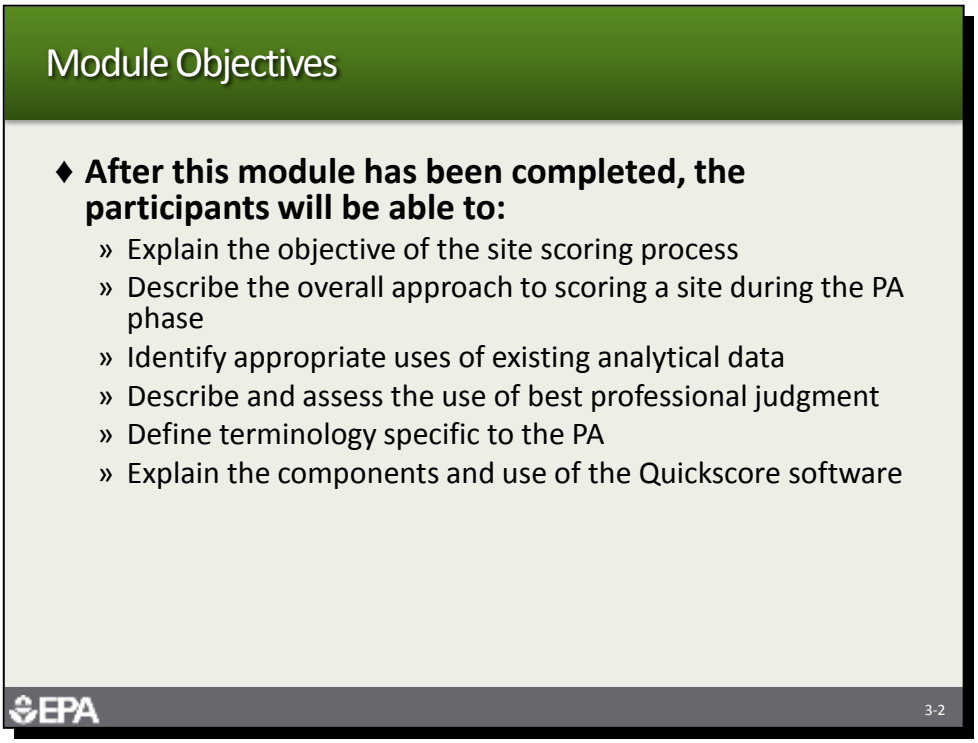
Module 3: Site Evaluation and Scoring Site Sources

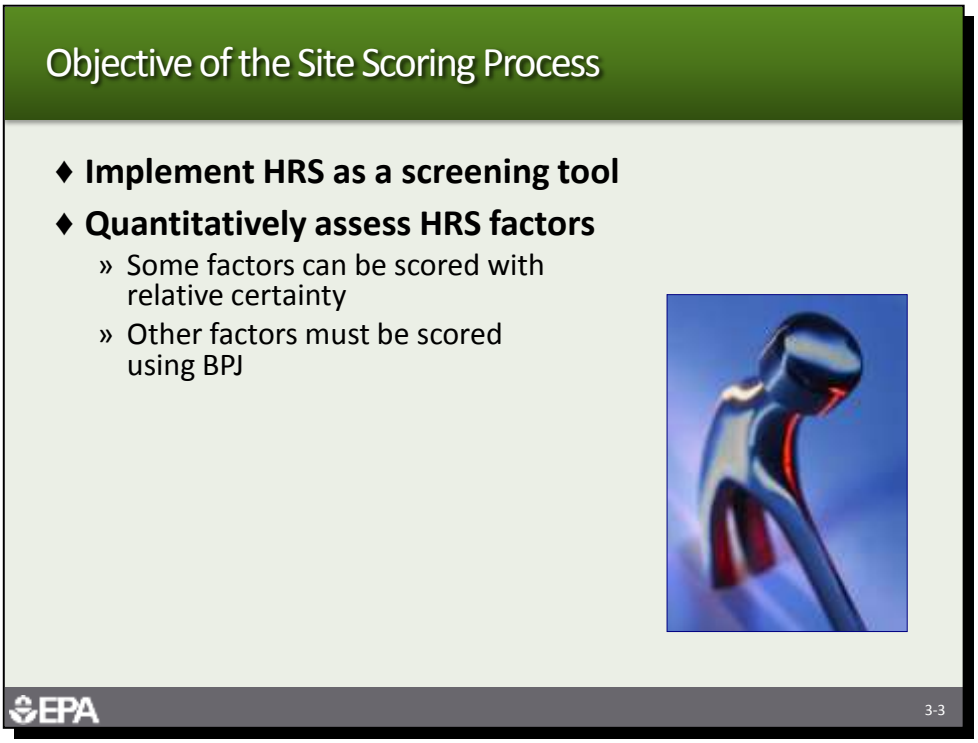
EPA
United States Environmental Protection Agency

3-1



Notes

◆ This module focuses on the specific elements of the scoring process that participants must understand to successfully apply the scoring model to a PA. After they have completed this module, participants will be prepared to apply the Quickscore software to an example PA. Participants will be able to (1) explain the objective of the site scoring process, (2) describe the overall approach to scoring a site during the PA phase, (3) identify appropriate uses of existing analytical data, (4) describe and assess the use of best professional judgment, (5) define the terminology specific to the PA, and (6) explain the components and use of the Quickscore software.

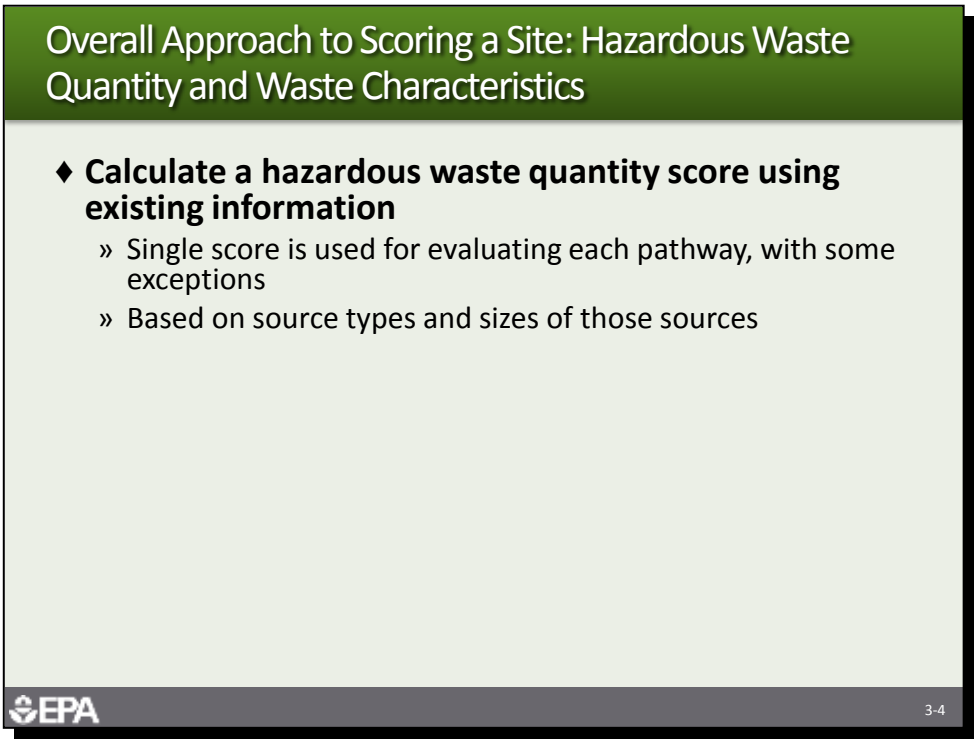


Notes

- **Implement HRS as a screening tool:** Developing an HRS score requires extensive analytical data and a great deal of information about the site and its surroundings. At the PA stage — where the scope of the investigation and available hours are limited — it is generally not practical to apply the HRS in its entirety. Consequently, EPA's objective during the PA is to apply the HRS as a screening tool. EPA has developed a simplified evaluation approach that meets this objective.

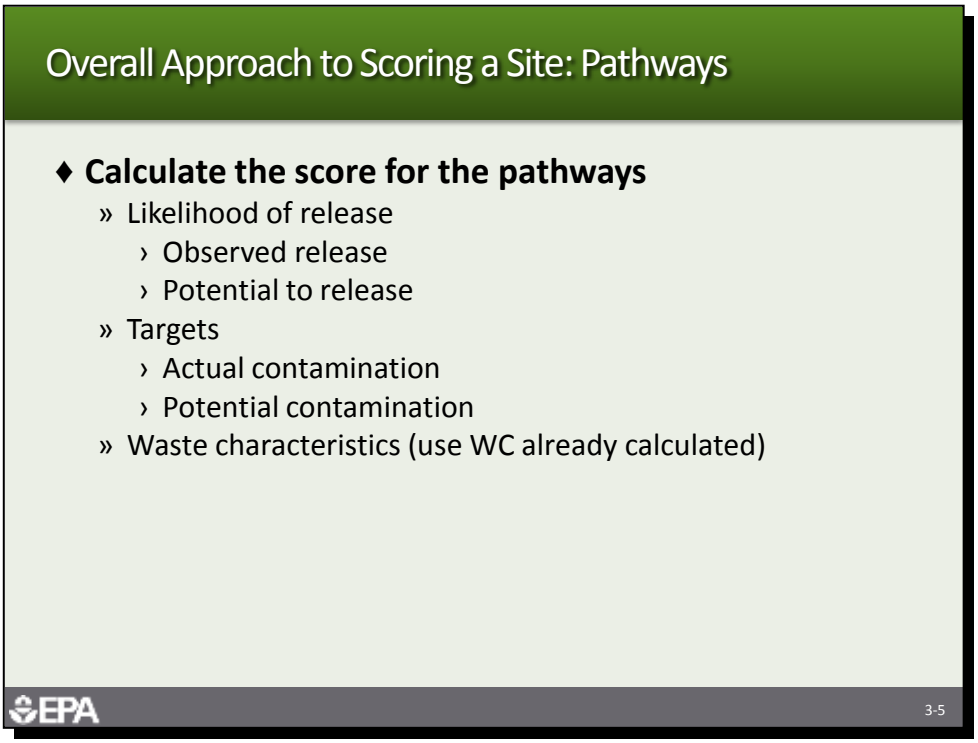
- **Quantitatively assess HRS factors:** Some HRS factors can be scored when sufficient information already exists; these factors may be strong indicators of the potential site score. Some HRS factors usually can be evaluated within the scope of the PA.

  However, sufficient information will not have been developed for some HRS factors to score them with relative certainty during the PA. As a result, the evaluator must use best professional judgment (BPJ) to determine how the factors will be scored and what impact the assumptions about the factors will have on the final HRS score.



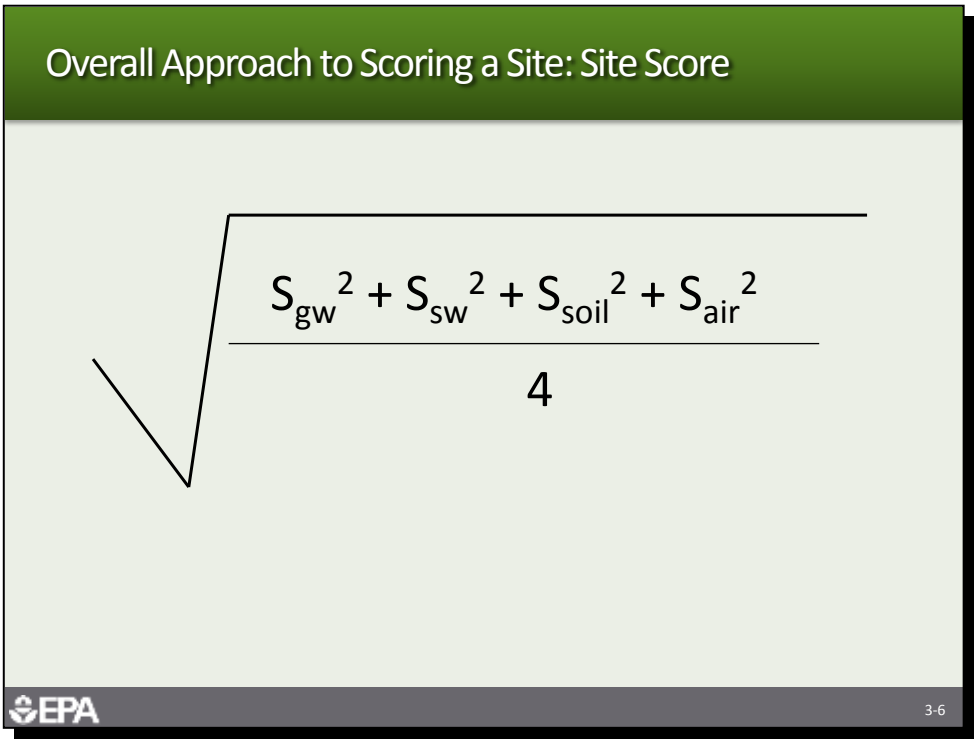
Notes

◆ **Calculate hazardous waste quantity score using existing information:** The first step in site scoring is to calculate the hazardous waste quantity score based on the information collected during the PA. The hazardous waste quantity score is based on the types and sizes of the sources at the site. There are several different ways to calculate waste quantity, such as by volume, area, or mass. The method that yields the highest waste quantity is used to calculate the WC for each pathway. With some exceptions, the hazardous waste quantity calculated during this first step is a factor category that contributes to the WC for each pathway.



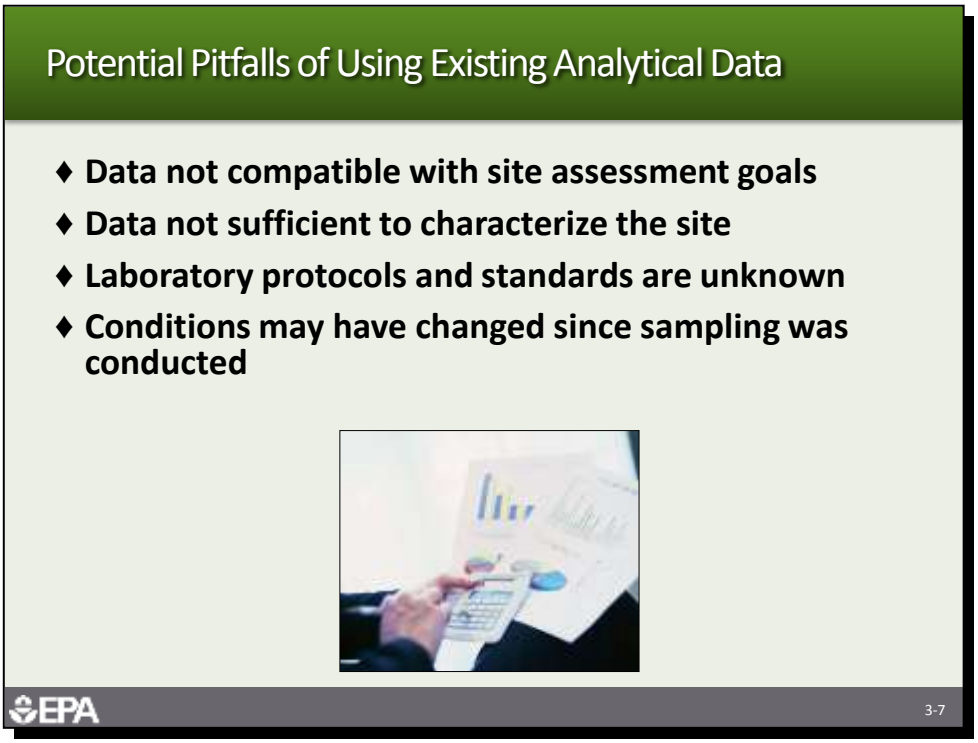
Notes

◆ **Calculate the score for the pathways by assessing the factor categories for each pathway:** Three factor categories for each pathway (groundwater, surface water, soil, and air) are evaluated to compute the score for the pathway. The likelihood of release, targets, and waste characteristics are evaluated in accordance with the scoring methodology and the PA information. These factor category scores are combined for a total pathway score.



Notes

- **Calculate the site score by entering the pathway scores into the formula:** The site score is calculated by squaring each pathway score, adding the squared pathway scores together, dividing the sum of the squared pathway scores by 4, and finally, taking the square root of the dividend. The Quickscore software calculates the site score automatically.



