





- Saturated subsurface zone from which drinking water is drawn: EPA's PA guidance defines an aquifer as a saturated subsurface zone from which drinking water is drawn. The principal threat under the groundwater pathway is the threat posed to drinking water and to populations relying on groundwater as their source of drinking water.
- Groundwater may be used for certain resources such as agriculture and recreation: Groundwater affected by a site may also be used for resources, such as agriculture, commercial food production, livestock, silviculture or recreation. If groundwater is used for certain resources, the groundwater score can be increased.
- Not all groundwater is used for drinking purposes: Groundwater may not be used for drinking in some areas. The reasons could be poor yield, poor quality or the availability of a high quality surface water source.





- What is the local stratigraphy?: Proper evaluation of the groundwater pathway requires a general understanding of the local geology and subsurface conditions. Publications of the USGS and State geological surveys are good sources for local and regional geologic information. Other local sources of information may include well drillers, well logs (possibly maintained by local and State government agencies) and university geology departments.
- What aquifer(s) serves the nearby areas?: The target distance limit for groundwater is 4 miles. All aquifers within 4 miles of the site should be evaluated to determine if they are used for drinking water. In many cases, a shallow aquifer may be used by private residents with individual wells while a deeper aquifer is used by a community or municipality.
- How deep is the shallowest aquifer that is used for drinking purposes?: The PA identifies the shallowest aquifer used for drinking purposes. This information is necessary to evaluate the potential to release if an observed release cannot be established.





Groundwater pathway questions: The groundwater pathway is scored by determining (1) the likelihood that hazardous substances have been released to the groundwater (the higher the likelihood the higher the score); (2) the number of targets affected or potentially affected by the contaminated groundwater (the greater the number of targets the greater the score); and (3) the toxicity, mobility and quantity of hazardous substances at the site (the more toxic and mobile, and the greater the quantity the greater the score).





- Observed release: This factor evaluates the likelihood that contamination from the site has reached groundwater. At the PA stage, groundwater sampling data may not be available. Therefore, several contaminant and hydrogeologic factors are evaluated to make this determination.
- Potential to release: This factor measures the likelihood of groundwater becoming contaminated based on site-specific factors. These factors include source containment, net precipitation, depth to aquifer and contaminant travel time.
- Evaluate sources/wastes/hydrogeology: The likelihood of release requires an evaluation of the sources at the site and the level of containment of those sources, the physical state of the contaminants, precipitation levels, infiltration rates, presence of karst geology, permeability, aquifer depth, contaminant mobility and any analytical or circumstantial evidence regarding releases.





- Actual Level I and II contamination: Actual contamination targets include populations associated with drinking water wells that are contaminated. Level I contamination occurs when contaminant levels in drinking water wells are above established standards, such as maximum contaminant levels (MCL). Level II contamination occurs when contaminant levels in drinking water qualifies as an observed release but is at or below established standards.
- Potential contamination: Potential contamination evaluates all drinking water wells within 4 miles of the sources. The population served by these wells is counted even if they live farther than 4 miles from the source. Populations associated with drinking water wells are distance weighted. The farther the well is from the source, the greater the reduction in target numbers due to distance weighting.





- Resources: This pathway score can be increased if groundwater is used for particular resources within 4 miles of the sources at the site.
- Wellhead Protection Area: If there is a formally established Wellhead Protection Area within 4 miles of the sources at the site then additional points can be added to the score. Only final Wellhead Protection Areas established in accordance with the Safe Drinking Water Act count. Proposed areas cannot be counted.





- Determine based on: At the PA stage, there may not be any analytical data to indicate that drinking water wells are subject to actual contamination. Therefore, BPJ must be used to evaluate whether actual contamination should be scored. These judgments should be conservative and err on the side of caution. The BPJ should consider the characteristics of the site and local hydrogeology; source types and quantities of waste; the proximity of drinking water wells; the depth to drinking water aquifers; and any information about closed wells or complaints of residents about the quality of well water. Existing analytical information from past sampling efforts can also be useful.
- Level I: Actual contamination can either be Level I or Level II. Level I groundwater contamination means that a drinking water well has contamination at levels that equal or exceed regulatory or health-based standards, such as, MCLs. Level I contamination is scored higher than Level II contamination.
- Level II: Level II contamination means that a drinking water well has contamination at levels that qualify as an observed release but are less than regulatory or health-based standards.





- Drinking water wells within 4 miles of sources: All drinking water wells within 4 miles of the source should be evaluated, including municipal wells, private wells and community supply wells. The depths of these wells and their distances from the sources should be established.
- Count all populations served by wells within 4 miles of sources: All populations served by wells located 4 miles from the source should be counted. Well located within 4 miles of the sources may serve populations outside 4 miles. Conversely, wells located outside the 4 mile distance limit may serve populations located within the 4 mile target distance limit.
- Groundwater flow direction is not considered: The PA, SI and HRS do not consider groundwater flow direction. The target distance limit is measured from sources in all directions.





Well location example: This example illustrates how populations are counted. The population from Well A would not be included because the well is located outside the 4 mile target distance limit, even though the population resides within the target distance limit. The population associated with Well B would be counted even though most of the people live outside the target distance limit because the well is within the target distance limit.





- Evaluate all groundwater targets within 4 miles of the sources regardless of which aquifer they draw from: Many sites will have more than one aquifer associated with them. All drinking water wells within the 4 mile target distance limit should be evaluated even if they draw from different aquifers.
- If two or more aquifers are interconnected, they can be counted as one aquifer: Interconnected aquifers can be counted as one aquifer. Evidence of interconnected must be established through existing geologic information or information developed during the SI.





