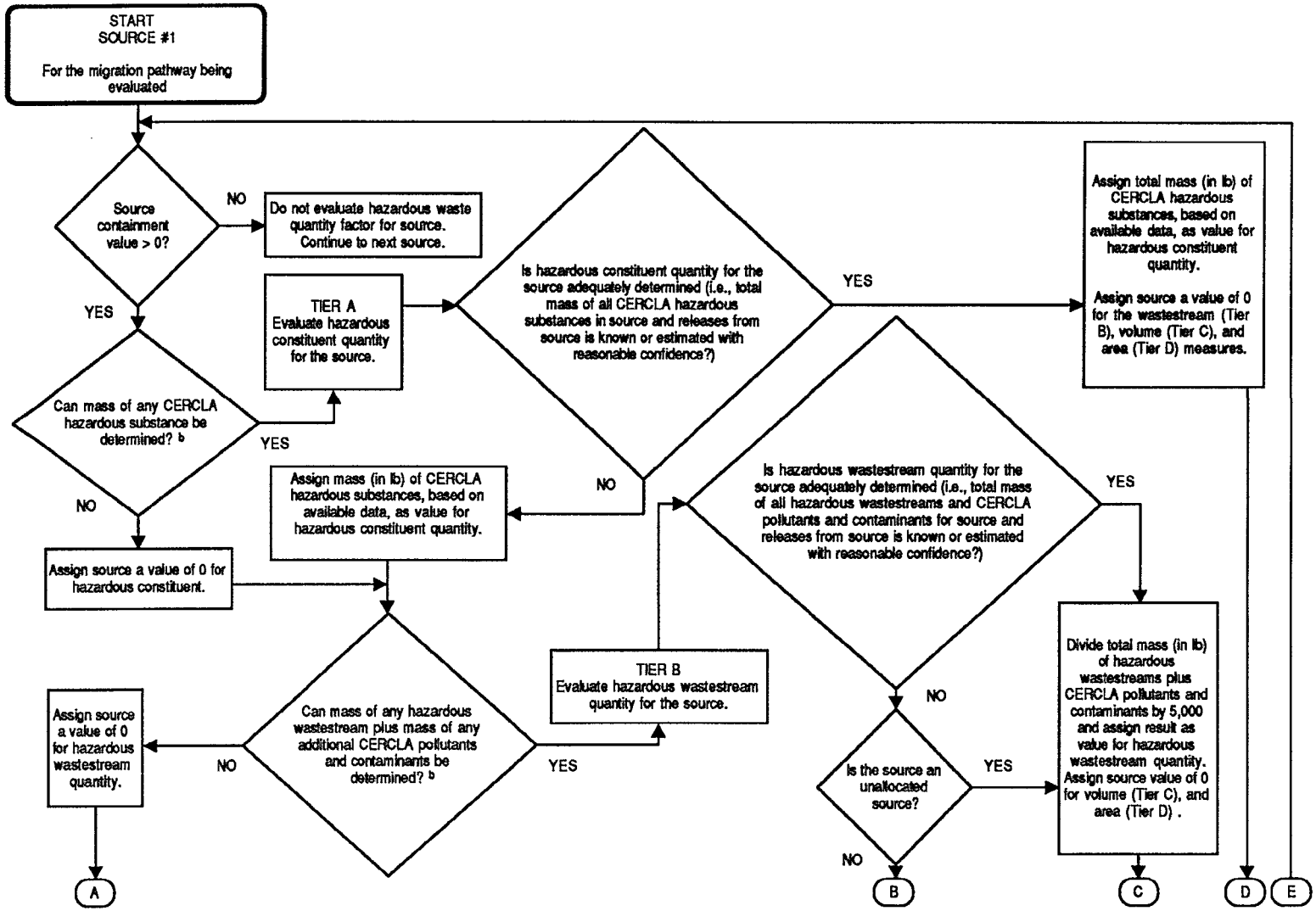
- Tier A Hazardous Constituent Quantity
- Tier B Hazardous Wastestrearn Quantity
- Tier C Source Volume
- Tier D Source Area.

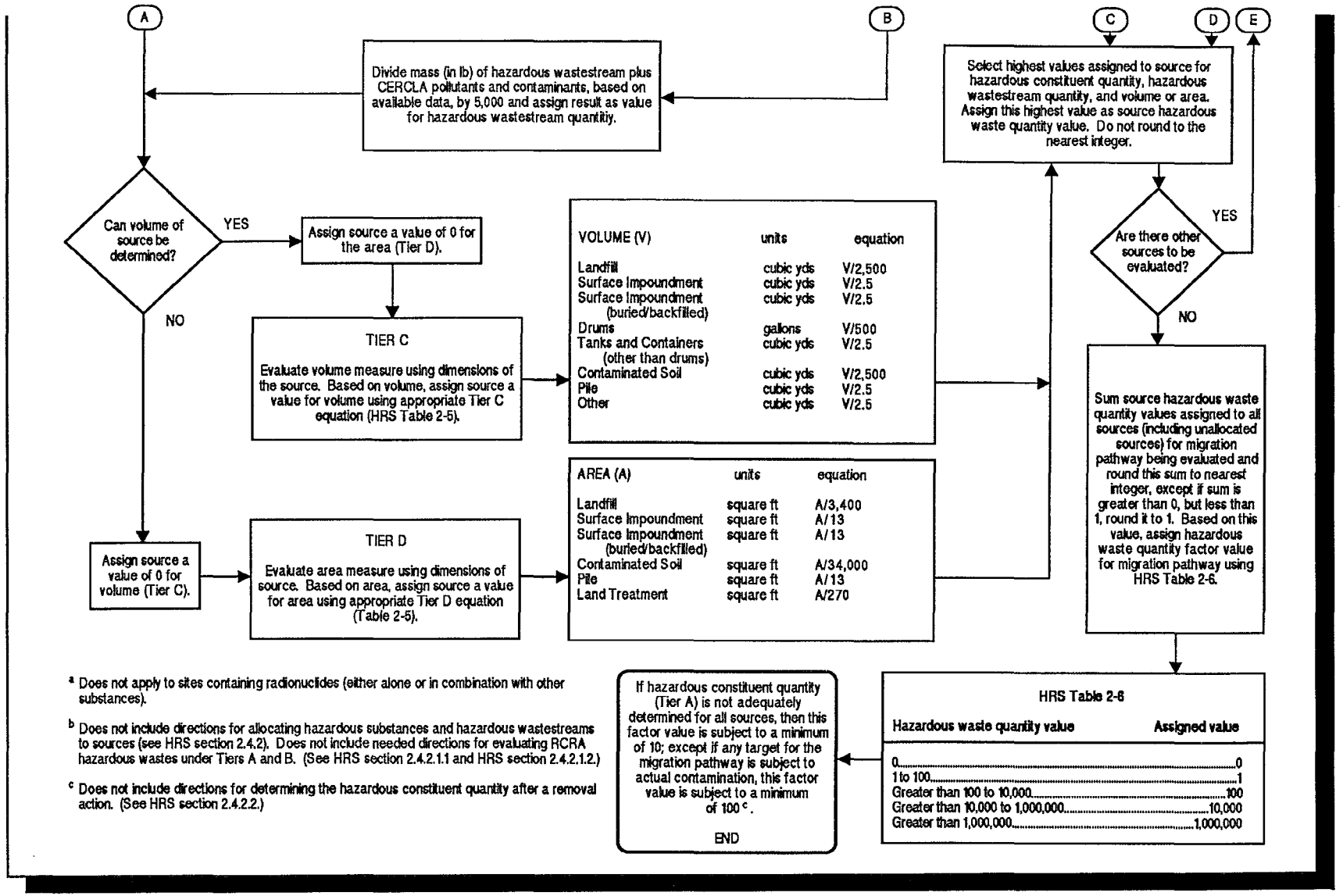
In general, Tier A is the most exact measure of hazardous waste quantity and also requires the highest level of data to score; successive tiers are less accurate and have less rigorous data requirements. The hierarchy allows evaluation of a source at the most precise level for which data are reasonably available, while not requiring extensive data collection where less information is available. The hazardous waste quantity for each source at a site is determined by evaluating as many of the tiers as necessary to estimate the mass of hazardous substances for the source (and in any associated releases from the source). The highest value among the tiers used is then selected as the source hazardous waste quantity value. The overall pathway hazardous waste quantity factor value is determined by summing the individual source hazardous waste quantity values, and then assigning a value using HRS Table 2-6.

The quantity of hazardous substances in each source generally should be estimated as a specific number, not a range or qualitative estimate. However, if data are only available to support a range of source hazardous waste quantity values, the range can be used. The documentation presented in the HRS scoring package should clearly demonstrate how the source hazardous waste quantity value was calculated, and the references should support that demonstration.