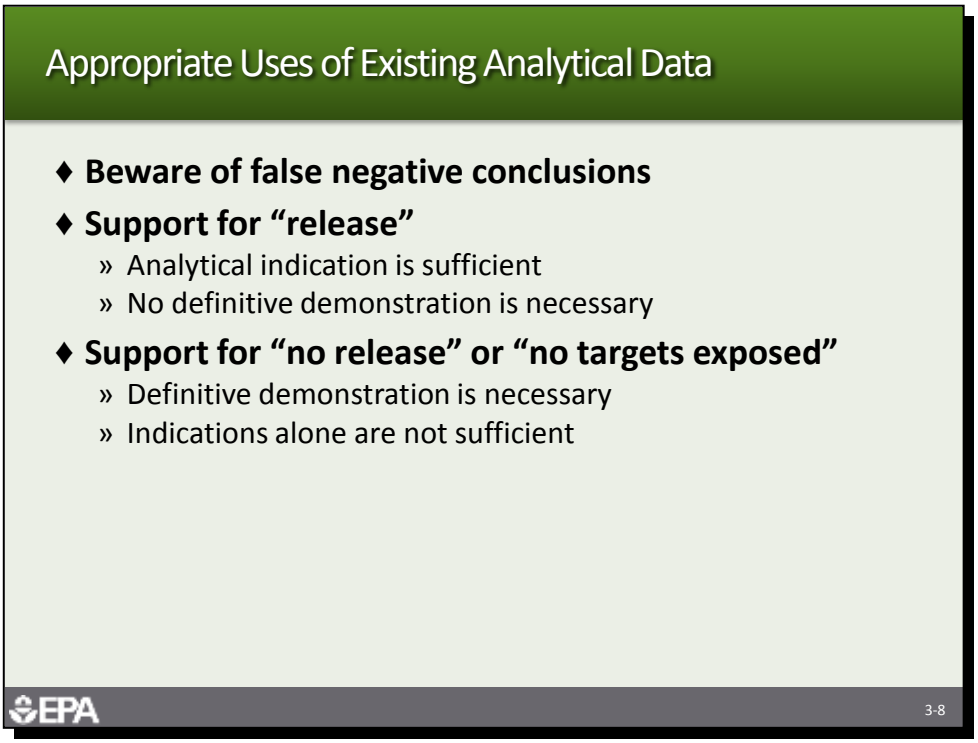
Notes

- **Data not compatible with site assessment goals:** It may not be appropriate to rely on existing analytical data if the data were collected for a purpose that is not compatible with the goals of a Superfund site assessment. The purpose of the data collection effort should be carefully reviewed to evaluate whether use of the data is appropriate for the PA. For example, if the purpose of data collection was to characterize material for proper waste disposal, the results of the sampling may have limited use because the analytes may be limited and the laboratory methodology may not be appropriate for determining if a release has occurred.

- **Data not sufficient to characterize the site:** It may not be appropriate to rely on existing analytical data if the sampling effort was not extensive enough to characterize the site and the possibility of a release. The types of media sampled, the analytical suite, and the sampling locations should be carefully reviewed to evaluate the extent existing data can be used.

- **Laboratory protocols and standards are unknown:** It may not be appropriate to rely on existing analytical data if the laboratory protocols and standards are not known. The analytical methods, QA/QC procedures, and validation procedures should be carefully reviewed before the investigator relies on existing analytical data.

- **Conditions may have changed since sampling was conducted:** It may not be appropriate to rely on existing analytical data if the conditions at the site may have changed since the sampling occurred. In some cases, months and even years may have passed since the data were collected. If the existing data indicate there was not a release, the condition could have changed in the time since the data were collected and the PA is conducted.



Notes

- **Beware of false negative conclusions:** Using existing analytical data to conclude that no release has occurred or no targets have been exposed could lead to false negative conclusions. EPA's PA guidance strongly urges a conservative approach when such judgments are made at the PA stage. The mistake of making a false negative conclusion is not acceptable to EPA; therefore, a higher standard exists for using existing analytical data to support a "no release" conclusion than does use of the data to support a "release" conclusion.

- **Support for "release":** Existing analytical data can be used to support a hypothesis that there has been a release without regard to data quality, attribution of substances to site operations, or concentrations compared with background levels. Analytical indications are sufficient to support the hypothesis, and a definitive determination is not necessary.

- **Support for "no release" or "no targets exposed":** Existing analytical data can be used to support a hypothesis that there has been no release or that no targets have been exposed, but must be used as the principal consideration leading to the hypothesis. Using existing analytical data as the principal support requires that the data definitively demonstrate that a problem does not exist, and data quality, attribution of substances to site operations, or concentrations relative to background levels must be considered. Analytical indications are not sufficient to support the "no release" or "no targets exposed" hypotheses.

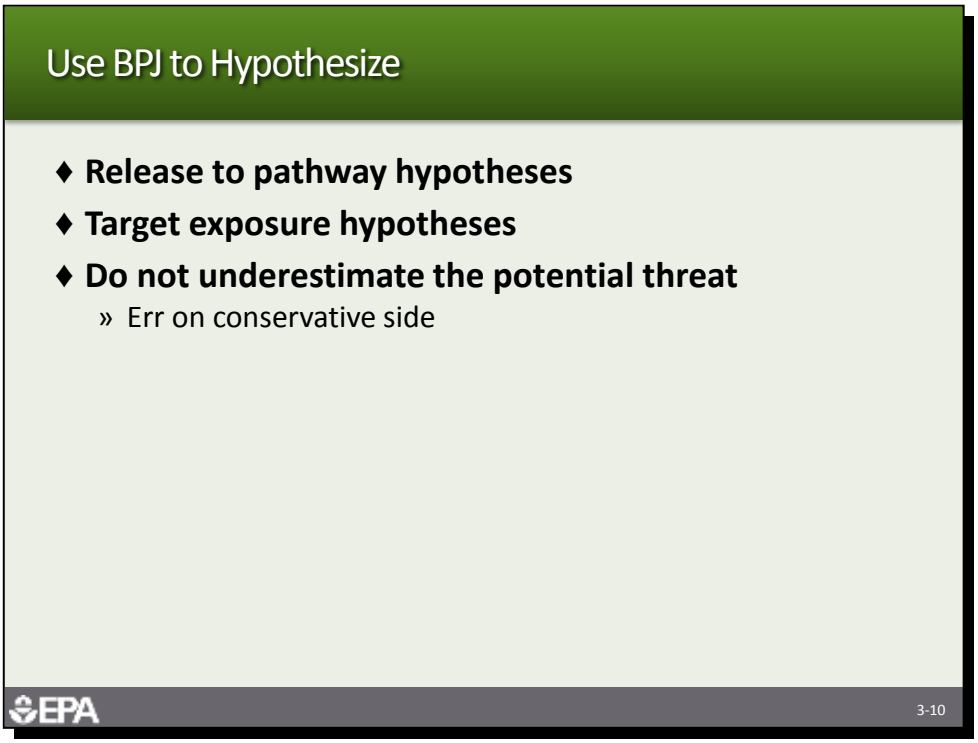
Best Professional Judgment

- **BPJ combines:**
  - Professional experience
  - Specific knowledge of characteristics and conditions of the site
  - Specific knowledge of site surroundings
  - Specific knowledge of targets

EPA 3-9

Notes

- **BPJ combines:** In most cases, suitable analytical data are not available during the PA. Therefore, the evaluator must apply professional judgment to evaluate the occurrence of releases and the presence of exposed targets. This process is somewhat intuitive and relies on the accumulated professional experience and the specific knowledge about the characteristics and conditions of the site, site surroundings, and targets.

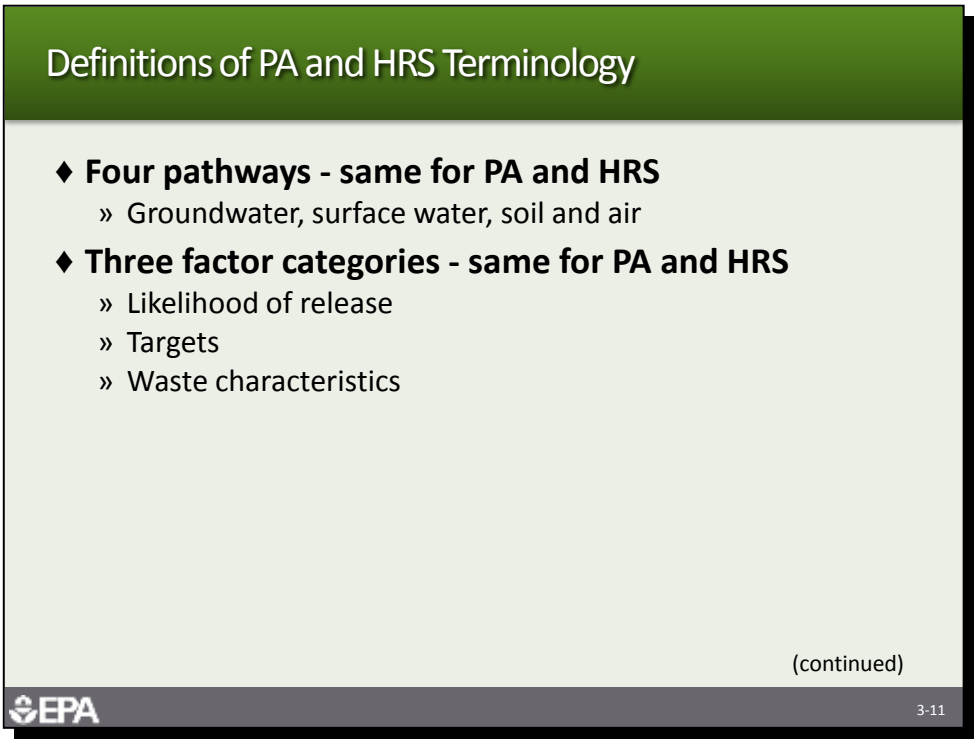


Notes

- **Release to pathway hypotheses:** The use of BPJ during the PA stage takes the form of hypotheses. The site investigator must hypothesize about whether a release has or has not occurred. Releases are evaluated for groundwater, surface water, soil, and air. Release hypotheses form the foundation for the SI sampling strategy, if the site moves into that phase. The impact of the hypotheses on the site score are evaluated during scoring for the PA.

- **Target exposure hypotheses:** The site investigator must hypothesize about whether targets have or have not been exposed. Actual or potential targets may exist for the four pathways evaluated. Target exposure hypotheses must be evaluated more fully in the SI. The impact of the hypotheses on the site score are tested during scoring for the PA.

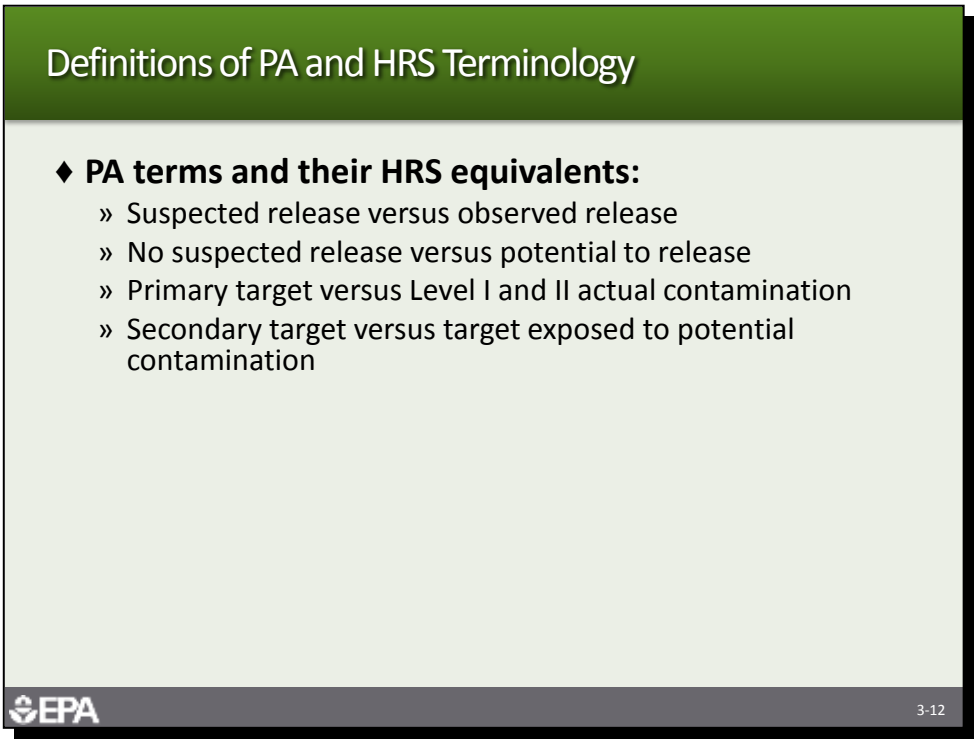
- **Do not underestimate the potential threat:** When BPJ is used, it is very important not to underestimate the potential threat. When in doubt, EPA strongly urges that it is best to err on the side of caution and conclude that a release has occurred or that specific targets have been affected. Not erring on the side of caution could result in prematurely designating the site as NFRAP.



Notes

- **Four pathways - same for PA and HRS:** The "pathway" for both the PA and the HRS refers to the environmental medium through which a hazardous substance may threaten targets. The PA and HRS evaluate the migration and threat potential through the groundwater, surface water, soil exposure, and air pathways.

- **Three factor categories - same for PA and HRS:** There are three factor categories for each pathway: likelihood of release or exposure, targets, and waste characteristics. Different factors are evaluated within each factor category, depending on the pathway examined. For example, the target factor category for the groundwater pathway looks at primary and secondary targets associated with drinking water, while the target factor category for surface water looks at drinking water, fisheries, and sensitive environments.



Notes

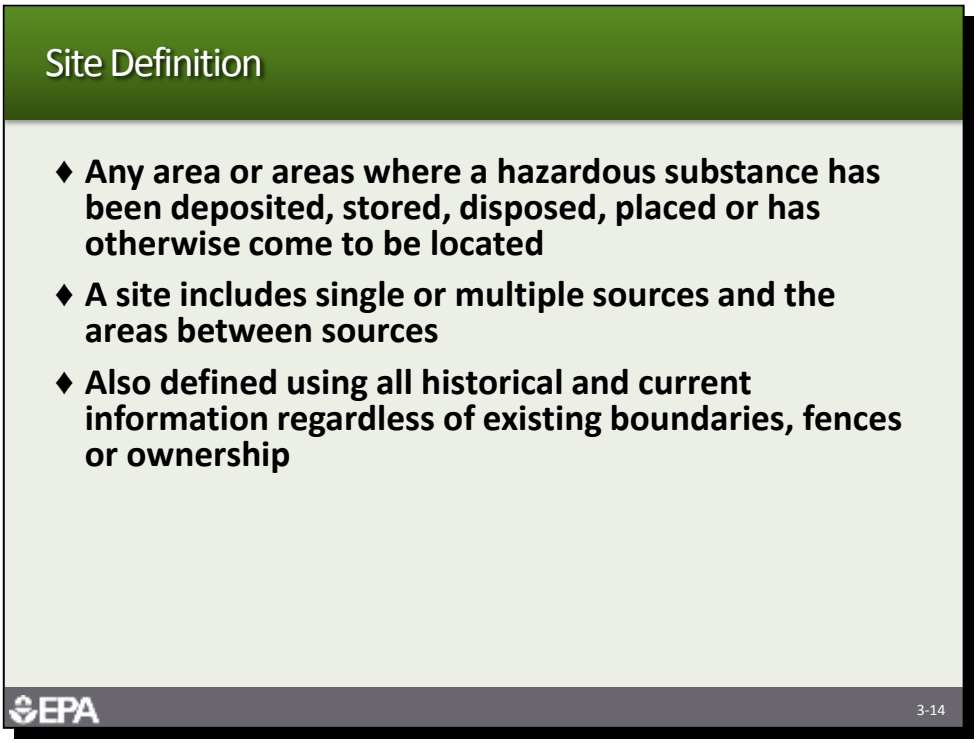
◆ **PA terms and their HRS equivalents:** The PA guidance uses terminology that is different than is used in the HRS model. This difference used to be significant because the software program formerly used by EPA, PA Score, used the PA terminology. EPA now uses one software program, Quickscore, for scoring during the PA and for the HRS, so HRS terminology is now used during the PA. However, when referring to the PA guidance, the following PA terms are equivalent to the listed HRS terms:

PA Term	Equivalent HRS Term
Suspected release	Observed release
No suspected release	Potential to release
Primary target	Level I and II actual contamination
Secondary target	Target exposed to potential contamination