- **Determine the following about each well:** As part of the PA, the following information should be collected for each well:
  - » Location, depth and screened interval
  - » Aquifer(s) tapped
  - » Number of people served
  - » Number of connections
  - » Volume of water pumped annually
- Locate and determine reason for any closed wells: If any wells have been closed, the PA should locate these wells in relation to the site, determine if they are within the target distance limit, and establish the reason for closing the well.





- Blended systems mix together water from several wells before distribution: Municipal systems may blend together water from two or more wells before distribution to users. In addition, the entire system may be interconnected, by way of valves or connecting lines, so that water drawn from any individual well has the potential to reach any user of the system. The population from such blended systems must be apportioned.
- ◆ Apportion population as follows: Population apportions for blended systems follows the 40% rule. If any one well contributes 40% or more to annual production, apportion the population based on actual contributions from wells. If no single well contributes 40% or more, apportion population evenly for all wells.



WELL #	% CONTRIBUTION	POPULATION SERVED
DW-1	30	?
DW-2	35	?
DW-3	35	?

Less Than 4	10% Solution	
WELL #	% CONTRIBUTION	POPULATION SERVED
DW-1	30	3,333
DW-2	35	3,333
DW-3	35	3,333
	TOTAL POPULATION = POPL	ILATION SERVED
	NUMBER OF WELLS	
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WELL	% CONTRIBUTION	POPULATION SERVED
#		
DW-1	50	?
DW-2	25	?
DW-3	25	?

WELL	% CONTRIBUTION	POPULATION SERVED
#		
DW-1	50	5,000
DW-2	25	2,500
DW-3	25	2,500
		ON = POPULATION SERVED





- Evaluate if they are served less than 1 mile from source: Worker and student populations served within 1 mile of sources should be evaluated if they are not already included in the population served by the municipal system.
- Count same person 3x if they are a worker, student and resident: A single individual can be counted three times if they are a worker, student and resident.
- Do NOT spend time collecting information on populations beyond 1 mile because distance-weighting will reduce their score: It generally will not be advantageous to spend time collecting information on worker and student populations beyond 1 mile because of the effects of distance-weighting. The exception to this may be the presence of a large major university or major manufacturing complex with many employees.

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• The participants will now score the groundwater pathway for the ABC site. Open the Pathway Scoresheets tab.

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• Open the Ground Water Scoresheet tab. Next review groundwater information for the ABC Vacuum Site.





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• Go to name the Aquifer or Scenario and check the box below that tells the program to use this aquifer in scoring. The sheet will not go "live" until you name the aquifer. Click on the summary tab to get the program to recognize the name.

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• Click the observed release drop down which shows 550 and 0.









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• The evidence points to a likely observed release.





## Source Containment BPJ – Drums and Tanks

#### Drums

- » 200 drums on a concrete pad
- » No berm around the pad is noted

#### ♦ Tanks

- » On a concrete pad
- » Covered by shed
- » No berm or secondary containment noted

### €PA

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 liner (or no essentially impervious base) under container area.	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, container area surrounded by sound diking the maintained, and:	nat is regularly inspected and
(a) Liner (or essentially impervious base) under container area.	9
(b) Essentially impervious base under container area with liquids collection and removal system.	7
(c) 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; plus functioning groundwater monitoring system, 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
(d) Free liquids present, containment system has sufficient capacity to hold total volume of all containers and to provide adequate freeboard, single liner under container area with functioning leachate collection and removal system below liner, and functioning groundwater monitoring system.	5
(e) Same as (d) 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-off 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 liquid or solidification of remaining wastes and waste residues).	Evaluate using All Sources criteria (with no bulk or free liquid 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
Table 3-2. Containment Factor Values for Groundwater Migration Pathway (Continued)	
Source	Assigned Value
Tank	
Tank and ancillary equipment not provided with secondary containment (e.g., liner under tank area, vault system, double wall).	10
No diking (or no similar structure) surrounding tank and ancillary equipment.	10
No evidence of hazardous substance migration from tank area, tank and ancillary equipment surrounded by sour inspected and maintained, and:	d diking that is regularly
(a) Tank and ancillary equipment provided with secondary containment.	9
(b) Tank and ancillary equipment provided with secondary containment with leak detection and collection system.	7
(c) 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 timely manner, at least weekly inspection of tank and secondary	5
containment system, all leaking or unfit-for-use tank systems promptly responded to, and functioning groundwater monitoring system.	
(d) Containment system has sufficient capacity to hold volume of all tanks within tank containment area and to	
provide adequate freeboard, single liner under that containment area with functioning leachate collection and removal system below liner, and functioning groundwater monitoring system.	5
(e) Same as (d) 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 – Containment Scores for Drums and Tanks

- Based on description of the drum storage area and the descriptions in Table 3-2, what score would you assign the drums?
- Based on description of the mixing tanks and the descriptions in Table 3-2, what score would you assign the tanks?

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Surface Impoundment	
Evidence of bazardous substance migration from surface impoundment	
No liner	10
Free liquids present with either no diking unsound diking or diking that is	10
not regularly inspected and maintained.	10
No evidence of hazardous substance migration from surface impoundment, present, sound diking that is regularly inspected and maintained, adequate f	free liquids freeboard, and:
(a) Liner	9
(b) Liner with functioning leachate collection and removal system below liner, and functioning groundwater monitoring system	5
(c) Double liner with functioning leachate collection and removal system between liners, and functioning groundwater monitoring system.	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 liquid deposited).





