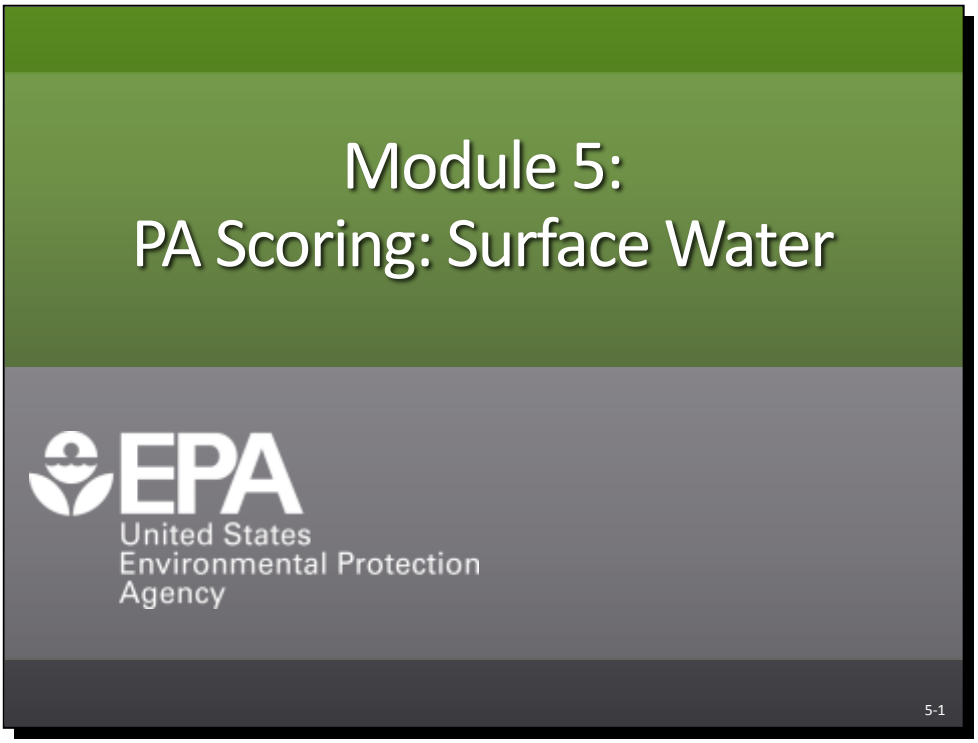
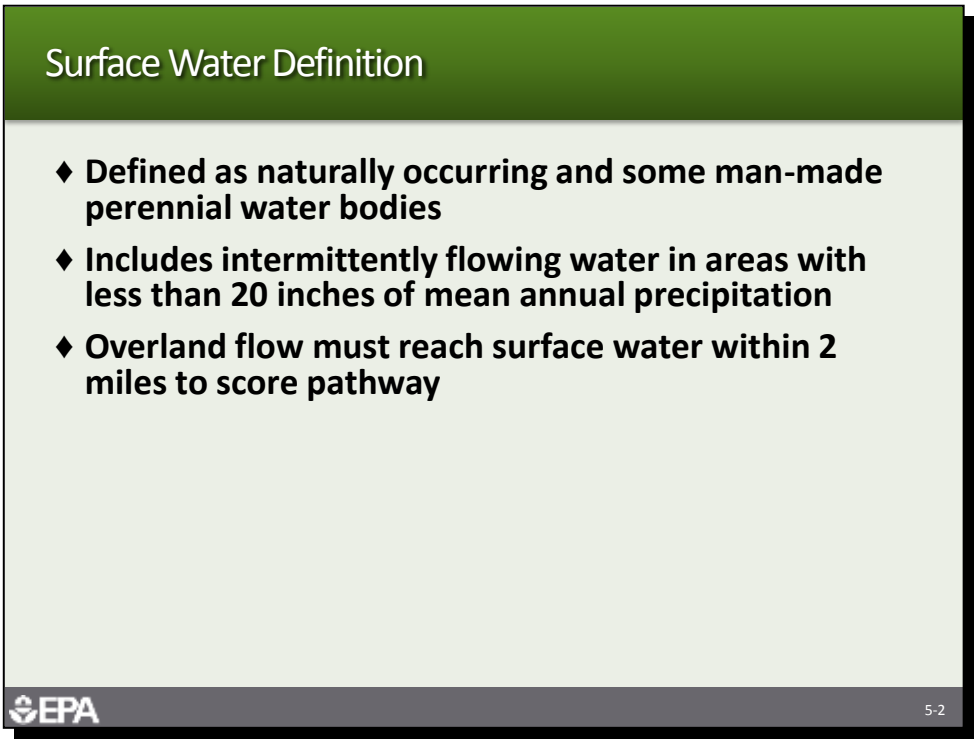
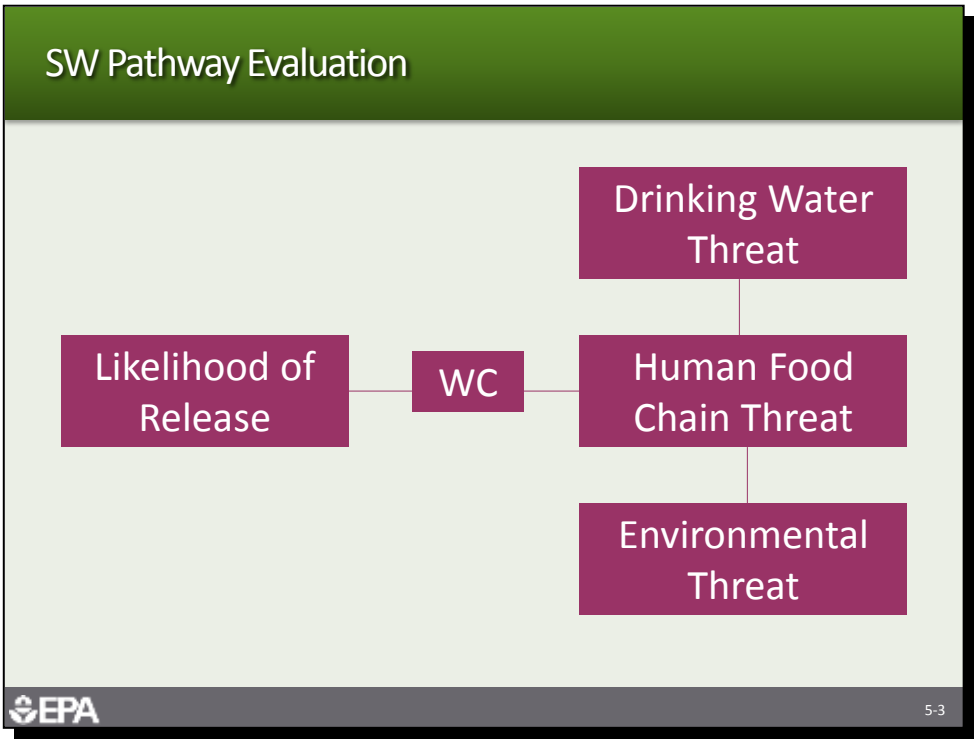

Module 5:
PA Scoring: Surface Water
EPA
United States
Environmental Protection
Agency
5-1



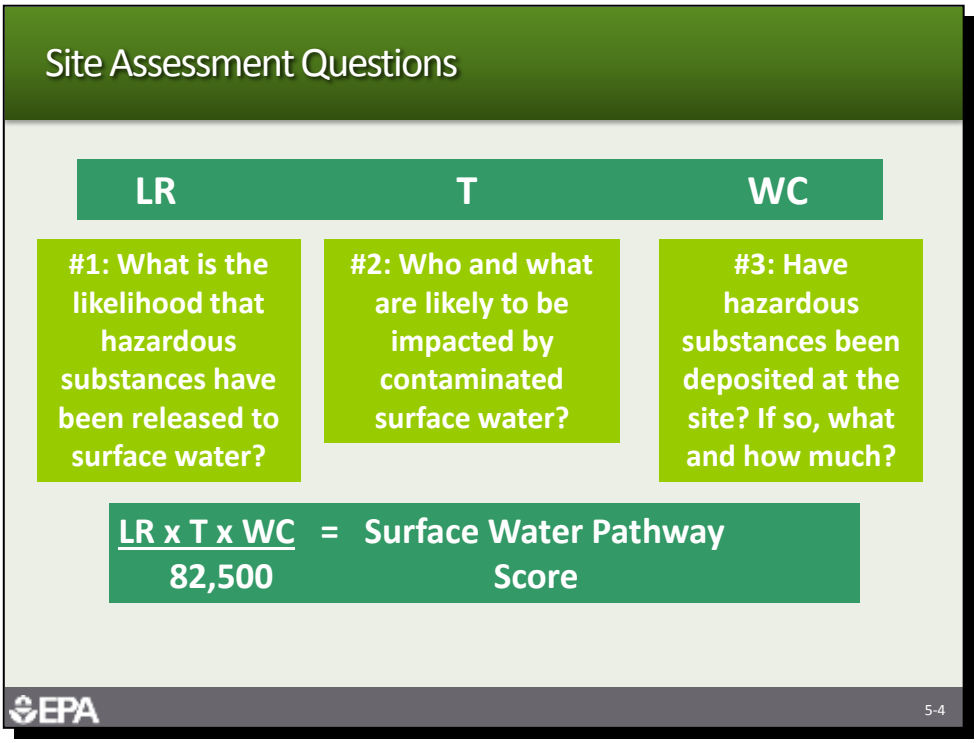
Notes

- **Defined as naturally occurring and some man-made perennial water bodies:** Surface waters include streams and rivers, lakes, coastal tidal waters, and oceans. Ditches qualify as surface water if they perennially flow into other surface water.
- **Includes intermittently flowing water in areas with less than 20 inches of mean annual precipitation:** In areas where the mean annual precipitation is less than 20 inches, intermittently-flowing waters and contiguous intermittently-flowing streams and ditches also qualify as surface water.
- **Overland flow must reach surface water within 2 mile to score pathway:** If there is no surface water within an overland flow distance of 2 miles from the site, this pathway should not be evaluated. However, the PA should identify the nearest surface water body and its distance from the site to support the reason for not evaluating the surface water pathway.



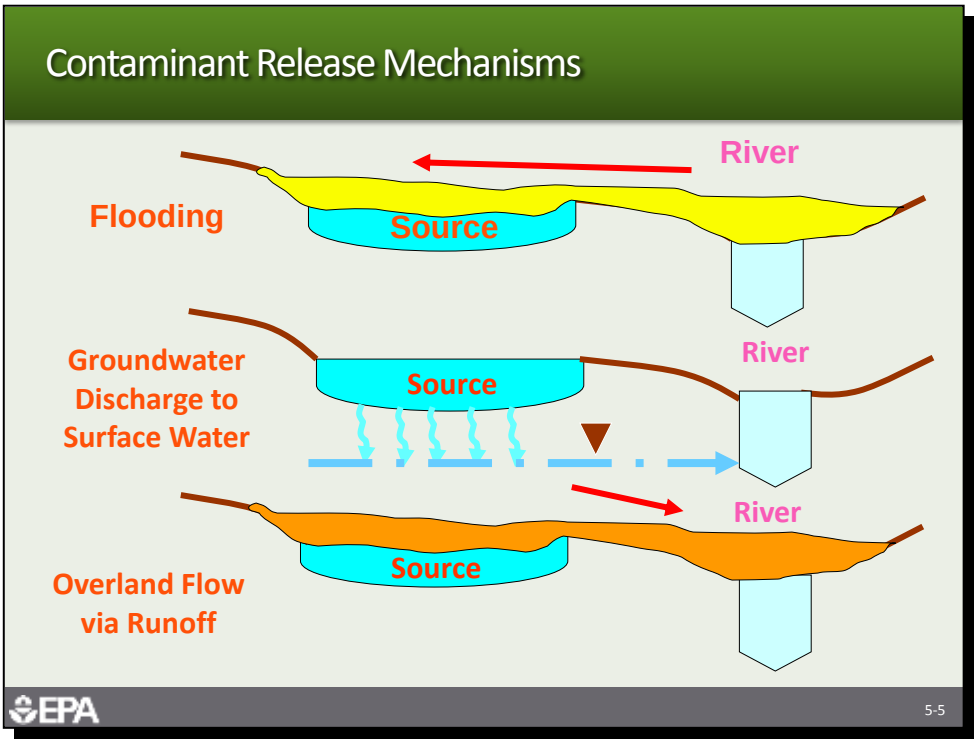
Notes

- **Surface water pathway evaluation:** The evaluation of the surface water pathway includes consideration of the likelihood of release, waste characteristics, and three threats. The threats include separate target populations for drinking water, human food chain, and the environment. The scores from each threat are added together to obtain the surface water pathway score. In addition, the surface water pathway can be evaluated for overland flow and for groundwater to surface water, with the highest score being used.



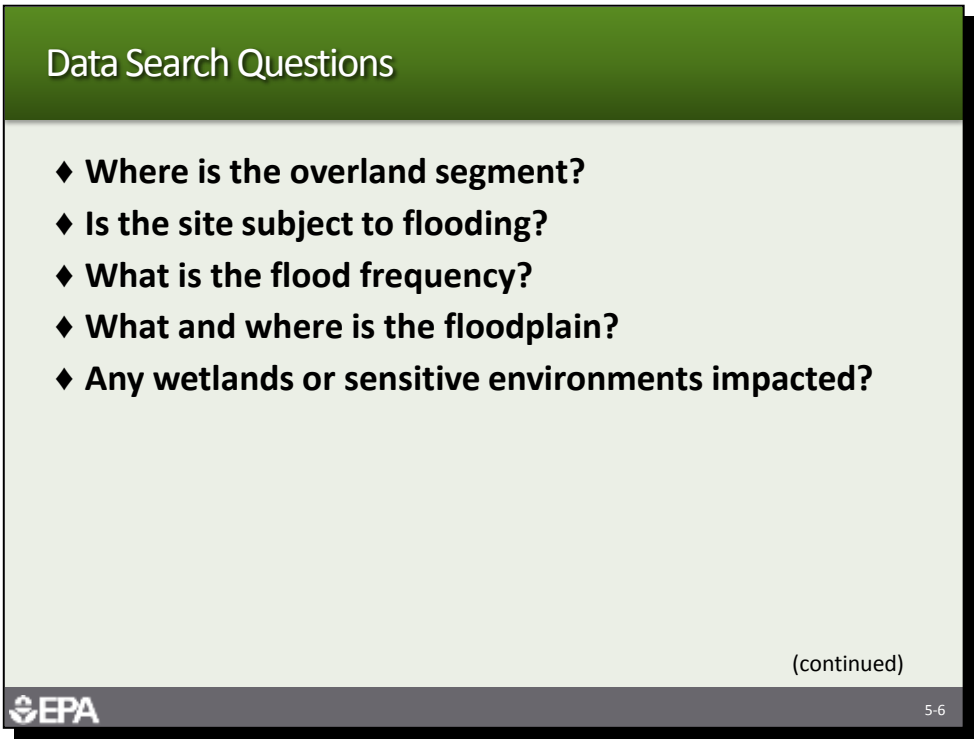
Notes

- **Site assessment questions:** The site assessment should answer the questions above so that this pathway can be scored. For LR, the PA should determine the likelihood that hazardous substances have been released to surface water and the SI should confirm through sampling whether or not releases have occurred. For T, the PA should evaluate whether target populations exist for (1) drinking water by evaluating the presence of intakes in the target distance limit, (2) human food chain by determining if fish and shellfish are consumed within the target distance limit, and (3) environment by locating any sensitive environments within the target distance limit. For WC, the PA should assess whether hazardous substances have been disposed of at the site, identify the types that have been disposed, and estimate the volumes, and the SI should confirm the presence of hazardous substances and ensure they are attributed to the site. The WC scores for each threat also evaluate the toxicity, mobility, and persistence of the hazardous substances, depending on the threat being evaluated.



Notes

- **Contaminant release mechanisms:** There are three contaminant release mechanisms that should be evaluated. The overland flow mechanism evaluates both flooding of a surface water body and overland flow into the sources and the overland flow of hazardous substances from the sources to the surface water body. The third mechanism is the discharge of hazardous substances from sources to underlying groundwater which then migrates and discharges to a surface water body.



Notes

- **Where is the overland segment?:** The PA should identify the overland segment, which is the drainage area from the sources to the surface water body. The overland segment may be a defined ditch or other obvious drainage way or may have to be estimated through site reconnaissance or from topographic maps. The PA should identify the shortest runoff route from the sources to the probable point of entry (PPE) into surface water.
- **Is the site subject to flooding?:** The PA should use existing information, interviews with local officials, and review of flood maps to determine if the site is subject to flooding or has ever flooded before.
- **What is the flood frequency?:** If possible, the PA should establish the frequency of flooding at the site. Existing information and flood maps should assist in determining flood frequency.
- **What and where is the floodplain?:** The PA should determine what type of floodplain the site lies in. This information is necessary to score the Potential to Release from flooding.
- **Any wetlands or sensitive environments impacted?:** The PA should identify all wetlands and other sensitive environments in the 15-mile TDL that may be affected by releases from the site.

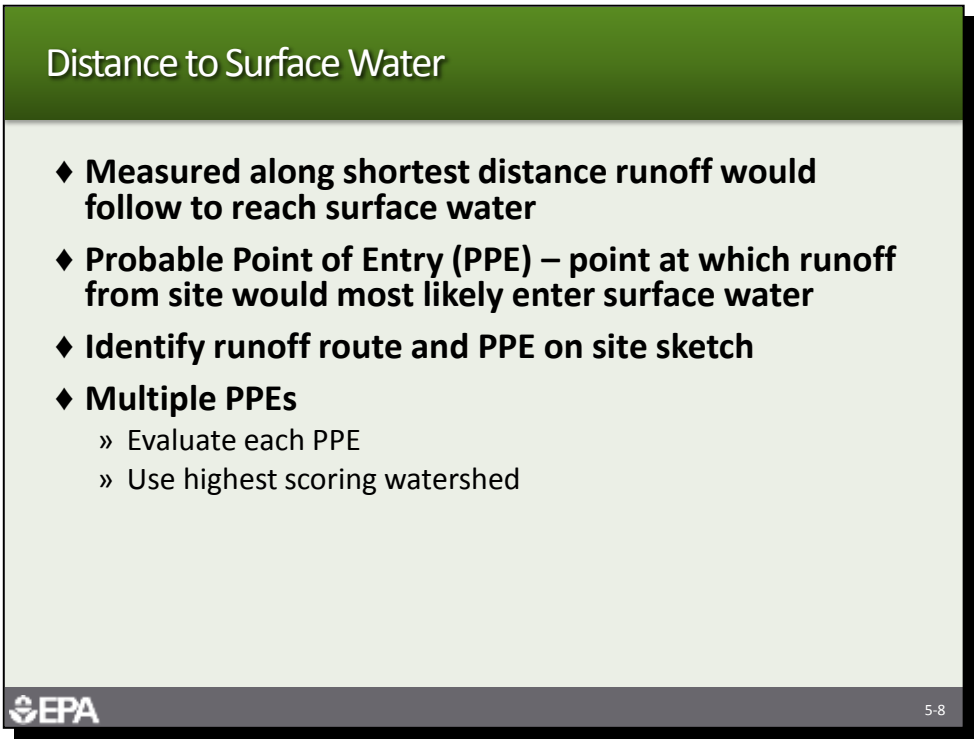
Data Search Questions

- **Where is the in-water segment?**
- **What are the flow(s) of surface water bodies along the 15-mile TDL?**
- **Is surface water downstream used:**
  - » in drinking water intakes?
  - » for fishing?
  - » for recreation?