Scoring Exercise – Defining the Site and Sources

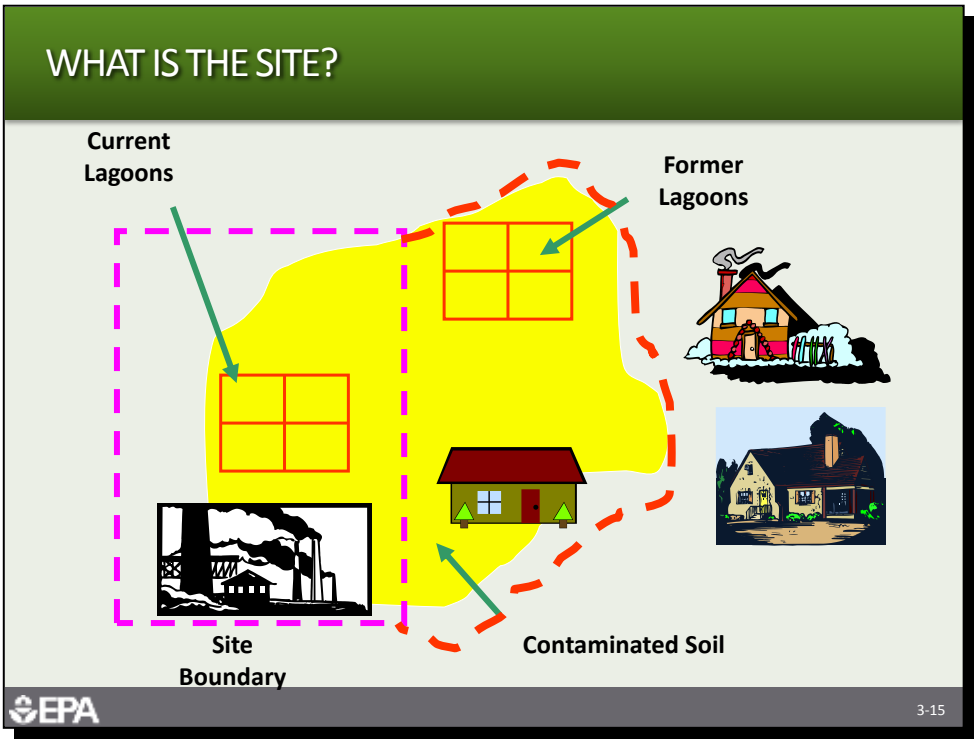
- **Objectives of the scoring exercise**
  - Review site background
  - Identify site sources and identify HRS source types
  - Determine the hazardous waste quantify (HWQ) for sources
  - Select hazardous substances associated with the source
  - Select pathways for which to evaluate the source
  - Navigate around HRS Quickscore software to efficiently score a site for PAs and SIs

EPA 3-13



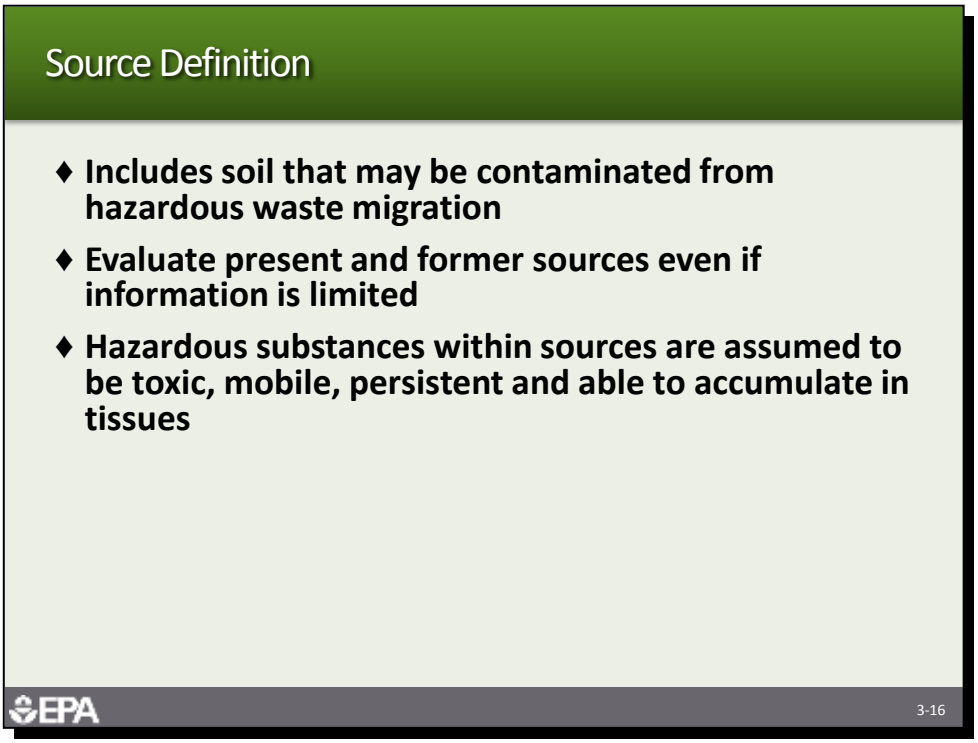
Notes

- **Site definition:** A site is defined independent of property boundaries. The location of hazardous substances that have been deposited, stored, disposed, placed or otherwise come to be located defines the boundaries of a site. In addition, a site can include multiple sources and the areas between the sources. During the PA, the site boundaries are defined using all available historical and current information. The site boundaries may be refined based on sampling conducted in future assessment efforts.



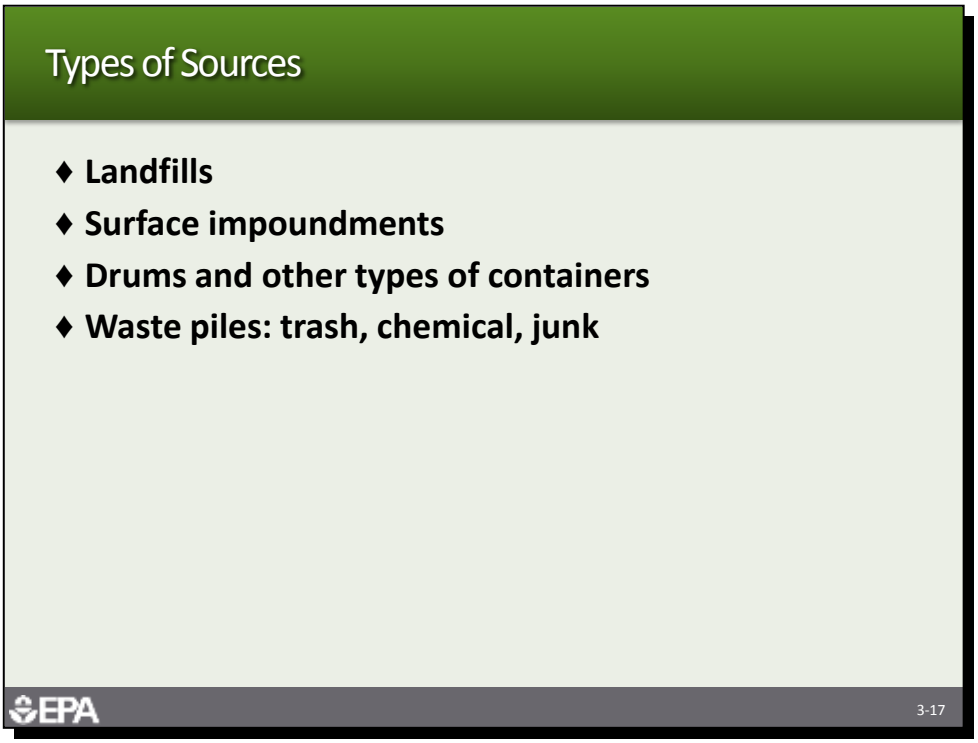
Notes

- **What is the site?** This example demonstrates that the property boundaries of a site do not necessarily define the site. In this example the site definition is extended beyond the property boundaries to include the contaminated soil and the former lagoons.



Notes

- **Includes soil that may be contaminated from hazardous waste migration:** Soils that may have become contaminated from hazardous substance migration are included in the definition of a source.
- **Evaluate present and former sources even if information is limited:** During the PA, all current and former sources of hazardous substances should be evaluated. Information may be limited but that should not preclude inclusion of these sources.
- **Hazardous substances within sources are assumed to be toxic, mobile, persistent and able to accumulate in tissues:** Due to the limited scope of the PA, evaluation of waste characteristics will never be complete. Therefore, the PA can assume the worst case that hazardous substances within sources are toxic, mobile, persistent, and able to accumulate in tissues.



Notes

- **Landfills:** A landfill is defined in the HRS Guidance Manual as an engineered (by excavation or construction) or natural hole in the ground into which wastes have been disposed of by backfilling or by contemporaneous deposition of soil and wastes. In order to classify a pile as a landfill there must be evidence of soil and daily cover. If evidence of those two items is not observed, the area would be considered a pile.

- **Surface impoundments:** A surface impoundment is a topographic depression, excavation, or diked area, primarily formed from earthen materials (lined or unlined) and designed to hold accumulated liquid wastes, wastes containing free liquids, or sludges that were not backfilled or otherwise covered during periods of deposition; depression may be dry if deposited liquid has evaporated, volatilized or leached; structures that may be more specifically described as lagoon, pond, aeration pit, settling pond, tailings pond, sludge pit, etc.; also a surface impoundment that has been covered with soil after the final deposition of wastes materials (that is, buried or backfilled).

- **Drums and other types of containers:** A drum is a type of container used to hold hazardous substances. Drums are standard 55-gallon cylindrical containers. A container or tank includes a stationary device constructed primarily of nonearthen materials (such as wood, concrete, steel, or plastic) used to contain an accumulation of hazardous substance; or a portable in which a hazardous substance is stored or otherwise handled. Tanks may be above-ground or below-ground.

- **Waste piles:** There are five different types of waste piles under HRS. A chemical waste pile consists primarily of discarded chemical products (whether marketable or not), by-products, radioactive wastes, or used or unused feedstocks. Another pile is a term reserved for a pile of indeterminate origin that contains hazardous substances. A scrap metal or junk pile consists primarily of scrap metal or discarded durable goods such as appliances, automobiles, auto parts, or batteries, that contain or have contained hazardous substances. A tailings pile consists primarily of any combination of overburden from a mining operation and tailings from a mineral mining, beneficiation, or processing operation. A trash pile consists primarily of paper, garbage, or discarded nondurable goods that contain or have contained hazardous substances.

LANDFILLS

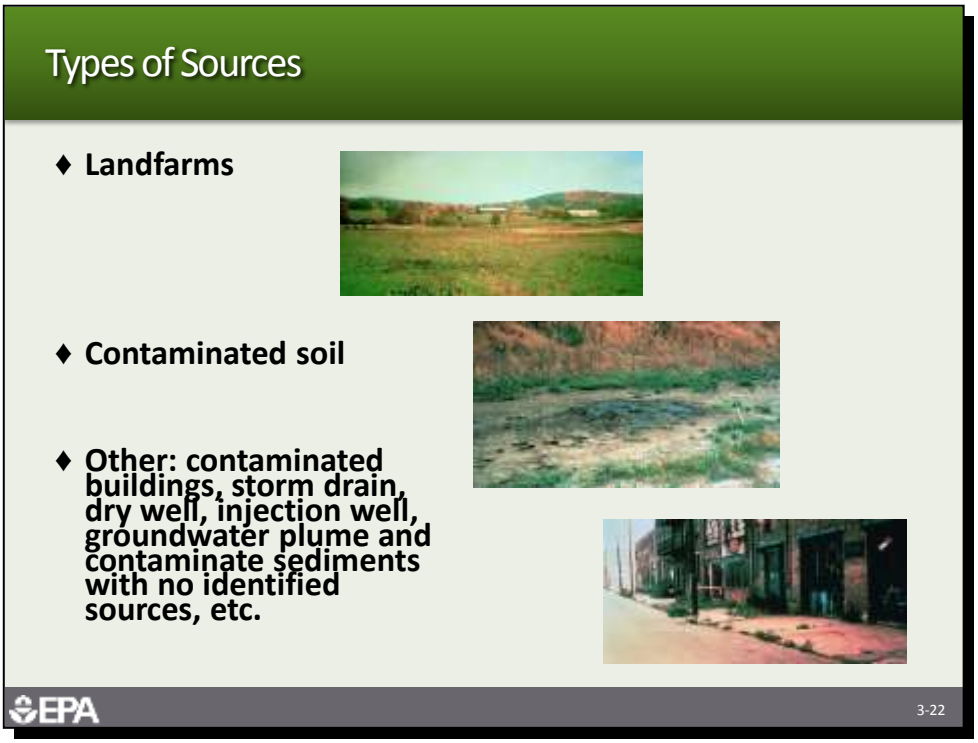
EPA 3-18

Surface Impoundments

EPA 3-19

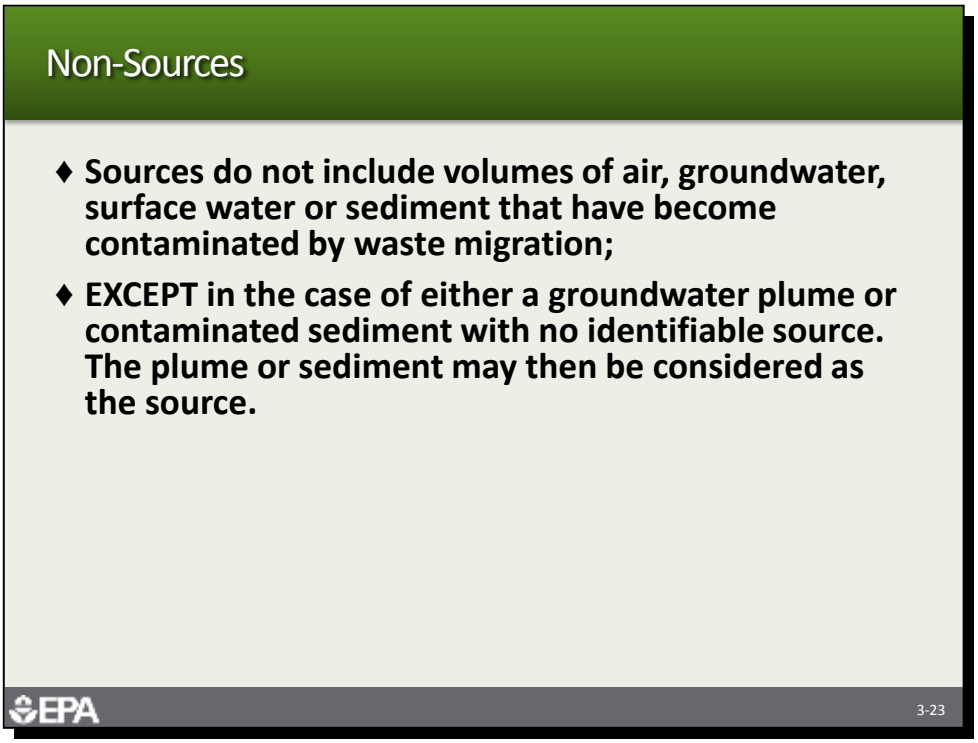

Drums and Other Containers
EPA
3-20


Trash Pile
Chemical Pile
EPA
3-21



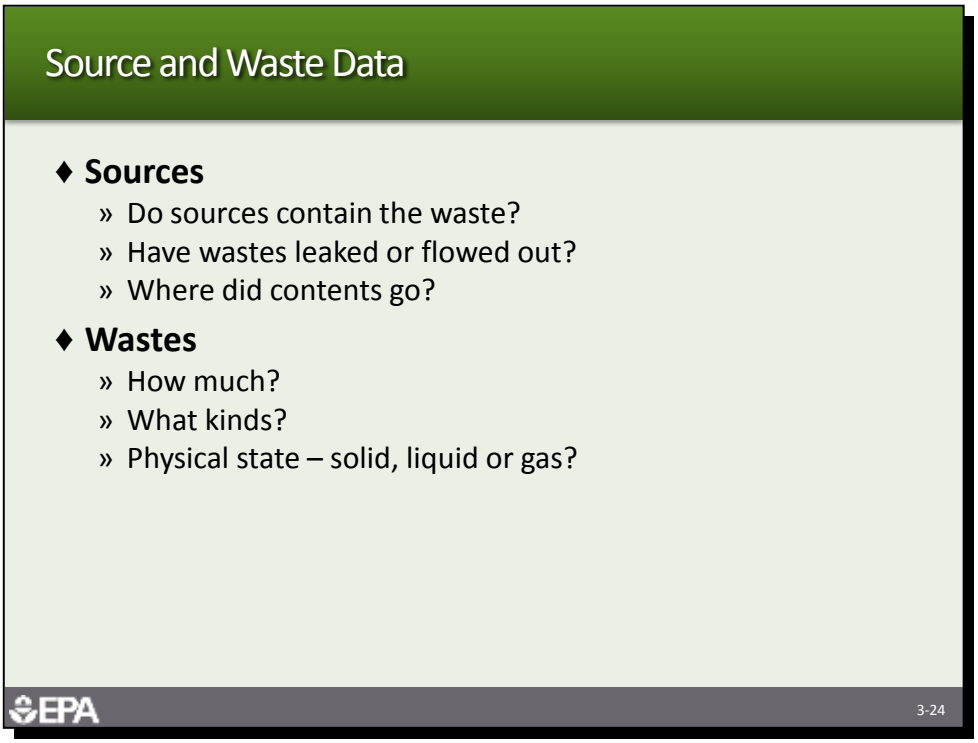
Notes

- **Landfarms:** Landfarm/land treatment is a method of waste management in which either liquid wastes or sludges are spread over land and tilled or liquids are injected at shallow depths into soils.
- **Contaminated soil:** Contaminated soil excludes land treatment and is soil onto which available evidence indicates a hazardous substance was spilled, spread, disposed, or deposited.
- **Other:** This is a source type used when defined source types do not apply. Examples include: contaminated buildings, storm drains, dry wells, injection wells, and French drains. “Other” also can be used for groundwater plumes and sediments with no identified source.