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 liner	10
No evidence of hazardous substance migration from source area, a liner, and:	
(a) None of the following present: (1) maintained engineered cover, or (2) functioning and maintained run-on control system and runoff management system, or (3) functioning leachate collection and removal system immediately above liner.	10
(b) Any one of the three items in (a) present.	9
(c) Any two of the items in (a) present.	7
(d) All three items in (a) present plus a functioning groundwater monitoring system.	5
(e) All items in (d) 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 colle removal system above and between liners, functioning groundwater monitoring system, and:	ection 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
Source area inside or under maintained intact structure that provides protection from	
precipitation so that neither runoff nor leachate is generated, liquids or materials containing	
present.	U

# Participant Poll – Containment Scores for Stained Soil and Rubbish Pile

- Based on description of the stained soil and the descriptions in Table 3-2, what score would you assign the stained soil
- Based on description of the rubbish pile and the descriptions in Table 3-2, what score would you assign the rubbish pile

Version: July 2014

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ABC Vacuum	Likelihood of Rele	ase to an Aquifer:		7. Nearest We	ell (3-11) O	<b>v</b>
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	Residential Ponulation		in	in		



• Highest containment value should be 10.

### Table 3-2. Containment Factor Values for Groundwater 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 liner	10			
No evidence of hazardous substance migration from source area, a liner, and:				
<ul> <li>(a) None of the following present: (1) maintained engineered cover, or (2)</li> <li>functioning and maintained run-on control system and runoff management system, or (3) functioning leachate collection and removal system immediately above liner.</li> </ul>	10			
(b) Any one of the three items in (a) present.	9			
(c) Any two of the items in (a) present.	7			
(d) All three items in (a) present plus a functioning groundwater monitoring system.	5			
(e) All items in (d) 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 ful collection and removal system above and between liners, functioning groundwater m and:	unctioning leachate nonitoring system,			
(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			
Source area inside or under maintained intact structure that provides protection from precipitation so that neither runoff nor leachate is generated, liquids or materials containing free liquids not deposited in source area, and functioning and maintained run-on control present.	0			
Surface Impoundment				
Evidence of hazardous substance migration from surface impoundment.	10			
No liner.	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) Liner	9			
(b) Liner with functioning leachate collection and removal system below liner, and functioning groundwater monitoring system	5			
(c) Double liner with functioning leachate collection and removal system between liners, and functioning groundwater monitoring system.	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 liquid deposited).			
Lang Treatment				
Evidence of hazardous substance migration from land treatment zone.	10			
No functioning, maintained, run-on control and runoff management system.	10			

### Table 3-2. Containment Factor Values for Groundwater Migration Pathway (Continued)

Source	Assigned Value			
Land Treatment				
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,	5			
(c) Land treatment area maintained in compliance with 40 CER 264 280	0			
Containers	Ū			
Containere				
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 liner (or no essentially impervious base) under container area.	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, container area s diking that is regularly inspected and maintained, and:	surrounded by sound			
(a) Liner (or essentially impervious base) under container area.	9			
(b) Essentially impervious base under container area with liquids collection and removal system.	7			
(c) 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; plus functioning groundwater monitoring system, 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			
(d) Free liquids present, containment system has sufficient capacity to hold total volume of all containers and to provide adequate freeboard, single liner under container area with functioning leachate collection and removal system below liner, and functioning groundwater monitoring system.	5			
(e) Same as (d) 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-off 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 liquid or solidification of remaining wastes and waste residues).	Evaluate using All Sources criteria (with no bulk or free liquid 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			

### Table 3-2. Containment Factor Values for Groundwater Migration Pathway (Continued)

Source	Assigned Value		
Tank			
Tank and ancillary equipment not provided with secondary containment (e.g., liner under tank area, vault system, double wall).	10		
No diking (or no similar structure) surrounding tank and ancillary equipment.	10		
No evidence of hazardous substance migration from tank area, tank and ancillary eq by sound diking that is regularly inspected and maintained, and:	uipment surrounded		
(a) Tank and ancillary equipment provided with secondary containment.	9		
(b) Tank and ancillary equipment provided with secondary containment with leak detection and collection system.	7		
(c) 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 timely manner, at least weekly inspection of tank and secondary containment system, all leaking or unfit-for-use tank systems promptly responded to, and functioning groundwater monitoring system.	5		
(d) Containment system has sufficient capacity to hold volume of all tanks within tank containment area and to provide adequate freeboard, single liner under that containment area with functioning leachate collection and removal system below liner, and functioning groundwater monitoring system.	5		
(e) Same as (d) 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		

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	5. Hazardous Wast	e Quantity (2-6) 10	0	[Highest value	e from line 12 for all aquiter	s evaluated]
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 Select the value from the dropdown menu that is obtained from Figure 3-2 in the HRS rule.













• Now evaluate depth to aquifer.



Depth to Aquifer Factor Values		
Table 3-5_Depth to Aquifer Factor Values Depth to aquifer <sup>a</sup> (feet)	Assigned Value	-
Less than or equal to 25 Greater than 25 to 250 Greater than 250	5 3 1	
a Use depth of all layers between the hazardous substances a Assign a thickness of 0 feet to any <u>karst</u> aquifer that underlies of the sources at the site.	and aquifer. any portion	
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	2b. Net Precipi	tation (3-4) 6	-	8d. Populat	tion [lines 8a+8b+8c]	
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		2. Potential to Release	8b. Level II Concentra	
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		2b. Net Precipitation (3-4) 2c. Depth to Aquifer (3-5) 5	8d. Population [lines 8a+8b+8c]	
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This factor value estimates contaminant travel time in the interval between 10 feet below ground surface and the top of the aquifer.