EPA 5-7

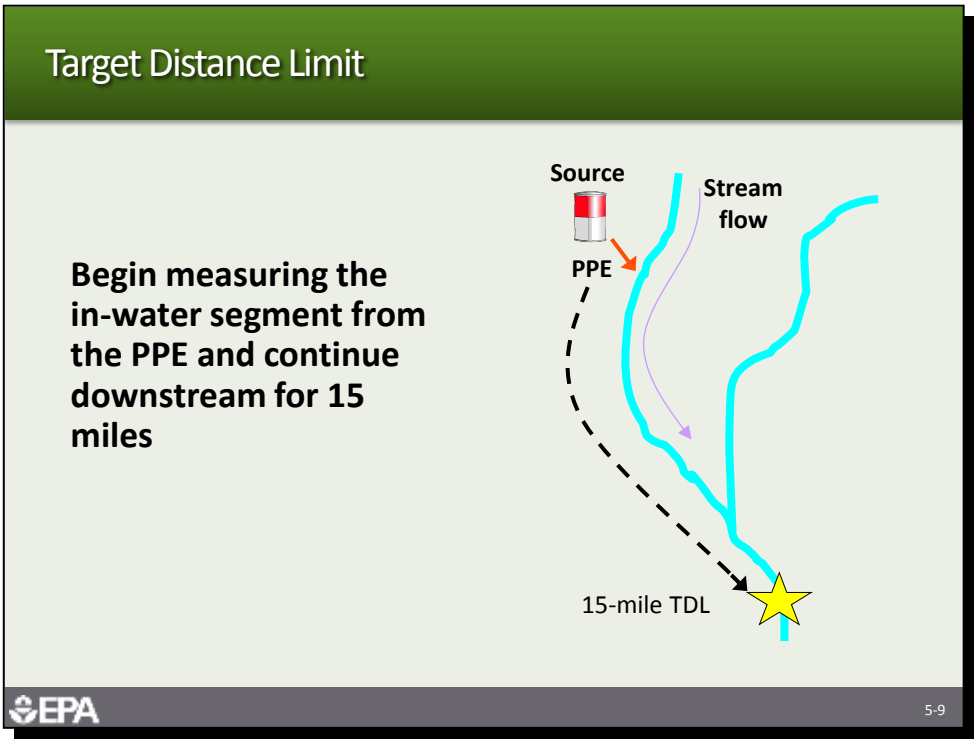
Notes

- **Where is the in-water segment?:** The PA should locate the 15-mile in-water segment on a map. All potential targets within the in-water segment should also be identified.
- **What are the flow(s) of surface water bodies along the 15-mile TDL?:** The PA should establish the flows of each different surface water body that occurs within the 15-mile TDL. This information is important for scoring each threat.
- **Is surface water downstream used?:** The PA should identify the uses of each type of water body located within the 15-mile TDL. The PA should evaluate drinking water uses, agricultural uses, fishing, and recreation.



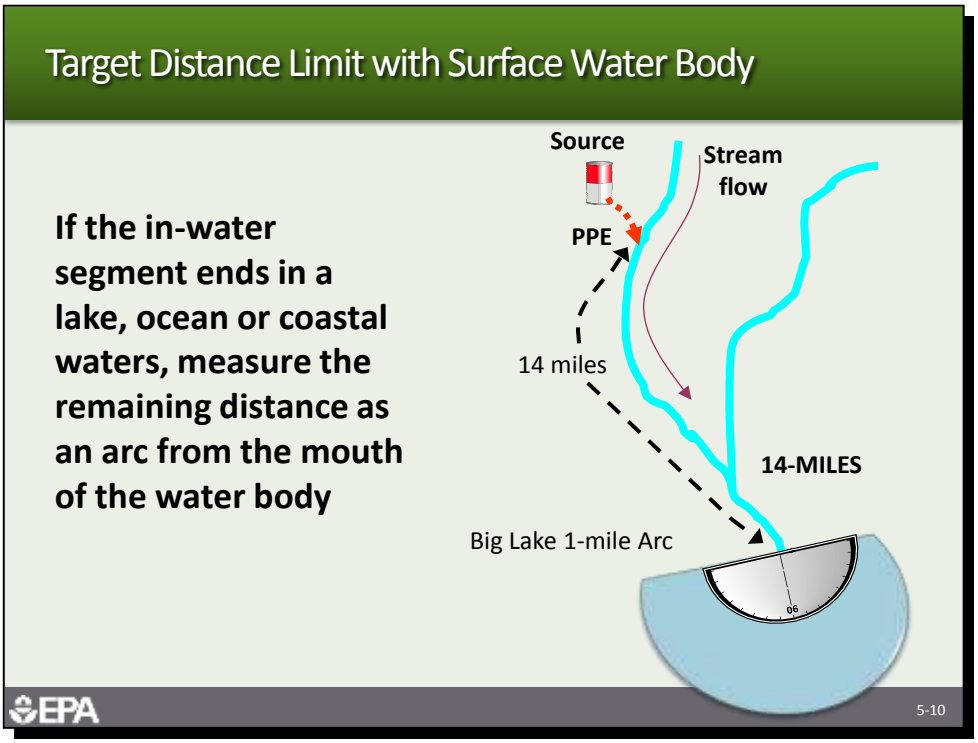
Notes

- **Measured along shortest distance runoff would follow to reach surface water:** The PA should estimate the shortest distance from the sources to the surface water. A straight line along the runoff path should be used unless another obvious drainage way is present. The distance should be measured during site recon if possible, or using a topographic map for longer distances.
- **Probable point of entry (PPE):** The PPE is that point at which runoff from the site would most likely enter surface water. All PPEs should be identified. The 15-mile TDL is measured starting at the PPE.
- **Identify runoff route and PPE on site sketch:** The site sketch developed based on the site recon should show the overland segment of the runoff route and the PPE.
- **Multiple PPEs:** Some sites may have more than one PPE. Each PPE should be identified and evaluated. The PPE and watershed that gives the highest score should be used.



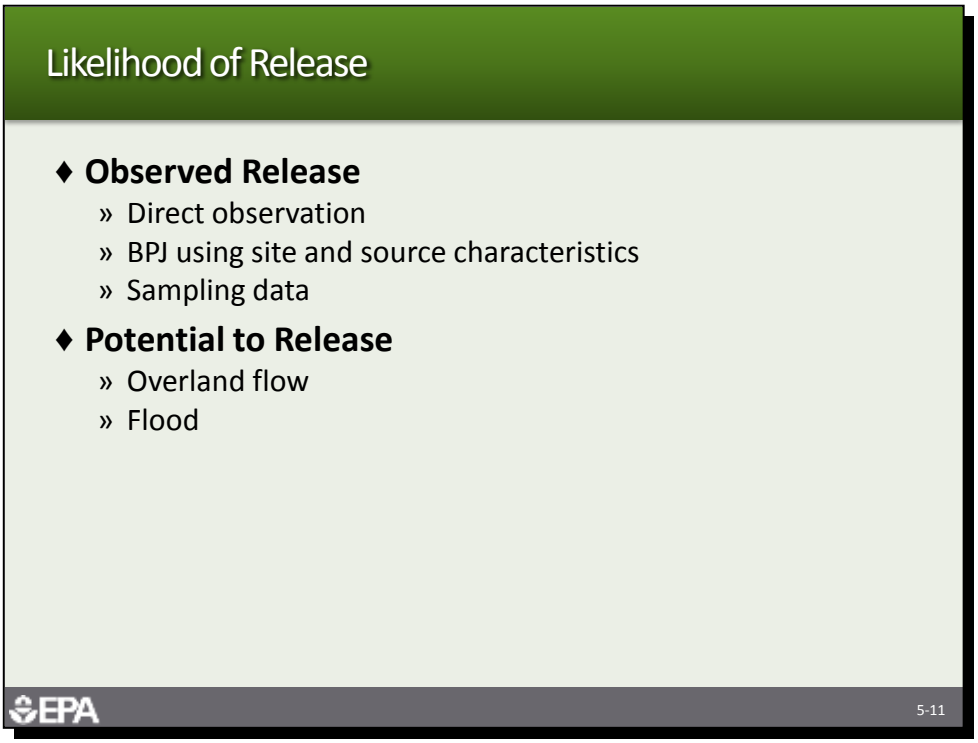
Notes

- **Target distance limit:** The TDL is the in-water segment measured from the PPE and continuing downstream for 15 miles. This example shows a TDL wholly on a river or stream.



Notes

- **TDL with surface water body:** When the in-water segment ends in a lake, ocean, or coastal waters, the remaining distance is measured as an arc from the mouth of the water body. The example above shows an in-water distance of 14 miles on a stream and a 1 mile arc in a lake.



Notes

- **Observed Release:** An observed release can be established by direct observation, such as from existing inspection reports that note such releases. As part of the PA, the evaluator must consider site and source characteristics and use their BPJ to determine if an observed release has occurred. Existing sampling data may also be available.
- **Potential to Release:** If an observed release cannot be established, then the potential to release can be evaluated. The potential to release evaluates overland flow from the source to the surface water and flooding potential.

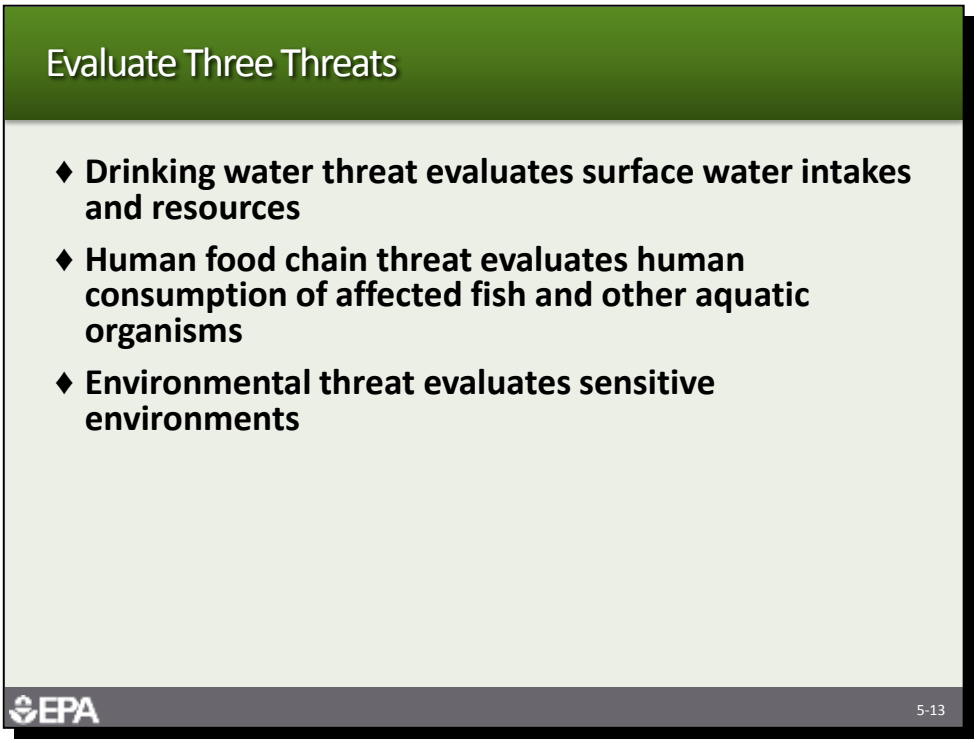
Potential to Release Information

- **Containment of sources**
- **Runoff – soil type, rainfall amount, drainage area size**
- **Distance from source to surface water**
- **Flood frequency – type of floodplain site is located in, which can be obtained from FEMA flood insurance maps**

EPA 5-12

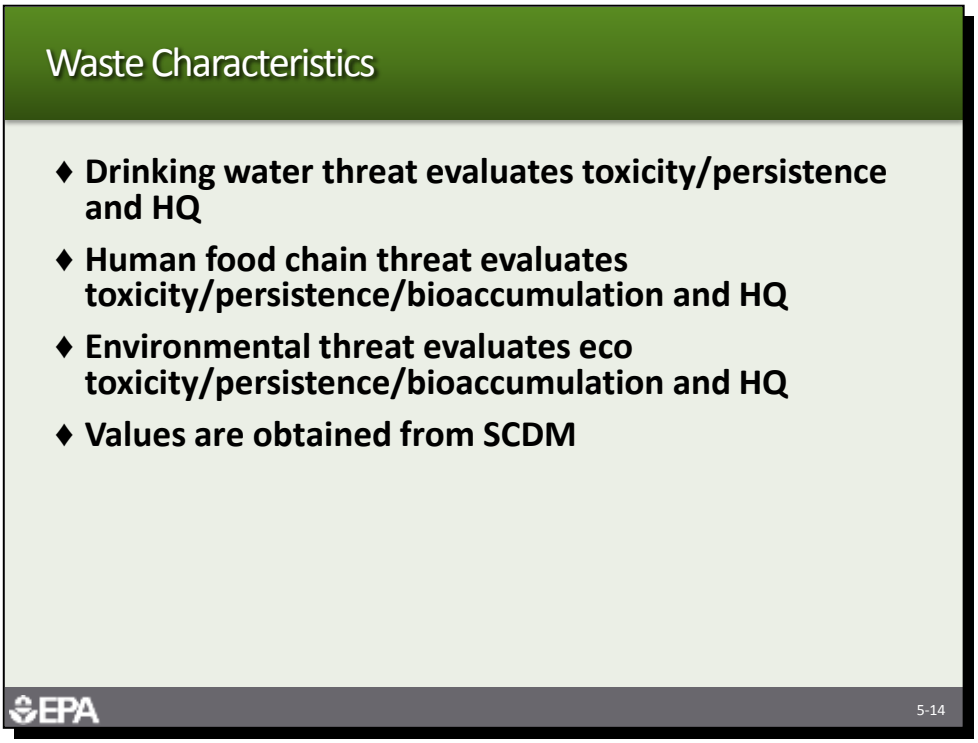
Notes

- **Containment of sources:** A score is assigned based on the containment of the sources at the site.
- **Runoff – soil type, rainfall amount, drainage area size:** A score is assigned for runoff based on the soil type at the site, the 2 year, 24-hour rainfall frequency, and the size of the drainage area.
- **Distance from source to surface water:** A score is assigned based on how close the source is to the surface water. The closer the source, the higher the score.
- **Flood frequency:** Flood frequency is evaluated based on the type of floodplain in which the site is located. The floodplain category can be obtained from FEMA flood insurance maps. The more frequently a site floods, based on the floodplain in which it is located, the higher the score.



Notes

- **Drinking water threat:** This threat considers the population that uses the surface water for drinking and resources, such as agriculture, food production, and recreation, that use the surface water.
- **Human food chain threat:** This threat considers human consumption of fish and other aquatic organisms. Estimates must be made of the amount of pounds of aquatic organisms that are produced annually.
- **Environmental threat:** This threat evaluates sensitive environments, such as wetlands, critical habitat for endangered species, and many other types of unique environments.



Notes

- **Drinking water threat:** For this threat, the WC includes the hazardous waste quantity (HQ) and the toxicity and persistence of the hazardous substances.
- **Human food chain threat:** For this threat, the WC includes the HQ and the toxicity, persistence, and bioaccumulation potential of the hazardous substances.
- **Environmental threat:** For this threat, the WC includes the HQ and the ecological toxicity, ecological persistence, and ecological bioaccumulation potential of the hazardous substances.
- **Values are obtained from SCDM:** The values for toxicity, persistence, and bioaccumulation potential can be obtained from the SCDM. Evaluators should make sure they have the most up-to-date version of the SCDM, which is updated periodically.

Drinking Water Threat Information

- **Identify surface water intakes in TDL**
- **Determine service connections and obtain average number of people served by each connection**
- **Apportion population for blended systems**
- **Identify resources that use surface water within TDL – agriculture, food production, livestock, major or designated recreation areas**
- **Determine or obtain water flow information at intakes in cubic feet per second**

EPA 5-15

Notes

- **Drinking water threat information:** The PA should collect as much information about the following elements so that a preliminary HRS score can be estimated:
  - » Surface water intakes – all intakes within the TDL should be identified
  - » Service connections – determine the number of service connections and obtain the average number of people served by each connection
  - » Blended systems – if the system is a blend of several intakes or intakes and groundwater wells, apportion the population for each intake
  - » Resources – identify resources that use surface water within the TDL, which may include agriculture involving the cultivation of 5 or more acres, food production that uses surface water, livestock watering, and major or designated recreation areas
  - » Flow information – determine or obtain water flow information at intakes in cubic feet per second

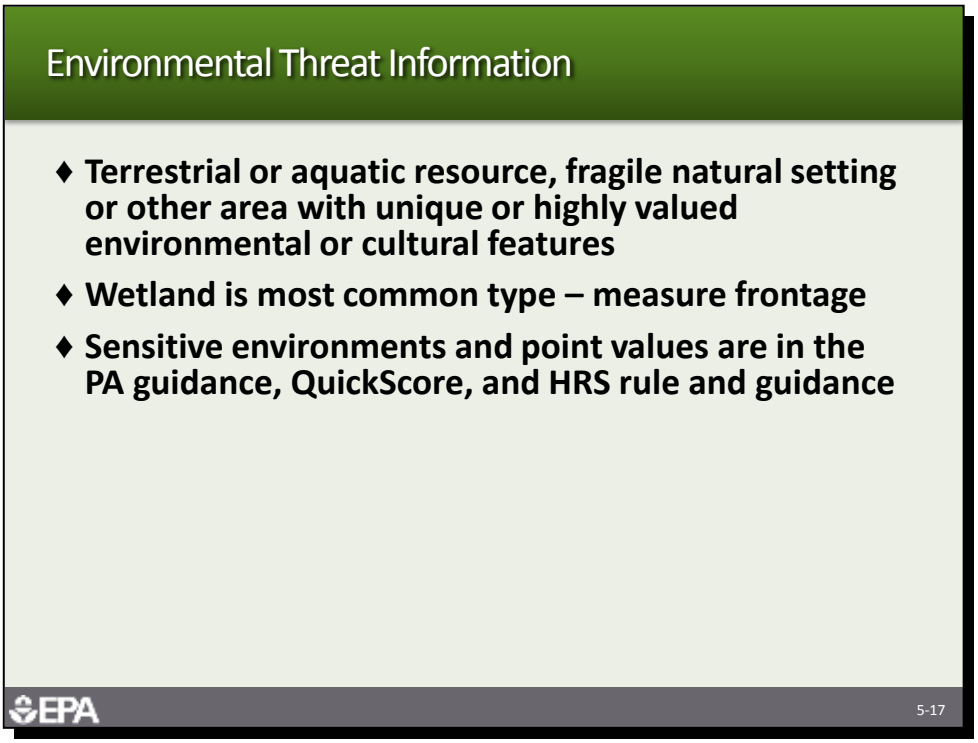
Human Food Chain Threat Information

- **Identify sport and commercial fisheries in TDL**
  - » Fishery - an area of a surface water body from which food chain organisms are taken or could be taken for human consumption
  - » Documentation of the catching and consumption of fish from the fishery is required
  - » Pounds of fish production per year needs to be estimated
- **Identify water body types and flow characteristics of all fisheries in TDL**

EPA 5-16

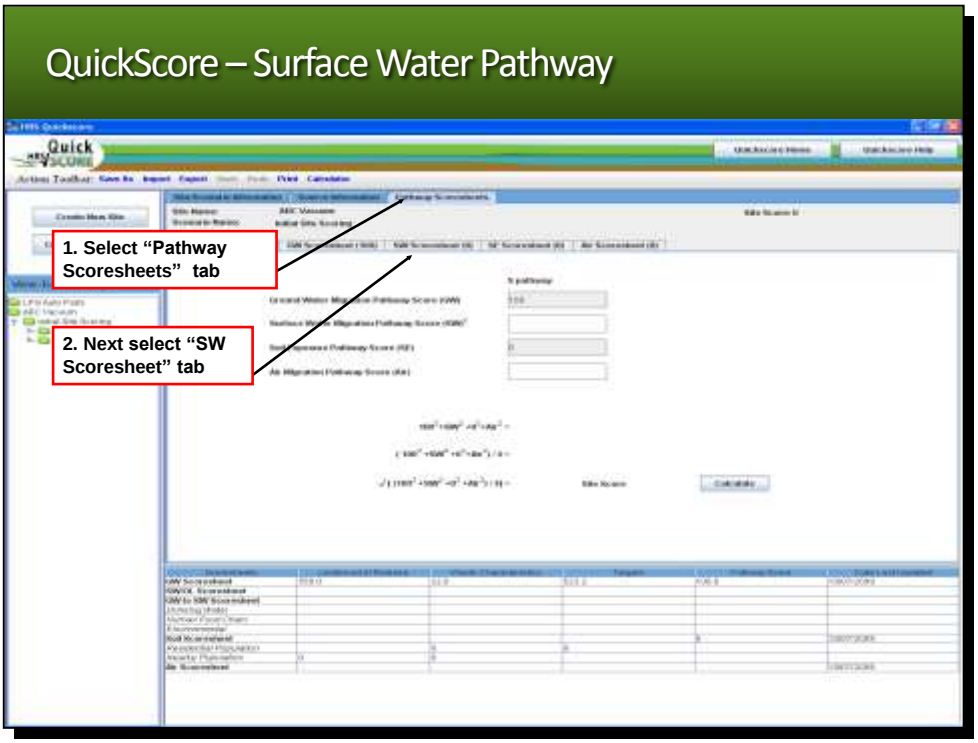
Notes

- **Human food chain threat information:** The PA should collect as much information about the following items in order to generate a preliminary HRS score:
  - » Sport and commercial fisheries – Identify all sport and commercial fisheries in the TDL and obtain estimates of the pounds of aquatic organisms harvested per year. A fishery is an area of a surface water body from which food chain organisms are taken or could be taken for human consumption.
  - » Water body types and flows – A surface water bodies in the TDL should be classified as to type, whether they are fresh or salt water, and their flow characteristics should be described.