Notes

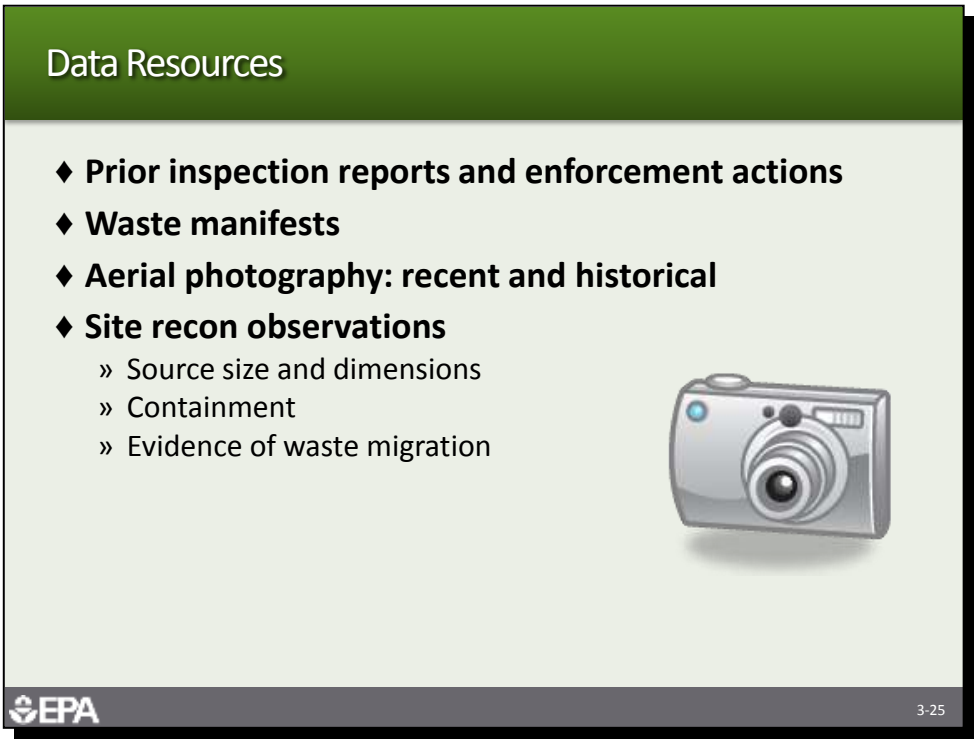
◆ **Non-sources:** According to the HRS Guidance Manual, in general, the volumes of air, groundwater, surface water, and surface water sediments that may have become contaminated through migration are not considered sources. The exception to this is the case of either a groundwater plume or contaminated sediment with no identifiable source. The plume or sediment may then be considered as the source.



Notes

- **Sources:** The PA should evaluate each source using historical data and current observations. The PA should assess whether each source adequately contains the waste and evaluate if wastes have leaked, flowed, or otherwise migrated out of the sources. The PA should assess where wastes may have gone after migrating from the sources.

- **Wastes:** The PA should also evaluate wastes within and migrating from the sources. The PA should conservatively estimate the volume of waste material in each source and use existing information to evaluate the kinds of wastes associated with each source. The PA should describe to the extent possible the physical state of material currently in the sources and the physical state of the wastes when they were first placed in the sources.



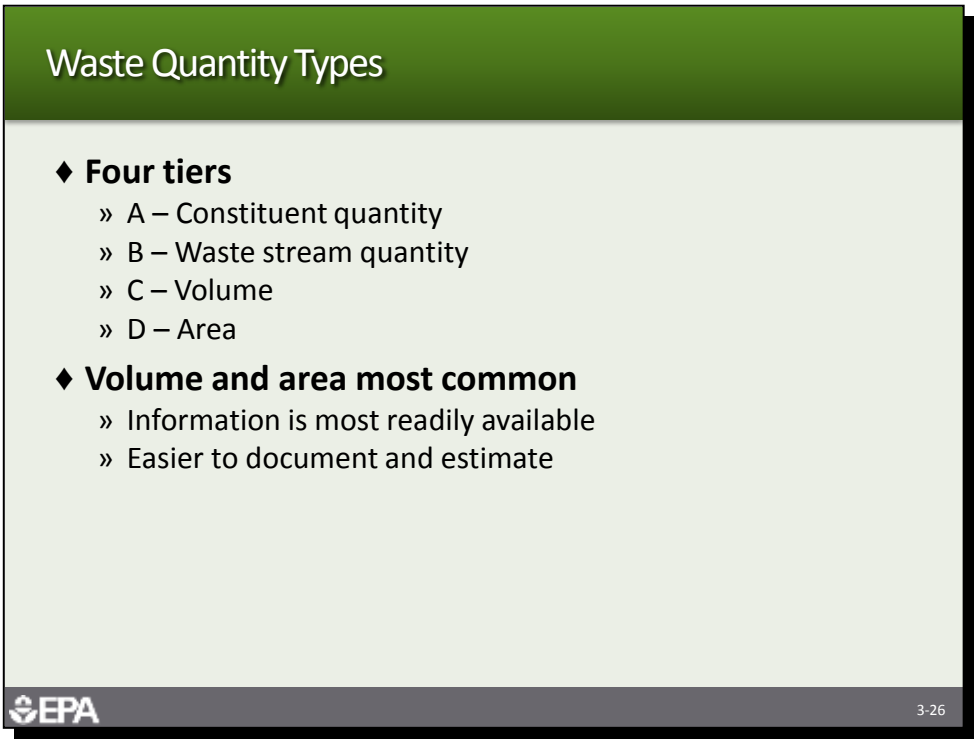
Notes

- **Prior inspection reports and enforcement actions:** Prior inspection reports and enforcement actions can provide valuable information for the PA. Both local health department (county or city) and state records should be searched for previous actions taken at the site. In addition, federal actions by another program, such as RCRA or the water program, may have also occurred in the past.

- **Waste manifests:** Depending on the type of facility and the time period of operation, waste manifests may be available in site files or local or state files, that describe the type of waste material in the sources at the site.

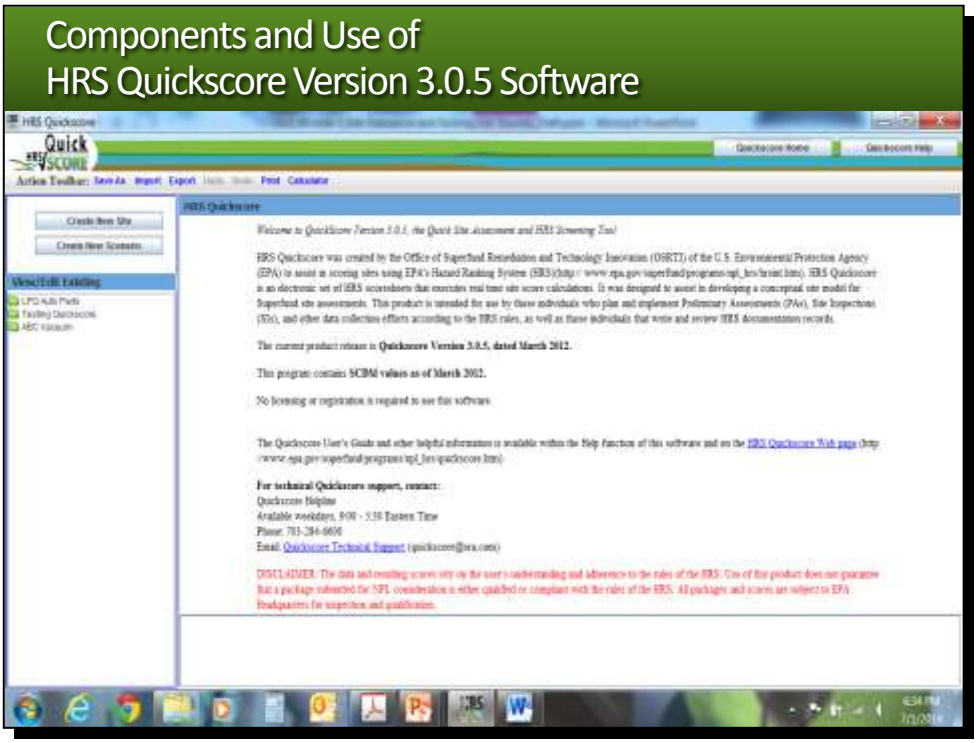
- **Aerial photography: recent and historical:** Aerial photography can be used to identify waste storage or disposal areas that may have been used in the past, but are not visible now.

- **Site recon observations:** Observations during site reconnaissance are very important for evaluating sources at a site. The site recon should estimate the size/dimensions of all sources. The site recon should also describe the presence or lack of containment for all sources. Finally, all evidence of waste migration from sources should be documented with photographs.



Notes

- **Four tiers:** Sources can be evaluated using four tiers. The tier giving the highest score is then used for preliminary HRS scoring purposes. Some source types, such as drums and tanks, cannot be evaluated using the Tier D – Area, and others, such as contaminated soil, can only be evaluated using Tier D – Area. Tiers A and B require specific information to be evaluated and are not commonly used during the PA.
- **Volume and area most common:** The easiest tiers to evaluate are Tiers C and D, because they require only estimates of dimensions rather than chemical-specific data.



Notes

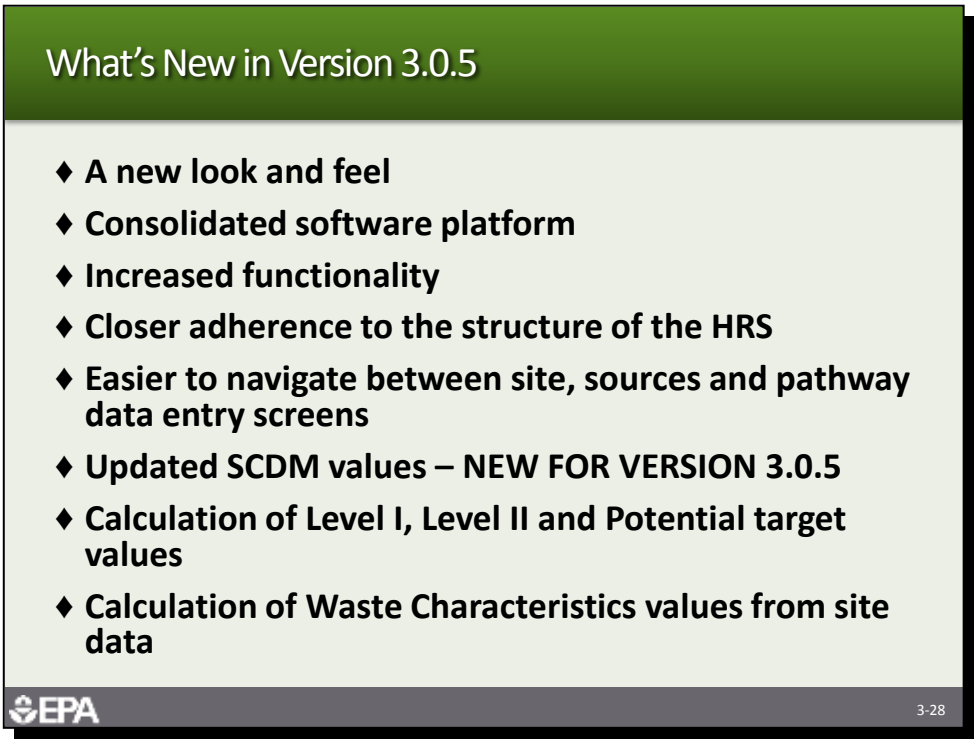
- The key functions of Quickscore version 3.0.5 are:
  - Quick HRS pathway and site score calculations
  - HRS scoresheet preparation and printing
  - Easy identification of HRS data gaps in your CSM
  - Back of the envelope tracking of data gaps, notes, refinements, and adjustments in scenario testing, and
  - Scratchpad ability to make notes as you work

- EPA recommends use of Quickscore during all phases of the site assessment process, from PA to HRS package. EPA no longer uses the software programs PA Score or PreScore during the PA stage and SI stage.

- Quickscore organizes information that you enter by site name, and then by scenario. It does not create an electronic file for each site or scenario. Instead, each scenario is maintained in a spreadsheet or database that is organized by the site name for easy retrieval. The summary page for each scenario is linked to the source evaluation and pathway score pages for the scenario.

- Each pathway scoring page has dropdown menus that link to HRS rule and appropriate HRS tables necessary to score all the factors related to the factor category. The hazardous waste quantity calculated from the source page is carried forward to all pathway scoring pages.

- Quickscore uses the inputs to calculate pathway scores and the site score. Quickscore makes it easy to evaluate the impact of particular assumptions and hypotheses when a pathway is scored.



Notes

- **Version 3.0.5:** This release includes updated SCDM values. In December 2011 and March 2012, EPA released information regarding updates to 49 volatile substances listed in SCDM. These updates affected the human toxicity factor (HTF), groundwater mobility, persistence, bioaccumulation, ecotoxicity, gas mobility and migration, and benchmark values of these substances.

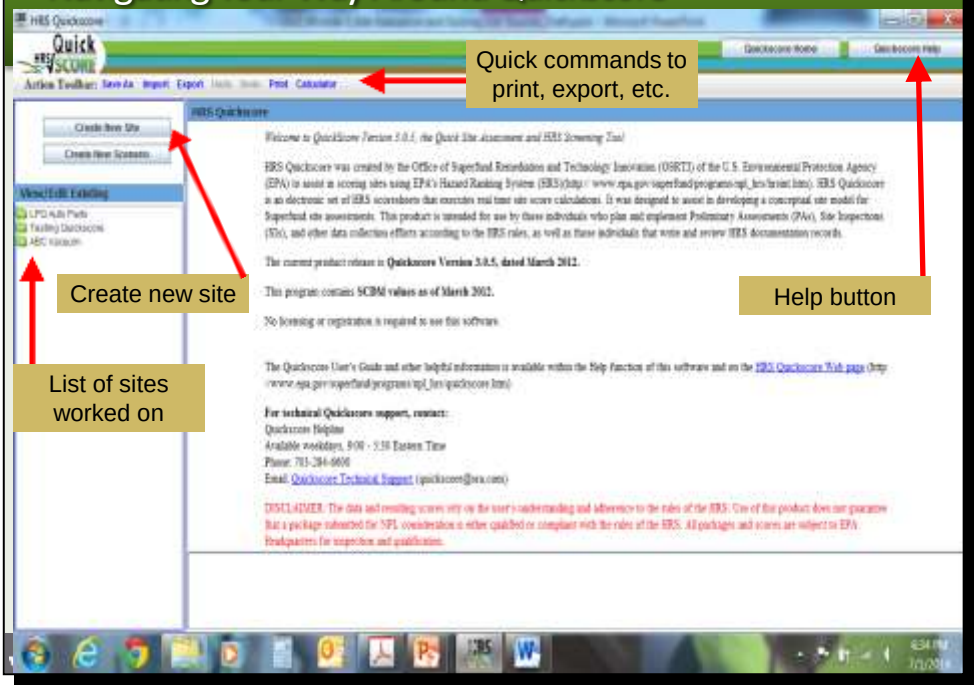
  A list of the chemicals with updated SCDM values is available at *http://www.epa.gov/superfund/sites/npl/hrsres/tools/scdm.htm#mar2012*.