## Use Table 3-6 to Determine Hydraulic Conductivity

#### Table 3-6. Hydraulic Conductivity of Geologic Materials

lype of material	Assigned Hy Conductivity (	draulic cm/sec) <sup>ª</sup>
Clay; low permeability till (compact unfractured till); shale; unfractured metamorphic and igneous rocks.	10 <sup>-8</sup>	
Silt; losses; silty clays; sediments that are predominantly silts; moderately permeable till (fine-grained, unconsolidated till, or compact till with some fractures); low permeability limestones and dolomites (no karst); low permeability sandstone; low permeability fractured igneous and metamorphic rocks.	10 <sup>-6</sup>	
Sands; sandy silts; sediments that are predominantly sand; highly permeable till (coarse-grained, unconsolidated or compact and highly fractured); peat; moderately permeable limestones and dolomites (no karst); moderately permeable sandstone; moderately permeable fractured igneous and metamorphic rocks.	10 <sup>-4</sup>	10 <sup>-3</sup> ?
Gravel; clean sand; highly permeable fractured igneous and metamorphic rocks; permeable basalt; karst limestones and dolomites	10 <sup>-2</sup>	

# Use Table 3-7 and Hydraulic Conductivity from Table 3-6 to Determine Score for Travel Time

#### Table 3-7: Travel Time Factor Values<sup>a</sup>

Hydraulic Conductivity	Thickness of Lowest Hydraulic Conductivity Layer(s) (feet) <sup>b</sup>				
(cm/sec)	Greater than 3 to 5	Greater than 5 to 100	Greater than 100 to 500	Greater than 500	
Greater than or equal to 10 <sup>-3</sup>	35	35	35	25	
Less than $10^{-3}$ to $10^{-5}$	35	25	15	15	
Less than 10 <sup>-5</sup> to 10 <sup>-7</sup>	15	15	5	5	
Less than 10 <sup>-7</sup>	5	5	1	1	

If <u>depth to aquifer</u> is 10 feet or less or if, for the interval being evaluated, all layers that underlie a portion of the sources at the site are karst, assign a value of 35.

<sup>b</sup> Consider only layers at least 3 feet thick. Do not consider layers or portions of layers within the first 10 feet of the depth to the aquifer.

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🚞 ABC Vacuum	Likelihood of Release to an Aquifer:	7. Nearest Well (3-11)
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for travel time	2b. Net Precipitation (3-4) 6	8d. Population [lines 8a+8b+8c]
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• The score of 35 can be justified. A more conservative score would be 25. Either is acceptable for the data we now have. Note the potential to release score has a maximum of 500 and will always be lower than an observed release score.

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The	Waste Characteristics:	[(lines 3 x 6 x 11)/82,500)]
maximum	4. Toxicity/Mobility Assign Mobility (3-9) 0	Ground Water Migration Pathway Score
value is 500.	5. Hazardous Waste Quantity (2-6) 100	[Highest value from line 12 for all aquifers evaluated]
Program	6. Waste Characteristics 0	Uncapped Score: 0
calculates	Times 4 x 5, then use Table 247 T	Add New Aquifier Delete Aquifier
value	Scoresheets Likelihood of Release Waste Characteristi	cs Targets Pathway Score Date Last Updated
value.	V/OL Scoresheet	0 0 10/10/2009 -
	GW to SW Scoresheet	=
	Human Food Chain	
	Environmental Soil Scoresheet	0 10/10/2009
	Residential Population 0	
🛃 start 💦 🕑 Lexa	(E:) 😫 078_GW Pathwa 🐏 078_GW Pathwa	HRS Quickscore 🌈 E:\ABCVa_0.xml 🥜 🕺 🦉 📍 🔍 💻 1:37 PM

🗱 HRS Quickscore			P 🗙
Quick		Quickscore Ho Quickscore H.	
			_
Action Toolbar: Save A	s Import Export Undo Redo Print Calculator		
	Site/Scenario Information Source Information Pathway Scoreshe	eets	
Create New Si	Site Name: ABC Vacuum	Site Score: 0	
Create New S	Scenario Name: Initial Site Scoring		
orotico riori oni	Scenario Summary (0) GW Scoresheet (0) SW Scoresheet (0)	SE Scoresheet (0) Air Scoresheet (0)	
View/Edit Existing			
L PQ Auto Parts	Ground water Midration Pat	nway scoresneet	
🛅 Quickscore Tutorial	Aquirer Name or Painway Scenario: ABC Vacuum Aquirer	Torreto	
Tutorial EX/IM Try	Check to use this Aquifer in Site Score calculations	7. Nearest Well (3-11) 0	
	1 Observed Release	8. Population 8. Level I Concentrati	
	2. Potential to Release	8b. Level II Concentra	
	2a. Containment (3-2) 10 💌	8c. Potential Contaminati(3-12)	
	2b. Net Precipitation (3-4) 6 💌	8d. Population [lines 8a+8b+8c]	
Assess	2c. Depth to Aquifer (3-5) 5 💌	9. Resources 0 💌	
T · · · /	2d. Travel Time (3-7) 35 💌	10. Wellhead Protection Area 0 💌	
IOXICITY/	2e. Potential to Release 460 [lines 2a x (2b + 2c + 2d)]	11. Targets [7 + 8d + 9 + 10] 0	
Mobility of	3. Likelihood of Release 550	Ground Water Migration Score for an Aquifer	
Chemicals	[Higher of lines 1 and 2e]	[(lines 3 x 6 x 11)/82,500)]	
Chemicais	4. Toxicity/Mobility Assign Mobility (3-9) 0	Ground Water Migration Pathway Score	
of	Using Substance:	13. Pathway Score (Sgw) 0	
Concern	5. Hazardous Waste Quantity (2-6) 100	[Highest value from line 12 for all aquifers evaluated]	
••••••	6. Waste Characteristics 0	Add New Amilier Delete Amilier	
	Calculate	Add New Aquiller Delete Aquiller	
	Scoresheets Likelihood of Release Waste Characteristics	Targets Pathway Score Date Last Updated	
	SW/QL Scoresheet	0 0 10/10/2009	-
	GW to SW Scoresheet		
	Drinking Water		
	Environmental		- -
	Soil Scoresheet	0 10/10/2009	
	Residential Population 0	- In	
🛃 start 🔰 🕜 Lexa	ar (E:) 🛛 🖉 078_GW Pathwa 🔛 078_GW Pathwa 🎇 HR	S Quickscore 🏉 E:\ABCVa_0.xml 🥜 🕺 🕄 🗘 💭 1:46	PM



• Now score waste characteristics. Click on Assign Mobility to begin.