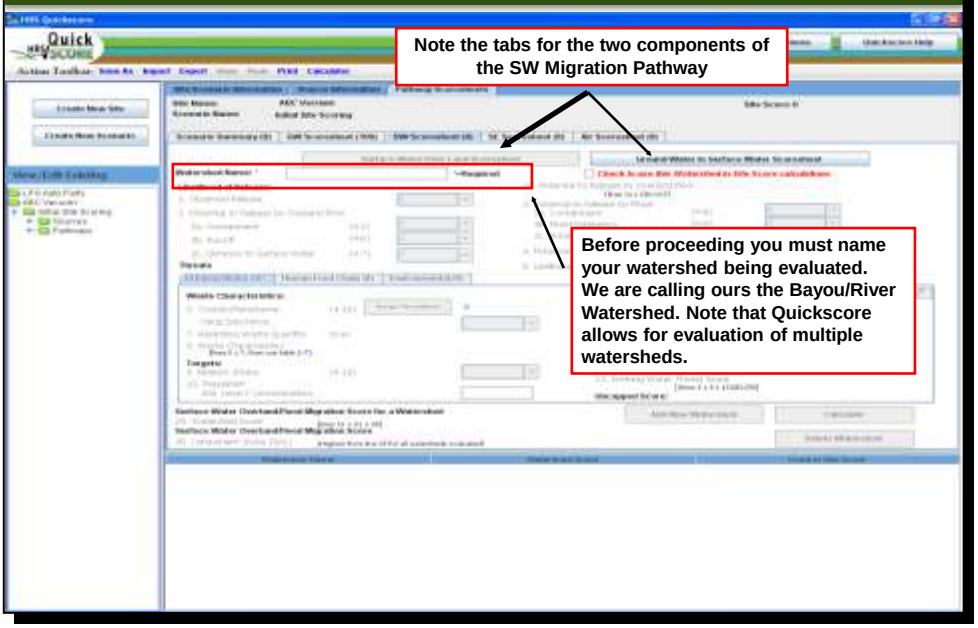


Notes

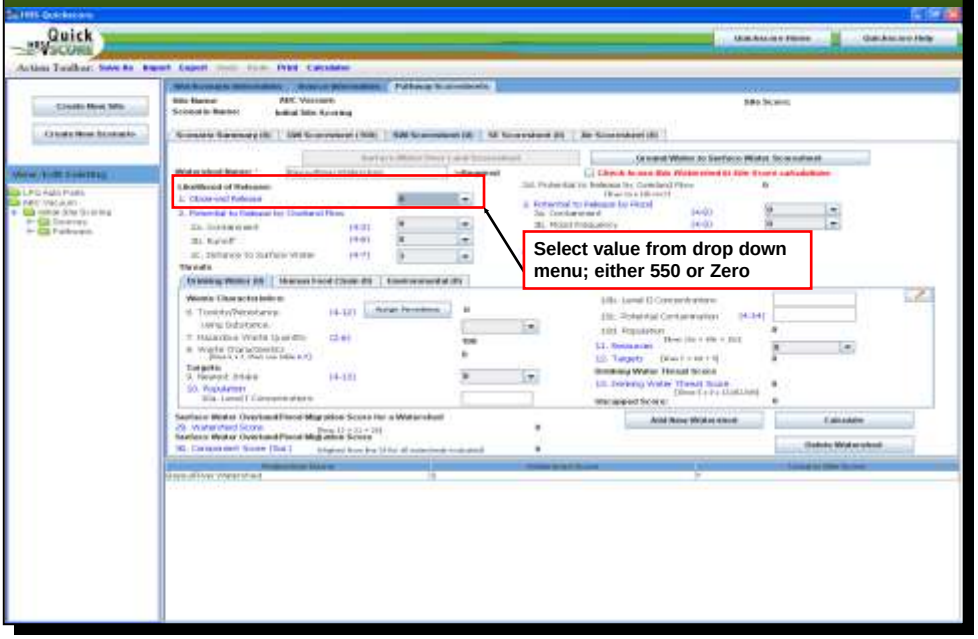
- **Environmental threat information:** The PA should collect as much information as possible on the following items in order to generate a preliminary HRS score:
  - » Terrestrial or aquatic resources – The environmental threat evaluates terrestrial and aquatic resources, fragile natural settings, and other areas with unique or highly valued environmental or cultural features should be identified.
  - » Wetlands – all wetlands should be identified and their frontage should be measured.
  - » Sensitive environments – the different types of environments considered to be sensitive and the point values associated with them are contained in the PA guidance, QuickScore, and the HRS rule and guidance.


QuickScore – Surface Water Pathway
1. Select "Pathway Scoresheets" tab
2. Next select "SW Scoresheet" tab

QuickScore – Surface Water Pathway



Is Observed Release Likely?



Evaluate SW Information for ABC Vacuum Site

- **Runoff is channeled into intermittent ditches along the perimeter of the facility**
- **These drainage ditches flow 6,000 feet (1.1 miles) into the perennial ditch**
- **The perennial ditch reaches the bayou 3 miles from where intermittent ditch dumps into it**
- **The distance between the bayou and the river is 10 miles**
- **Estimated flow rates:**
  - » Bayou = 15 cubic feet per second (cfs)
  - » River = 75 cfs

(continued)

EPA 5-21

Evaluate SW Information for ABC Vacuum Site

- **Both the bayou and the river are used for fishing and swimming**
- **There are no surface water intakes within the 15-mile target distance limit**
- **The following sensitive environments are present:**
  - » A critical habitat for federally designated endangered species is located 14 miles downriver from the PPE
  - » A 5-acre wetland is located downriver from the site
  - » The wetland frontage equals 0.4 miles
- **The site lies within a 500-year floodplain**
- **The drainage basin above the site covers about 165 acres**

EPA 5-22

Participant Poll – Label the Map – Place Label With Number Next to Appropriate Letter

1. End of TDL
2. Overland Segment
3. In-Water Segment
4. PPE

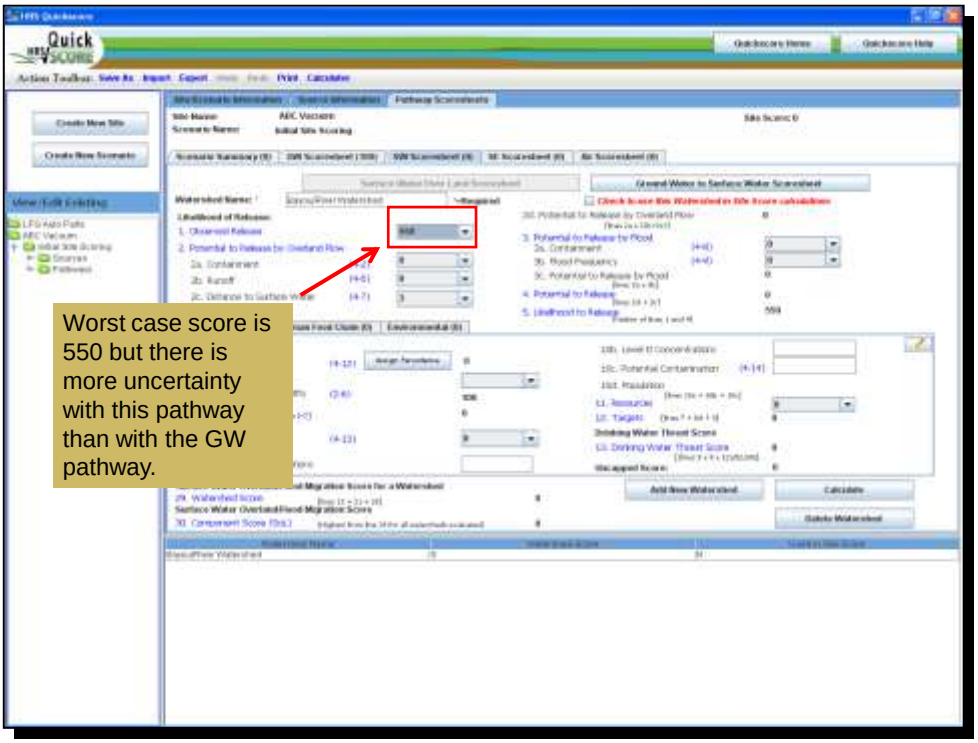
A. ?
B. ?
C. ?
D. ?
E. ?

EPA 5-23

SW Conditions of Note

- Distance from sources to PPE
- Migration potential of contaminants in surface water
- Attribution issues along 15-mile TDL
- Distance from site to environmental receptors

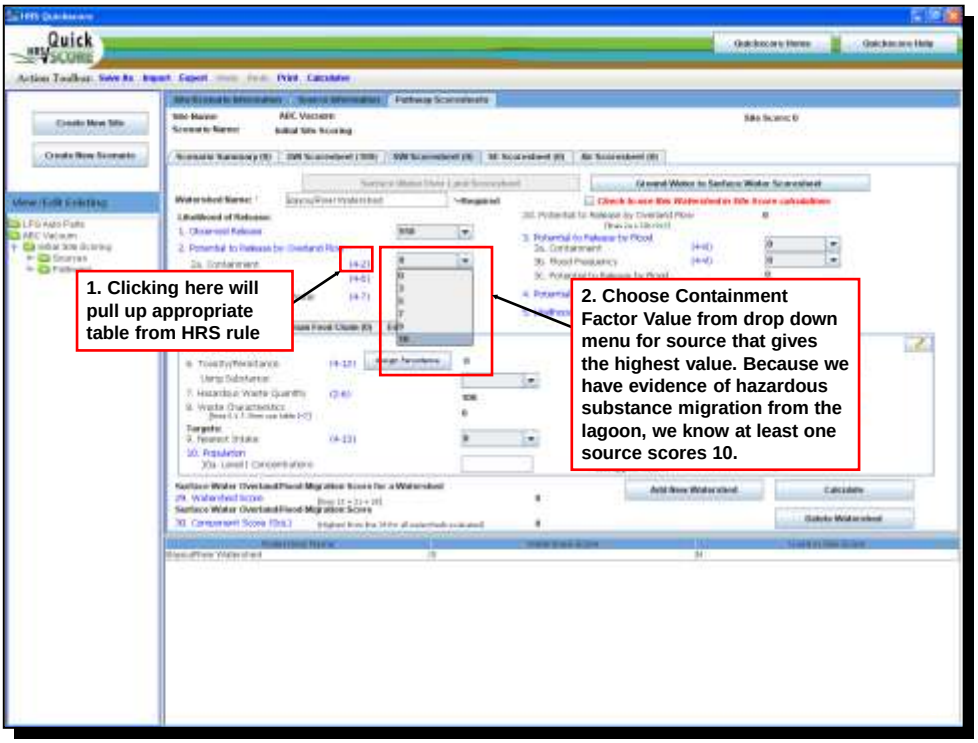
EPA 5-24



Potential to Release – Two Components

- **Overland flow**
  - » Containment of sources
  - » Runoff
  - » Distance to surface water
- **Flood**
  - » Containment of sources
  - » Flood frequency

EPA 5-26


1. Clicking here will pull up appropriate table from HRS rule
2. Choose Containment Factor Value from drop down menu for source that gives the highest value. Because we have evidence of hazardous substance migration from the lagoon, we know at least one source scores 10.

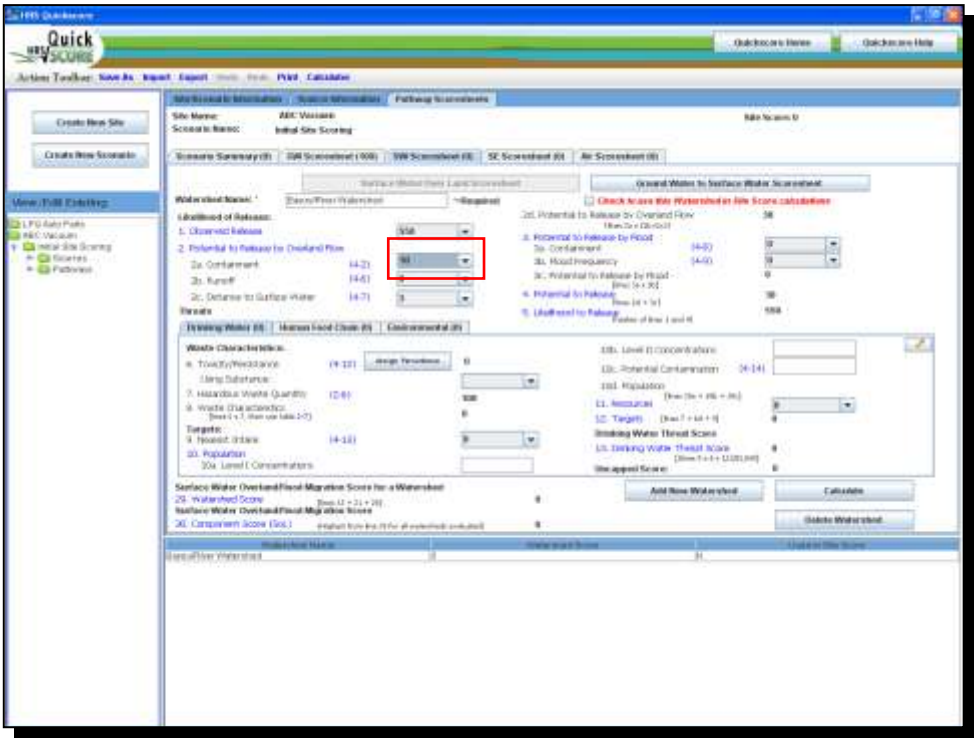


Table 4-2: Containment Factor Values for Surface Water Migration Pathway

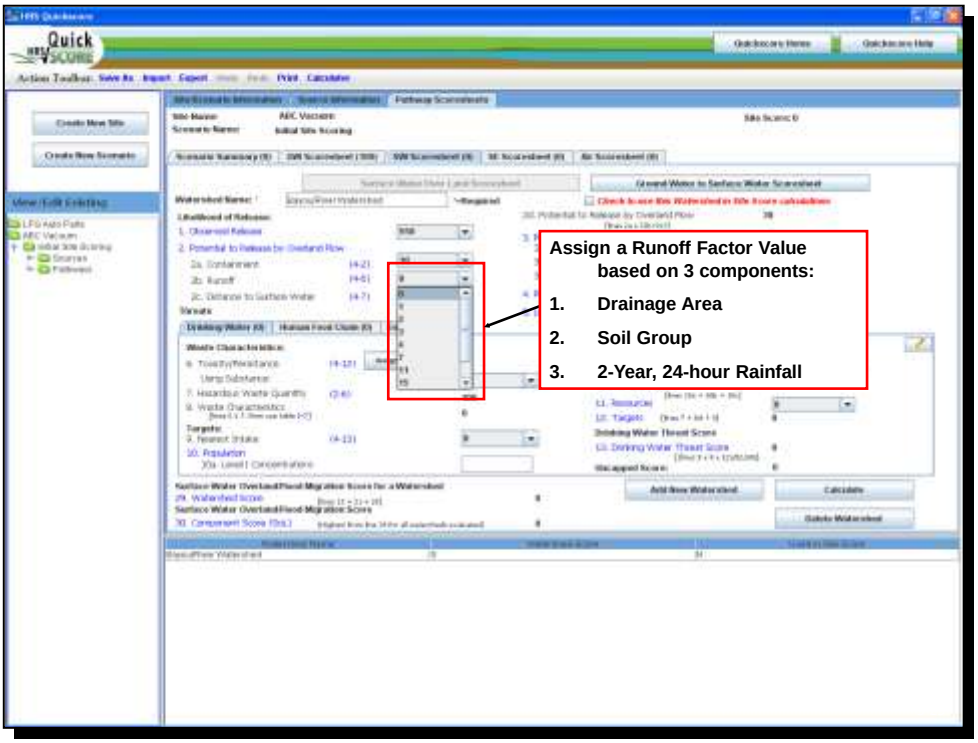
Source	Assigned Value
All Sources (Except Surface Impoundments, Land Treatment, Containers, and Tanks)	
Evidence of hazardous substance migration from source area (i.e., source area includes source and any associated containment structures).	10
No evidence of hazardous substance migration from source area and:	
a) Neither of the following present: (1) maintained engineered cover, or (2) functioning and maintained run-on control system and runoff management system.	10
(b) Any one of the two items in (a) present	9
(c) Any two of the following present: (1) maintained engineered cover, or (2) functioning and maintained run-on control system and runoff management system, or (3) liner with functioning leachate collection and removal system immediately above liner.	7
(d) All items in (c) present	5
(e) All items in (c) present, plus no bulk or non-containerized liquids nor materials containing free liquids deposited in source area.	3
No evidence of hazardous substance migration from source area, double liner with functioning leachate collection and removal system above and between liners, and:	
(f) Only one of the following deficiencies present in containment: (1) bulk or noncontainerized liquids or materials containing free liquids deposited in source area, or (2) no or nonfunctioning or nonmaintained run-on control system and runoff management system, or (3) no or nonmaintained engineered cover.	3
(g) None of the deficiencies in (f) present.	0
Surface Impoundment	
Evidence of hazardous substance migration from surface impoundment.	10
Free liquids present with either no diking, unsound diking, or diking that is not regularly inspected and maintained.	10
No evidence of hazardous substance migration from surface impoundment, free liquids present, sound diking that is regularly inspected and maintained, adequate freeboard, and:	
(a) No liner	9
(b) Liner	7
(c) Liner with functioning leachate collection and removal system below liner.	5
(d) Double liner with functioning leachate collection and removal system between liners.	3
No evidence of hazardous substance migration from surface impoundment and all free liquids eliminated at closure (either by removal of liquids or solidification of remaining wastes and waste residues).	Evaluate using All Sources criteria (with no bulk or free liquids deposited).
Land Treatment	
Evidence of hazardous substance migration from land treatment zone.	10
No functioning and maintained run-on control and runoff management system	10
No evidence of hazardous substance migration from land treatment zone and:	
(a) Functioning and maintained run-on control and runoff management system.	7
(b) Functioning and maintained run-on control and runoff management system, and vegetative cover established over entire land treatment area.	5
(c) Land treatment area maintained in compliance with 40 CFR 264.280.	0

Table 4-2: Containment Factor Values for Surface Water Migration Pathway (Continued)

Source	Assigned Value
Containers	
All containers buried	Evaluate using All Sources criteria.
Evidence of hazardous substance migration from container area (i.e., container area includes containers and any associated containment structures).	10
No diking (or no similar structure) surrounding container area.	10
Diking surrounding container area unsound or not regularly inspected and maintained.	10
No evidence of hazardous substance migration from container area and container area surrounded by sound diking that is regularly inspected and maintained.	9
No evidence of hazardous substance migration from container area, container area surrounded by sound diking that is regularly inspected and maintained, and:	
(a) Essentially impervious base under container area with liquids collection and removal system.	7
(b) Containment system includes essentially impervious base, liquids collection system, sufficient capacity to contain 10 percent of volume of all containers, and functioning and maintained run-on control; and spilled or leaked hazardous substances and accumulated precipitation removed in timely manner to prevent overflow of collection system, at least weekly inspection of containers, hazardous substances in leaking or deteriorating containers transferred to containers in good condition, and containers sealed except when waste is added or removed.	5
(c) Free liquids present, containment system has sufficient capacity to hold total volume of all containers and to provide adequate freeboard, and single liner under container area with functioning leachate collection and removal system below liner.	5
(d) Same as (c) except: double liner under container area with functioning leachate collection and removal system between liners.	3
Containers inside or under maintained intact structure that provides protection from precipitation so that neither runoff nor leachate would be generated from any unsealed or ruptured containers, liquids or materials containing free liquids not deposited in any container, and functioning and maintained run-on control present.	0
No evidence of hazardous substance migration from container area, containers leaking, and all free liquids eliminated at closure (either by removal of liquids or solidification of remaining wastes and waste residues).	Evaluate using All Sources criteria (with no bulk or free liquids deposited).
Tank	
Below-ground tank	Evaluate using All Sources criteria.
Evidence of hazardous substance migration from tank area (i.e., tank area includes tank, ancillary equipment such as piping, and any associated containment structures).	10
No diking (or no similar structure) surrounding tank and ancillary equipment.	10
Diking surrounding tank and ancillary equipment unsound or not regularly inspected and maintained.	10
No evidence of hazardous substance migration from tank area and tank and ancillary equipment surrounded by sound diking that is regularly inspected and maintained.	9

Table 4-2: Containment Factor Values for Surface Water Migration Pathway (Continued)