Navigating Your Way Around Quickscore

- **Easy to use by clicking on buttons**
- **Help provides information on the use and scoring elements of the software**
- **Information is saved as you enter it**
- **Numbered steps to guide you through the process for all scoring elements**
- **If corrections are made, they transfer to all screens in the program**
- **Quickly run multiple scenarios**
- **Printable HRS scoresheets**

EPA 3-29

Navigating Your Way Around Quickscore

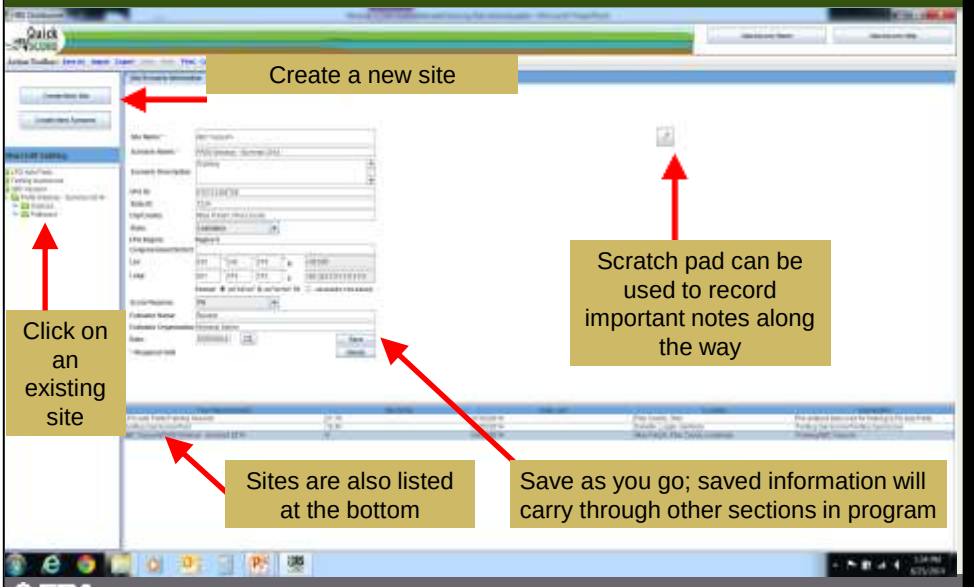


QuickScore – Site Information

- Review ABC site information
- Complete site characterization information in QuickScore

EPA 3-31

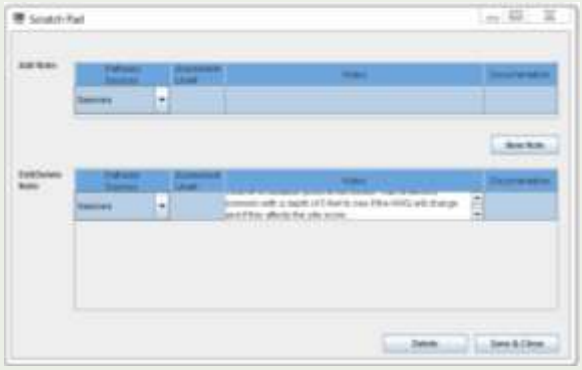
HRS QUICKSCORE – General Site Information



EPA 3-32

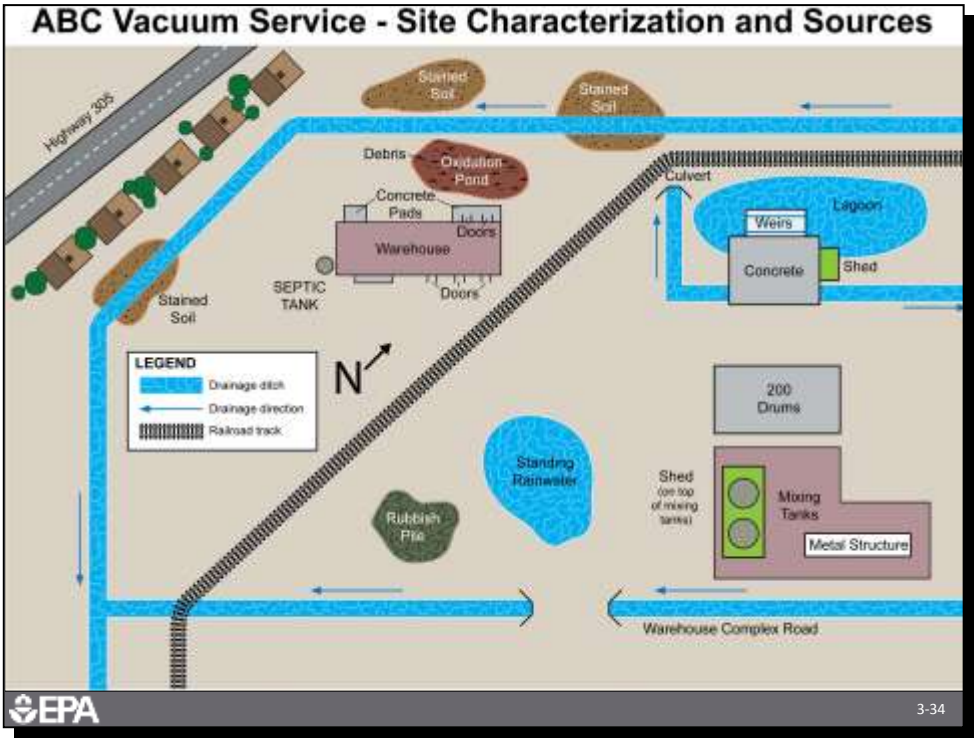
HRS QUICKSCORE – Scratchpad

- **Scratch pad allows the user to make notes along the way and notes can be printed out with scoresheets**



- **We will use HRS Quickscore to prepare a preliminary HRS score for the ABC Vacuum site**

EPA 3-33



HRS Quickscore – Sources at ABC Vacuum

- **Use the site background information to identify sources at ABC Vacuum**
  - 200, 55-gallon drums
  - Two, 1,000 gallon mixing tanks
  - 3,000 ft^2 lagoon
  - 750 ft^2 oxidation pond
  - 500 ft^2 rubbish pile
  - Contaminated soil
- **Hazardous substances associated with the sources include:**
  - Benzene, benzo(a)pyrene, trichloroethylene (TCE), arsenic, barium, cadmium, chromium, lead and selenium
- **An excerpt from the field notes is provided on the next page**

EPA 3-35

Logbook Excerpts from Site Reconnaissance

1-2-99 by Lisa A. Lillis

0845 Perform on-site reconnaissance. Site is currently inactive. Enter site from warehouse complex road.

0850 Proceeding north/northwest from road. Observe rubbish pile due west of railroad tracks which traverses the site. The rubbish pile consists of assorted debris and is estimated to be 500 square feet in area. Continue walking east from rubbish pile.

0855 Observe area of standing rainwater east of shed and metal structure. Shed covers two-1,000 gallon mixing tanks. The tanks and metal structure are situated on one concrete pad. The metal structure is inaccessible. Adjacent to the north of this pad is a smaller, second concrete pad on which 200, 55-gallon drums are stored. Contents of the tanks and drums are not indicated.

0915 Walked north/northwest of drum pad to a lagoon. A concrete pad, shed and a series of weirs are located on the southern edge of the lagoon. A drainage ditch borders the west and south of the lagoon; flow appears to be north and east, respectively. North drainage flows into a culvert pipe. The lagoon is estimated to be 3,000 square feet, volume unknown.

0940 Walk west over railroad tracks to site warehouse building. Doors are located on the south and north facades. The facility septic tank is located to the west, outside of the warehouse. Two small concrete pads are located on the northeast and northwest corners of the north façade. An oxidation pond is observed north/northwest of the warehouse. The pond is estimated to be 750 square feet. Volume unknown. Some debris is observed in the pond.

0955 A drainage ditch is observed along the perimeter of the property. The drainage ditch is walked. The ditch appears to be intermittent, although areas of the ditch were observed to be overflowing during the reconnaissance. The ditch appears to receive all site runoff and borders the site to the north and west and south. Eventual flow is to the south into a perennial ditch approximately 6,000 feet from the site. Three areas of overflow and stained soils are observed along the northwest corner of the property. Each area is approximately 10 feet wide and are estimated at 50 feet, 20 feet, and 30 feet in length, respectively, for a total of 1,000 square feet of observed stained soils.

1030 The site perimeter is unfenced, but no evidence of trespassing was observed. Total site area is approximated to be 13 acres.

1040 Leave ABC property to complete survey of nearby targets (environs).

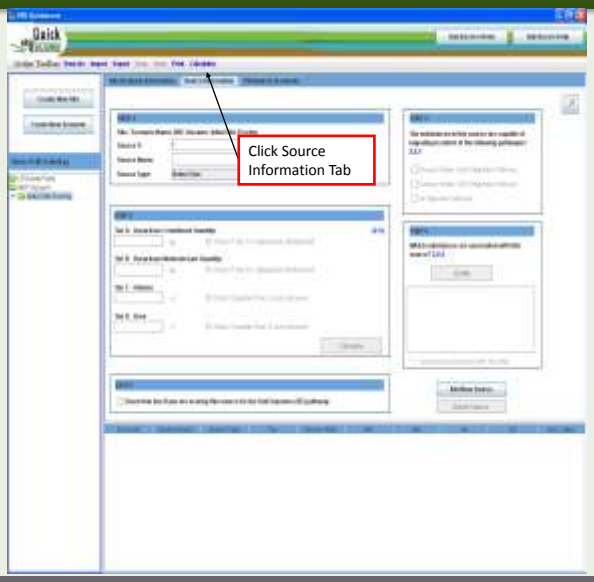
1050 A small subdivision of 5 houses is located between 100 and 200 feet to the north and west of the site. No schools or daycare facilities are observed within ½ mile of the site.

1130 Environs survey completed.

EPA 3-36

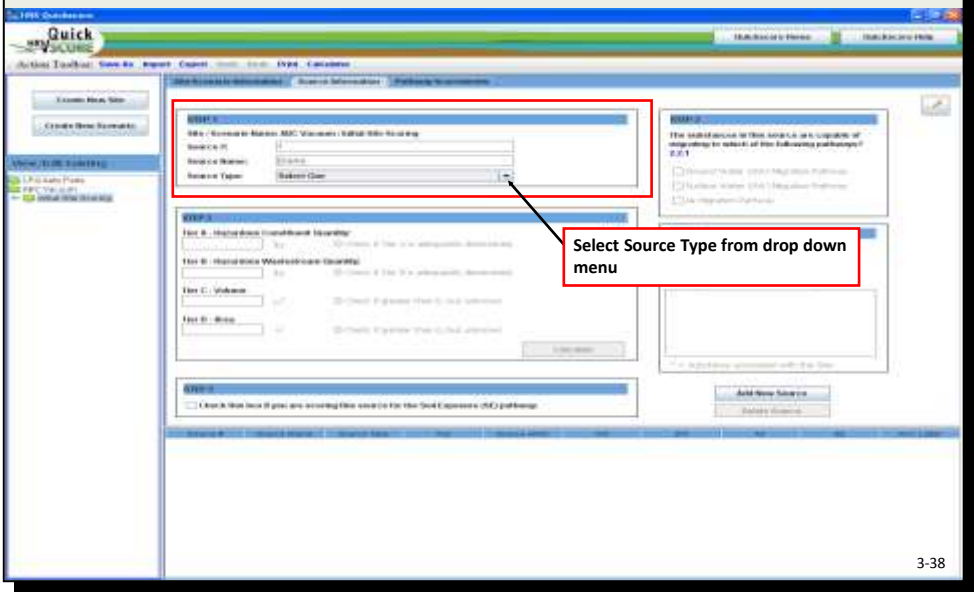
HRS Quickscore – Sources at ABC Vacuum

- **Score each source associated with the site**
- **Determine the hazardous substances**
- **Calculate the source hazardous waste quantity (HWQ)**



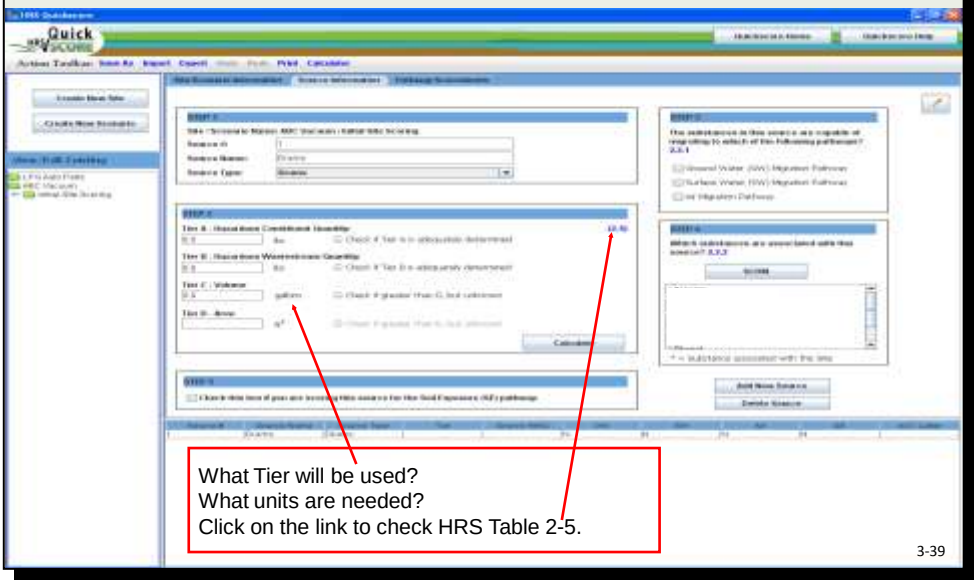
EPA 3-37

Source 1 – Drums – Step 1 – Source Name and Source Type



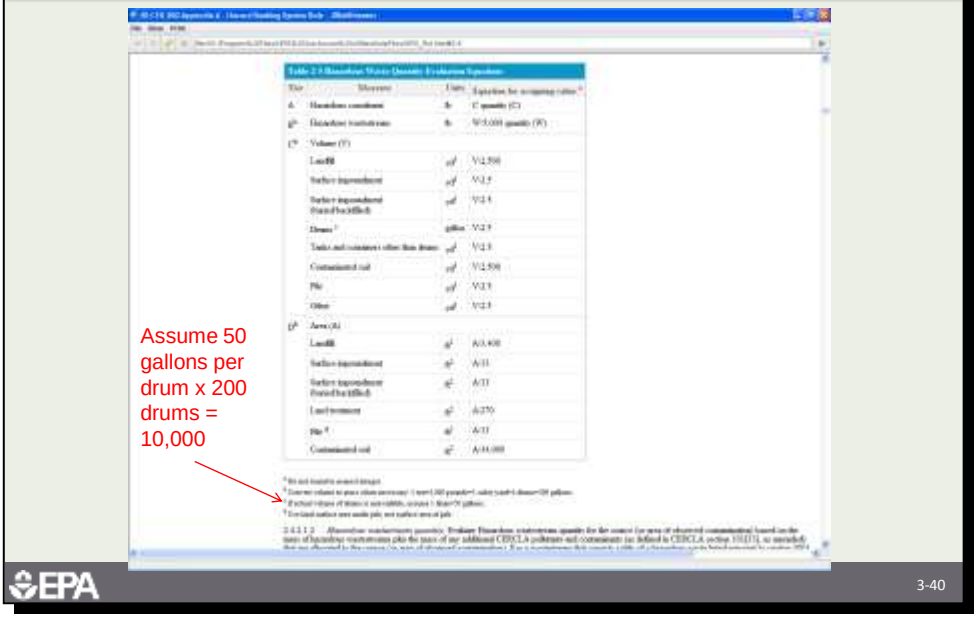
3-38

Source 1 – Step 2 – Hazardous Waste Quantity



3-39

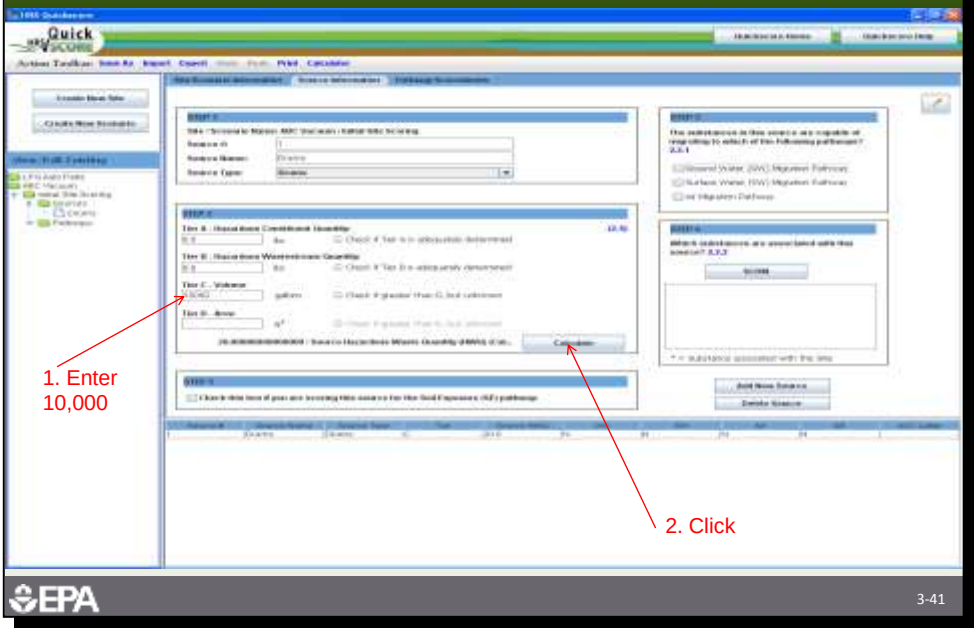
Source 1 – Step 2 – Hazardous Waste Quantity