Highlight 6-1 is a flowchart that summarizes the methodology for evaluating hazardous waste quantity. In addition, flowcharts in subsequent sections provide step-wise instruction for scoring each individual tier.

HIGHLIGHT 6-1
FLOWCHART FOR EVALUATING HAZARDOUS WASTE QUANTITY




A
B
C
D
E
Divide mass (in lb) of hazardous wastestream plus CERCLA pollutants and contaminants, based on available data, by 5,000 and assign result as value for hazardous wastestream quantity.
Select highest values assigned to source for hazardous constituent quantity, hazardous wastestream quantity, and volume or area. Assign this highest value as source hazardous waste quantity value. Do not round to the nearest integer.
Can volume of source be determined?
YES
NO
Assign source a value of 0 for the area (Tier D).
TIER C
Evaluate volume measure using dimensions of the source. Based on volume, assign source a value for volume using appropriate Tier C equation (HRS Table 2-5).
VOLUME (V) units equation
Landfill cubic yds V/2,500
Surface Impoundment cubic yds V/2.5
Surface Impoundment (buried/backfilled) cubic yds V/2.5
Drums gallons V/500
Tanks and Containers (other than drums) cubic yds V/2.5
Contaminated Soil cubic yds V/2,500
Pile cubic yds V/2.5
Other cubic yds V/2.5
Are there other sources to be evaluated?
YES
NO
Sum source hazardous waste quantity values assigned to all sources (including unallocated sources) for migration pathway being evaluated and round this sum to nearest integer, except if sum is greater than 0, but less than 1, round it to 1. Based on this value, assign hazardous waste quantity factor value for migration pathway using HRS Table 2-6.
Assign source a value of 0 for volume (Tier C).
TIER D
Evaluate area measure using dimensions of source. Based on area, assign source a value for area using appropriate Tier D equation (Table 2-5).
AREA (A) units equation
Landfill square ft A/3,400
Surface Impoundment square ft A/13
Surface Impoundment (buried/backfilled) square ft A/13
Contaminated Soil square ft A/34,000
Pile square ft A/13
Land Treatment square ft A/270
[a] Does not apply to sites containing radionuclides (either alone or in combination with other substances).
[b] Does not include directions for allocating hazardous substances and hazardous wastestreams to sources (see HRS section 2.4.2). Does not include needed directions for evaluating RCRA hazardous wastes under Tiers A and B. (See HRS section 2.4.2.1.1 and HRS section 2.4.2.1.2.)
[c] Does not include directions for determining the hazardous constituent quantity after a removal action. (See HRS section 2.4.2.2.)
If hazardous constituent quantity (Tier A) is not adequately determined for all sources, then this factor value is subject to a minimum of 10; except if any target for the migration pathway is subject to actual contamination, this factor value is subject to a minimum of 100 [c].
END
HRS Table 2-6
Hazardous waste quantity value Assigned value
0 0
1 to 100 1
Greater than 100 to 10,000 100
Greater than 10,000 to 1,000,000 10,000
Greater than 1,000,000 1,000,000

RELEVANT HRS SECTIONS

Section 2.4.2	Hazardous waste quantity
Section 2.4.2.1	Source hazardous waste quantity
Section 2.4.2.1.1	Hazardous constituent quantity
Section 2.4.2.1.2	Hazardous wastestream quantity
Section 2.4.2.1.3	Volume
Section 2.4.2.1.4	Area
Section 2.4.2.1.5	Calculation of source hazardous waste quantity value
Section 2.4.2.2	Calculation of hazardous waste quantity factor value

DEFINITIONS

Hazardous Waste Quantity Factor Value: An assigned value for the pathway that is based on the sum of all source hazardous waste quantity values, and assigned using HRS Table 2-6.

Source Hazardous Waste Quantity Factor Value: The highest of the values assigned to a source using the four hazardous waste quantity tiers.

BEGINNING THE HAZARDOUS WASTE QUANTITY EVALUATION

The evaluation of hazardous waste quantity begins with allocation of hazardous substances to sources and evaluation of containment factor values. These steps are an extension of source characterizations, discussed in Section 4.1.

(1) **Allocate hazardous substances to sources.** Review the evidence that hazardous substances and/or wastestreams are associated with the site. This information can be retrieved from a variety of references. See subsection below, Locating hazardous waste quantity Information. These references may indicate which and possibly how much hazardous substances are present. To begin evaluating the hazardous waste quantity factor, allocate the substances and wastestreams deemed hazardous to specific sources at the site.

(2) **Evaluate an unallocated source, if necessary.** If hazardous substances and/or wastestreams are documented as deposited at the site, but cannot be allocated to a specific source, consider them allocated to a separate "unallocated source." Assign the unallocated source a containment factor value of greater than 0. In rare circumstances, there may be definitive information that the substance or wastestream that cannot be allocated to a specific source could only have been placed in sources with a containment factor value of 0 for a particular pathway; in this particular situation, do not evaluate hazardous waste quantity for these hazardous substances. In all situations, only Tier A and Tier B can be used to evaluate the unallocated source.

- To begin evaluating hazardous waste quantity, allocate hazardous substances and wastestreams at the site to specific sources, to the extent possible. If necessary, assign hazardous substances and/or wastestreams to an unallocated source.

(3) **Evaluate pathway-specific containment factor values for each source.** To be evaluated for hazardous waste quantity, a source must have a containment factor value greater than 0 for the pathway being scored. As discussed above, always assume that the unallocated source has a containment factor value greater than 0 for all migration pathways. If a source has a containment factor value equal to 0, hazardous waste quantity cannot be evaluated for that particular source in that particular pathway.

- To evaluate hazardous waste quantity for a source for a particular pathway, the containment factor value for the source must be greater than 0 for that pathway.

Highlight 6-2 is a matrix that indicates tiers for which hazardous waste quantity data are most likely to be available for each HRS source type. For instance, when calculating hazardous waste quantity for a landfill, it is more likely that data adequate for evaluating Tier D will be available than data adequate for evaluating Tier A. Note that the information provided in ***Highlight 6-2***, although generally appropriate, may or may not apply to particular sources at a site and is to be used only for general guidance.

HIGHLIGHT 6-2
DATA AVAILABILITY BY SOURCE TYPE

Source Type	TIER A Hazardous Constituent Quantity	TIER B Hazardous Wastestream Quantity	TIER C Volume	TIER D Area
Landfill	—	+	+	++
Surface Impoundment	+	+	++	++
Surface Impoundment (buried/backfill)	—	+	+	++
Drums	+	++	++	—
Tanks/Containers	+	++	++	—
Contaminated Soil	—	—	—	++
Pile	—	+	++	+
Land Treatment	+	+	+	++
Other	—	+	+	++

++ Likely that data on HWQ will be available.
\+ Possible that data on HWQ will be available.
— Unlikely that data on HWQ will be available.

LOCATING HAZARDOUS WASTE QUANTITY INFORMATION

Various types of information may be helpful for determining hazardous waste quantity. Although Tiers A and B require more detailed information, Tiers C and D also require documentation to substantiate the volume or area being used. It may be necessary to rely on a single particular recordkeeping reference to estimate hazardous waste quantity, and to incorporate other documents supporting such an estimate.

- **RCRA Waste Manifests.** The RCRA Subtitle C program uses the Uniform Hazardous Waste Manifest to track the movement of hazardous waste from the point of generation to off-site points of treatment, storage, or disposal. RCRA manifests include:

  — Name and EPA identification number of the generator, transporter(s), and facility where the waste is to be treated, stored, or disposed;

  — Department of Transportation (DOT) description of the waste being transported;

  — Quantity of each hazardous waste being transported by units of weight or volume; and

  — Address of the treatment, storage, or disposal facility to which the generator is sending waste.

  For purposes of hazardous wastestream quantity, RCRA manifests are most useful when the site being scored is (or was) a RCRA treatment, storage or disposal facility; then, manifests document the types and quantities of waste that have been received. If the site being scored is a generator of RCRA hazardous wastes that were transported off-site, manifests can be used to document the quantity of waste generated.

- **State Manifests.** Many states impose additional or more stringent regulations that require the manifesting of materials/wastes other than RCRA Subtitle C wastes. Although each state's requirements vary, investigating state manifests may be helpful in scoring hazardous waste quantity.

- **Permits.** Permits may provide helpful information about a site. Permits, however, establish levels that should be compiled with and not levels that actually occur at the site. Any permits used to provide information must be signed and finalized. Permits are rarely used as the only supporting documentation for actual hazardous waste quantity at a site. However, permits can provide supporting documentation to allocate certain hazardous substances to a wastestream (e.g., support the presence of benzene in a wastewater discharge under a National Pollution Discharge Elimination System (NPDES) permit).

- **EPA Compliance Orders.** EPA signed and finalized compliance orders may provide information relevant to hazardous waste quantity. For example, a violation of a NPDES permit may be used to document that certain concentration levels of hazardous substances were actually released.