Source	Assigned Value
Tank	
No evidence of hazardous substance migration from tank area, tank and ancillary equipment surrounded by sound diking that is regularly inspected and maintained, and:	
(a) Tank and ancillary equipment provided with secondary containment (e.g., liner under tank area, vault system, double-wall) with leak detection and collection system.	7
(b) Tank and ancillary equipment provided with secondary containment system that detects and collects spilled or leaked hazardous substances and accumulated precipitation and has sufficient capacity to contain 110 percent of volume of largest tank within containment area, spilled or leaked hazardous substances and accumulated precipitation removed in a timely manner, at least weekly inspection of tank and secondary containment system, and all leaking or unfit-for-use tank systems promptly responded to.	5
(c) Containment system has sufficient capacity to hold total volume of all tanks within the tank containment area and to provide adequate freeboard, and single liner under tank containment area with functioning leachate collection and removal system below liner.	5
(d) Same as (c) except: double liner under tank containment area with functioning leachate collection and removal system between liners.	3
Tank is above ground, and inside or under maintained intact structure that provides protection from precipitation so that neither runoff nor leachate would be generated from any material released from tank, liquids or materials containing free liquids not deposited in any tank, and functioning and maintained run-on control present.	0



Participant Poll - Drainage Area Value

- **Determine value for size of drainage area at ABC using Table 4-3 below**
- **ABC has 165 acre drainage area**

Drainage Area (acres)	Assigned Value
Less than 50	1
50 to 250	2
Greater than 250 to 1,000	3
Greater than 1,000	4

- **What is the drainage area factor value? _____**

EPA 5-30

Soil Group Designation is Obtained from Table 4-4

Surface Soil Description	Soil Group Designation
Coarse-textured soils with high infiltration rates (for example, sands and loamy sands)	A
Medium-textured soils with moderate infiltration rates (for example, sandy loams and loams)	B
Moderately fine-textured soils with low infiltration rates (for example, silty loams, silts, and sandy clay loams)	C
Fine-textured soils with very low infiltration rates (for example, clays, sandy clays, silty clay loams, clay loams, and silty clays); or impermeable surfaces (for example, pavement)	D

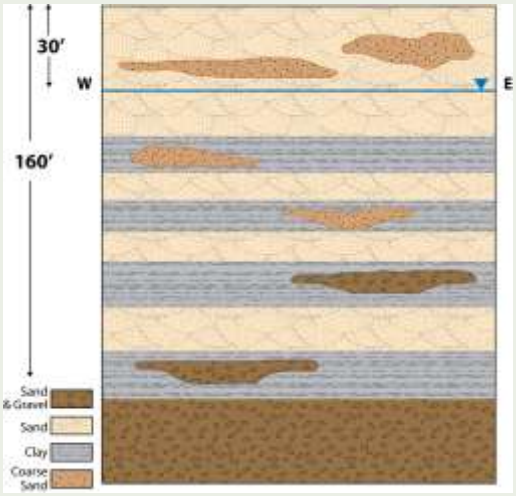
EPA 5-31

Site-Specific Geological Information

- **Hydrogeologic Setting**
  - Atlas Parish is situated in the subtropical zone along the borders of the Mississippi River
  - Annual precipitation for this region averages 57 inches and is the major source of recharge for the aquifers of the area
- **Geologic Setting**
  - The Atlas Parish aquifer system consists of two aquifers of similar composition
  - The shallow aquifer is composed of alluvial sediments, namely fine-to-coarse grained sands, and has a depth to water of approximately 30 feet
  - The deeper aquifer consists mainly of fine-to-coarse grained sand and gravel with silty clay layers, with depth to water being estimated at 160 feet
  - As a result of these compositions, permeabilities for both aquifers are high

EPA 5-32

Cross-Section



EPA 5-33

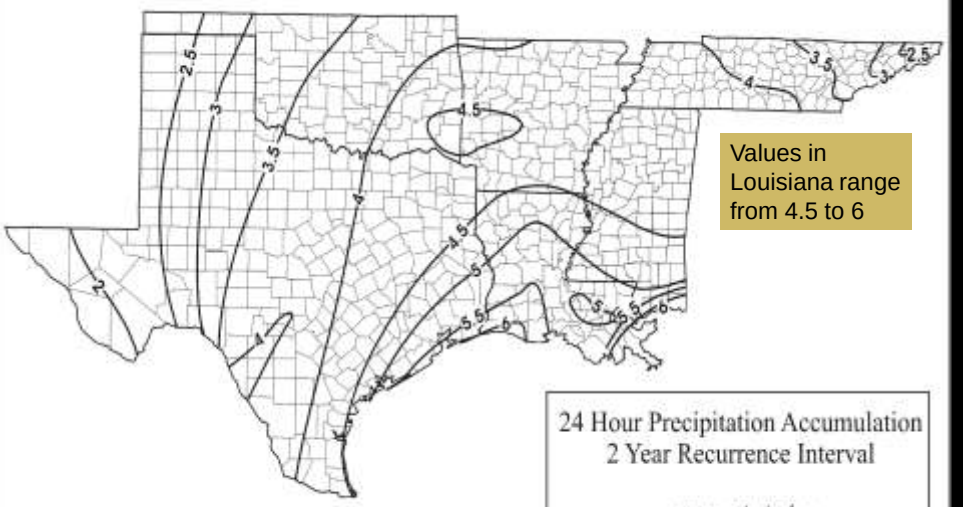
Participant Poll – What Soil Group Designation Should be Assigned

Surface Soil Description	Soil Group Designation
Coarse-textured soils with high infiltration rates (for example, sands and loamy sands)	A
Medium-textured soils with moderate infiltration rates (for example, sandy loams and loams)	B
Moderately fine-textured soils with low infiltration rates (for example, silty loams, silts, and sandy clay loams)	C
Fine-textured soils with very low infiltration rates (for example, clays, sandy clays, silty clay loams, clay loams, and silty clays); or impermeable surfaces (for example, pavement)	D

Multiple Choice:
A
B
C
D

EPA 5-34

Estimate 2 year/24 Hour Rainfall Using Map Below



Determine Rainfall/Runoff Values Using Table 4-5 Below

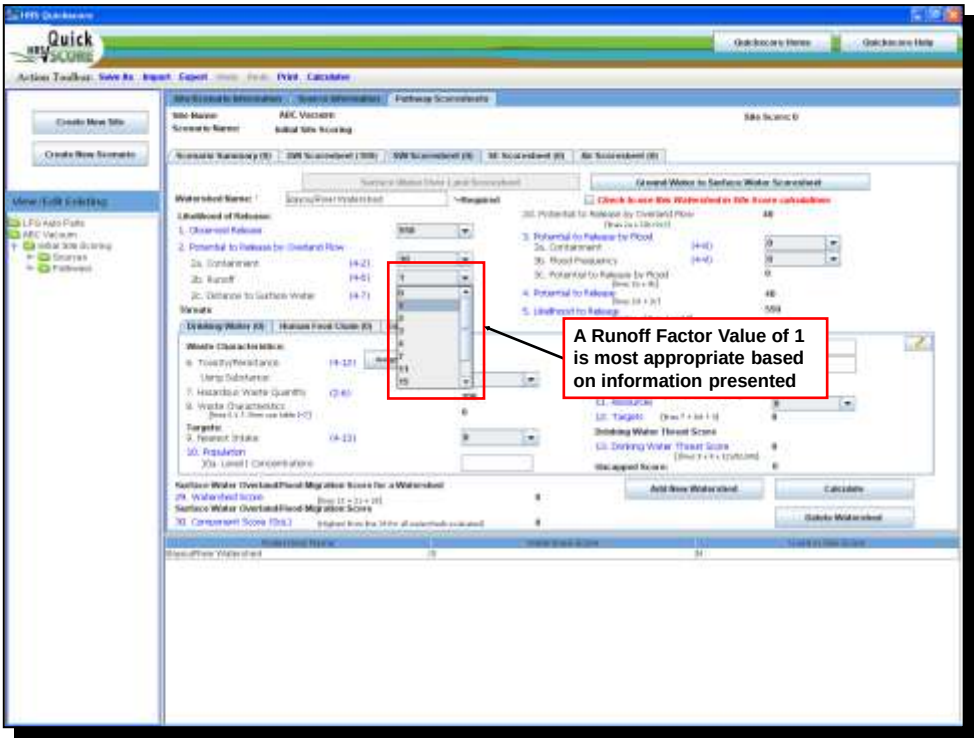
2-Year, 24-Hour Rainfall (inches)	Soil Group Designation			
	A	B	C	D
Less than 1.0	0	0	2	3
1.0 to less than 1.5	0	1	2	3
1.5 to less than 2.0	0	2	3	4
2.0 to less than 2.5	1	2	3	4
2.5 to less than 3.0	2	3	4	4
3.0 to less than 3.5	2	3	4	5
3.5 or greater	3	4	5	6

EPA 5-36

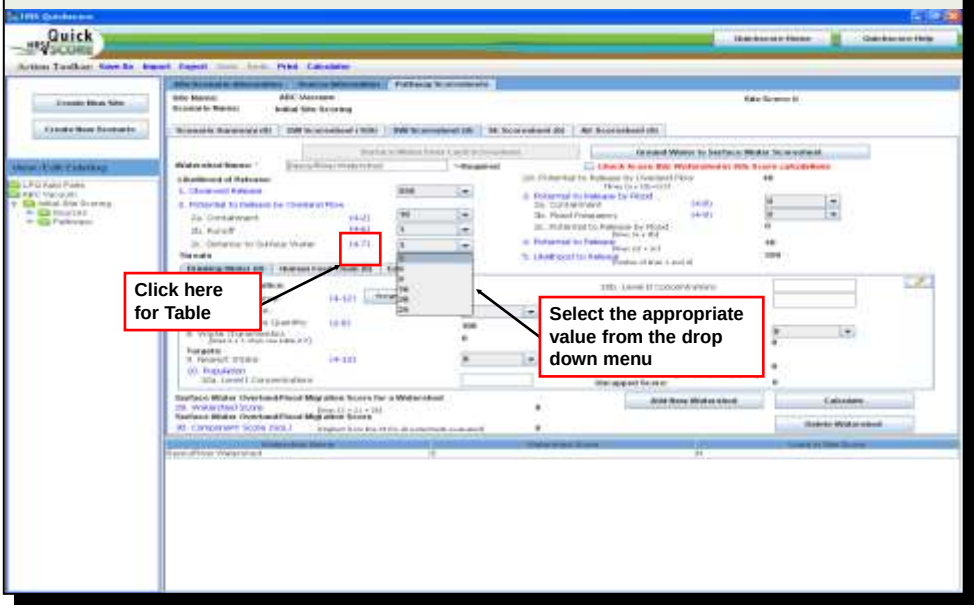
Determine Runoff Factor Value Using Table 4-6

	Rainfall/Runoff Value						
Drainage Area Value	0	1	2	3	4	5	6
1	0	0	0	1	1	1	1
2 ←	0	0	1	1	2	3	4
3	0	0	1	3	7	11	15
4	0	1	2	7	17	25	25

EPA 5-37



Determine Distance to Surface Water Based on Site Data



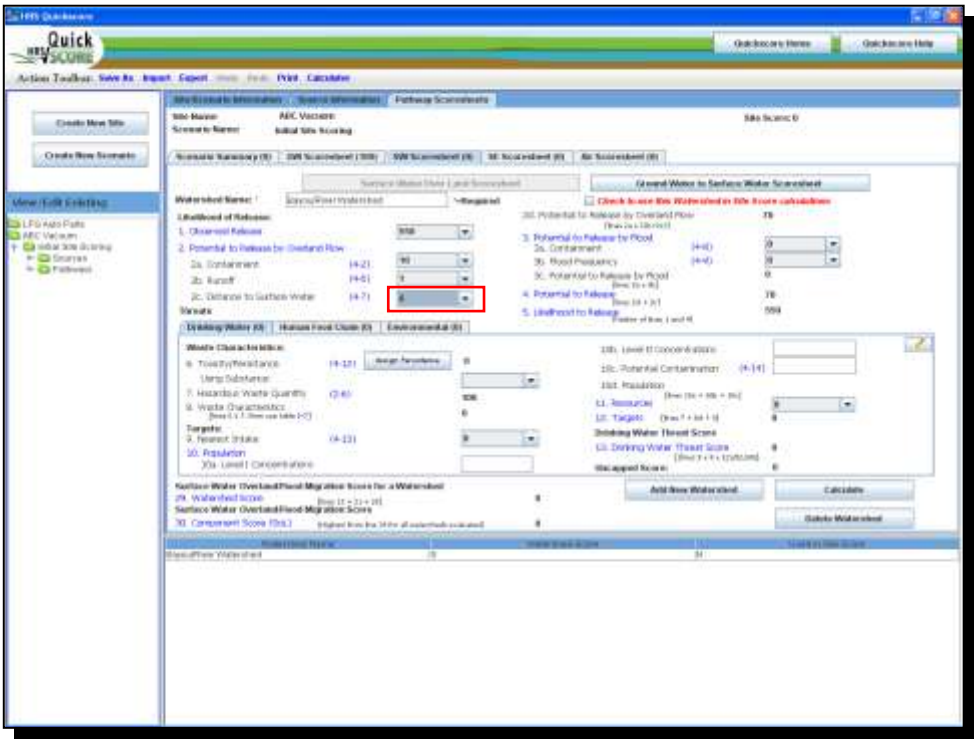
Measures Distance of Overland Segment

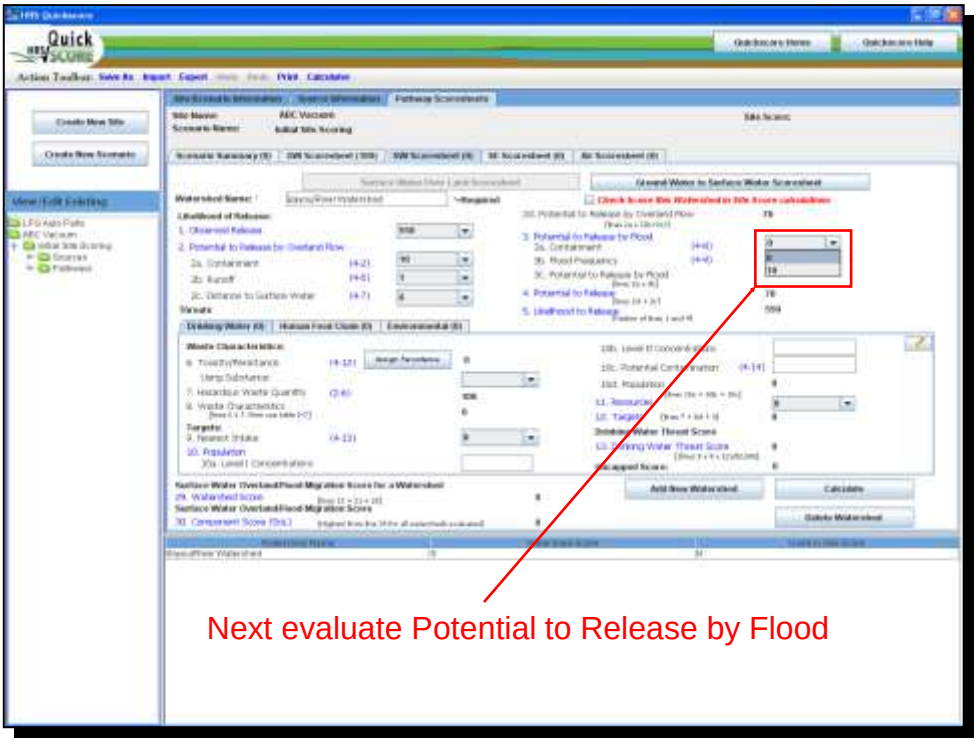
- **The overland segment at ABC Vacuum is about 6,000 feet or 1.1 miles**
- **This gives a value of 6 from Table 4-7**

Table 4-7. Distance to Surface Water Factor Values

Distance	Assigned value
Less than 100 feet	25
100 feet to 500 feet	20
Greater than 500 feet to 1,000 feet	16
Greater than 1,000 feet to 2,500 feet	9
Greater than 2,500 feet to 1.5 miles	6
Greater than 1.5 miles to 2 miles	3

EPA 5-40




Next evaluate Potential to Release by Flood

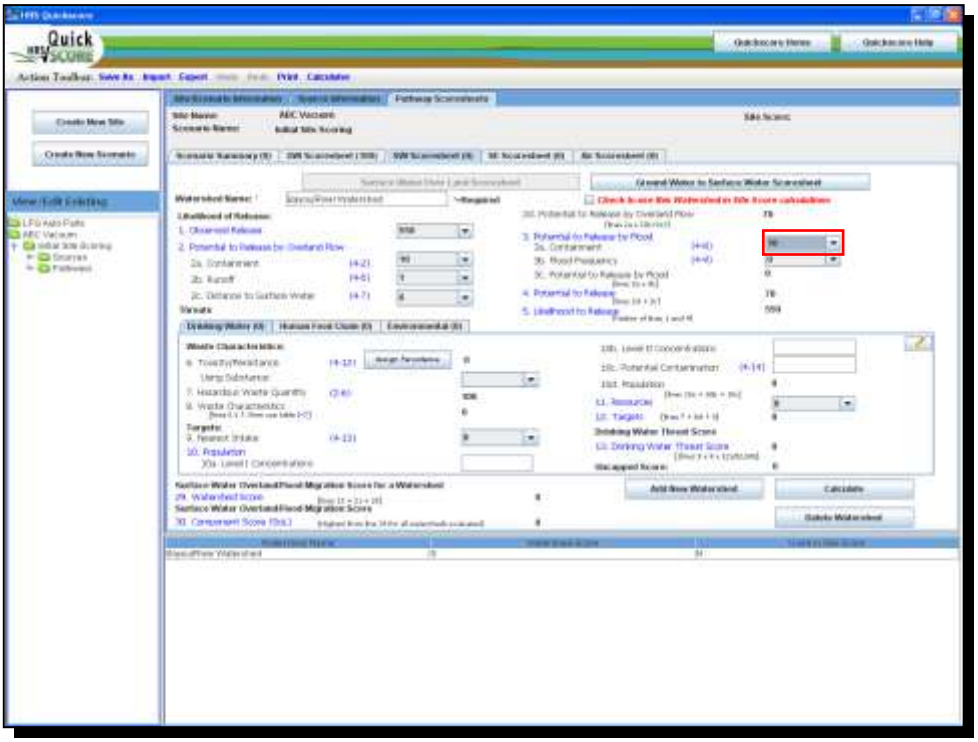
Participant Poll - Assign Containment Value Using Table 4-8

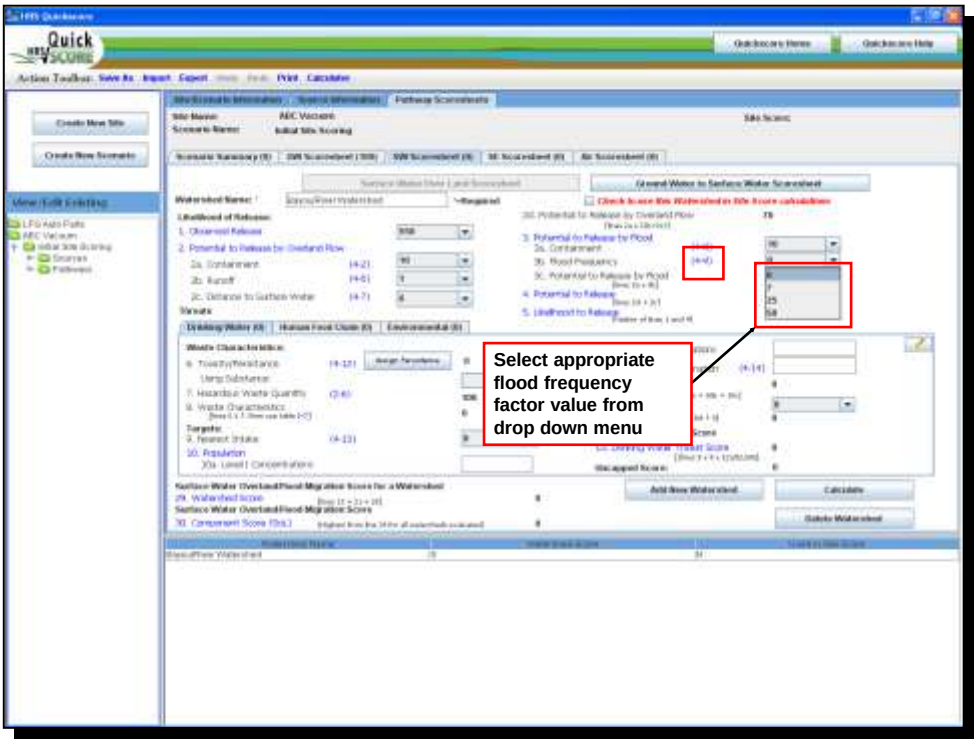
----------Table 4-8_Containment (Flood) Factor Values ----------

Containment criteria	Assigned value
Documentation that containment at the source is designed, constructed, operated, and maintained to prevent a washout of hazardous substances by the flood being evaluated	0
Other	10