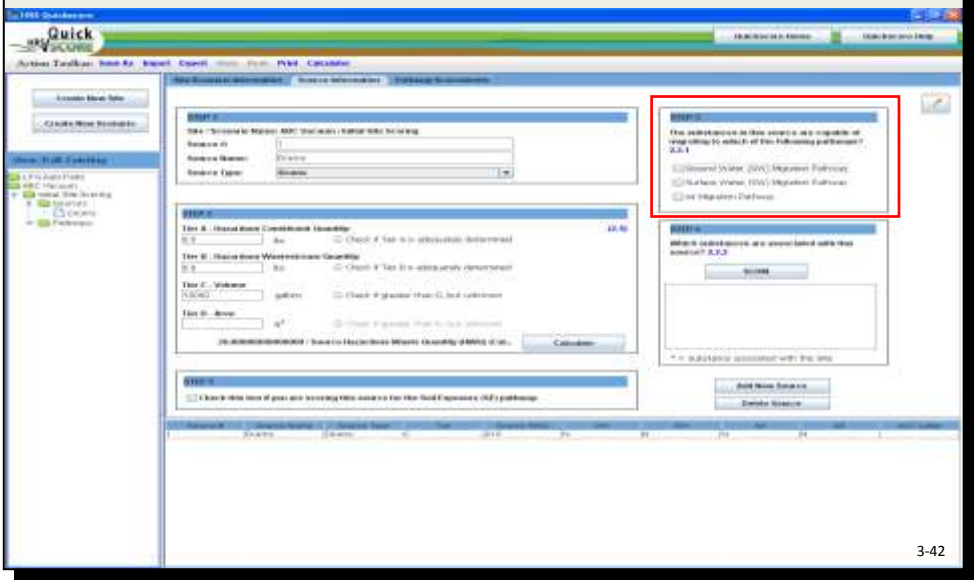
EPA

3-40

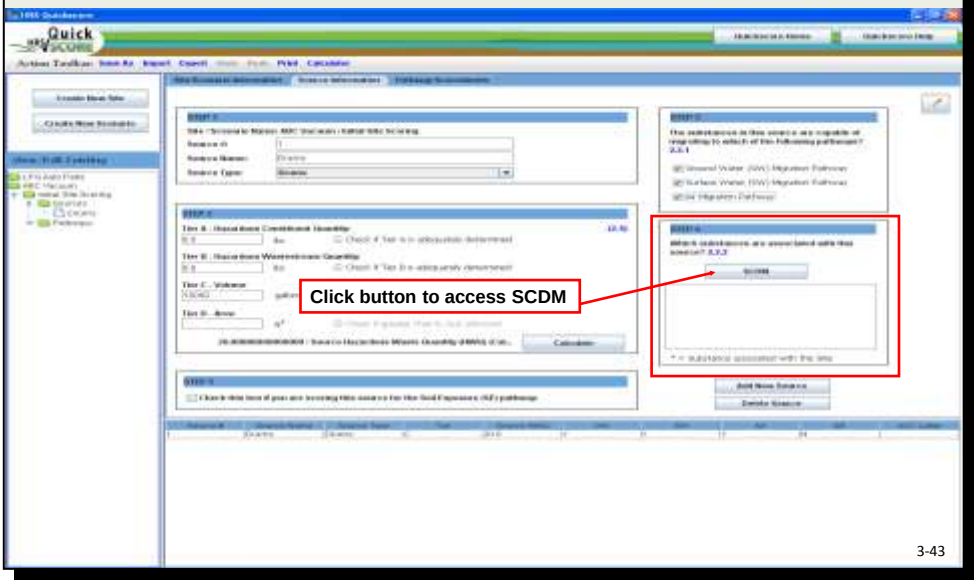
Source 1 – Step 2 – Hazardous Waste Quantity Volume



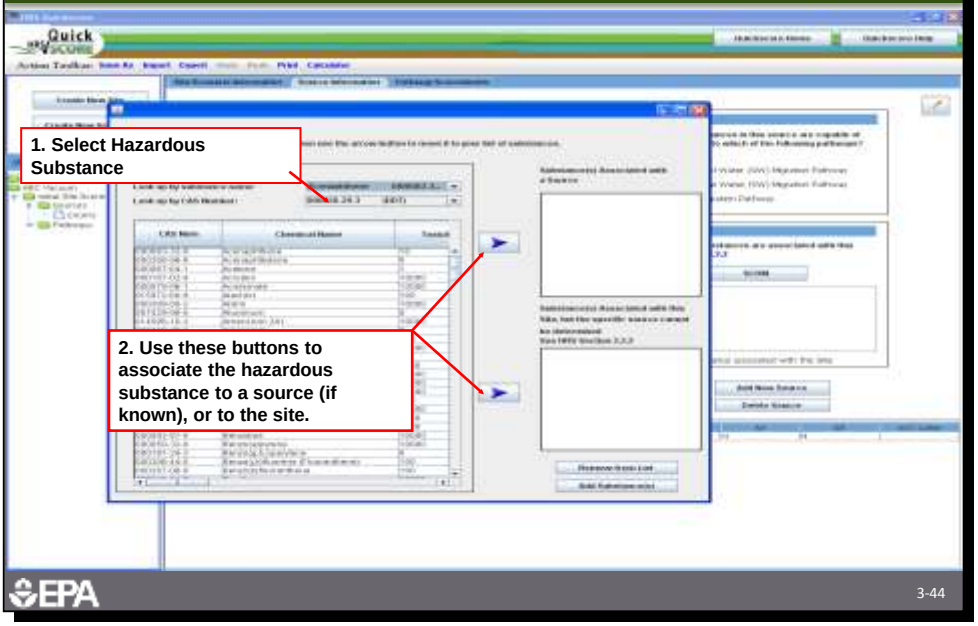
Source 1 – Step 3 – Availability to Migrate to a Pathway

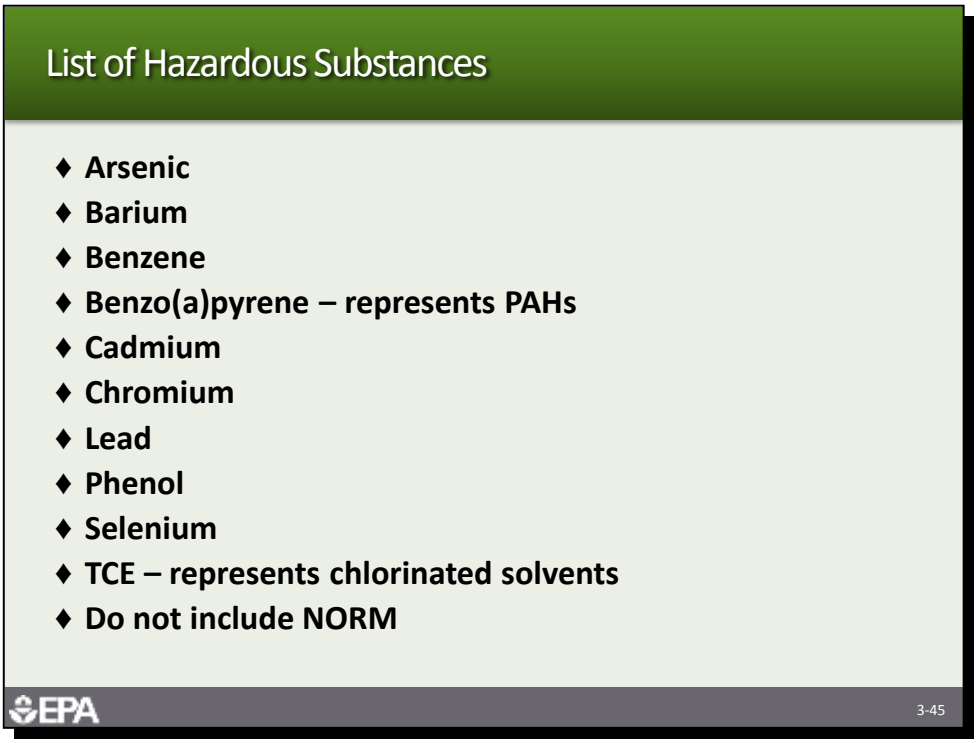


Source 1 – Step 4 – Hazardous Substances Associated with Source



Source 1 – Step 4 – Hazardous Substances Associated with Source

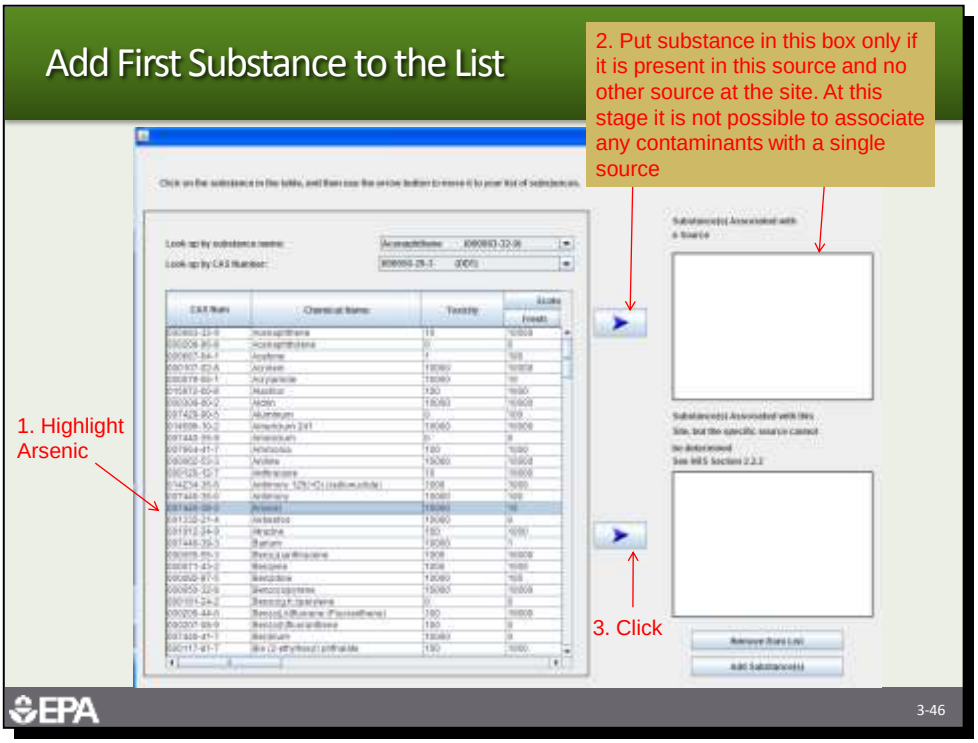




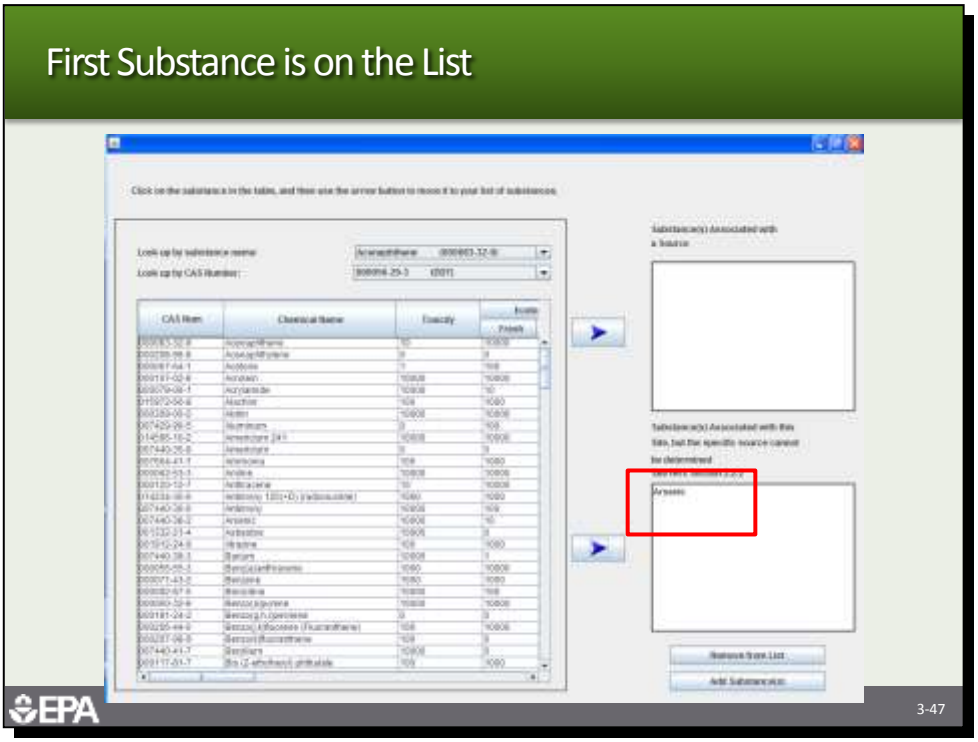
Notes

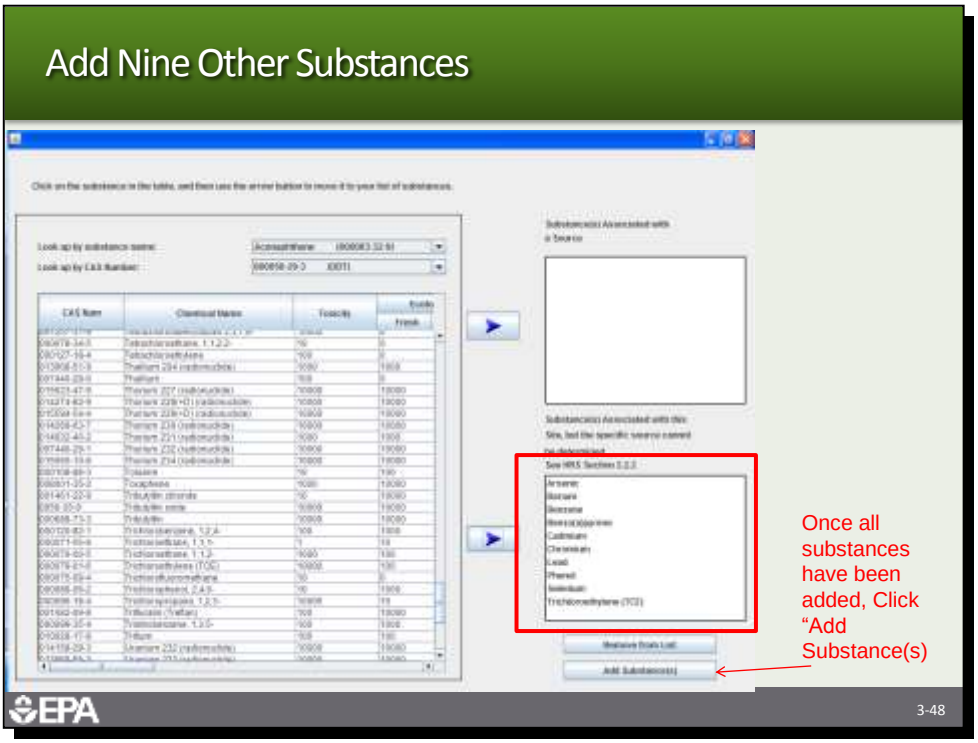
- This slide shows the list of contaminants generally associated with the ABC site. Two general categories of contaminants were listed, PAHs and chlorinated solvents. For the purpose of scoring, we decided to select the most toxic compounds in those two categories, benzo(a)pyrene representing PAHs and TCE representing chlorinated solvents. We will not include naturally occurring radioactive material (NORM).

Add First Substance to the List



First Substance is on the List

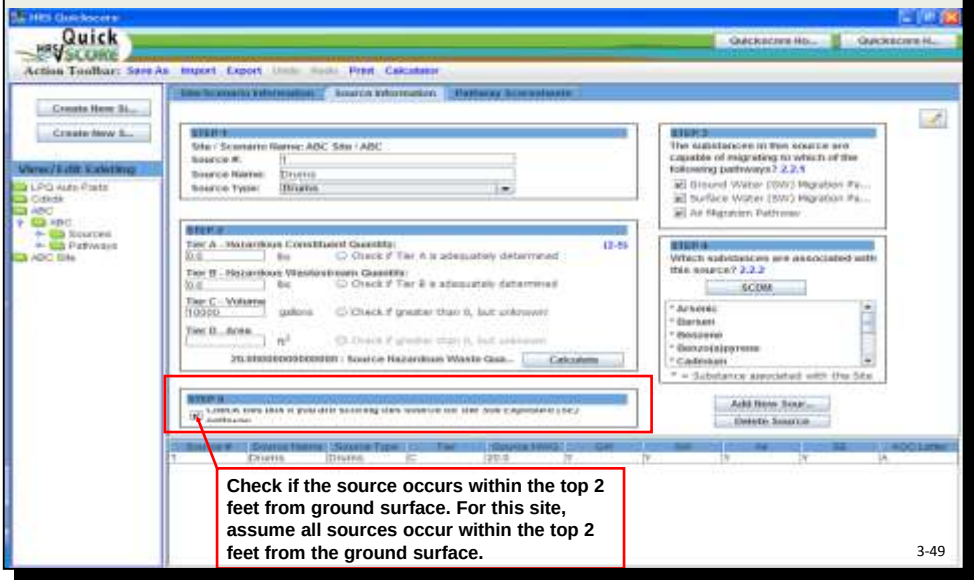




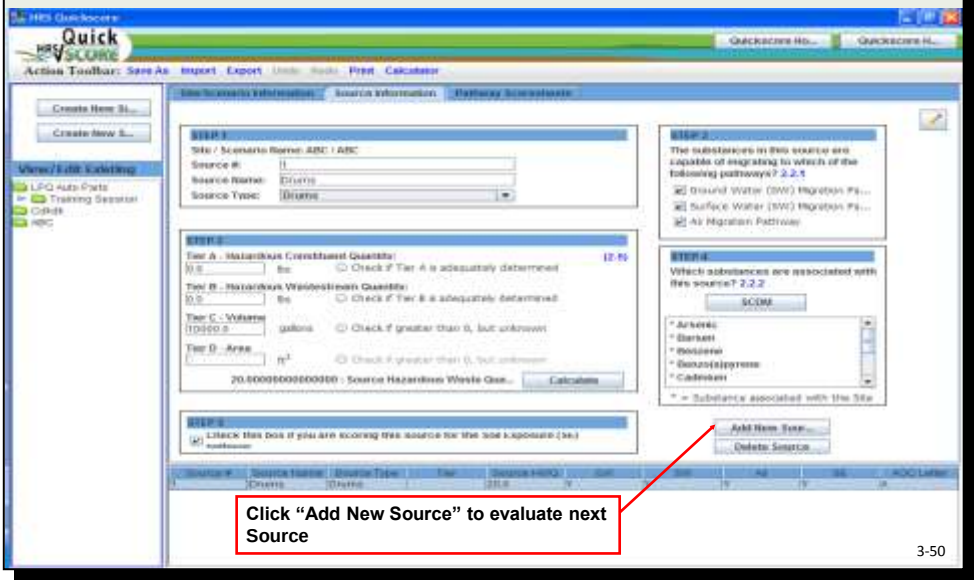
Notes

- Add the other nine hazardous substances in the same manner was done for Arsenic. Substances can be added and associated with the source and the site, but they cannot be the same substances. So for instance, if they were two drums labeled PCB oil, they could add PCBs as a substance associated with the source and have the other 10 substances associated with the site. Tell them to click the "Add Substances" button when they have all ten substances in the box.