- **Section 10(k) Reports.** The Securities and Exchange Commission requires section 10(k) reports that may contain detailed information related to hazardous waste quantity. The section 10(k) report, a version of the annual report that all U.S. corporations must file with the Securities and Exchange Commission, frequently contains more information on the company's assets and liabilities (e.g., hazardous waste) than the annual report distributed to stockholders.

- **CERCLA 103(c) "Notification of Hazardous Waste Site" Forms.** These forms are a direct source of waste quantity information. If a facility stored, treated, or disposed of hazardous substances before (and during) 1980, then the owner/operator was required to submit a CERCLA 103(c) “Notification of Hazardous Waste Site" form. This form provides the amount and types of hazardous substances on the site, as well as any known, suspected, or likely releases of such substances from the facility.

- **PRP Records.** At sites where PRPs have been identified, PRP records of incoming/outgoing wastes may be used to estimate the hazardous waste quantity at a site.

- **Property Owners' Tax Assessment Documents.** Property owners' tax assessment documents may contain some useful information.

- **Emergency Response Monitoring Data.** The scorer might find relevant information in this general source.

- **Material Safety Data Sheets.** This source can provide limited information such as chemical properties, Chemical Abstract Service number, percent technical grades and safe handling procedures.

- **Other Records.** In addition, numerous other records may be used to estimate the hazardous waste quantity at a site. A facility's product records, annual reports, property records, and production reports may be useful, as may trade association information, transcripts of interviews with former employees, and aerial photographs. Completeness, accuracy, and validity of these information sources varies and should be evaluated on a case-by-case basis.

TIPS AND REMINDERS

- Some scorers find it helpful to start evaluating hazardous waste quantity under Tier D and then work backward to Tier A. In certain situations (e.g., landfills, manufacturing sites), this method makes it easier to recognize which tier should be used to evaluate hazardous waste quantity.

- Incomplete information on a higher tier can at times score higher than complete information on lower tiers.

- Adequate references should be included for all tiers evaluated for the hazardous waste quantity factor. At a minimum, references should support the tier(s) used to score the source and also at least one tier both below and above (e.g., if Tier B is used, references should also be provided for Tier C or D, and Tier A if scored). This provides usable data for these other tiers if the assumptions used during evaluation of the tier do not hold up. Note that although Tier A or Tier B may be adequately determined in some situations, it may be advisable to include references for Tier C or Tier D.

- Additional sampling generally will not be performed to obtain Tier A data. Instead, use a different tier as the basis of the source hazardous waste quantity value.

- Hazardous waste quantity is a measure of the hazardous substances deposited in sources at the site rather than a measure of hazardous substances in sources at the site. Therefore, the hazardous substances in the sources and in the releases from those sources are evaluated for hazardous waste quantity.

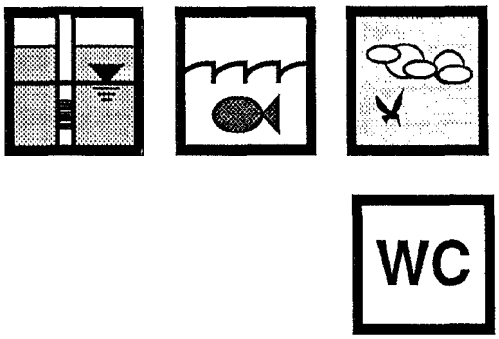
- The unallocated source is not used in scoring factors other than hazardous waste quantity. An unallocated source results when a hazardous substance or hazardous wastestream is known to have been deposited at the site but cannot be allocated to any specific source.

- Do not confuse the unallocated source with sources that are "ground water plumes (or surface water sediments) with no identified source."

- For an unallocated source, only Tier A or Tier B can be used to evaluate the hazardous waste quantity.

- The most reasonable and defensible estimate of hazardous waste quantity should always be applied for each of the tiers used for calculating hazardous waste quantity, regardless of whether the estimate is based on the most recent or highest figures.

SECTION 6.2
TIER A – HAZARDOUS CONSTITUENT QUANTITY



This section clarifies the method for evaluating hazardous waste quantity under Tier A of the HRS. Topics include definitions that pertain to Tier A, data requirements for scoring under Tier A, data sources that can provide hazardous waste quantity information, and evaluation of RCRA wastes.

Tier A is used when data are available on the quantities of individual CERCLA hazardous substances. If complete data are available for the evaluation, Tier A yields the most accurate measure of the mass of CERCLA hazardous substances in the source. Any data that provide quantities of CERCLA hazardous substances deposited into a particular source are ideal for evaluating Tier A. However, in many cases, a representative value for the average concentration of CERCLA hazardous substances present in a source will not be adequately documented or obtainable. ***Highlight 6-3*** is a flowchart that provides step-wise instructions for scoring a source with Tier A.

DEFINITIONS

Adequately Determined (for purposes of Tier A only): The total mass of all CERCLA hazardous substances in the source and releases from the source (or for the area of observed contamination) is known or is estimated with reasonable confidence. (For the site hazardous waste quantity factor value to be adequately determined for Tier A, this definition must apply for all sources.)

CERCLA Hazardous Substances: Hazardous substance as defined by statute in CERCLA section 101 (14); the list of CERCLA hazardous substances having reportable quantities is found in 40 CFR 302 in Table 302.4.

Hazardous Constituent Quantity: The mass (in pounds) of CERCLA hazardous substances allocated to a source (with certain exceptions for RCRA wastes).

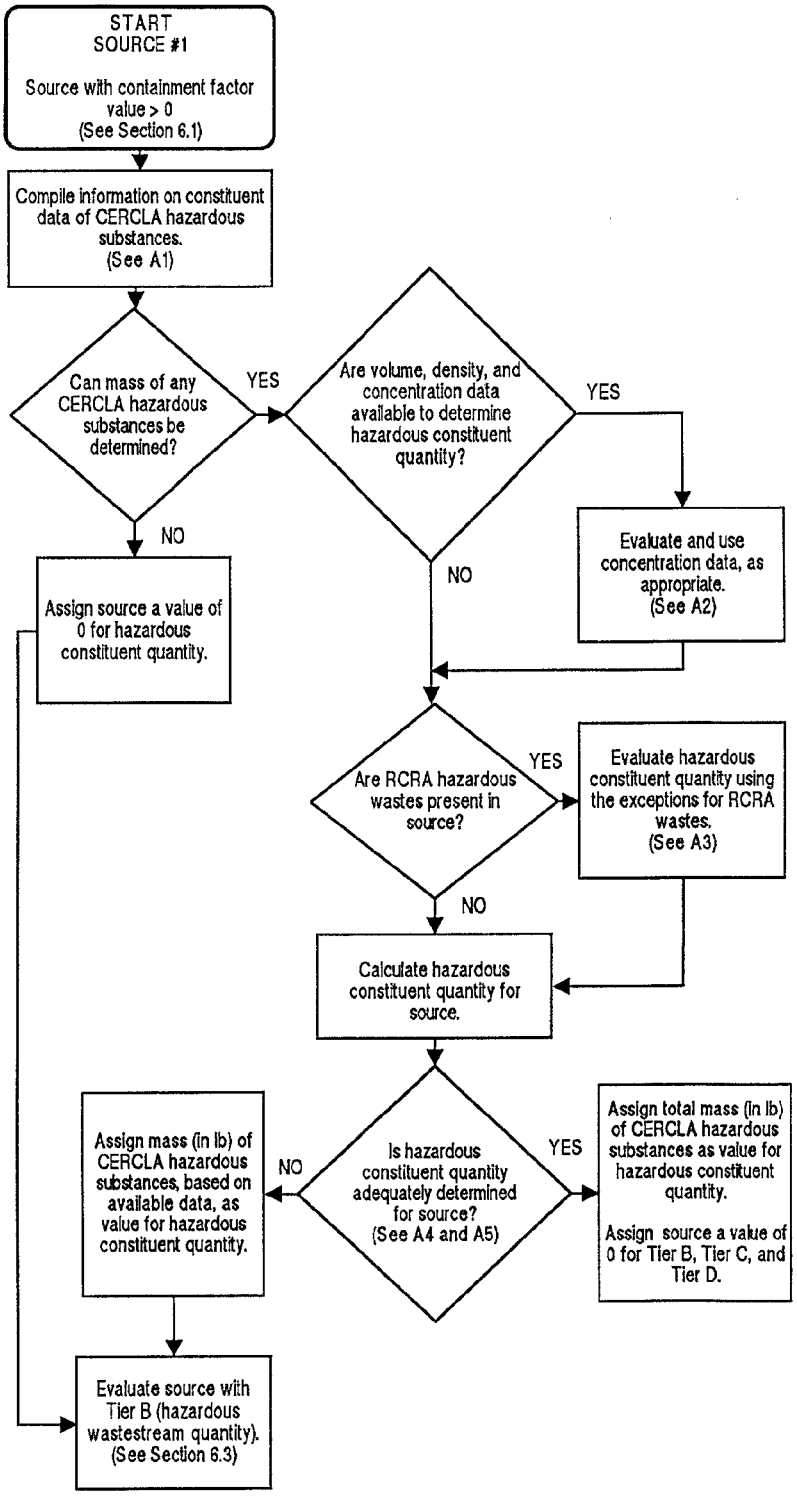
Hazardous Substances: CERCLA hazardous substances and pollutants or contaminants as defined in CERCLA sections 101 (14) and 101 (33), except as otherwise specifically noted in the HRS.