What value would you assign? 10 or 0

EPA 5-43



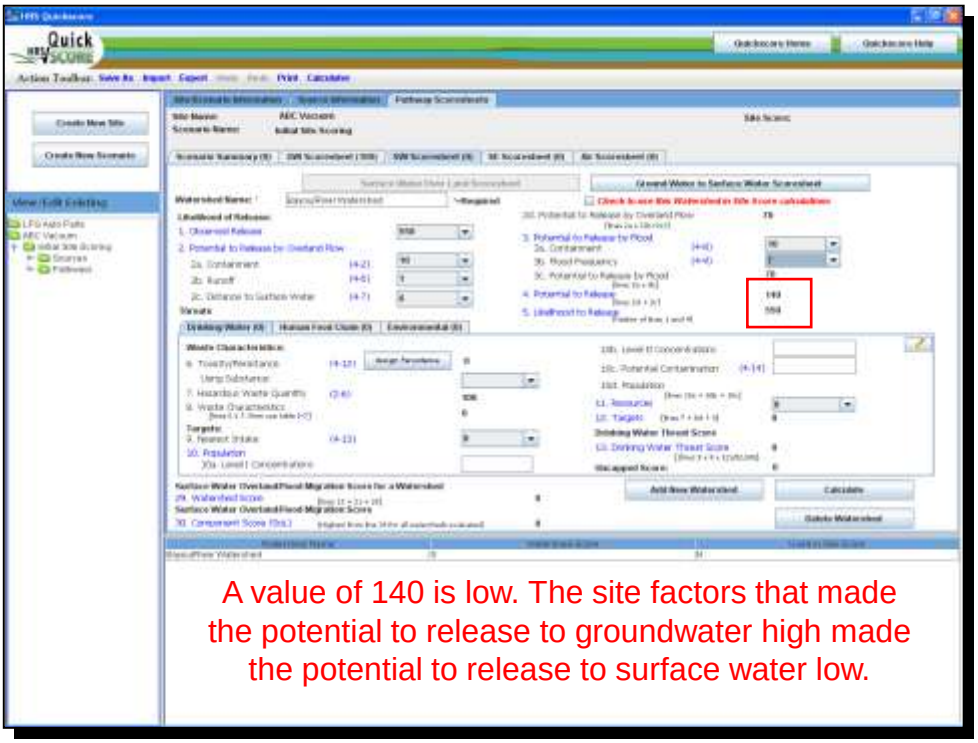


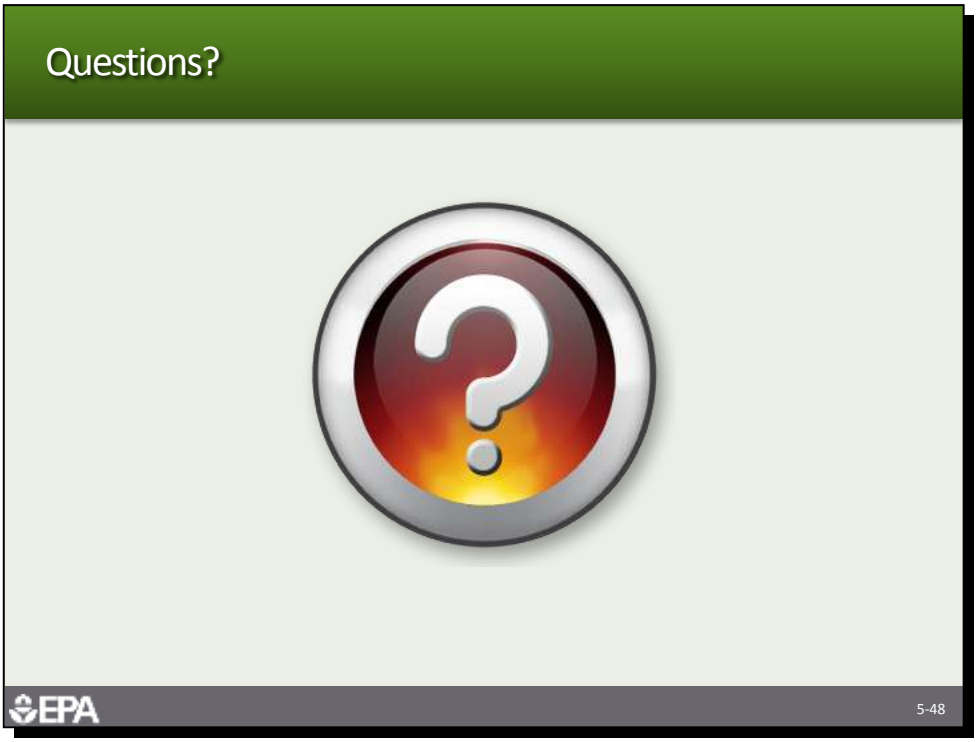
ABC Vacuum Site is in 500 year flood plain

Table 4-9. Flood Frequency Factor Values

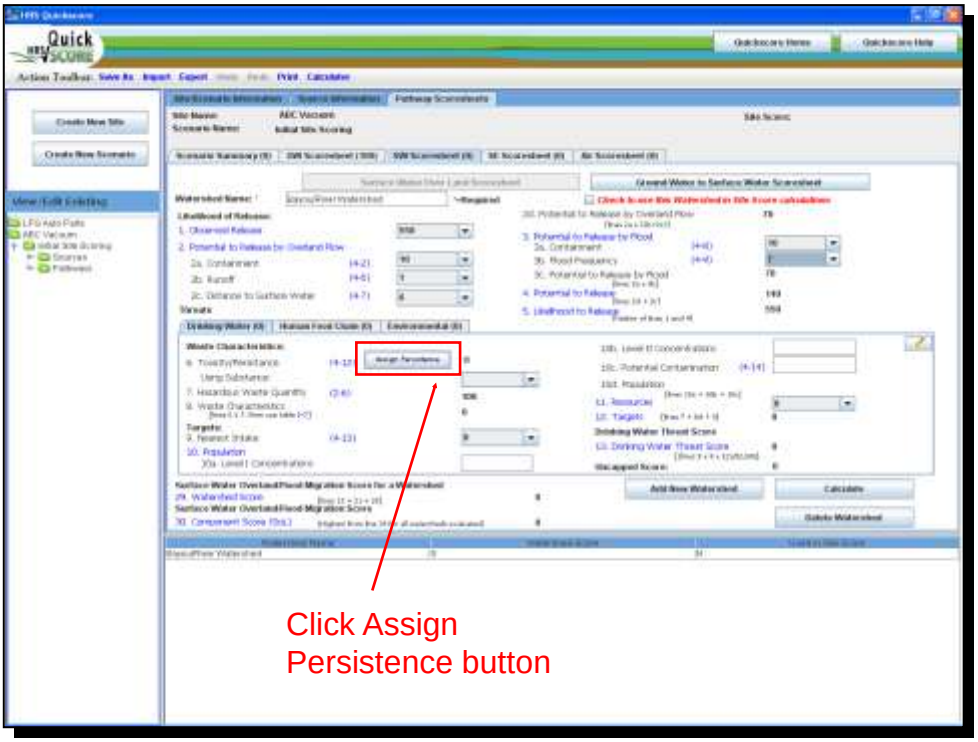
Floodplain category	Assigned value
Source floods annually	50
Source in 10-year floodplain	50
Source in 100-year floodplain	25
Source in 500-year floodplain	7
None of above	0

EPA 5-46

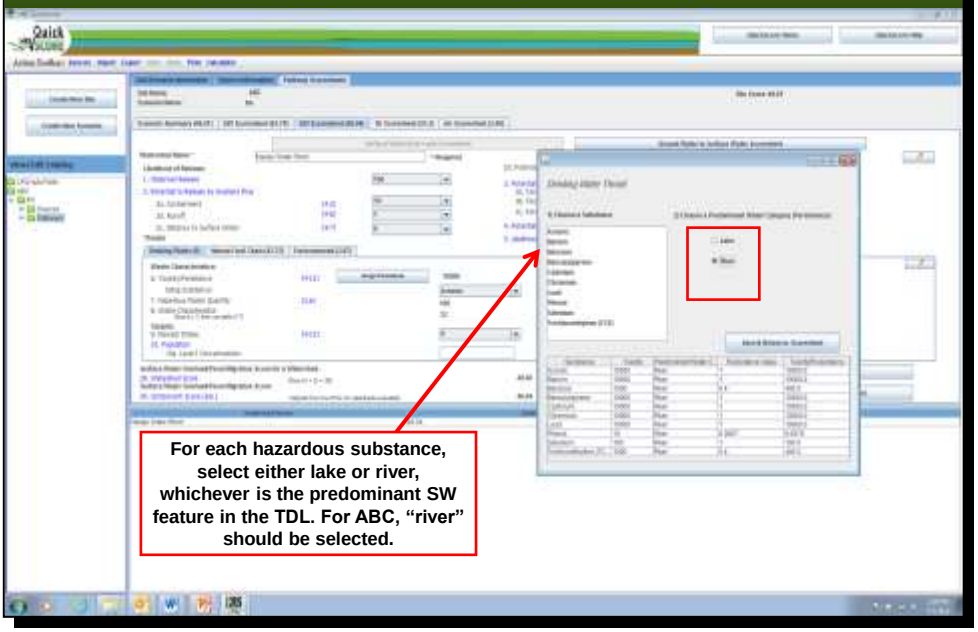

A value of 140 is low. The site factors that made the potential to release to groundwater high made the potential to release to surface water low.


Questions?
EPA
5-48

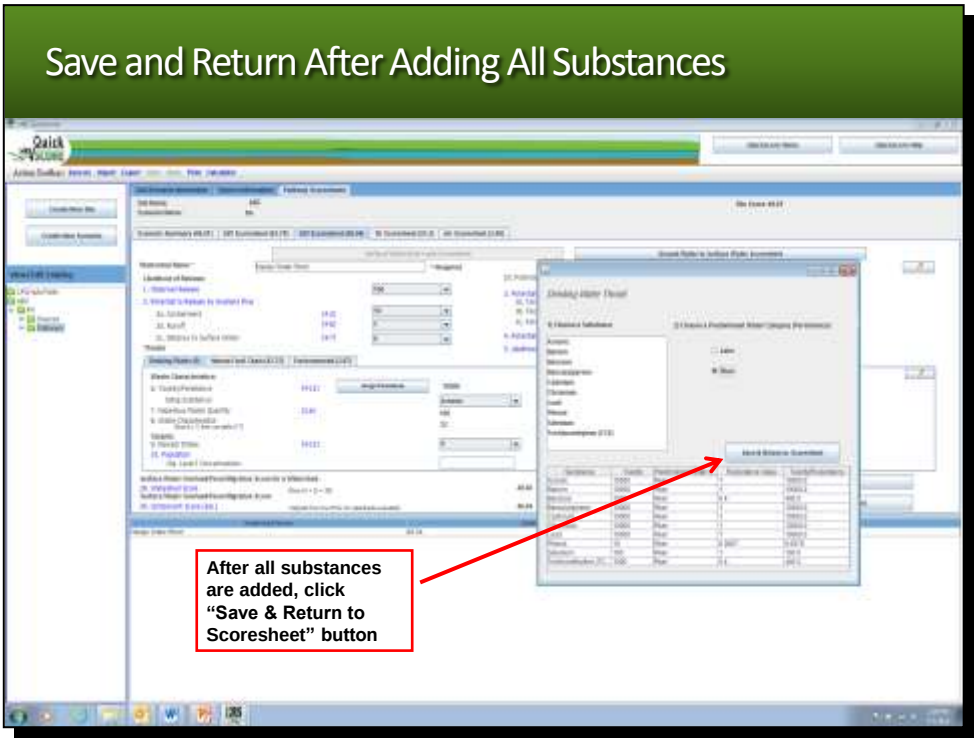
Drinking Water Threat – Click Tab

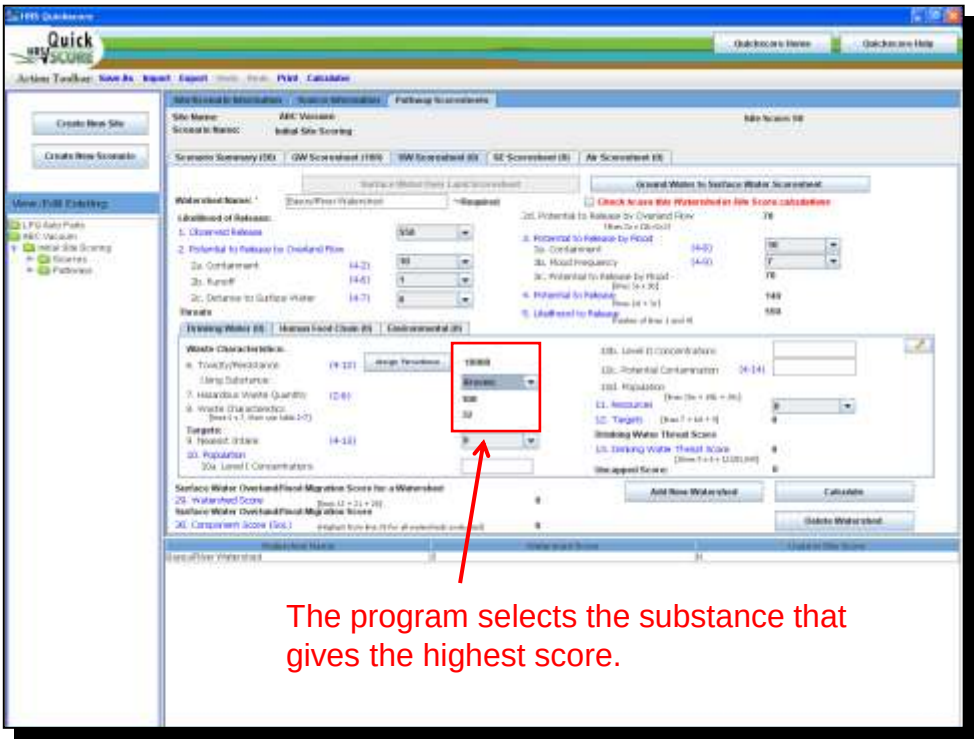


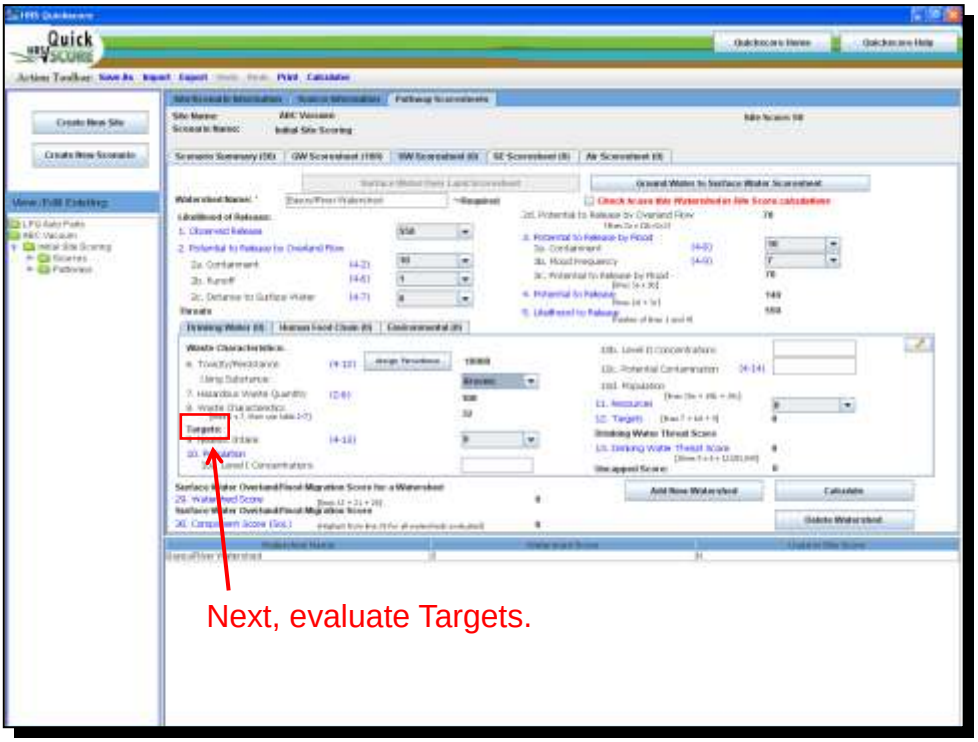
Add ABC Substances One-by-One



Save and Return After Adding All Substances




The program selects the substance that gives the highest score.

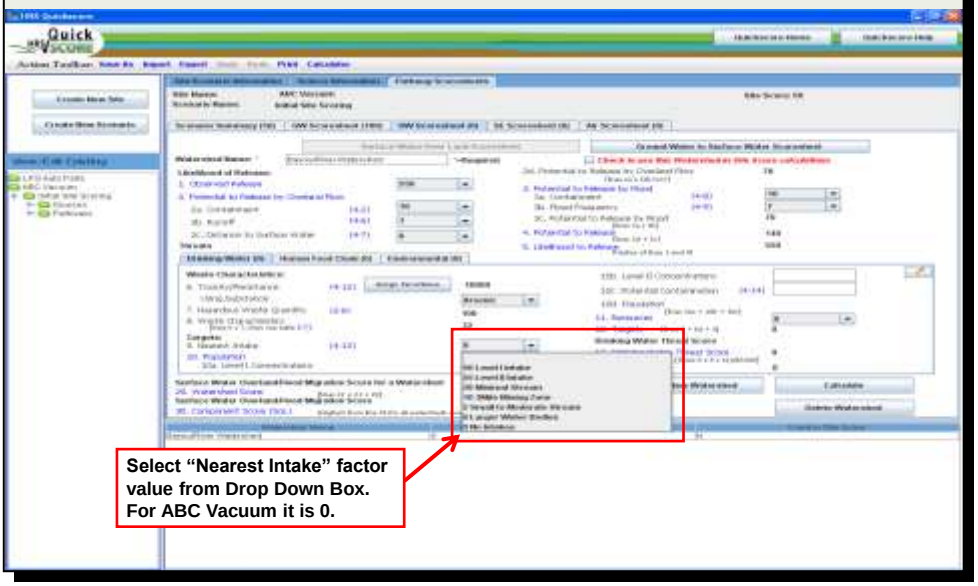

Next, evaluate Targets.