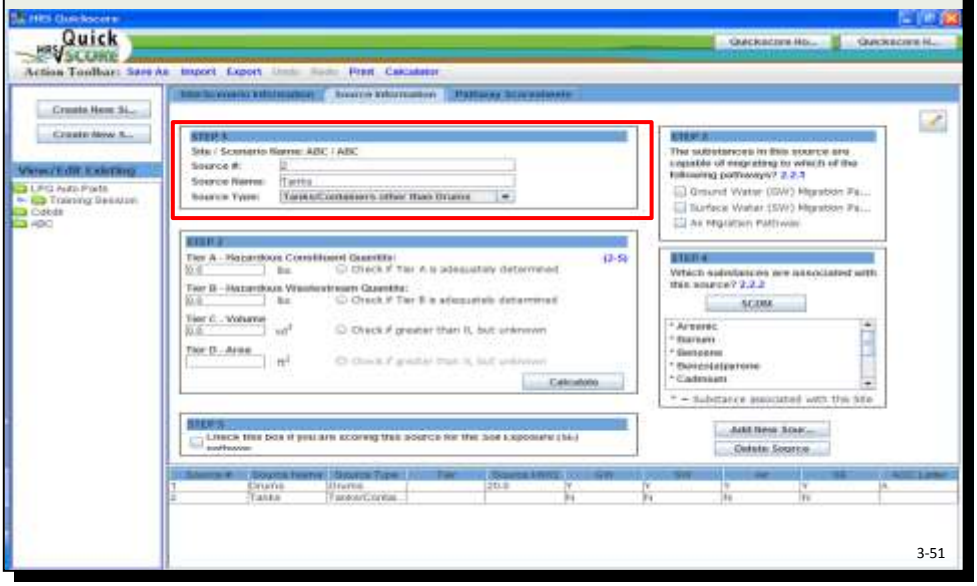
Source 1 – Step 5 – Determine if Source Can Be Considered for Soil Exposure Pathway



Source 1 – Source Characterization Complete



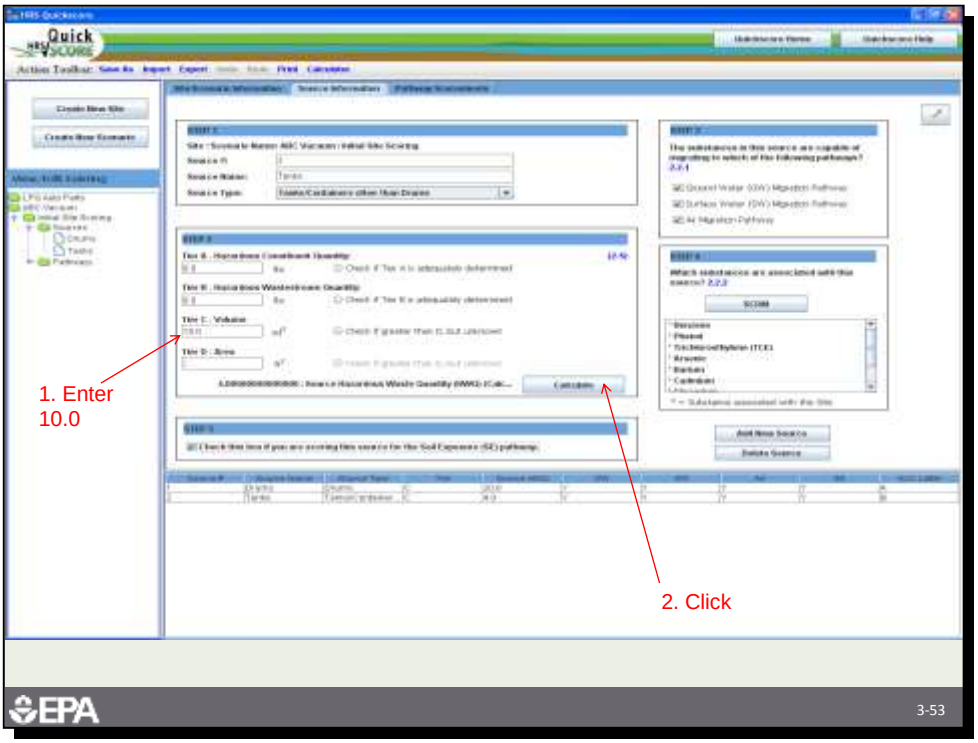
Source 2 – Tanks – Step 1 – Source Name and Source Type



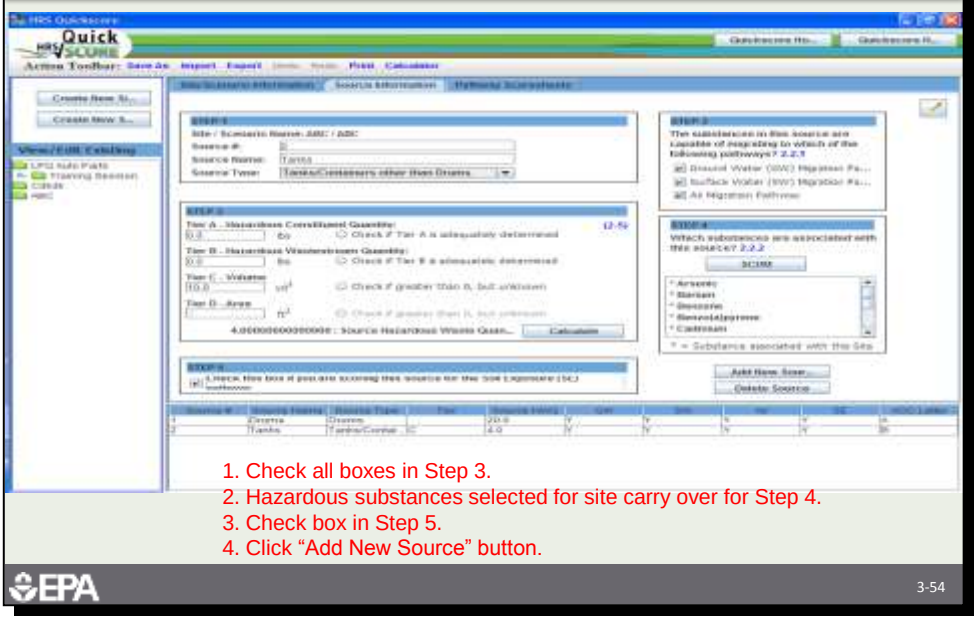
Tanks – Step 2 – Hazardous Waste Quantity

- **How many tanks are there?**
  - » Two 1,000 gallon tanks
- **What Tier should be used?**
  - » Tier C – Volume
- **What are the units needed?**
  - » Cubic yards
- **What is the conversion factor – see HRS Table 2-5**
  - » 1 ton = 2,000 lbs = 1 yd^3 = 4 drums = 200 gal
  - » 2,000 gal = ? yd^3

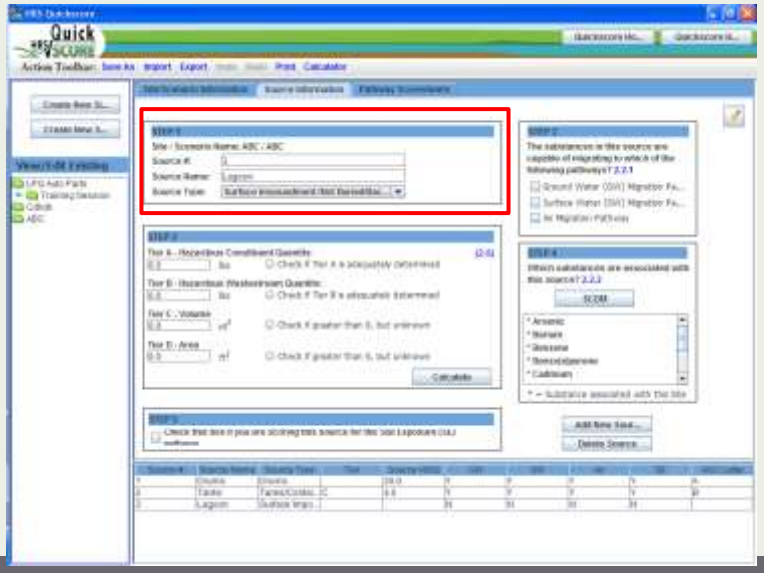
EPA 3-52



Tanks – Steps 3, 4 and 5



Source 3 – Lagoon – Step 1 – Source Name and Type

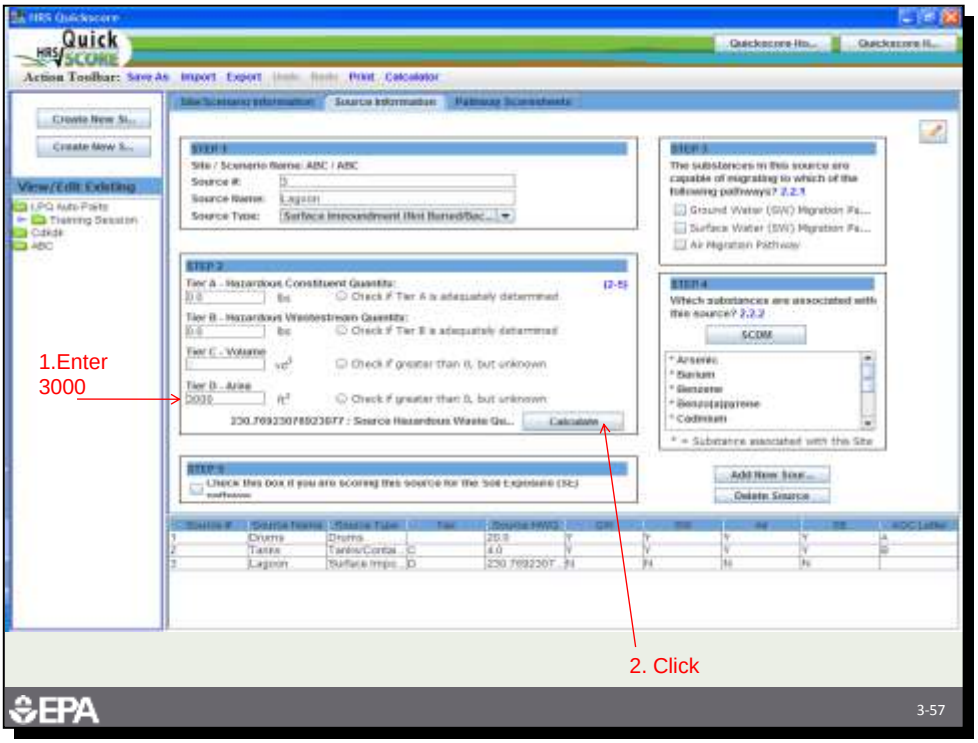


EPA 3-55

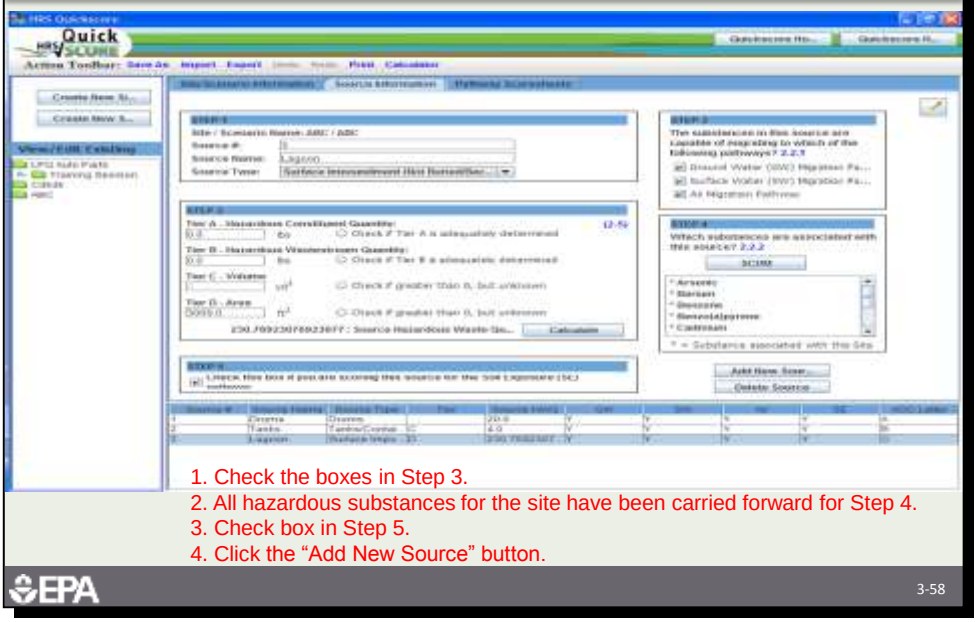
Lagoon – Step 2 – Hazardous Waste Quantity

- **What Tier should be used?**
  - » Tier C Volume or Tier D Area
  - » Tier D should be used because depth was not provided; therefore, volume cannot be calculated
- **What units are needed?**
  - » Square feet
- **How many square feet is the lagoon?**
  - » 3,000 square feet