A1. LOCATING DATA

The following records or resources, which are described in more detail in Section 6.1, can provide accounts of quantities of hazardous substances deposited into sources:

- Manifests
- PRP records
- State records
- EPA signed and finalized compliance orders
- Material Safety Data Sheets (for product)
- Permits
- Waste concentration data (see discussion in A2).

HIGHLIGHT 6-3
FLOWCHART FOR EVALUATING TIER A



The hazardous constituent quantity is evaluated based solely on the mass of CERCLA hazardous substances present in the source (with certain exceptions for RCRA wastes). The mass of CERCLA pollutants or contaminants, if any, are not included. HRS Table 2-5 designates hazardous constituent quantity as *C* – the mass in pounds of CERCLA hazardous substances. No further calculations are required (e.g., no divisors).

A2. USING CONCENTRATION DATA

To use concentration data to calculate the hazardous constituent quantity, the following must be true:

- Volume and density of the source (or portion of the source) are known with reasonable confidence; and
- Concentration data are representative of the source (or portion of the source).

If concentration data meet the above criteria, the following equation can be used to calculate the hazardous constituent quantity:

$$HCQ_S \sum_{i=1}^{n} C_i \times D_M \times V_S$$

where:

HCQ_s	=	hazardous constituent quantity for source S (mass)
C_i	=	average concentration of CERCLA hazardous substance 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)

The equation can be modified to estimate the quantity of hazardous constituents in a portion of the source or in different media within a source. Note that when concentration data are available for some but not all hazardous substances in a source, the equation can still be used and a hazardous constituent quantity value determined under Tier A; in such cases, however, the scorer would have to proceed to Tier B because scoring under Tier A would be incomplete.

Highlight 6-4 presents some sample scoring examples for the hazardous constituent quantity evaluation.

A3. EVALUATING RCRA HAZARDOUS WASTES

The HRS provides exceptions when calculating hazardous constituent quantity for certain RCRA hazardous wastes. For HRS purposes, the presence of RCRA hazardous wastes is usually documented through manifests or other PRP records. It is not the intent of the SI to sample in order to determine the presence of RCRA hazardous wastes. If RCRA hazardous wastes are evaluated for hazardous constituent quantity, evidence supporting their presence must be provided and documented. The next section provides background about the classification scheme for RCRA hazardous wastes, and the HRS scoring instructions.

HIGHLIGHT 6-4
SCORING EXAMPLES FOR TIER A

Scenario 1 1,000 gallons of pure toluene were found In 19 drums onsite. (The density of toluene is 7.2 lbs/gallon.) These 19 drums are the only source at the site.

Hazardous Constituent Quantity:

1,000 gallons x 7.2 lb/gallon = 7,200 lb

Hazardous constituent quantity is adequately determined for this source.

Scenario 2 1,000 gallons of pure toluene leaked onto the ground at a site. The source of this information is an emergency response notification report. The spill area is the only source at the site.

Hazardous Constituent Quantity:

1,000 gallons x 7.2 lb/gallon = 7,200 lb

Hazardous constituent quantity is adequately determined for this source.

Scenario 3 1,000 gallons of pure toluene were spilled onto the ground onsite; 1,000,000 pounds of soil were excavated to clean up the spill; the excavated soil was placed in a waste pile on the site. The site is located In a deserted industrial park and it is not known whether other sources exist.

Hazardous Constituent Quantity:

1,000 gallons x 7.2 lb/gallon = 7,200 lb

Hazardous constituent quantity is not adequately determined -- other substances may have been present In the soil prior to the spill. The other tiers need to be evaluated.

Scenario 4 1,000 gallons of pure toluene mixed with 1,000,000 gallons of process water discharged to a settling surface impoundment.

Hazardous Constituent Quantity:

1,000 gallons x 7.2 lb/gallon = 7,200 lb

Hazardous constituent quantity is not adequately determined -- other substances may be present In the process water. The other tiers need to be evaluated.

All mass is converted to pounds. In each scenario the source HWQ value is 7,200.

BACKGROUND AND DEFINITIONS

RCRA, an amendment to the Solid Waste Disposal Act (SWDA), was enacted in 1976 to manage the large volumes of solid wastes being generated, including certain municipal and industrial wastes. Subtitle C of RCRA establishes a system for managing hazardous wastes.

The RCRA regulations in 40 CFR 261 specify that a solid waste is a RCRA hazardous waste if it is not excluded from regulation, and it either:

- Exhibits any of the characteristics of a hazardous waste (known as characteristic hazardous waste); or
- Has been listed as a hazardous waste in the RCRA Subtitle C regulations (known as listed hazardous waste).

For purposes of the RCRA Subtitle C regulations, a solid waste is any discarded material (solid, semisolid, liquid, and contained gas) that is not excluded under SWDA.

RCRA characteristic wastes. EPA has identified four characteristics for hazardous waste. Any solid waste that exhibits one or more of these characteristics is classified as a RCRA hazardous waste:

- Ignitability (40 CFR 261.21);
- Corrosivity (40 CFR 261.22);
- Reactivity (40 CFR 261.23); or
- Toxicity (40 CFR 261.24; determined either by the Toxicity Characteristic Leaching Procedure (TCLP) or Extraction Procedure (EP)). (Note that the transition from the EP to the TCLP occurred between 1990 and 1991.)

Guidelines defining each of these characteristics are contained in the CFR citations.

RCRA listed wastes. A solid waste is a RCRA hazardous waste if it is named on one of the lists developed by EPA:

- **Nonspecific source wastes** (40 CFR 261.31, also called "**F**" list wastes) – generic wastes, commonly produced by manufacturing and industrial processes. Examples include spent halogenated solvents used in degreasing and wastewater treatment sludge from electroplating processes.
- **Specific source wastes** (40 CFR 261.32, also called "**K**" list wastes) – wastes from specifically identified industries such as wood preserving, petroleum refining, and organic chemical manufacturing. These wastes typically include sludges, still bottoms, wastewaters, spent catalysts, and residues.
- **Commercial chemical products** (40 CFR 261.33(e) and (f), also called "**P**" and "**U**" list wastes) – specific commercial chemical products or manufacturing intermediates. These products are considered hazardous wastes when discarded.

EPA developed these listed wastes by examining different types of wastes and chemical products and by determining if any of the following criteria were met:

- Exhibits one of the four characteristics of a hazardous waste (Hazard Codes **I** (for ignitability), **C** (for corrosivity), **R** (for reactivity), and **E** (for toxicity));

- Is acutely toxic or acutely hazardous (Hazard Code **H**); or

- Is otherwise toxic (Hazard Code **T**).

These criteria and associated codes are listed in 40 CFR 261.30(b). For a particular listed waste, one or more of the hazard codes are assigned as the basis for listing that waste (in 40 CFR 261.31, 261.32, and 261.33).

SPECIAL CONSIDERATIONS FOR CALCULATION OF HAZARDOUS CONSTITUENT QUANTITY

For a RCRA characteristic waste that exhibits only the characteristic of toxicity (either TCLP or EP), only the mass of constituents in the hazardous waste that are CERCLA hazardous substances are included in the hazardous constituent quantity.

For a RCRA characteristic waste that exhibits any characteristic other than toxicity (including any other characteristic plus the characteristic of toxicity), the entire mass of the hazardous waste is included in the hazardous constituent quantity.

For hazardous constituent quantity for a RCRA listed waste that is listed solely for Hazard Code T, only the mass of constituents in the hazardous waste that are CERCLA hazardous substances is included in the hazardous constituent quantity.

If the RCRA listed waste is listed for any other Hazard Code (including T plus any other Hazard Code), then the mass of the entire hazardous waste is included in the hazardous constituent quantity.

Highlight 6-5 is a flowchart that enables scorers to decide which situation applies.

A4. CALCULATING HAZARDOUS CONSTITUENT QUANTITY

At this point in the hazardous waste quantity evaluation, the scorer needs to answer the following question for the source:

Is the hazardous constituent quantity adequately determined? That is, is the total mass of all CERCLA hazardous substances in the source and associated releases from the source known or estimated with reasonable confidence?