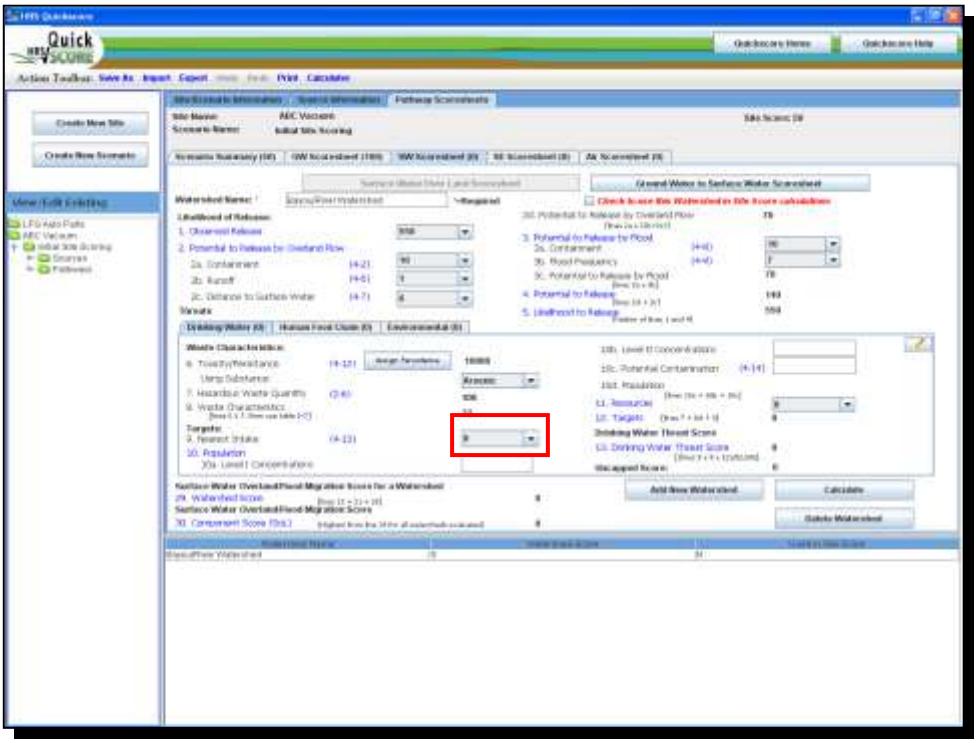
Participant Poll – Intakes at ABC Vacuum

- **Are there surface water intakes in the TDL of ABC Vacuum?**
  - » Yes _____
  - » No _____

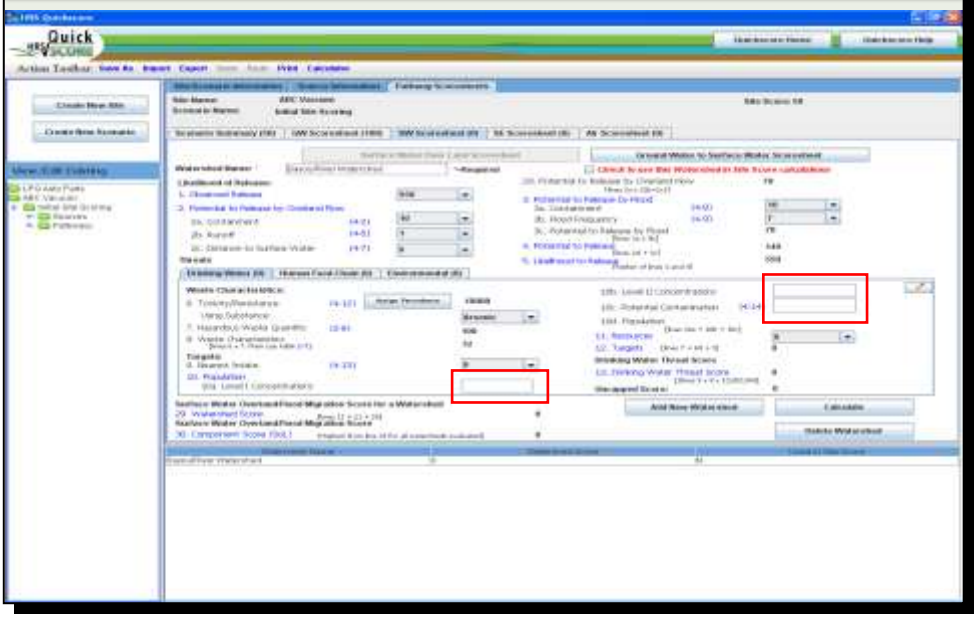
EPA 5-55

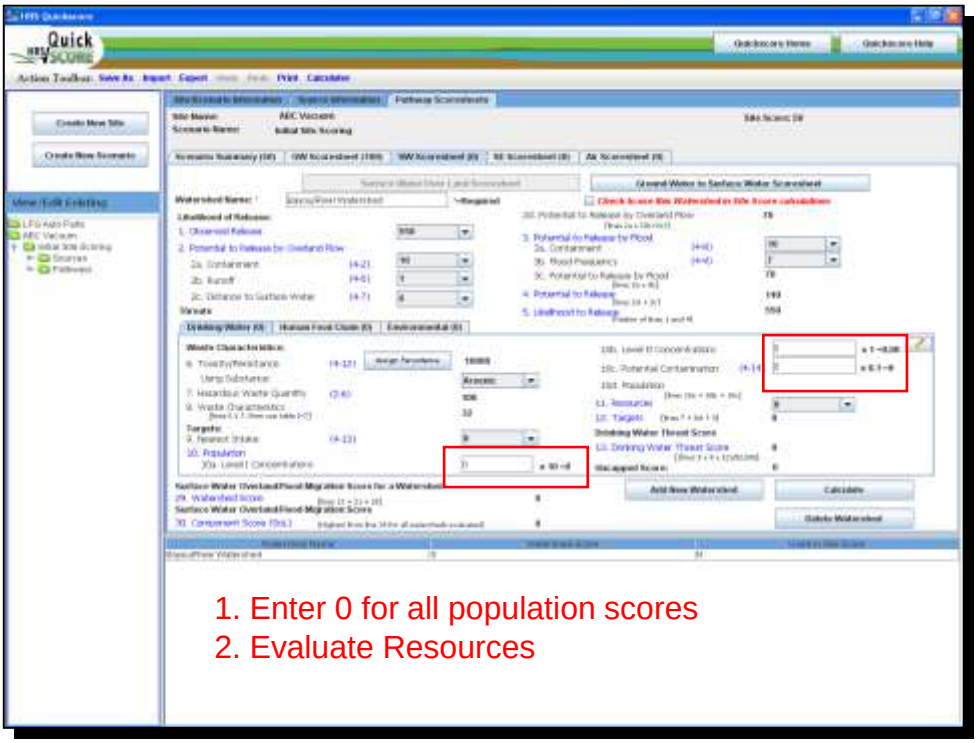
Factor Value for Nearest Intake





If There Are No Intakes, the Population is 0 for Level I, Level II, and Potential

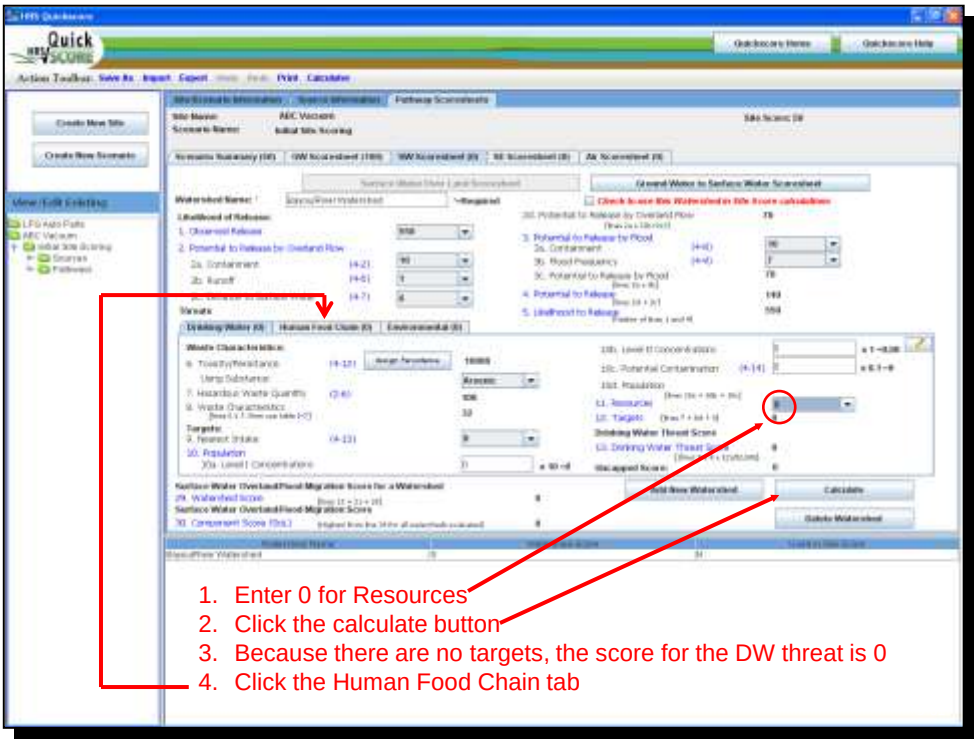


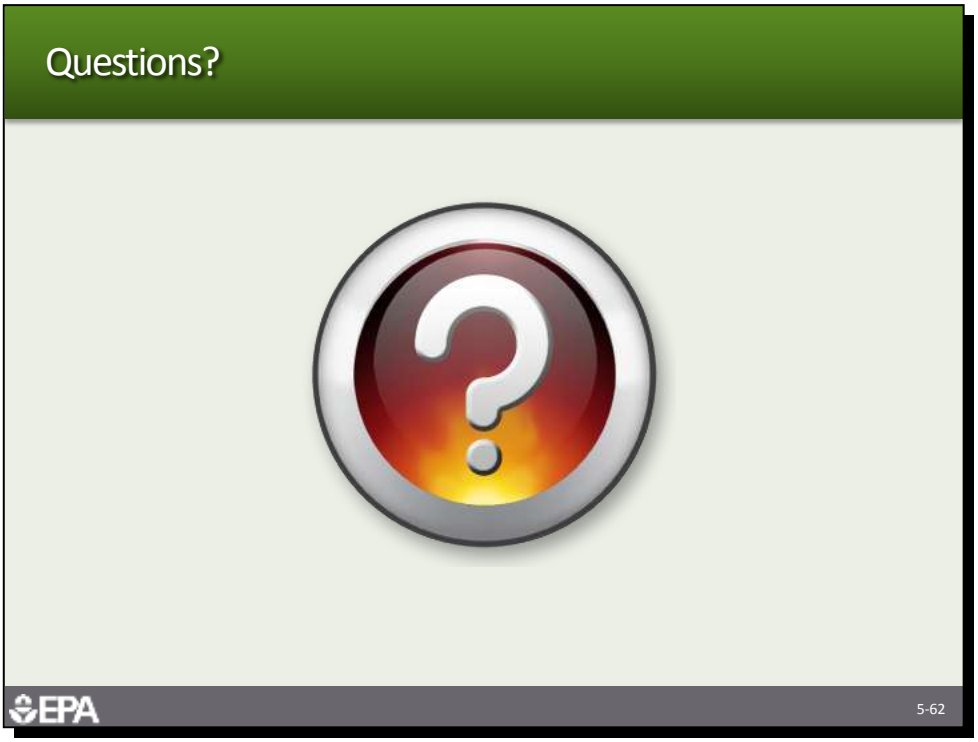


Checklist for Resources

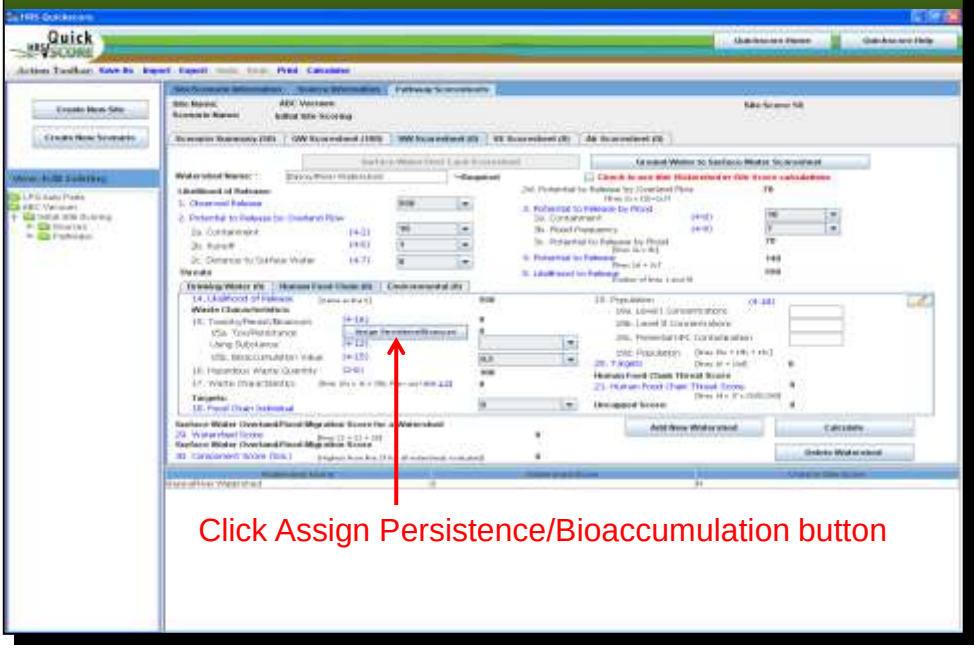
Is surface water used to irrigate five or more acres of commercial food crops or commercial forage crops?
Is surface water used to water commercial livestock?
Is surface water used as an ingredient in commercial food preparation?
Is surface water used as, or used to supply, a major or designated water recreation area, excluding drinking water use?
If surface water is not used for drinking within the TDL, is any portion of the surface water designated by the state for drinking water use under Section 305(a) of the Clean Water Act, as amended, or is any portion usable for drinking purposes?

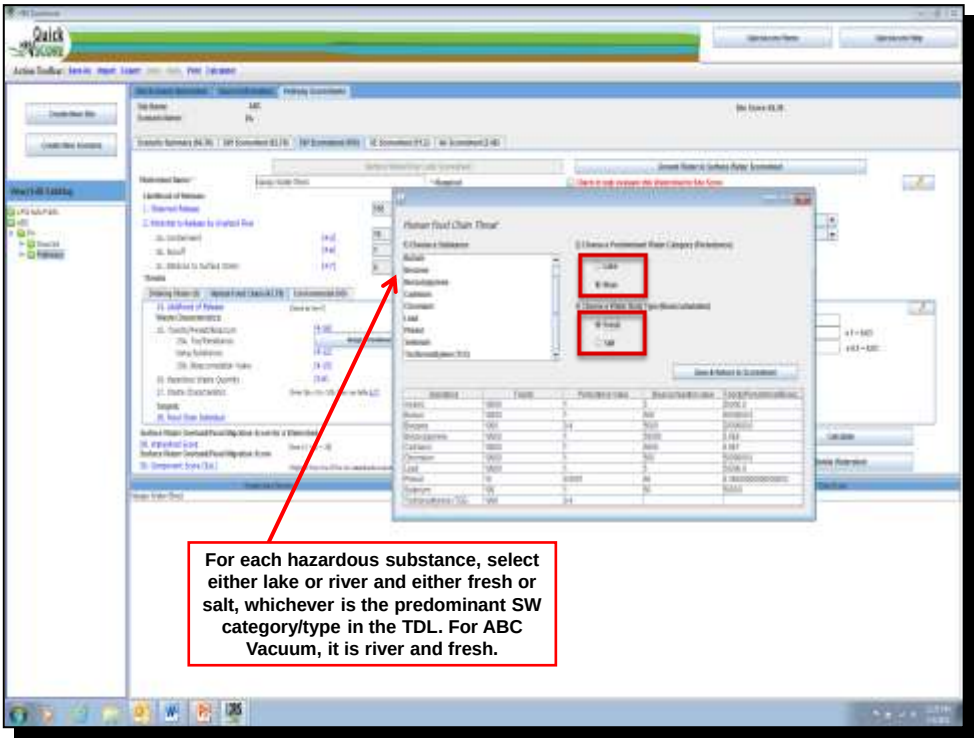
EPA 5-60

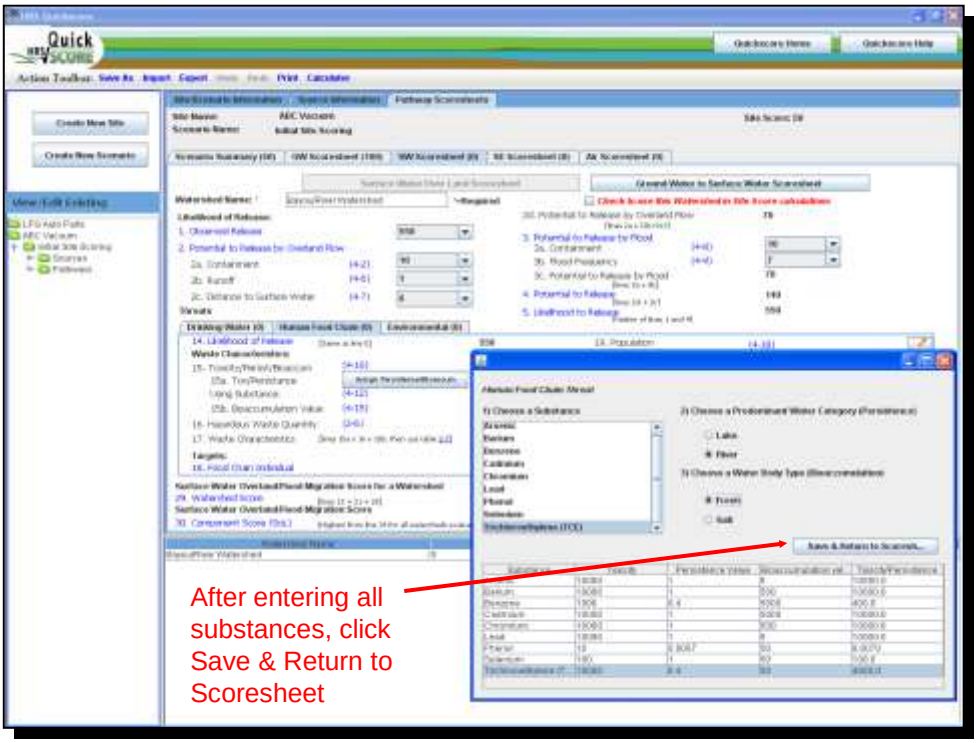

1. Enter 0 for Resources
2. Click the calculate button
3. Because there are no targets, the score for the DW threat is 0
4. Click the Human Food Chain tab

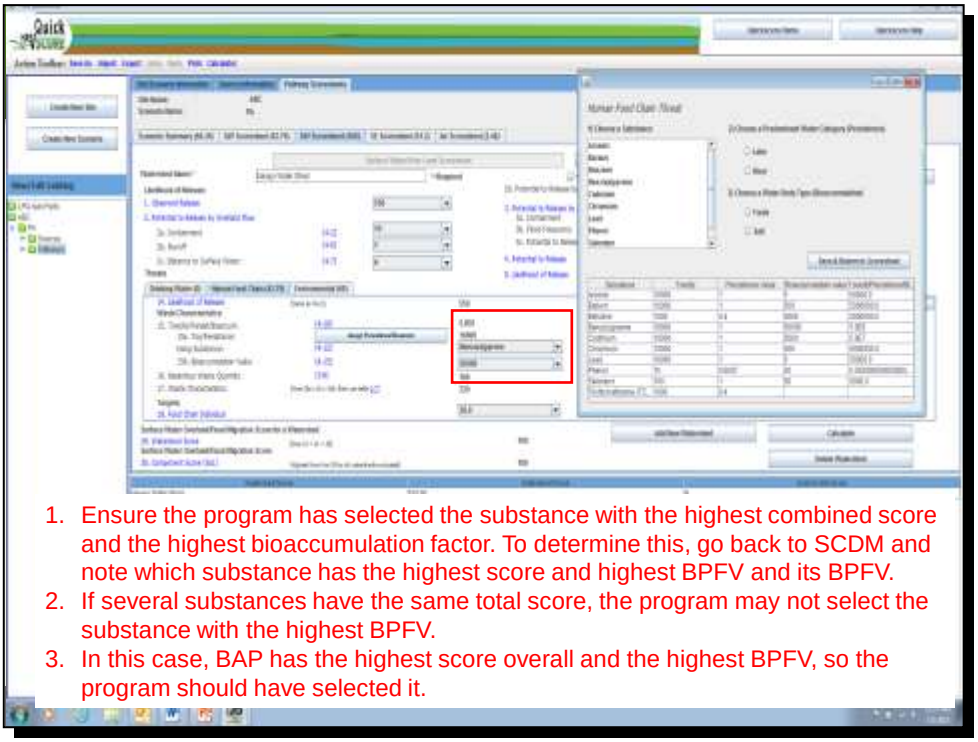

Questions?
EPA
5-62

Click Assign Persistence/Bioaccum

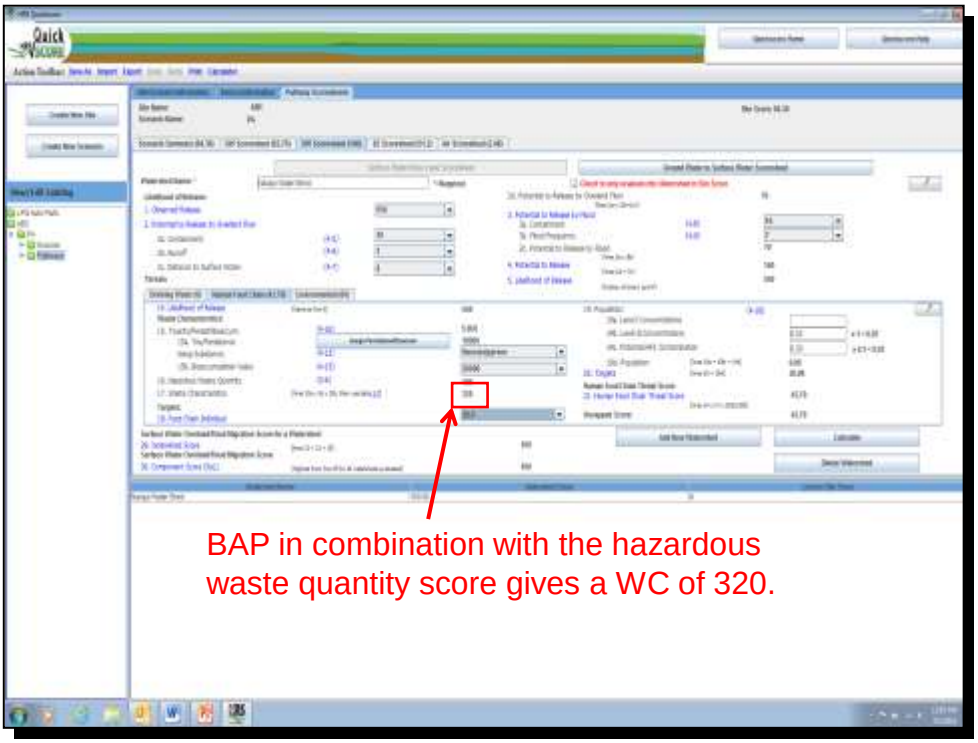








1. Ensure the program has selected the substance with the highest combined score and the highest bioaccumulation factor. To determine this, go back to SCDM and note which substance has the highest score and highest BPFV and its BPFV.
2. If several substances have the same total score, the program may not select the substance with the highest BPFV.
3. In this case, BAP has the highest score overall and the highest BPFV, so the program should have selected it.