🕌 Ground Water Scoresheet - As	sign Mobility			
	1. Select the fire	st chemical		
1) Choose a Substance			2) Choose a Mobility Type	2. Liquid or non- liquid refers to the
Arsenic			🔾 Liquid/Karst	contaminant as
Benzene Cadmium Chromium Lead			Liquid/Non-Karst	disposed and karst or non-karst
Phenol			○ Non-Liquid/Karst	refers to
Trichloroethylene (TCE)			O Non-Liquid/Non-Karst	beneath sources.
	3. Toxicity and	mobility values are	O In Observed Release	For this site Liquid/Non-Karst
	shown and the	e Toxicity/Mobility		is appropriate for
	score is	calculated		all COCs.
			Save & Retur	n to Scoresheet
Substance	Toxicity	Mobility Type	Mobility Value	Toxicity/Mobility
Arsenic	10000	Liquid/Non-Karst	0.01	100
Cadmium	1000			
Chromium	10000			
Lead	10000			
Phenol	10			
Selenium Trichloroethylene (TCE)	1000			
	4. Repe	at process for all c	hemicals	
🛃 start 🕜 C Lexar (E:)	👫 078_GW Pat 🔛 078	.GW Pat 🧱 HRS Quicksc 🥻	Ground Wat 🌈 E:\ABCVa_0	🧷 🥜 😰 🕄 🗘 💭 1:57 PM



 Click on the first chemical and then click Liquid/Non-karst. The chemical and its values will show up in the table at the bottom. Repeat this for every chemical.

🛓 Ground Water Scoresheet – Assign Mobility				•
1) Choose a Substance			2) Choose a Mobility Type	
Arsenic		]	🔾 Liquid/Karst	
Barium Benzene				
Benzo(a)pyrene			Liquid/Non-Karst	
Cadmium			O Non Liquid/Karret	
Lead			U Non-Eigunarst	
Phenol		When all chemicals	are entered click	the Save &
Trichloroethylene (TCE)		Doturn to	Soorooboot butte	
		Return to		ות
				7
			Save & Return	i to Scoresheet
Substance	Toxicity	Mobility Type	Mobility Value	Toxicity/Mobility
Arsenic	10000	Liquid/Non-Karst 0.	.01	100
Benzene	10000	LiquidNon-Karst 0.	01	10
Benzo(a)pyrene	10000	Liquid/Non-Karst 1	0F-4	1
Cadmium	10000	Liquid/Non-Karst 0.	.01	100
Chromium	10000	Liquid/Non-Karst 0.	.01	100
Lead	10000	Liquid/Non-Karst 0.	.01	100
Phenol	10	Liquid/Non-Karst 1.	.0	10
Selenium	100	Liquid/Non-Karst 1.	.0	100
Trichloroethylene (TCE)	1000	Liquid/Non-Karst 1.	.0	1000
🕘 O 🏉 📜 🧕	s 💌 📪 💽 😤			- 🏴 🗗 🖬 🌒 🧯



 When all substances are in the table at the bottom, click Save & Return to Scoresheet.

HRS Quickscore				
			Quickscore Home	Quickscore Help
Action Toolbar: Save As Import Ex	oort Undo Redo Print Calculator			
	Stel'Scenario Information Source Information Pathway Scoresheets			
Create New Site	Site Name: ABC		Site Score: 64.39	
	Scenario narro: VA			
Create New Scenario	Scenario Summary (84.39) GW Scoresheet (62.91) SW Scoresheet (100) SE Scoresheet (51.2) Air Scoresheet (2.48)			
	Ground Water Migration Pathway Scoresheet			1
View/Edit Existing	Aquifer Name or Pathway Scenario: * ABC Vacuum Aquifier	*=Required		
LPQ Auto Parts	Check to only evaluate this Aquifer in Site Score	Targets:	(2.11)	
P PA	Likelihood of Release to an Aquiter:	8. Population	(3.11) 20	
Patrivays	1. Observed Rokase 550 💌	8a. Level I Concentrations	20	x 10 = 200
	2. Potencia to koleste	8b. Level II Concentrations	1	x1=1
	2b. Net Precipitation (34) 6	Sc. Potential Contamination	(3-12) [2082 469.20	x 0.1 = 268.20
	2c. Depth to Aquifer (3-5) 5	9. Resources	5	
	2d. Travel Time (3-7) 35 💌	10. Welhead Protection Area	0 -	
	2e. Potential to Release 460	11. Targets [7+8d+9+10]	524.20	
	2   feiling of Drives	Ground Water Migration Score for an Aquifer		
	St. Consister of Interaction and 2a	12. Aquifer Score [[lines 3 x 6 x 11]/82,500]]	62.91	
	Waste Characteristics:			
	4. Toxicty/Mobility Assign Boolity (3-9) 1000 Using Substance: Trichloroethylene (T., V	Ground Water Nigration Pathway Score 13. Pathway Score (Sgw)	62.91	
	5. Hazardous Waste Quantity (2-6) 100	(Highest value from line 12 for all aquifers evaluat	ted]	
	6. Waste Characteristics 18	Uncapped Score:	62.91	
	[Inve 4 x 5; then use Table 2-7] Calculate	Add New Aquifier	Delete Aquifier	
	Apuller Name Apuller Score Apuller Score	,	Used in Site Score	
	pour racional inquiner			
	TCE gives highest toxicity/mob	vility cooro wh	on	
	TOE gives highest toxicity/hou	mity score, wi		
	combined with a HWQ of 100 c	gives a WC of	18	
		•		
	S S S S S S S S S S S S S S S S S S S			- 🏲 🕅 🎿 🕕 313 PM 6/25/2014



• The program should select the substance with the highest toxicity/mobility score as shown. The program also uses the information from sources to calculate the WC.