- If the answer to the question is YES:

  — Assign the total mass (in pounds) of CERCLA hazardous substances as the value for hazardous constituent quantity. Assign the other three tiers (hazardous wastestream quantity, volume, and area) values of 0 for the source.

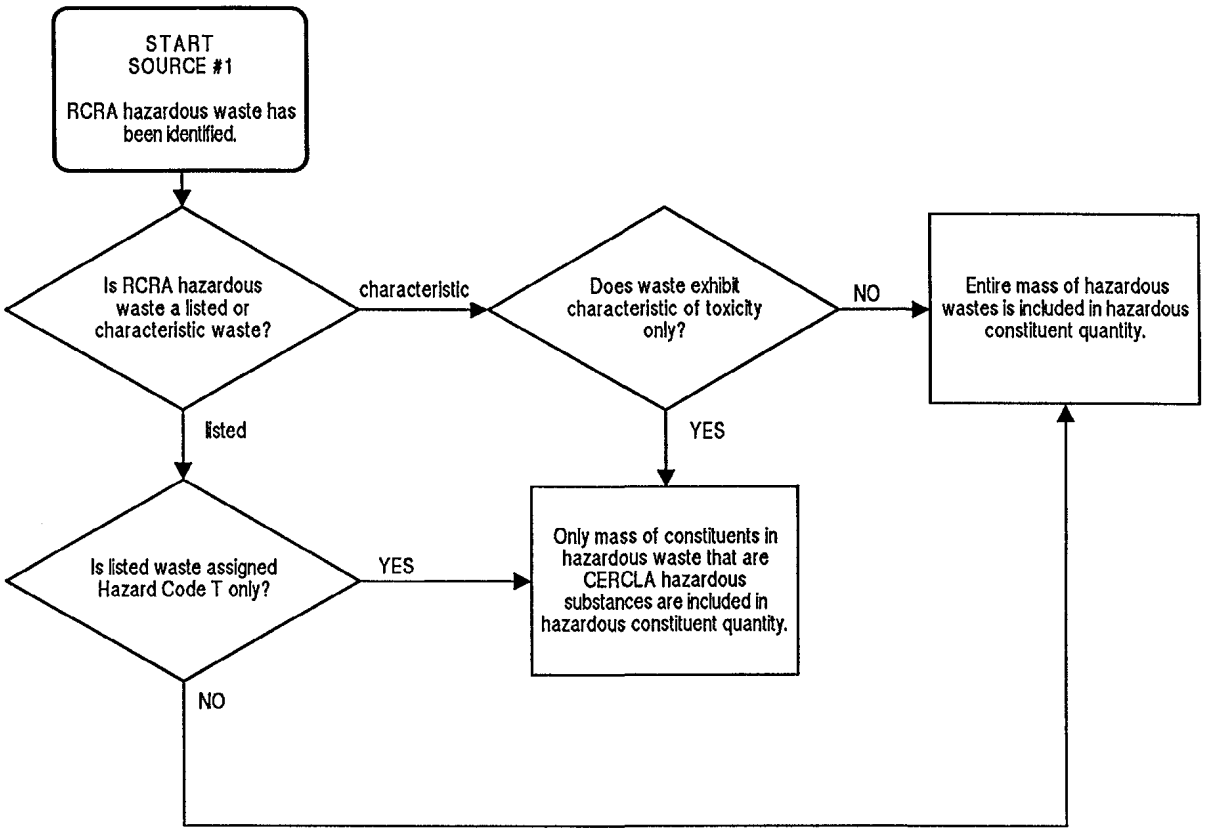
  — Assign the hazardous constituent quantity value as the source hazardous waste quantity value. (Do not round to the nearest integer.)

- If the answer to the question is NO:

  — Assign the total mass (in pounds) of the CERCLA hazardous substances, based on the available data, as the value for hazardous constituent quantity.

  — Continue the hazardous waste quantity evaluation for this source. See Section 6.3 for guidance on evaluating Tier B.

HIGHLIGHT 6-5
FLOWCHART FOR EVALUATING RCRA HAZARDOUS WASTES UNDER TIER A



TIPS AND REMINDERS

- The scorer is unlikely to find information to adequately determine the hazardous constituent quantity. Tier A (hazardous constituent quantity) can be used to evaluate hazardous waste quantity if the mass of some CERCLA hazardous substances in the source or in releases from the source is known. Even if Tier A is not adequately determined, it may result in a higher value than the other tiers.

- Include the mass of all deposited CERCLA hazardous substances, even if they have migrated, in calculating hazardous constituent quantity for the source.

- When evaluating Tier A, only CERCLA defined hazardous substances are used; CERCLA defined pollutants and contaminants are not used. However, CERCLA hazardous substances, pollutants, or contaminants can be used in all other waste characteristics factor evaluations, including waste quantity evaluations using Tiers B, C, and D.

- The most reasonable and defensible estimate of hazardous waste quantity should always be applied for each of the tiers used for calculating hazardous waste quantity, regardless of whether the estimate is based on the most recent or highest figures.

- Do not subtract background levels for hazardous substances before calculating hazardous constituent quantity, except for radioactive substances.

- Sampling data can only be used to extrapolate hazardous constituent quantity if the source is documented to be homogeneous.

- Mining wastes generally should not be considered “homogeneous," particularly since ores and mining processes change over time.

- Tier A can be used where representative concentration data are available from sampling or manifest data. However, sampling to determine hazardous constituent quantity is typically beyond the scope of the SI. For some sites, sampling conducted by other parties (e.g., PRPs or states) may be sufficient to score Tier A.

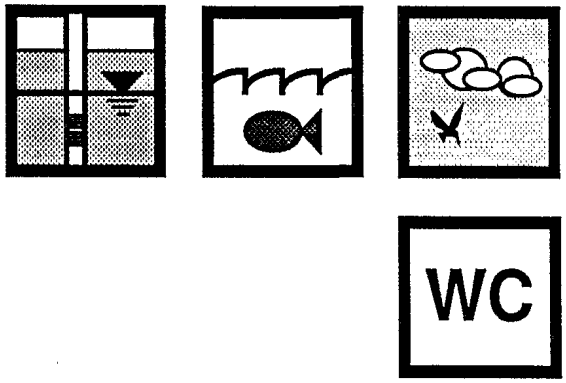
- Drums, tanks, and containers are examples of source types most likely to have Tier A data.

- For Tier A, RCRA listed or characteristic hazardous wastes are given special consideration. For certain RCRA waste codes, only the mass of constituents in the hazardous waste that are CERCLA hazardous substances are included in the hazardous waste quantity.

- Unless there is evidence that products have spilled or been abandoned, the total volume of tanks, drums, or containers containing product should not be used to determine hazardous constituent quantity.

- For the site hazardous waste quantity factor value to be adequately determined, the hazardous waste quantities for all the sources must be adequately determined.

SECTION 6.3 TIER B — HAZARDOUS WASTESTREAM QUANTITY



This section clarifies the method for evaluating hazardous waste quantity under Tier B of the HRS. Topics include definitions that pertain to Tier 8, data requirements for scoring under Tier B, evaluation of RCRA wastes, and extrapolation of data.

Tier B is used when Tier A data are not adequately determined and when wastestrearn and/or CERCLA pollutant and contaminant data are available. This tier deals with wastes "as deposited", as does Tier A. ***Highlight 6-6*** is a flowchart that provides step-wise instructions for scoring a source with Tier B.

DEFINITIONS

Adequately Determined (for purposes of Tier B only): The total mass of all hazardous waste streams and CERCLA pollutants and contaminants for the source and releases from the source (or for the area of observed contamination) is known or is estimated with reasonable confidence. (For the site hazardous waste quantity to be adequately determined for Tier B, this must apply for all sources.)