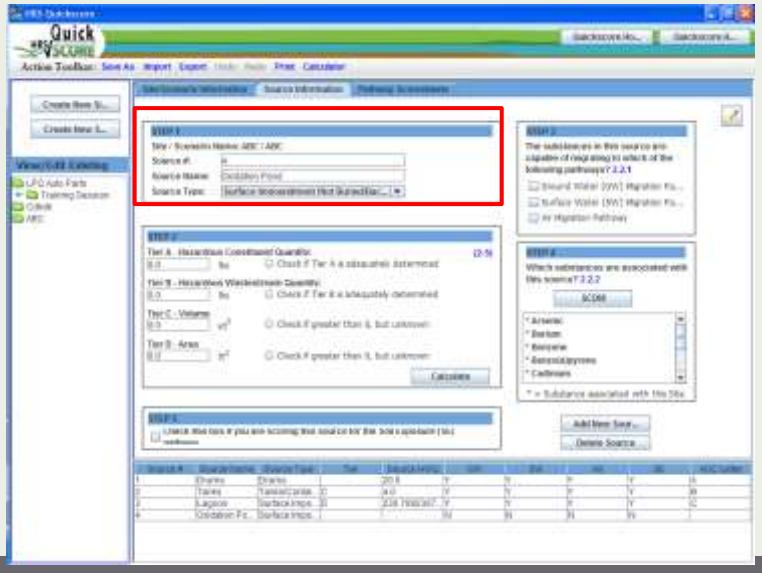
EPA 3-56



Lagoon – Steps 3, 4 and 5



Source 4 – Oxidation Pond – Step 1 – Source Name and Type

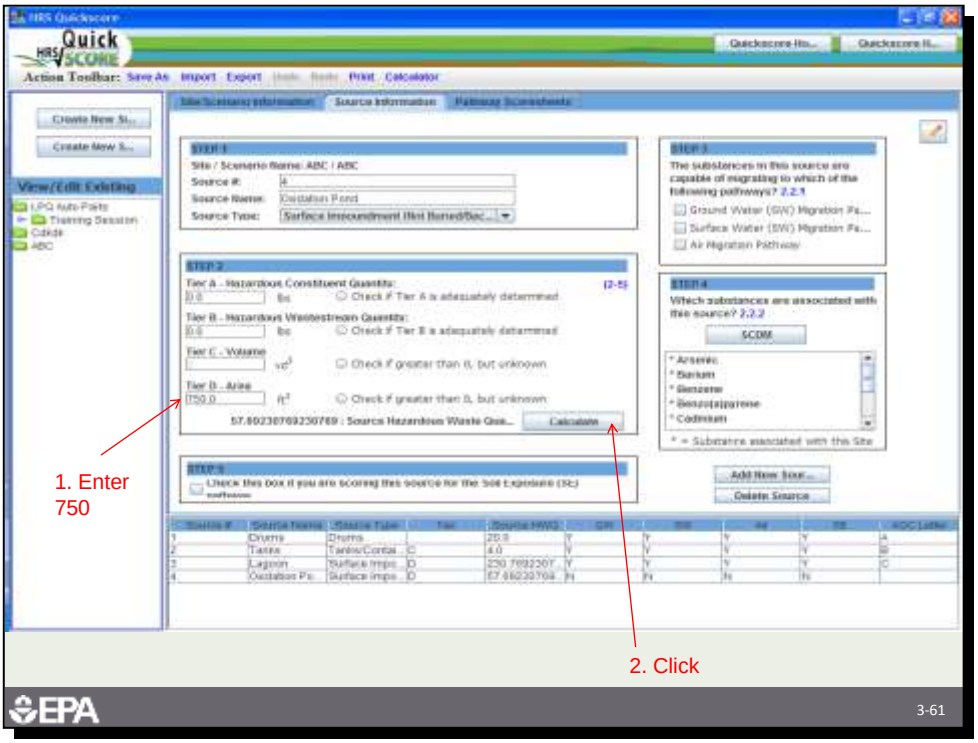


EPA 3-59

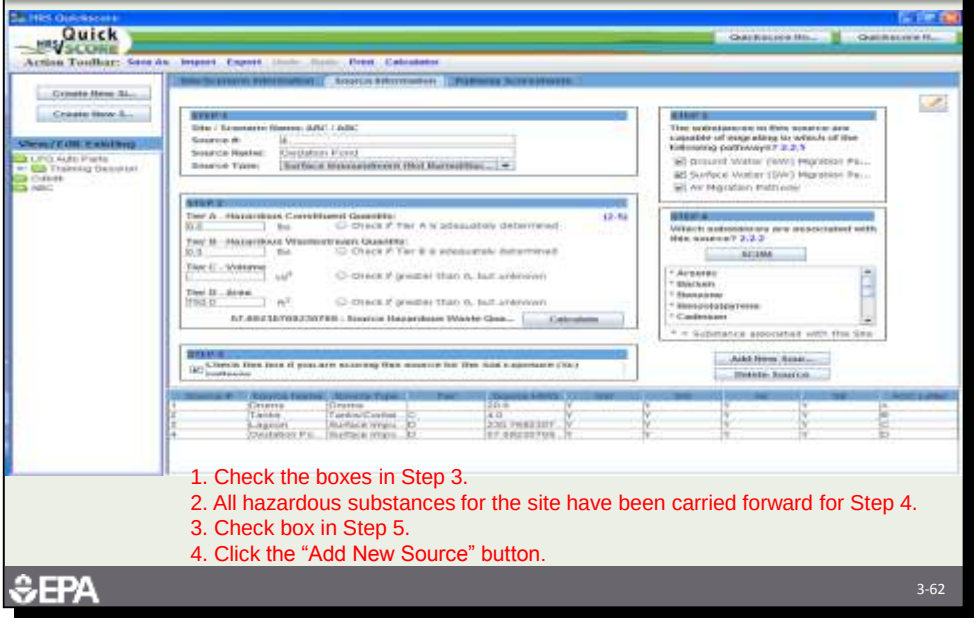
Oxidation Pond – Step 2 – Hazardous Waste Quantity

- **What Tier should be used?**
  - » Tier C Volume or Tier D Area
  - » Tier D should be used because depth was not provided; therefore, volume cannot be calculated
- **What units are needed?**
  - » Square feet
- **How many square feet is the oxidation pond?**
  - » 750 square feet

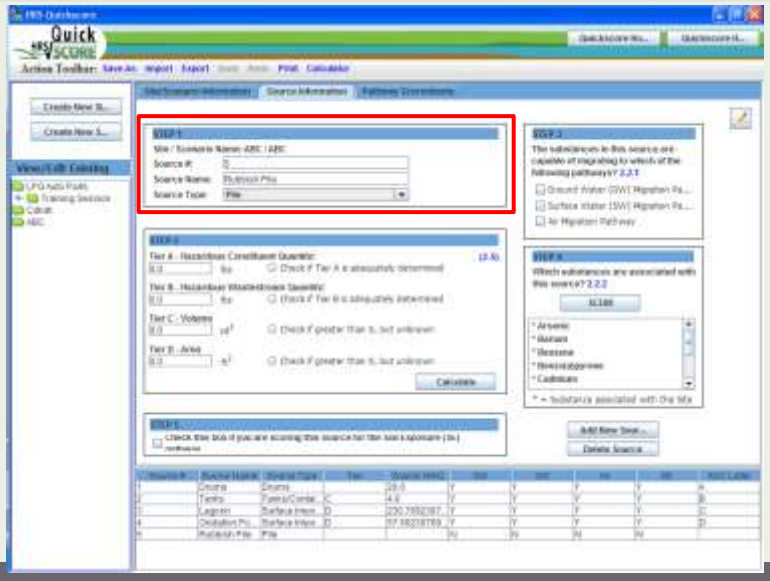
EPA 3-60



Oxidation Pond – Steps 3, 4 and 5



Source 5 – Rubbish Pile – Source Name and Type

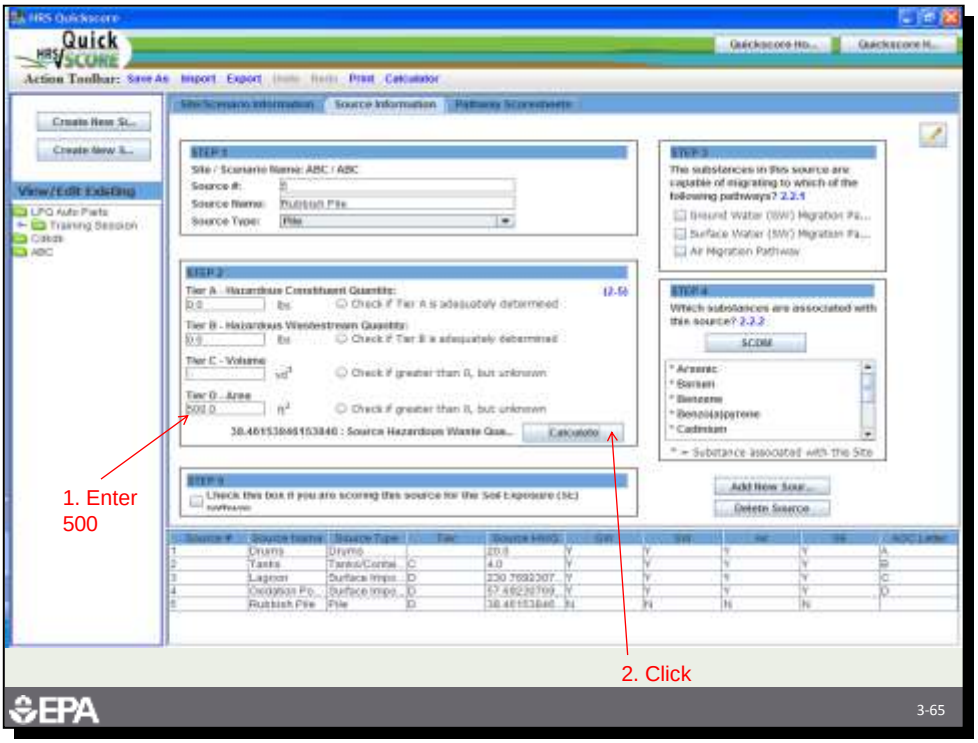


EPA 3-63

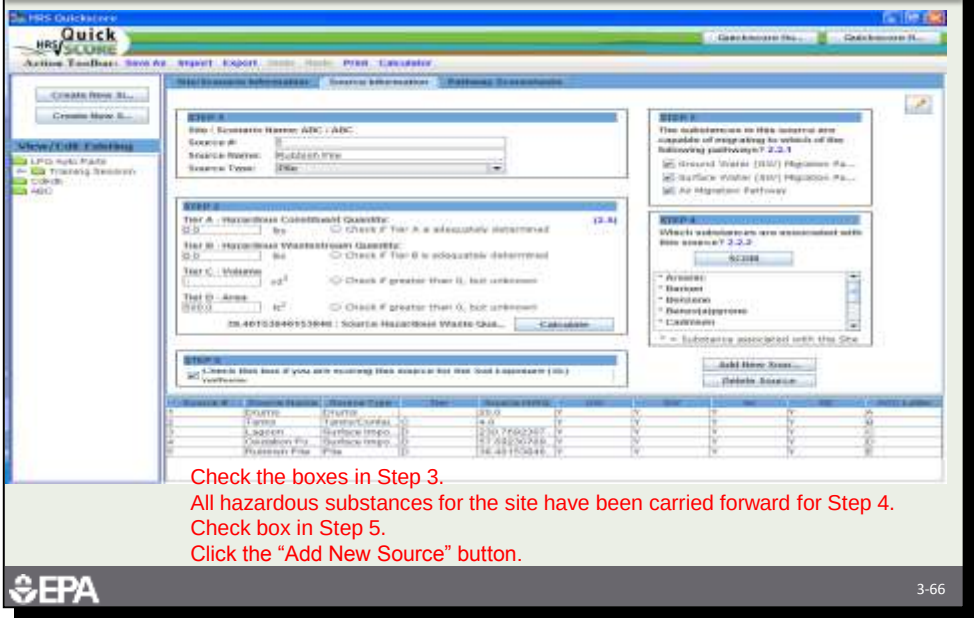
Rubbish Pile – Step 2 – Hazardous Waste Quantity

- **What Tier should be used?**
  - » Tier D – Area
- **What units are needed?**
  - » Square feet
- **Look at footnote "d" in Table 2-5**
- **What is area of rubbish pile?**
  - » 500 square feet

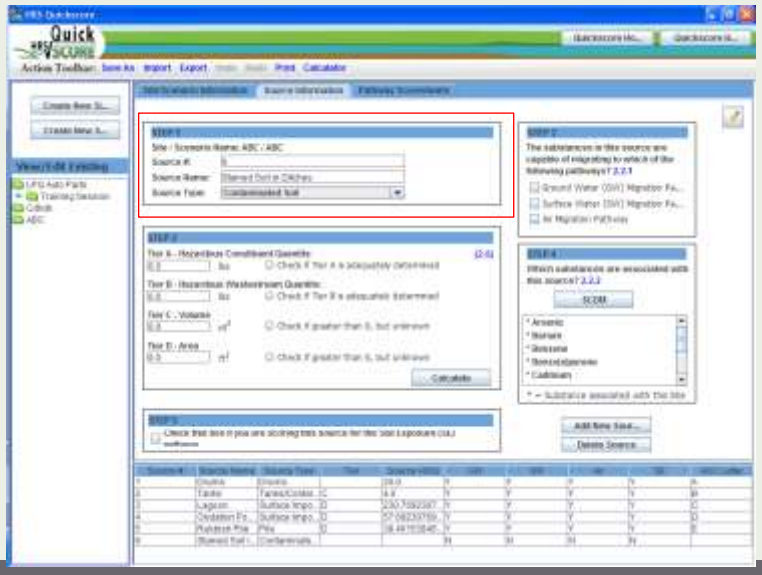
EPA 3-64



Rubbish Pile – Steps 3, 4 and 5



Source 6 – Stained Soil – Source Name and Type

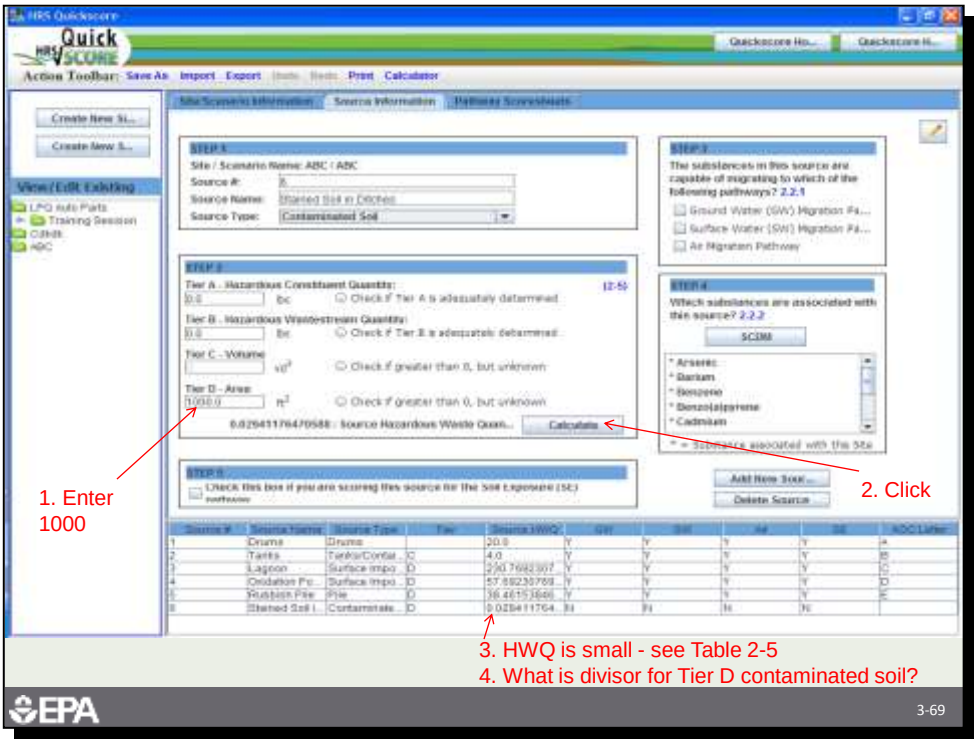


EPA 3-67

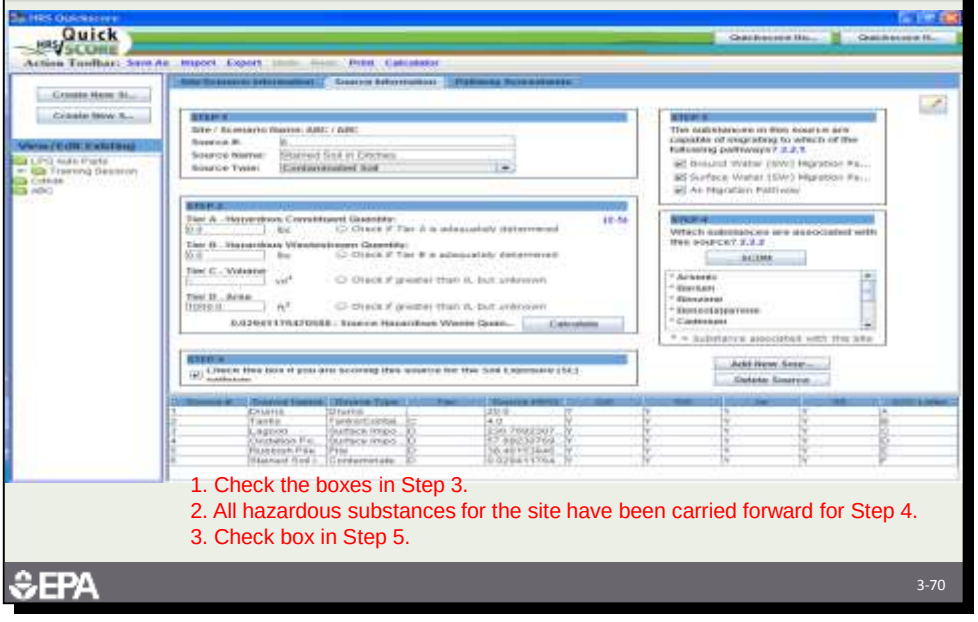
Stained Soil – Step 2 – Hazardous Waste Quantity

- **What Tier should be used?**
  - » Tier D – Area
- **What units are needed?**
  - » Square feet
- **What is area of stained soil?**
  - » 1,000 square feet

EPA 3-68



Stained Soil – Steps 3, 4 and 5



Final Sources 1 through 6

Source #	Source Name	Source Type	Tier	Source HWQ	GW	SW	Air	SE	AOC Letter
1	Drums	Drums		20.0	Y	Y	Y	Y	A
2	Tanks	Tanks/Contai...	C	4.0	Y	Y	Y	Y	B
3	Lagoon	Surface Impo...	D	230.7692307...	Y	Y	Y	Y	C
4	Oxidation Po...	Surface Impo...	D	57.69230769...	Y	Y	Y	Y	D
5	Rubbish Pile	Pile	D	38.46153846...	Y	Y	Y	Y	E
6	Stained Soil i...	Contaminate...	D	0.029411764...	Y	Y	Y	Y	F

The assigned source HWQ for the site will be automatically calculated for each pathway based on the information we entered for the sources

AOC letter or Area of Observed Contamination is for the soil exposure pathway

EPA 3-71

Summary

- **The objectives of the site scoring process are to:**
  - Use the HRS as a screening tool
  - Calculate a preliminary HRS score
- **The overall approach to scoring involves calculating:**
  - The waste quantity score
  - The pathway scores by evaluating factor categories
- **Existing analytical data should be used with caution**

(continued)

EPA 3-72

Summary

- Best professional judgment should be used to evaluate and score pathways, as appropriate and in the absence of existing data
- Proper understanding of PA and HRS terminology is necessary
- HRS Quicksocre is used to calculate pathway and site scores
- Several scenarios can easily be evaluated to determine what factors affect the pathway and overall site score
- Best professional judgment assumptions and hypotheses can be tested during the SI

EPA 3-73

Next Webinar – Module 4

- Module 4 – Groundwater Migration Pathway Exercise will be on Wednesday, July 9, 2014.

QUESTIONS

EPA 3-74