• Use BPJ to decide if there is actual contamination and that they should be conservative at this stage. They will need to decide for both aquifers.





• This map shows the location of the 5 private wells.





• This map shows the location of the municipal wells that draw from lower aquifer. Although the 4 miles target distance limit is not shown, these are the only wells within the 4 mile target distance limit.

🗱 HRS Quickscore				- 6 🛛
			Quickscor	e Ho Quickscore H
Action Toolbar: Save As	s Import Export Undo Redo Print Calculat	or	Evaluate	Nearest Well
	Site/Scenario Information Source Informatio	n Pathway Scoreshe	ets	
Create New Si	Site Name: ABC Vacuum Scenario Name: Initial Site Scoring		Site Sco	ore: 0
Create New S	Scenario Summary (0) GW Scoresheet (0)	SW Scoresheet (0)	SE Scoresheet (0) Air Scoresheet (0)	
View/Edit Existing	Grou	und Water Migration Path	way Scoresheet	
🚞 LPQ Auto Parts	Aquifer Name or Pathway Scenario: * ABC Va	icuum Aquifer	*=Required	🚽 🗹 📗
Cuickscore Tutorial	Check to use this Aquifer in Site Score cale Likelihood of Release to an Aquifer:	culations	Targets: 7. Nearest Wel (3-11) [ 8. Population	0 -
	1. Observed Release 5 2. Potential to Release	50 💌	8a. Level I Concentrati [ 8b. Level II Concentra [	
	2a. Containment     (3-2)       2b. Net Precipitation     (3-4)		8c. Potential Contaminati(3-12) [ 8d. Population [lines 8a+8b+8c]	
	2c. Depth to Aquiter (3-5) 5	•	9. Resources	0 💌
	20. Travel Time (3-7) 3 2e. Potential to Release 46	5	10. Wellhead Protection Area	0 💌
	[lines 2a x (2b + 2c + 2d)]	0	II. Tardets [/ + 8d + 9 + 10]	0
	3. Likelihood of Release 55	0	12. Aquiter Score	Aquirer D
	Waste Characteristics:		[(iines 3 x 6 x 11)/82,500)]	
	4. Toxicity/Mobility Assign Mobility (3-9) 10	ichler T	Ground Water Migration Pathway Score (Sow)	bre D
	5. Hazardous Waste Quantity (2.6) 10		[Highest value from line 12 for all aquife	ers evaluated]
	6. Waste Characteristics 32		Uncapped Score: 0	D
	[lines 4 x 5, then use Table 2-7 ]	Calculate	Add New Aquifier Del	ete Aquifier
	Scoresheets Likelihood of Release	Waste Characteristics	Targets Pathway Score	e Date Last Updated
	SW/OL Scoresheet	U	0	10/10/2009
	GW to SW Scoresheet			
	Drinking Water Human Food Chain			
	Environmental			
	Soil Scoresheet		0	10/10/2009
start G Lexa	r (E:)	GW Pathwa SRS HR	Ouirkscare	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
O text			Contraction (Contraction of the second secon	



• First evaluate the nearest well.





 This slide summarizes Section 3.3.1 from the HRS rule and describes how Tables 3-10 and 3-11 are used to select the factor value for the nearest well.



Table 3-11 Values		
Table 3-11: Nearest Well Facto	or Values	
Distance from Source (miles)	Assigned Value	
Level I concentrations <sup>a</sup>	50	
Level II concentrations <sup>a</sup>	45	
0 to $^{1}/_{4}$	20	
Greater than $1/4$ to $1/2$	18	
Greater than $^{1}/_{2}$ to 1	9	
Greater than 1 to 2	5	
Greater than 2 to 3	3	
Greater than 3 to 4	2	
Greater than 4	0	
<sup>a</sup> Distance does not apply.		
≎EPA		4-71

🏙 HRS Quickscore									- 7 🛛
Quick						Q	uickscore Ho	Quick	score H
SCORE									
Action Toolbar: Save As	Import Export Undo	Redo Print Cal	culator						
	Site/Scenario Informati	ion Source Inform	nation Pathw	ay Scoresheets					
Create New Si	Site Name: AB	C Vacuum							
Create New S	Scenario Name: Initia	al Site Scoring				E	3PJ supj	ports 5	0
	Scenario Summary (0)	GW Scoresheet	(10.67) SW 9	coresheet (0)	SE Scoresheet (	0) Air Scor	esheet (0)		
View/Edit Existing									
L PQ Auto Parts	A		Ground water N	lidration Pathwa	v Scoresneet			. 🧳	
🚞 Quickscore Tutorial	Aquirer Name of Paul	way scenario. AB	C vacuum Aquin	er	Tarnets	equireu			
Tutorial EX/IM Try ABC Vacuum	Likelihood of Rele	Aquifer in Site Score ase to an Aquifer:	calculations		7. Nearest Well (3-11) 50 💌				
	1. Observed Release	5e	550 💌		8. Population 8a. Level I	Concentrati			
	2. Potential to Rele	ease			8b. Level II	Concentra			
	2a. Containmen	t (3-2)	10 💌		8c. Potenti	ial Contaminati.	(3-12)		
	2b. Net Precipit	ation (3-4)	6 💌		8d. Populat	tion [lines 8a+8b	+8c]		
	2c. Debth to Ac 2d. Travel Time	(3-7)	2 ▼		9. Resources		0	-	
	2e. Potential to	Release	460		10. weinead F	<pre>Protection Area r + 8d + 9 + 10]</pre>	a U	-	
	[lines 2a x (2b + 2c	+ 2d)]			Ground Water	Migration Sco	50 Sto for an Aquifo	r	
	3. Likelihood of Re	ease	550		12. Aquiter So	ore	10.67	•	
	[Higher of lines 1 Waste Characteris	and 2e] stics:			[(lines 3 x	6 x 11)/82,500)]			
	4. Toxicity/Mobility	Assign Mobility (3-9)	10000		Ground Water	Migration Pat	hway Score		
	Using Substan	ce:	Trichlor 💌		13. Pathway S [Highest v	icore (Sgw) alue from line 12 fi	10.67 for all aquifers evalu	ated]	
	<ol> <li>Hazardous Wast</li> <li>Waste Characte</li> </ol>	e Quantity (2-6 ristics	32		Uncapped Sco	ore:	10.67		
	[lines 4 x 5, then us	e Table 2-7 ]		Calculate	Add New	Aquifier	Delete Aqu	uifier	
	Scoresheets	Likelihood of Relea	ise   Waste Ch	aracteristics	Targets	Path	way Score	Date Last U	Jodated
	GW Scoresheet	550.0	0	0	-	0	1	0/10/2009	· · · · · · · · · · · · · · · · · · ·
	SW/OL Scoresheet								
	Drinking Water								=
	Human Food Chain								
	Environmental Soil Scoresheet					0	1	0/10/2009	
	Residential Ponulation		n	n					
🛃 start 💦 😮 Lexa	r (E:)	GW Pathwa 🗐	07B_GW Pathwa	HR5 Qu	ickscore 🛛 🌔	E:\ABCVa_0.xm	1 🧷 🎘	1 🛛 🖞 📢	2:14 PM
and a second sec									