CERCLA Pollutant or Contaminant: Section 101 (33) of CERCLA states that: *"pollutant or contaminant shall include, but not be limited to, any element, substance, compound, or mixture, including disease-causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction) or physical deformations, in such organisms or their offspring, except that the term "pollutant or contaminanr shall not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance under subparagraphs (A) through (F) of paragraph (14) and shall not include natural gas, liquefied natural gas, or synthetic gas of pipeline quality (or mixtures of natural gas and such synthetic gas)."*

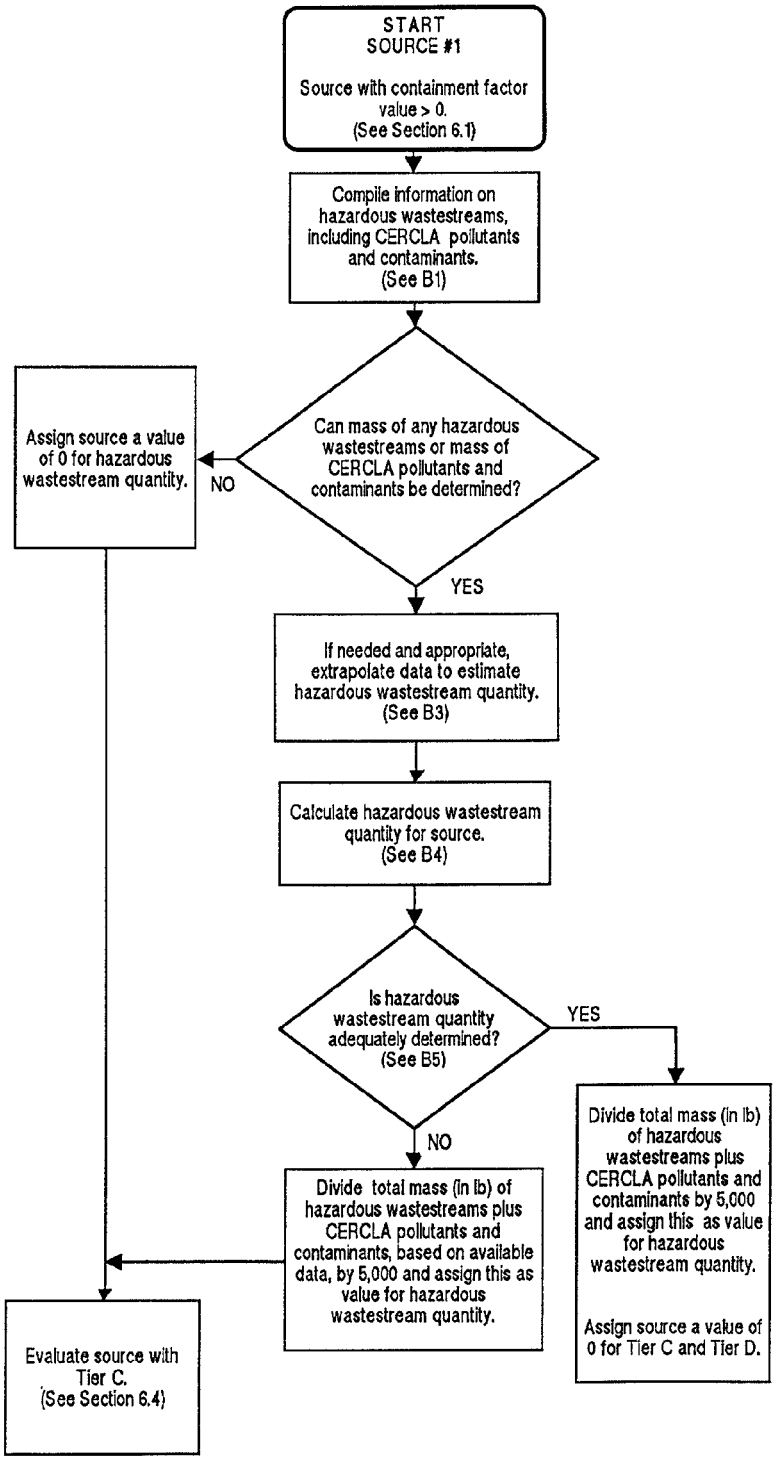
Hazardous Waste Stream: Material containing CERCLA hazardous substances as defined in CERCLA section 101 (14), that was deposited, stored, disposed, or placed in, or that otherwise migrated to, a source.

B1. LOCATING DATA

The following records or resources usually provide direct accounts of hazardous wastestreams:

- Manifests
- PRP and state records
- Permits.

HIGHLIGHT 6-6
FLOWCHART FOR EVALUATING TIER B



To evaluate Tier B for hazardous wastestream quantity for a source, the following must be true:

- The mass of any hazardous wastestrearn or the mass of any additional CERCLA pollutants and contaminants allocated to the source are known.

- Hazardous constituent quantity (Tier A) was not adequately determined for that source.

HRS Table 5-2 designates the hazardous wastestrearn quantity as *W*. Once this mass (in pounds) is determined, assign the source a value for hazardous wastestrearn quantity by dividing *W* by 5,000.

B2. EVALUATING RCRA HAZARDOUS WASTE

Under Tier B, RCRA hazardous wastes are treated the same as all other hazardous wastestreams. For a wastestrearn that consists solely of RCRA listed wastes or RCRA characteristic wastes, the mass of the entire hazardous wastestream is used to calculate hazardous wastestrearn quantity. (Note that RCRA hazardous wastes under Tier B are treated differently than under Tier A (see Section 6.2)).

B3. EXTRAPOLATING DATA

Scorers should employ data that support the most accurate estimate of hazardous wastestrearn quantity for each source. Generally, the best data to use are those that document wastestrearn disposal over the longest time period. If information is available for only one year, extrapolating that information to multiple years may be acceptable, depending on the documentation available to support the required assumptions. Extrapolating short-term wastestrearn data over much longer periods (e.g., six months of data extrapolated over 20 years of operation) is generally not acceptable.

The following may provide information to document the extrapolation of wastestrearn data over a longer period:

- Property records
- Production reports
- NPDES signed and finalized permits
- EPA signed and finalized compliance orders
- RCRA manifests
- Annual reports
- Tax records
- Interviews with former employees
- The Kirk-Othmer Encyclopedia of Chemical Technology (this reference provides
- information on constituents normally present in certain process wastestrearns, and can be used to support reasonableness of data)
- Effluent guidelines documents
- Trade association information
- Industry studies and data bases from EPA's Office of Solid Waste.

If there is sufficient evidence supporting the assumption that a discharge for a particular day was typical, a discharge estimate based on that day may be sufficient basis for estimating discharge over the entire year. For example, the scorer could verify that the production figure is reasonable for the industry as a whole. The scorer would also need to know the typical number of days of operation per year. In addition, the scorer needs to provide a convincing argument that the extrapolated value being used is defensible. Information about continuity of the plant operations could be included in the argument, especially if data are extrapolated over time. For example, if the plant was bankrupt or the local economy depressed for a portion of the time period, that would need to be documented and

considered in the calculation. General industry or local economy descriptions could be included as further evidence of reasonable estimates.

B4. CALCULATING HAZARDOUS WASTESTREAM QUANTITY

At this point in the hazardous waste quantity evaluation, the scorer needs to answer the following question:

Is the hazardous wastestream quantity adequately determined for the source? That is, is the total mass of all hazardous wastestreams and any additional CERCLA pollutants and contaminants in the source and associated releases from the source known or estimated with reasonable confidence?

- If the answer to the question is YES:
  - **S** Sum the total mass (in pounds) of hazardous wastestreams plus any additional CERCLA pollutants and contaminants and divide the sum by 5,000. This result is the hazardous wastestrearn quantity value. Assign the source a value of 0 for the Tier C (volume) and Tier D (area) measures.
  - **S** Select the highest of the values assigned to the source for hazardous constituent quantity and hazardous wastestrearn quantity as the value for the source hazardous waste quantity value (do not round to the nearest integer).
- If the answer to the question is **NO**, and the source is not an unallocated source:
  - **S** Sum the mass (in pounds) of hazardous wastestreams plus any additional CERCLA pollutants and contaminants, based on the available data, and divide the sum by 5,000. Assign the result as the value for hazardous wastestrearn quantity.
  - **S** Evaluate Tier C for this source.

S If the answer to the question is **NO**, and the source is an unallocated source:

- **S** Sum the mass (in pounds) of hazardous wastestreams plus any additional CERCLA pollutants and contaminants based on available data and divide the sum by 5,000. This result is the hazardous wastestream quantity value. Assign the source a value of 0 for the Tier C (volume) and Tier D (area) measures.
- **S** Select the highest of the values assigned to the source for hazardous constituent quantity and hazardous wastestrearn as the source hazardous waste quantity value. (Do not round to the nearest integer).

TIPS AND REMINDERS

- Tier B can be used to evaluate hazardous waste quantity if the mass of some hazardous wastestream is known; the total mass of all wastestreams need not be determined in order to evaluate Tier B.
- Wastestreams can be liquid, sludge, or solid (e.g., wastewater, slag pile).
- Tier B is based on the actual contents of the source not on its hypothetical capacity (e.g., weight or volume of contents actually in tank is used, not volume of tank). Tier C or D would involve the capacity of the tank.

- Drums, tanks, containers, surface impoundments, and waste piles are examples of source types most likely to have Tier B data.

- If long-term information regarding waste disposal at the site is not available, short-term data regarding waste disposal may be extrapolated to a longer time period depending on the documentation available to support the required assumptions. However, extrapolating short-term data over very long periods of time (e.g., six months of data extrapolated over 20 years of operation) is generally not acceptable.

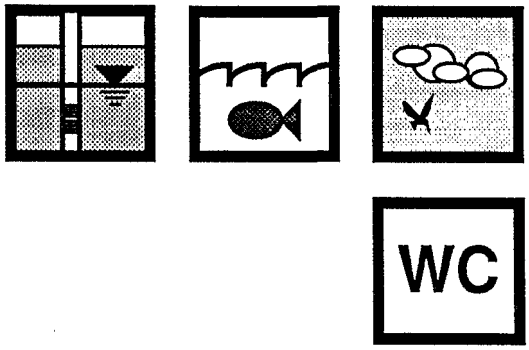
- Tier B treats RCRA hazardous wastes identical to other hazardous wastes.