Food Chain Individual

- **Requires a assessment of whether there is a fishery within the in-stream segment**
- **Requires an evaluation of whether there is actual food chain contamination in any fishery within the TDL**

EPA 5-68

Participant Poll – Select all Stretches of Water that are Fisheries

1. Intermittent Ditch
2. Perennial Ditch
3. Bayou
4. River

EPA 5-69

ABC Vacuum Fisheries

- **Intermittent ditch is not a surface water body by the HRS definition and cannot be a fishery – the intermittent ditch is 1.1 miles from the perennial ditch**
- **Perennial ditch is a surface water body but the PA does not note that it is used for fishing – the perennial ditch is 3 miles from the Bayou**
- **Bayou is noted as a fishery in PA**
- **River is noted as a fisher in PA**

EPA 5-70

Evaluating Actual Food Chain Contamination – 3 Ways to Establish – First Way – HRS 4.1.3.3

- **A hazardous substance having a bioaccumulation potential factor value of 500 or greater is present either in an observed release by direct observation to the watershed or in a surface water or sediment sample from the watershed at a level that meets the criteria for an observed release to the watershed from the site, and at least a portion of the fishery is within the boundaries of the observed release (that is, it is located either at the point of direct observation or at or between the probable point of entry and the most distant sampling point establishing the observed release).**

EPA 5-71

Evaluating Actual Food Chain Contamination – 3 Ways to Establish – Second and Third Way – HRS 4.1.3.3

- **The fishery is closed, and a hazardous substance for which the fishery has been closed has been documented in an observed release to the watershed from the site, and at least a portion of the fishery is within the boundaries of the observed release.**
- **A hazardous substance is present in a tissue sample from an essentially sessile, benthic, human food chain organism from the watershed at a level that meets the criteria for an observed release to the watershed from the site, and at least a portion of the fishery is within the boundaries of the observed release.**

EPA 5-72

Evaluating Actual Food Chain Contamination

- **Based on ABC site information and LR scoring, evaluate if there has been an observed release**
  - » PPE is 1.1 miles from the site
  - » Closest known fishery is 4.1 miles from the site
- **If so, evaluate what type of actual contamination there could potentially be**
  - » There are site hazardous substances with a BPFV of 500 or greater
  - » No site-related fisheries are closed
  - » No tissue samples are yet available
- **Based on these factors, review the next slide and determine how to score Food Chain Individual for the ABC site**

EPA 5-73

4.1.3.3.1 *Food chain individual.* Evaluate the food chain individual factor based on the fisheries (or portions of fisheries) within the target distance limit for the watershed. Assign this factor a value as follows:

- If any fishery (or portion of a fishery) is subject to Level I concentrations, assign a value of 50.
- If not, but if any fishery (or portion of a fishery) is subject to Level II concentrations, assign a value of 45.
- If not, but if there is an observed release of a hazardous substance having a bioaccumulation potential factor value of 500 or greater to surface water in the watershed and there is a fishery (or portion of a fishery) present anywhere within the target distance limit, assign a value of 20.
- If there is no observed release to surface water in the watershed or there is no observed release of a hazardous substance having a bioaccumulation potential factor value of 500 or greater, but there is a fishery (or portion of a fishery) present anywhere within the target distance limit, assign a value as follows:
  - -Using table 4-13, determine the highest dilution weight (that is, lowest amount of dilution) applicable to the fisheries (or portions of fisheries) within the target distance limit. Multiply this dilution weight by 20 and round to the nearest integer.
  - -Assign this calculated value as the factor value.
- If there are no fisheries (or portions of fisheries) within the target distance limit of the watershed, assign a value of 0.

Enter the value assigned in table 4-1.

5-74

4.1.3.3 *Human food chain threat-targets.* Evaluate two target factors for each watershed: food chain individual and population. For both factors, determine whether the target fisheries are subject to actual or potential human food chain contamination.

Consider a fishery (or portion of a fishery) within the target distance limit of the watershed to be subject to actual human food chain contamination if any of the following apply:

- A hazardous substance having a bioaccumulation potential factor value of 500 or greater is present either in an observed release by direct observation to the watershed or in a surface water or sediment sample from the watershed at a level that meets the criteria for an observed release to the watershed from the site, and at least a portion of the fishery is within the boundaries of the observed release (that is, it is located either at the point of direct observation or at or between the probable point of entry and the most distant sampling point establishing the observed release).
- The fishery is closed, and a hazardous substance for which the fishery has been closed has been documented in an observed release to the watershed from the site, and at least a portion of the fishery is within the boundaries of the observed release.
- A hazardous substance is present in a tissue sample from an essentially sessile, benthic, human food chain organism from the watershed at a level that meets the criteria for an observed release to the watershed from the site, and at least a portion of the fishery is within the boundaries of the observed release.

For a fishery that meets any of these three criteria, but that is not wholly within the boundaries of the observed release, consider only the portion of the fishery that is within the boundaries of the observed release to be subject to actual human food chain contamination. Consider the remainder of the fishery within the target distance limit to be subject to potential food chain contamination.

In addition, consider all other fisheries that are partially or wholly within the target distance limit for the watershed, including fisheries partially or wholly within the boundaries of an observed release for the watershed that do not meet any of the three criteria listed above, to be subject to potential human food chain contamination. If only a portion of the fishery is within the target distance limit for the watershed, include only that portion in evaluating the targets factor category.

When a fishery (or portion of a fishery) is subject to actual food chain contamination, determine the part of the fishery subject to Level I concentrations and the part subject to Level II concentrations. If the actual food chain contamination is based on direct observation, evaluate it using Level II concentrations. However, if the actual food chain contamination is based on samples from the watershed, use these samples and, if available, additional tissue samples from aquatic human food chain organisms as specified below, to determine the part subject to Level I concentrations and the part subject to Level II concentrations:

- Determine the level of actual contamination from samples (including tissue samples from essentially sessile, benthic organisms) that meet the criteria for actual food chain contamination by comparing the exposure concentrations (see section 4.1.2.3) from these samples (or comparable samples) to the health-based benchmarks from table 4-17, as described in section 2.5.1 and 2.5.2. Use only the exposure concentrations for those hazardous substances in the sample (or comparable samples) that meet the criteria for actual contamination of the fishery.
- In addition, determine the level of actual contamination from other tissue samples by comparing the concentrations of hazardous substances in the tissue samples (or comparable tissue samples) to the health-based benchmarks from table 4-17, as described in sections 2.5.1 and 2.5.2. Use only those additional tissue samples and only those hazardous substances in the tissue samples that meet all the following criteria:

-The tissue sample is from a location that is within the boundaries of the actual food chain contamination for the site (that is, either at the point of direct observation or at or between the

probable point of entry and the most distant sample point meeting the criteria for actual food chain contamination).
-The tissue sample is from a species of aquatic human food chain organism that spends extended periods of time within the boundaries of the actual food chain contamination for the site and that is not an essentially sessile, benthic organism.
-The hazardous substance is a substance that is also present in a surface water, benthic, or sediment sample from within the target distance limit for the watershed and, for such a sample, meets the criteria for actual food chain contamination.

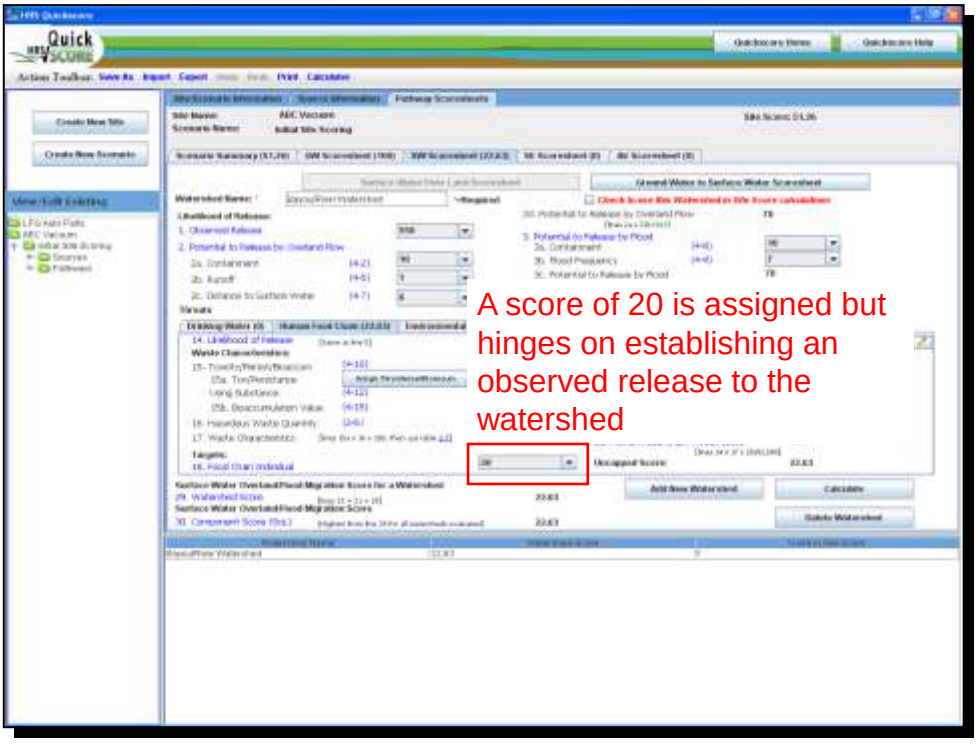
Table 4-17: Health-Based Benchmarks for Hazardous Substances in Human Food Chain

---
• Concentration corresponding to Food and Drug Administration Action Level (FDAAL) for fish or shellfish.
• Screening concentration for cancer corresponding to that concentration that corresponds to the 10^{-6} individual cancer risk for oral exposures.
• Screening concentration for noncancer toxicological responses corresponding to the Reference Dose (RfD) for oral exposures.

ABC Vacuum Nearest Food Chain Individual Score

- **Level I is difficult to establish because it requires that benchmarks for tissue or aqueous samples are exceeded (there are no benchmarks for sediment)**
- **Level II is less difficult because it can be established from an observed release by direct observation or by sampling data, including sediment samples**
- **Because there is a substance with a BPFV of 500 or greater, it may be possible to score 20 if an observed release to the watershed is established**
- **Otherwise a dilution-weighted score is estimated**
- **Assign 20 but note what would have to be shown with the SI to assign those 20 points**

EPA 5-75



Food Chain Population – Actual Contamination

- **Level I, estimate HFC production and use Table 4-18 to obtain HFC population values for each fishery – add values together and multiply by 10**
- **Level II, estimate HFC production and use Table 4-18 to obtain HFC population values for each fishery – add values together**

EPA 5-77

HFC Population Values

----------Table 4-18_Human Food Chain Population Values[a] ----------

Human food chain production (pounds per year)	Assigned human food chain population value
0	0
Greater than 0 to 100	0.03
Greater than 100 to 1,000	0.3
Greater than 1,000 to 10,000	3
Greater than 10,000 to 100,000	31
Greater than 100,000 to 1,000,000	310
Greater than 10^6 to 10^7	3,100
Greater than 10^7 to 10^8	31,000
Greater than 10^8 to 10^9	310,000
Greater than 10^9	3,100,000

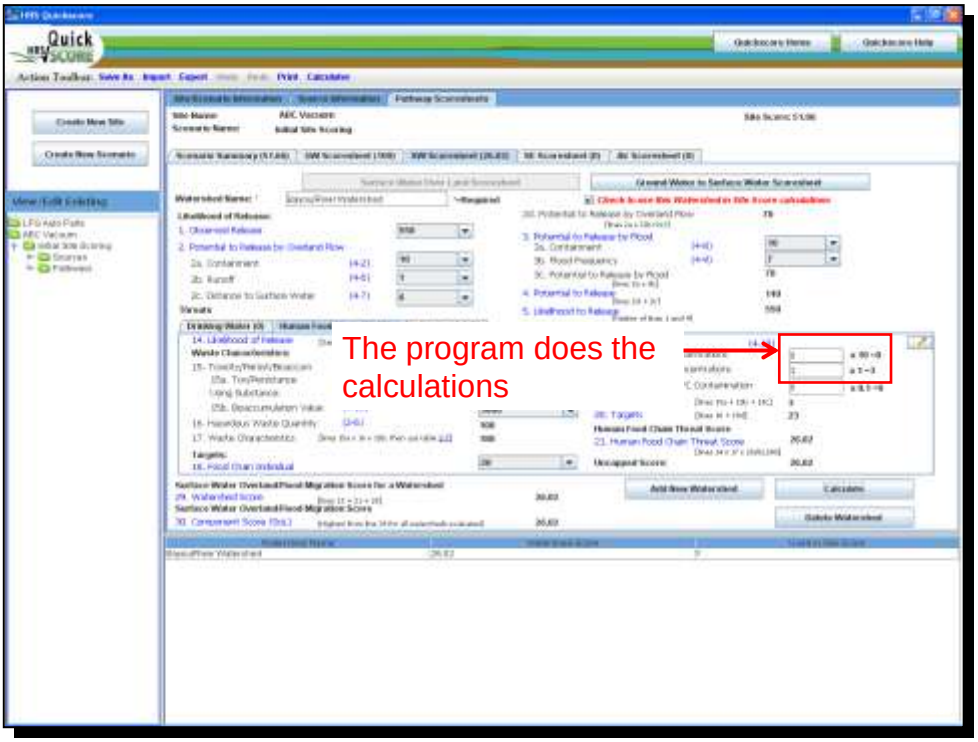
[a] Do not round to nearest integer.

EPA 5-78

HFC Population Example Calculation for the ABC Site

- **HFC Population Values**
  - » Bayou = 100 to 1,000 lbs = 0.3
  - » River = 1,000 to 10,000 lbs = 3
- **Level I for both fisheries**
  - » 0.3 + 3 = 3.3 rounded to 3
  - » 3 x 10 = 30
- **Level II for both fisheries**
  - » 0.3 + 3 = 3.3 rounded to 3

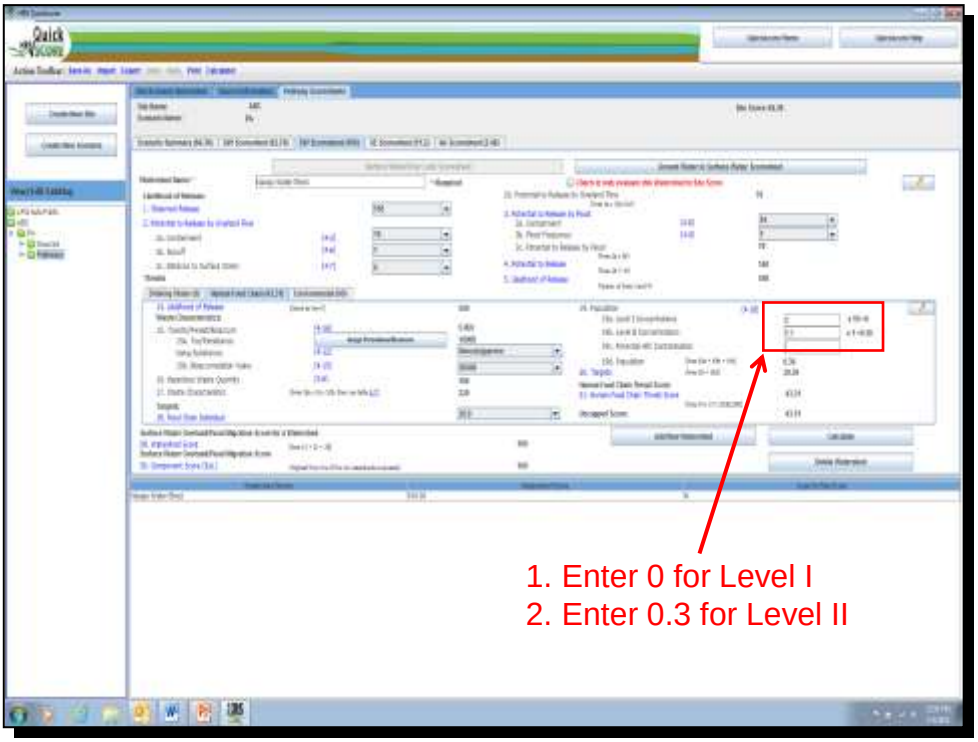
EPA 5-79



Scoring Level I and Level II for ABC

- **Assume no Level I contamination**
  - » Difficult to establish
  - » PPE and fisheries are far from the site
- **Assume Level II contamination of the Bayou only**
  - » Can be established based on finding an observed release by chemical analysis with most likely medium to sample being sediment
  - » River is too distant from the site to score Level II
- **Bayou = 100 to 1,000 lbs = 0.3 (from Table 4-18)**

EPA 5-81



Potential HFC Contamination

- **Assign HFC population value to each fishery subject to potential contamination using Table 4-18**
- **Assign dilution weight to each fishery using Table 4-13**
- **For each fishery, multiply HFC population value by the dilution weight**
- **Sum the values for all fisheries**
- **Divide the sum by 10**
- **Dilution weighting can drastically reduce potential contamination population**

EPA 5-83

River Flow

- **Flow = 75 cubic feet per second**
  - » Obtain value for this flow from Table 4-13
  - » Value is 0.1

EPA 5-84

Descriptor	Flow Characteristics	Assigned Dilution Weight[b]
Minimal Stream	Less than 10 cfs	1
Small to Moderate Stream	10 to 100 cfs	0.1
Moderate to Large Stream	Greater than 100 to 1,000 cfs	0.01
Large Stream to River	Greater than 1,000 to 10,000 cfs	0.001
Large River	Greater than 10,000 to 100,000 cfs	0.0001
Very Large River	Greater than 100,000 cfs	0.00001
Coastal Tidal Waters[d]	Flow and depth not applicable	0.0001
Shallow Ocean Zone[e] or Great Lake	Flow not applicable; depth less than 20 feet	0.0001
Moderate Depth Ocean Zone[e] or Great Lake	Flow not applicable; depth 20 to 200 feet	0.00001
Deep Ocean Zone[e] or Great Lake	Flow not applicable; depth greater than 200 feet	0.000005
3-Mile Mixing Zone in Quiet Flowing River	10 cfs or greater	0.5

5-85

River Human Food Chain Production

- **Production = 1,000 lbs to 10,000 lbs per year**
  - » Obtain value for this production from Table 4-18
  - » Value is 3

EPA

5-86

Table 4-18

----------Table 4-18_Human Food Chain Population Values[a] ----------

Human food chain production (pounds per year)	Assigned human food chain population value
0	0
Greater than 0 to 100	0.03
Greater than 100 to 1,000	0.3
Greater than 1,000 to 10,000	3
Greater than 10,000 to 100,000	31
Greater than 100,000 to 1,000,000	310
Greater than 10^6 to 10^7	3,100
Greater than 10^7 to 10^8	31,000
Greater than 10^8 to 10^9	310,000
Greater than 10^9	3,100,000

[a] Do not round to nearest integer.