 Level I contamination of at least the shallow aquifer is justified based on existing information.





• A 50 for nearest well requires an estimation of Level I population. Sum the number of people served by contaminated wells and then multiply this by 10.

MRS Quickscore						
Quick					Quickscore Ho.	. Quickscore H
SCORE						
Action Toolbar: Save As	Import Export Undo Red	Print Calculator				
	Site/Scenario Information	Source Information	Pathway Scoresheets			
Create New Si	Site Name: ABC Vacu	um			Site Score: 0	
Croate New S	Scenario Name: Initial Site	Scoring				
Create New 3	Scenario Summary (0) GV	V Scoresheet (53.34)	SW Scoresheet (0)	SE Scoresheet (0)	Air Scoresheet (0)	
View/Edit Existing					Program doe	s calculation
I PO Auto Parte		Ground	Water Migration Pathwa	v Scoresheet	i iografii uoe	Scalculation
Quickscore Tutorial	Aquifer Name or Pathway So	cenario: * ABC Vacuu	ım Aquifer	'=Requi	red	
🚞 Tutorial EX/IM Try	Check to use this Aquifer	in Site Score calcula	tions	7 Novert Well	(2.11) 50	
🚞 ABC Vacuum	Likelihood of Release to	an Aquifer:		8. Population	(3-11) 50	
	1. Observed Release	550		8a. Level I Con	entrati 20	x 10 = 200
	2. Potential to Release	(0.0) 40		8b. Level II Cor	icentra	
	2a. Containment 2b. Not Procipitation	(3-2) 10		8c. Potential Co	ontaminati (3-12	
	20. Net Precipitation 2c. Denth to aquifer	(3-5) 5	<b>•</b>	8d. Population	[lines 8a+8b+8c] 200	
	2d. Travel Time	(3-7) 35	-	9. Resources	u oction Area	-
	2e. Potential to Releas	e 460		10. Weineau Prote	L+9+10] 250	
	[lines 2a x (2b + 2c + 2d)]			Ground Water Mig	zotion Score for on Aquil	lor.
	<ol><li>Likelihood of Release</li></ol>	550		12. Aquiter Score	53.34	e
	[Higher of lines 1 and 2e]			[(lines 3 x 6 x 1:	1)/82,500)]	
	4. Toxicity/Mobility Assign	Mobility (3-9) 10000	1	Ground Water Mig	ration Pathway Score	
	Using Substance:	Trich	lor 💌	13. Pathway Score	(Sgw) 53.34	
	5. Hazardous Waste Quar	ntity (2-6) 100		[Highest Value r	rom line 12 for all aquifers eval 53 34	uated j
	<ol> <li>Waste Characteristics</li> <li>Filmes 4 x 5, then use Table</li> </ol>	32	Coloulate	Add Now Agu	fior Delete #	
	finds the system day rable	- / 1	Calculate	Aud New Aqu	Delete A	quiller
	Scoresheets Likeli	hood of Release 🛛 🕅	aste Characteristics	Targets	Pathway Score	Date Last Updated
	GW Scoresheet 550.0	0	0		0	10/10/2009
	GW to SW Scoresheet					
	Drinking Water					=
	Human Food Chain					
	Environmental Soil Scorosboot				0	10/10/2000
	Residential Ronulation	0	n		0	▼
Start Gleva	r (E-)	wa 🐻 078 GW	Pathwa	ickscore	BCVa 0 xml	20 10 <sup>2</sup> 🖉 🔲 2:19 PM
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Record 20 in Level I contamination box. The Quickscore program does the calculation.





The process for scoring Level II contamination is similar as that for Level I except that is does not include Level I populations and that there is no multiplier.