- Process models can sometimes be used to estimate hazardous wastestrearn quantity. However, convincing evidence must be presented to demonstrate the applicability of the assumed process flows to the source being scored.

- When extrapolating wastestrearn data, if the Tier B calculation assumes constant and continuous production levels, the rationale for this assumption needs to be included in the documentation record.

- One way to support a Tier B estimate of wastestrearn quantity is to assume a certain number of batch processes per year, when the approximate mass of hazardous waste produced is known per batch.

SECTION 6.4
TIER C – VOLUME



Tier C of the HRS is used when the volume of the source can be determined. Tier C cannot be used for the unallocated source. HRS Table 2-5 designates volume as *V.* ***Highlight 6-7*** is a flowchart that provides step-wise instructions for scoring a source with Tier C.

C1. LOCATING DATA

The following may provide accounts of the source volume (i.e., capacity):

- PRP data
- State records
- Property records
- EPA signed and finalized compliance orders
- Permits
- Aerial photographs.

To calculate the volume of the source, all of the following must be true:

- The volume of the source can be estimated.
- The hazardous constituent quantity and/or hazardous wastestrearn quantity were not adequately determined for the source.

C2. CALCULATING VOLUME

If the volume of the source can be estimated:

(1) **Evaluate the volume measure using the dimensions for the source type, specified in HRS Table 2-5.** This measure can be obtained by using the engineered capacity for certain source types (e.g., landfills) or the maximum volume for source types that are not specifically engineered (e.g., piles, quarries).

(2) **Based on the volume, assign the source a value for volume using the appropriate Tier C equation found in HRS Table 2-5.**

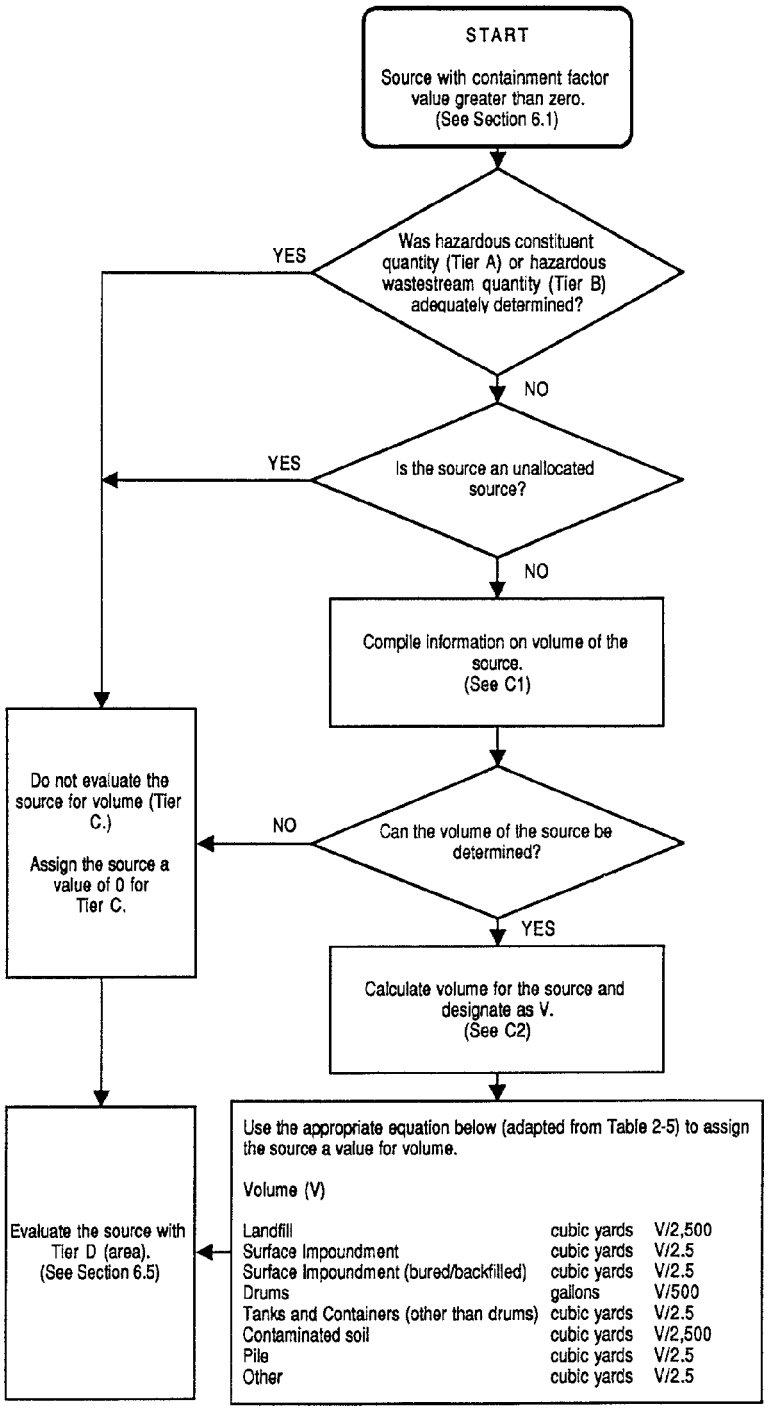
(3) **Assign the source a value of 0 for the area measure (Tier D).** Select the highest of the values assigned to the source (hazardous constituent quantity, hazardous wastestrearn quantity, and volume) as the source hazardous waste quantity value. (Do not round to the nearest integer.)

If the volume of the source cannot be determined:

(1) Assign the source a value of 0 for Tier C.

(2) Evaluate Tier D for this source.

HIGHLIGHT 6-7
FLOWCHART FOR EVALUATING TIER C



TIPS AND REMINDERS

- Tier C is based on capacity, not the actual contents of the source (e.g., use the total drum volume, not the volume of the waste when deposited; use the surface impoundment once-filled volume, not the volume of the waste disposed of in the impoundment).

- Use Tier C for containerized source types (e.g., drums, tanks) and for source types with reasonably well-defined horizontal and vertical boundaries (e.g., waste piles).

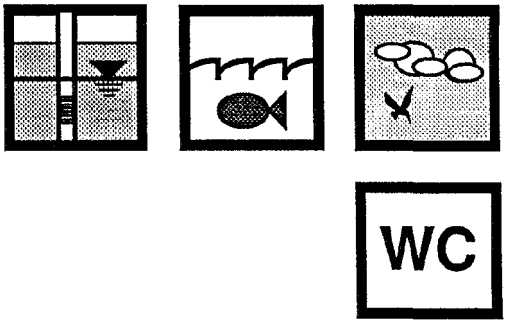
- Subsurface source types generally need engineered drawings to support volume calculations (e.g., landfills, buried surface impoundments). Obtaining representative depth measurements of these source types during the SI is not recommended. Geophysical surveys generally should not be used to document source volume.

- Waste permit applications often include waste unit designs specifying volume capacity.

- Tier C is not applicable for unallocated sources.

- For a quarry, Tier C volume measures cannot be assumed to be equal to the volume of the filled quarry unless there is a reasonable basis for making that assumption. The scorer should attempt to estimate the level at which the waste accumulated in the quarry. For dry quarries or quarries where waste has migrated, the scorer should look for indicators of the previous maximum depth of wastes (such as contaminated waterlines). Volume may be calculated based on this depth. If the scorer cannot establish that waste was historically deposited to a certain depth, calculate hazardous waste quantity based on current conditions (i.e., using Tiers A, B, and D, as appropriate).

SECTION 6.5
TIER D – AREA



Tier D is used when data on the surface area of the base of a source are available. Tier D assumes a default depth for each source and, thus, provides a less reliable estimate than when the depth of a source can be estimated. Thus, Tier D is not used when Tier C can be used. Aerial photographs, especially historical photographs, are particularly helpful in evaluating this tier. Tier D should be used for source types without reasonably well-defined vertical boundaries (e.g., contaminated soil, landfills). Tier D cannot be used for unallocated sources HRS Table 2-5 designates area as*A.*. ***Highlight 6-8*** is a flowchart that provides step-wise instructions for scoring Tier D.

D1. LOCATING DATA

The following may provide accounts of the areas of sources containing hazardous substances:

- PRP data
- State data
- Property records
- EPA signed and finalized compliance orders
- Permits
- Aerial photographs.

To calculate the area of the source, all of the following must be true:

- The area of the source (or a portion of the area) can be estimated.
- The source was not assigned a value for volume.
- The hazardous constituent quantity and/or hazardous wastestrearn quantity were not adequately determined for the source.