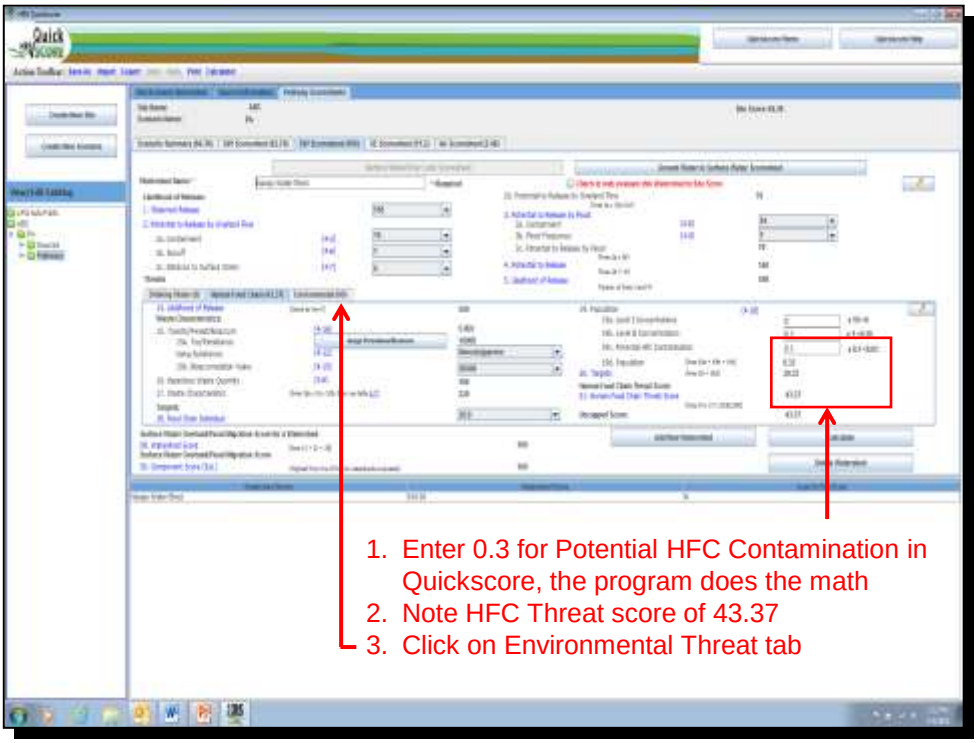
EPA 5-87

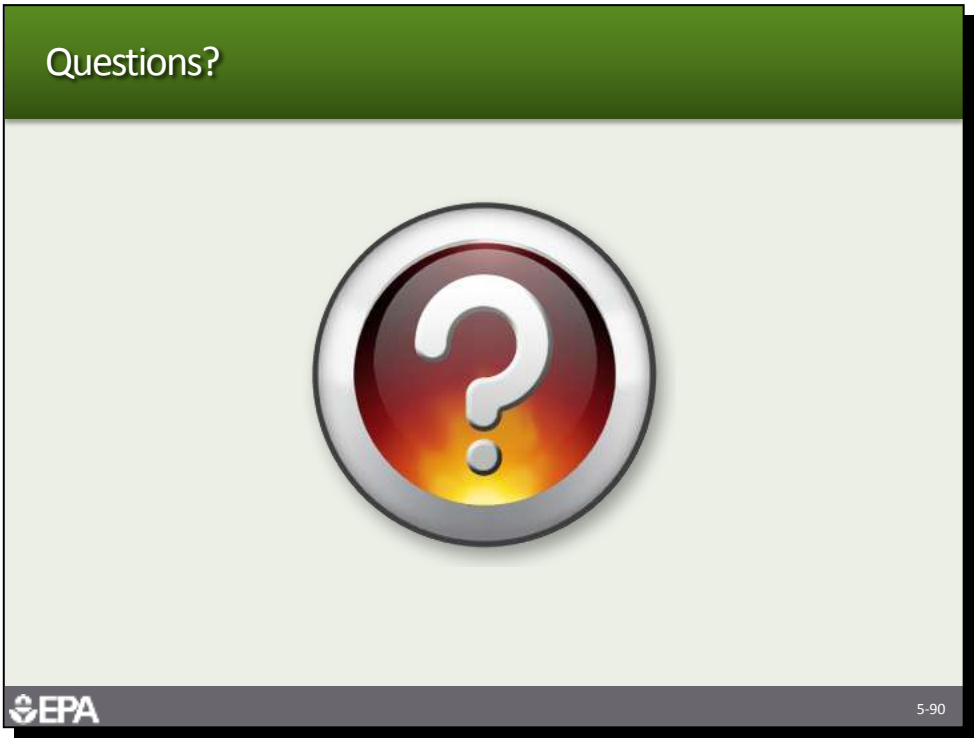
Potential HFC Population for ABC

Fishery	HFC Production Value, Table 4-18	Dilution Weight, Table 4-13	HFC x Dilution
River	3	0.1	0.3
		Sum	0.3

Calculation if scoring manually: 0.3/10 = 0.03

EPA 5-88


1. Enter 0.3 for Potential HFC Contamination in Quickscore, the program does the math
2. Note HFC Threat score of 43.37
3. Click on Environmental Threat tab


Questions?
EPA
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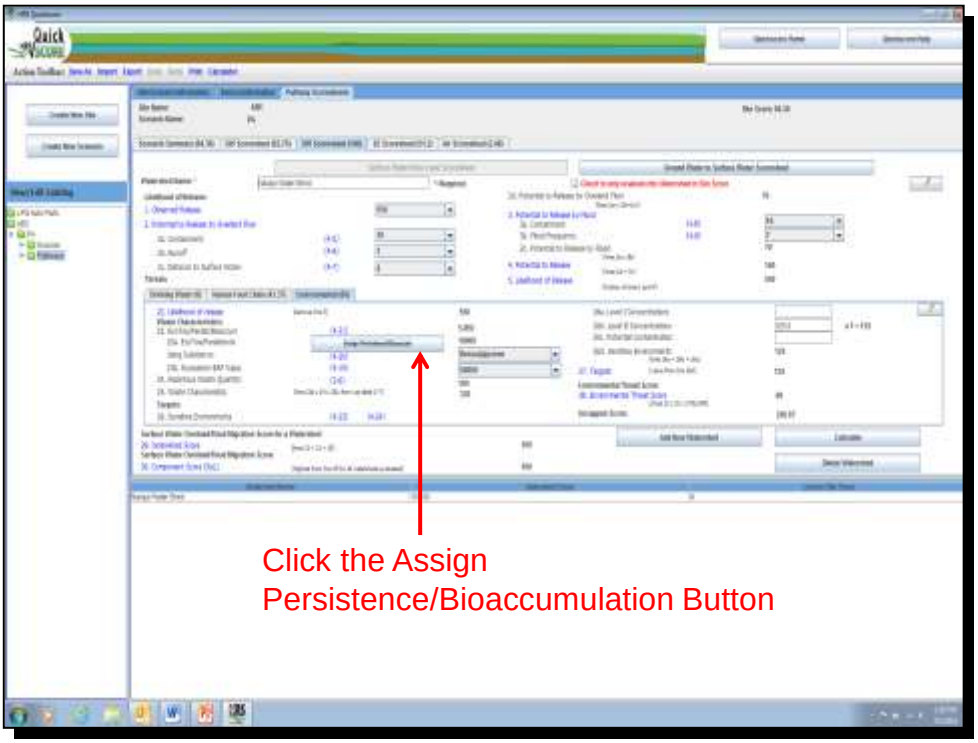
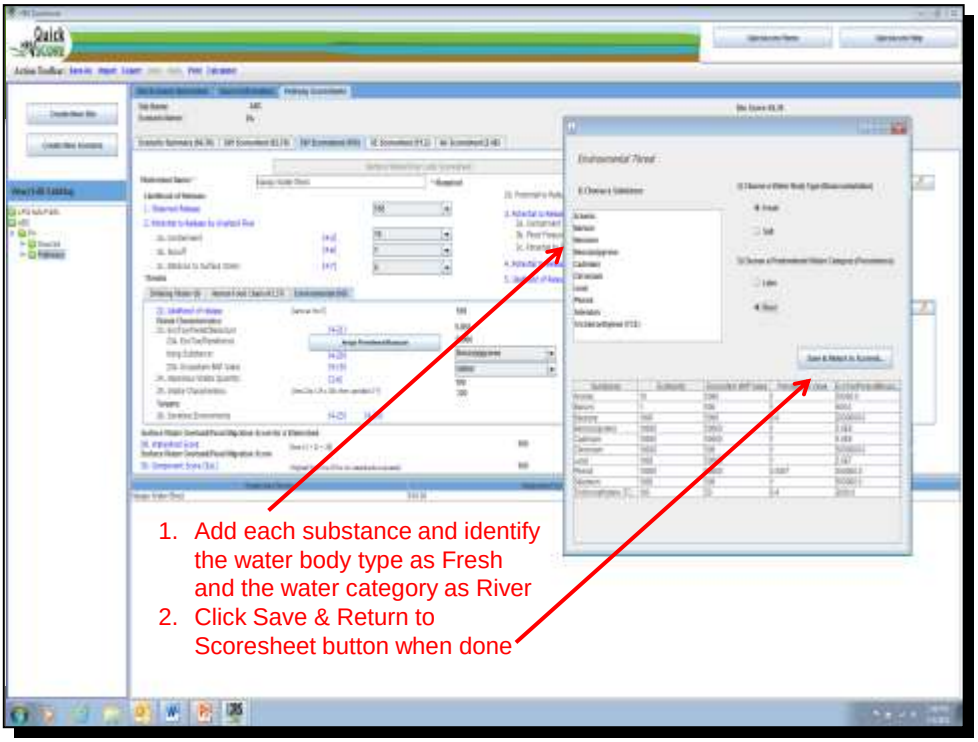
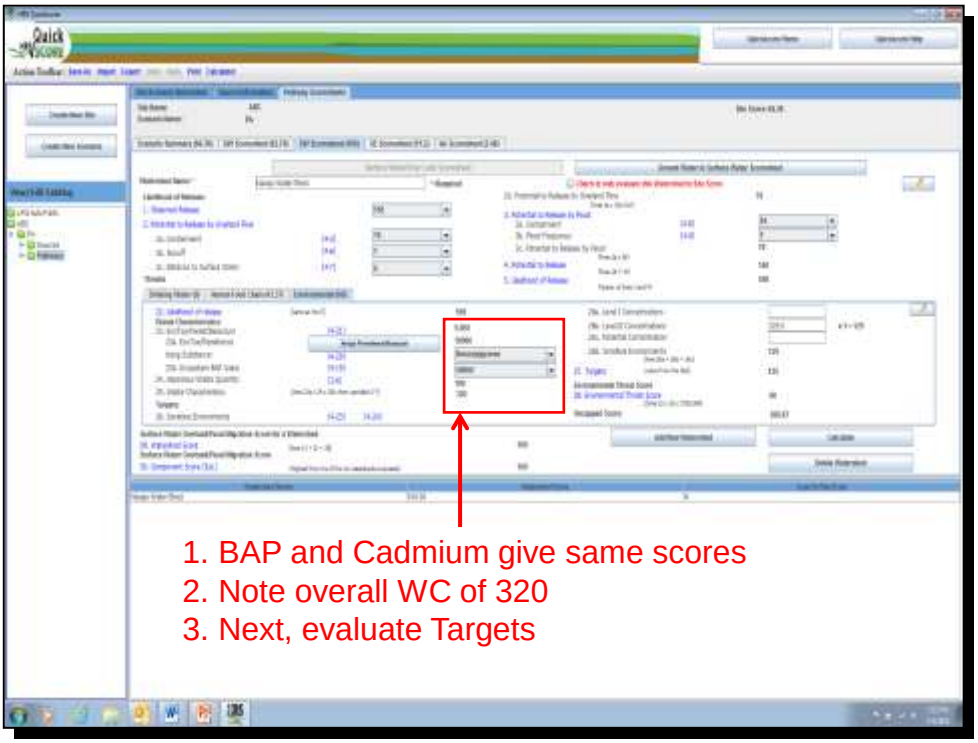

Click the Assign
Persistence/Bioaccumulation Button


1. Add each substance and identify the water body type as Fresh and the water category as River
2. Click Save & Return to Scoresheet button when done



Sensitive Environments at ABC

- **Wetlands**
  - » Frontage = 0.4 miles
  - » Determine value from Table 4-24
- **Endangered species critical habitat**
  - » Determine value from Table 4-23 in manual

EPA 5-94

Participant Poll – Fill in the Blank – The correct value for the ABC Vacuum wetland is _____.

Table 4-24_Wetlands Rating Values for Surface Water Migration Pathway

Total length of wetlands [a] (miles)	Assigned value
Less than 0.1	0
0.1 to 1	25
Greater than 1 to 2	50
Greater than 2 to 3	75
Greater than 3 to 4	100
Greater than 4 to 8	150
Greater than 8 to 12	250
Greater than 12 to 16	350
Greater than 16 to 20	450
Greater than 20	500

[a] Wetlands as defined in 40 CFR section 230.3.

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Excerpt from Table 4-23

♦ **Participant Poll – The correct value for the ABC Vacuum sensitive environment is _____.**

Sensitive Environment	Assigned Value
Critical habitat[a] for Federal designated endangered or threatened species	100
Marine Sanctuary	
National Park	
Designated Federal Wilderness Area	
Areas identified under Coastal Zone Management Act	
Sensitive areas identified under National Estuary Program[c] or Near Coastal Waters Program[d]	
Critical areas identified under the Clean Lakes Program[e]	
National Monument[f]	
National Seashore Recreational Area	
National Lakeshore Recreational Area	

EPA

5-96

Determining Level of Actual Contamination

In determining the level of actual contamination, use a point of direct observation anywhere within the sensitive environment or samples (that is, surface water, benthic, or sediment samples) taken anywhere within or beyond the sensitive environment (or anywhere adjacent to or beyond the sensitive environment if it is contiguous to the migration path).

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Table 4-23: Sensitive Environments Rating Values

Sensitive Environment	Assigned Value
Critical habitat[a] for Federal designated endangered or threatened species	100
Marine Sanctuary	
National Park	
Designated Federal Wilderness Area	
Areas identified under Coastal Zone Management Act	
Sensitive areas identified under National Estuary Program[c] or Near Coastal Waters Program[d]	
Critical areas identified under the Clean Lakes Program[e]	
National Monument[f]	
National Seashore Recreational Area	
National Lakeshore Recreational Area	
Habitat known to be used by Federal designated or proposed endangered or threatened species	75
National Preserve	
National or State Wildlife Refuge	
Unit of Coastal Barrier Resources System	
Coastal Barrier (undeveloped)	
Federal land designated for protection of natural ecosystems	
Administratively Proposed Federal Wilderness Area	
Spawning areas critical[g] for the maintenance of fish/shellfish species within river, lake, or coastal tidal waters	
Migratory pathways and feeding areas critical for maintenance of anadromous fish species within river reaches or areas in lakes or coastal tidal waters in which the fish spend extended periods of time	
Terrestrial areas utilized for breeding by large or dense aggregations of animals[h]	
National river reach designated as Recreational	
Habitat known to be used by State designated endangered or threatened species	50
Habitat known to be used by species under review as to its Federal endangered or threatened status	
Coastal Barrier (partially developed)	
Federal designated Scenic or Wild River	
State land designated for wildlife or game management	25
State designated Scenic or Wild River	
State designated Natural Areas	
Particular areas, relatively small in size, important to maintenance of unique biotic communities	
State designated areas for protection or maintenance of aquatic life[i]	5

[a] Critical habitat as defined in 50 CFR 424.02.
[b] Areas identified in State Coastal Zone Management plans as requiring protection because of ecological value.
[c] National Estuary Program study areas (subareas within estuaries) identified in Comprehensive Conservation and Management Plans as requiring protection because they support critical life stages of key estuarine species (Section 320 of Clean Water Act, as amended).
[d] Near Coastal Waters as defined in Sections 104(b)(3), 304(1), 319, and 320 of Clean Water Act, as amended.
[e] Clean Lakes Program critical areas (subareas within lakes, or in some cases entire small lakes) identified by State Clean Lake Plans as critical habitat (Section 314 of Clean Water Act, as amended).
[f] Use only for air migration pathway.
[g] Limit to areas described as being used for intense or concentrated spawning by a given species.
[h] For the air migration pathway, limit to terrestrial vertebrate species. For the surface water migration pathway, limit to terrestrial vertebrate species with aquatic or semiaquatic foraging habits.
[i] Areas designated under Section 305(a) of Clean Water Act, as amended.

ABC Vacuum Sensitive Environments

- **One wetland and one endangered species habitat**
- **Located near end of TDL greater than 10 miles from site**
- **Potential attribution issues**

EPA 5-98

Calculations for Level I, Level II, and Potential Targets

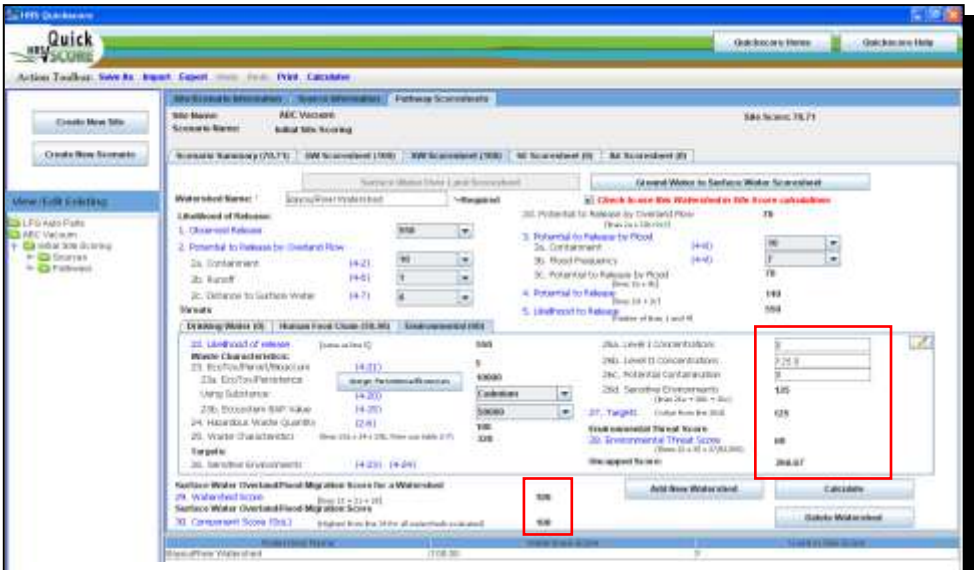
- **Level I**
  - » 10(Wetland Frontage Value + Sensitive Environment Value)
- **Level II**
  - » Wetland Frontage Value + Sensitive Environment Value
- **Potential**
  - » 1/10[(Wetland Frontage Value + Sensitive Environment Value) Dilution Weight for Water Body from Table 4-13]
  - » Dilution weight for River from Table 4-13 is 0.1

EPA 5-99

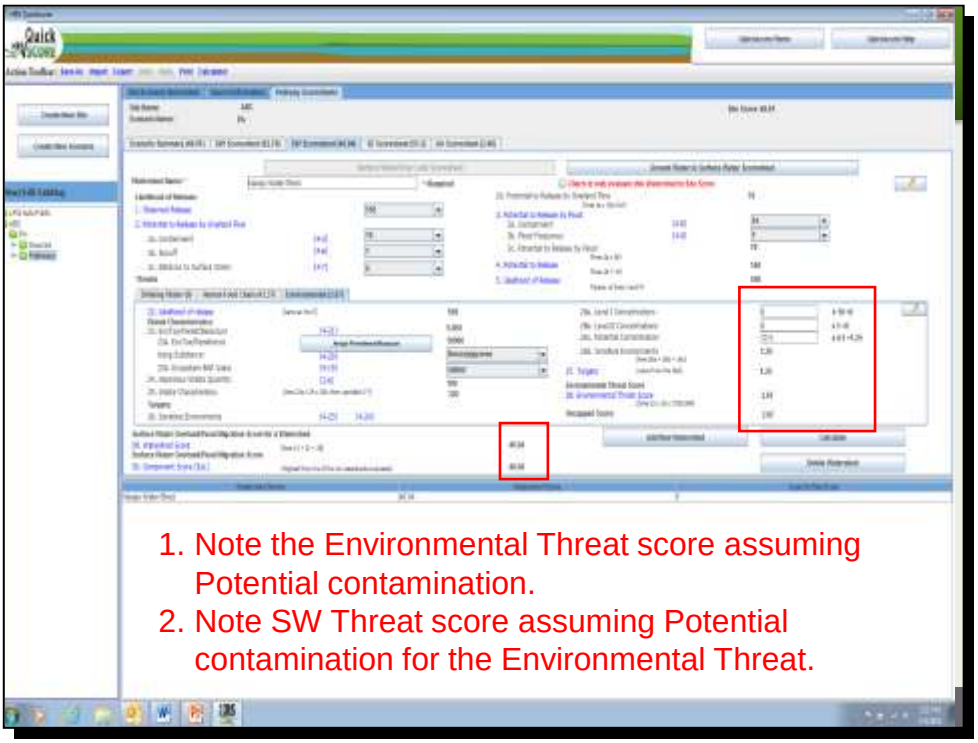
ABC Site Sensitive Environment Possibilities

- **Level I**
  - » 10(25 + 100) = 1,250
- **Level II**
  - » 25 + 100 = 125
- **Potential**
  - » 1/10[(25 + 100)0.1] = 1.25 rounded to 1

EPA 5-100



1. Note the Environmental Threat score assuming Level II contamination. Remember it is capped at 60.
2. Note SW Threat score assuming Level II contamination for the Environmental Threat.



SI Considerations for Surface Water Pathway

- **Evaluate whether or not an observed release at the PPE can be documented**
- **Confirm there are no drinking water intakes in TDL**
- **Evaluate if the Perennial Ditch can be considered a fishery**
- **Document that the Bayou and River are fisheries and flow and HFC production from each**

(continued)

EPA 5-103

SI Considerations for Surface Water Pathway

- **Evaluate whether or not an observed release to the Bayou or River fisheries can be documented**
- **Evaluate whether or not an observed release to the River at the sensitive environments can be documented**
- **Determine the types of contaminants associated with the site**
- **Assess whether attribution will be an issue in the surface water pathway**

EPA 5-104

Questions?

EPA 5-105

Next PA/SI Module

- **Monday, July 14, 2014; 1:00 p.m. – 3:00 p.m. Eastern**
  - » PA Scoring Exercise for Air and Soil Pathways

EPA 5-106