D2. CALCULATING AREA

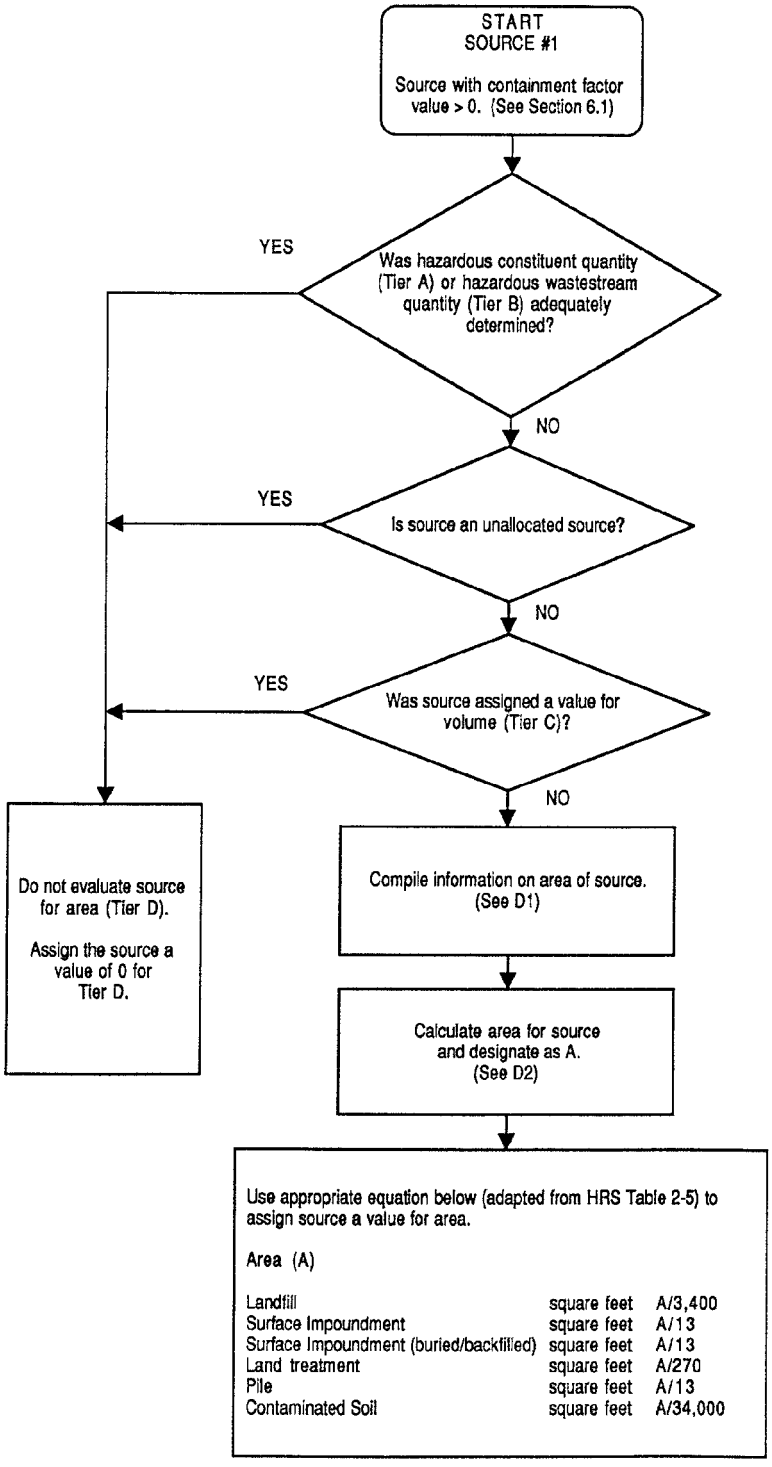
If the area of the source (or a portion of the area) can be determined:

(1) **Evaluate area using the required dimensions for the source type, specified in HRS Table 2-5.**

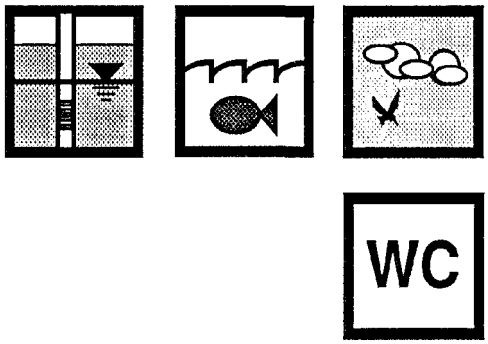
(2) **Based on the area, assign the source a value for area using the appropriate Tier D equation found in HRS Table 2-5.**

(3) **Select the highest of the values assigned to the source (hazardous constituent quantity, hazardous wastestrearn quantity, and area) as the source hazardous waste quantity value.** (Do not round to the nearest integer.)

HIGHLIGHT 6-8
FLOWCHART FOR EVALUATING TIER D



SECTION 6.6
HAZARDOUS WASTE QUANTITY CALCULATION



This section discusses, in greater detail, calculating the hazardous waste quantity factor value and provides the scorer with some examples. Minimum factor values are also discussed.

SELECTING SOURCE HAZARDOUS WASTE QUANTITY VALUES

After evaluating all the appropriate tiers for the source, make a list of the scores for each tier. Select the highest of the values assigned to the source for hazardous constituent quantity, hazardous wastestream quantity, volume, and area. This value is the source hazardous waste quantity value. ***Highlight 6-9*** is a typical calculation for the source hazardous waste quantity value.

CALCULATING PATHWAY HAZARDOUS WASTE QUANTITY FACTOR VALUE

After assigning source hazardous waste quantity values to all the sources (both allocated and unallocated) at a site, determine the hazardous waste quantity factor value for the migration pathway. Sum the source hazardous waste quantity values assigned to all the applicable sources (including the unallocated sources) for the migration pathway being evaluated. Round this sum to the nearest integer, except if the sum is greater than 0, but less than one, round it to one. Based on this value, select a hazardous waste quantity factor value for the migration pathway using HRS Table 2-6.

APPLYING THE MINIMUM FACTOR VALUE

If the hazardous constituent quantity (Tier A) is not adequately determined for all sources, then the hazardous waste quantity factor value is subject to a minimum value of 10. However, if any target for the migration pathway is also subject to Level I or II concentrations, this factor value is subject to a minimum of 100. If a removal has taken place, see the removal fact sheet for additional considerations regarding the minimum factor value.

Highlight 6-10 provides a typical calculation for the pathway hazardous waste quantity factor value.

HIGHLIGHT 6-9
CALCULATION OF SOURCE HAZARDOUS WASTE QUANTITY VALUE

Site A has a surface impoundment filled to capacity with various wastes. The hazardous substances that are present in the surface impoundment include: ethyl acetate, acetone, lead, chromium, dichlorophenol, and phenol. All of these hazardous substances were detected in soil below the impoundment.

Tier A: No concentration data are available for any waste in the impoundment. Representative samples could not be obtained.

Tier B: Internal waste tracking forms at the site indicate that 475,000 pounds of waste from a plating operation were deposited into the impoundment between 1965 and 1970.The data are incomplete; however, because there were other hazardous wastestreams deposited prior to 1965.

For Tier B, the mass (in pounds) of the hazardous wastestreams, based on incomplete data, is to be divided by 5,000, according to HRS Table 2-5.

475,000 pounds/5,000 = **95**

Tier C: The surface impoundment measures 150 x 10 x 8 feet. Therefore, the volume is:

150 x 10 x 8 ft = 12,000 ft^3 = 444.444 yd^3

According to HRS Table 2-5, the appropriate divisor for a surface impoundment that is not buried or backfilled is 2.5. Therefore, the value for source volume is:

444 y^3/2.5 = **176**

Tier D: Because the volume has been determined, assign a value of 0.

Final Values:

Tier A:	N/A
Tier B:	95
Tier C:	176
Tier D:	0

Source HWQ Value **176**

HIGHLIGHT 6-10
CALCULATION OF PATHWAY HAZARDOUS WASTE QUANTITY FACTOR VALUE

For each pathway, add source HWQ values for sources with containment values greater than 0 for that pathway plus the HWQ from any unallocated source. This sample site has three sources and no targets are subject to Level I or II concentrations:

Source	Source HWQ Value	Source Containment Factor Value
Surface impoundment	4,615.38	Greater than 0 for all pathways
Contaminated soil area	0.28	Greater than 0 for all pathways
Buried trench	177.78	0 for air pathway; greater than 0 for ground water and surface water pathways

The air pathway HWQ value is 4,616 (4,615.38 + 0.28). The ground water and surface water pathway HWQ value is 4,793 (4,615.38 + 0.28 + 177.78). The HRS requires rounding off to the nearest integer.

Based on the HWQ value for each pathway, select the HWQ factor value from HRS Table 2-6. For all pathways, the value is 100.