🗱 HRS Quickscore							- C 🛛
Quick						Quickscore H	o Quickscore H
SCORE							
Action Toolbar: Save As	s Import Export Unde	Redo Print Ca	liculator				
	Site/Scenario Informat	ion Source Info	mation Pat	hway Scoresheet	S		
Create New Si	Site Name: AB	C Vacuum				Site Score:	0
Create New S	Scenario Name: Initi	al Site Scoring					
	Scenario Summary (0	) GW Scoreshee	et (53.34) SV	V Scoresheet (0)	SE Scoresheet (0)	Air Scoresheet (0)	
View/Edit Existing			Ground Wate	r Migration Pathw	avs. Assuming	g no Level II	contamination
🚞 LPQ Auto Parts	Aquifer Name or Path	way Scenario: * 🛛	BC Vacuum Ad	uifer	*=Requir	ed	
Quickscore Tutorial	Check to use this	Aquifer in Site Sco	e calculations		Targets:		
ABC Vacuum	Likelihood of Rele	ase to an Aquifer:			7. Nearest Well	(3-11) 50	
	1. Observed Relea	se	550	•	8a. Level I Conce	entrati 20	x 10 = 200
	2. Potential to Rel	ease			8b. Level II Cond	entra 0	x1=0
	2a. Containmen	it (3-2)	10	-	8c. Potential Cor	ntaminati (3-12	
	2b. Net Precipit	ation (3-4)	5	-	8d. Population [	lines 8a+8b+8c] 200	
	2d. Travel Time	(3-7)	35	-	9. Resources		
	2e. Potential to	Release	460	-	<ol> <li>Weinleau Protect</li> <li>Targets (7 + 8d)</li> </ol>	+ 9 + 10] 250	
	[lines 2a x (2b + 2c	+ 2d)]			Ground Water Migra	ation Score for an Ag	uifer
	3. Likelihood of Re	lease	550		12. Aquiter Score	53.3	4
	Waste Characteri	stics:			[(lines 3 x 6 x 11)	(/82,500)]	
	4. Toxicity/Mobility	Assign Mobility (3-)	) 10000	_	Ground Water Migra	ation Pathway Score	
	Using Substan	ice:	Trichlor	•	13. Pathway Score [Highest value fro	(5GW) 53.3 om line 12 for all aquifers e	#4 valuated]
	6. Waste Characte	e Quantity (2- eristics	32		Uncapped Score:	53.3	34
	[lines 4 x 5, then u	se Table 2-7 ]		Calculate	Add New Aquif	ier Delete	Aquifier
	Scoresheets	Likelihood of Rela	ase Waste	Characteristics	Targets	Pathway Score	Date Last Updated
	GW Scoresheet	550.0	0	0	0	)	10/10/2009
	SW/OL Scoresheet						
	Drinking Water						=
	Human Food Chain						
	Soil Scoresheet				0	)	10/10/2009
	Residential Ponulation		n	n	· · · · · · · · · · · · · · · · · · ·		
🐉 start 💦 🕜 Lexa	r (E:)	GW Pathwa 🕎	07B_GW Pathwa	🎇 HRS Qu	ickscore 🏾 🏉 E:\ABCV	'a_0.xml 🥜 😼	a 😰 🖞 🔇 🕏 🛄 2:23 PM 👘





Potential Contamination they should evaluate all wells within 4 miles of sources that have not been scored under Level I or II. The approach for the shallow and deeper aquifers is to consider them as one hydrogeological unit. Connecting the two aquifers makes scoring easier but whether or not they are connected would need to be addressed by the SI. The population for the blended municipal well system at ABC Vacuum must be apportioned and then distance-weighted.

Well Identification	Distance from Site	Percent Annual Production	Population Apportionment
Well A	2,600 ft (0.45 miles)	30	
Well B	4,000 ft (0.76 miles)	35	
Well C	4,000 ft (0.76 miles)	35	



• Complete this table using the 40% rule.

L

Well Identification	Distance from Site	Percent Annual Production	Population Apportionment
Vell A	2,600 ft (0.45 miles)	30	2,966
Well B	4,000 ft (0.76 miles)	35	2,966
Well C	4,000 ft (0.76 miles)	35	2,966



• This is the ABC site apportionment.

Well Identification	Distance from Site	Population Apportionment	Table 3-12 Weighting
Vell A	2,600 ft (0.45 miles)	2,966	
Vells B and C	4,000 ft (0.76 miles)	5,932	



 Use Table 3-12 on the following slide to determine the distance weighted populations associated with Well A and the combined population of Wells B and C. Wells B and C can be combined because they are in the same target distance limit.

						Well A	Wells B & C					
Distance Category				I	Number of	f People Wi	ithin the Di	stance Ca	tegory			
(miles)	1 -10	11-30	31-100	101-300	301- 1,000	1,001- 3,000	3,001- 10,000	10,001- 30,000	30,001- 100,000	100,001- 300,000	300,001- 1,000,000	1,000,001 3,000,000
Other than	Karst <sup>b</sup>											
0 to 1/4	4	17	53	164	522	1,633	5,214	16,325	52,137	163,246	521,360	1,632,45
$>^{1}/_{4}$ to $^{1}/_{2}$	2	11	33	102	324	(1,013)	3,233	10,122	32,325	101,213	323,243	1,012,12
>1/2 to 1	1	5	17	52	167	523	1,669	5,224	16,684	52,239	166,835	522,385
> 1 to 2	0.7	3	10	30	94	294	939	2,939	9,385	29,384	93,845	293,842
> 2 to 3	0.5	2	7	21	68	212	678	2,122	6,778	21,222	67,777	212,219
> 3 to 4	0.3	1	4	13	42	131	417	1,306	4,171	13,060	41,709	130,596
Karst <sup>c</sup>												
0 to 1/4	4	17	53	164	522	1,633	5,214	16,325	52,137	163,246	521,360	1,632,45
>1/4 to 1/2	2	11	33	102	324	1,013	3,233	10,122	32,325	101,213	323,243	1,012,12
>1/2 to 1	2	9	26	82	261	817	2,607	8,163	26,068	81,623	260,680	816,227
> 1 to 2	2	9	26	82	261	817	2,607	8,163	26,068	81,623	260,680	816,227
> 2 to 3	2	9	26	82	261	817	2,607	8,163	26,068	81,623	260,680	816,227
> 3 to 4	2	9	26	82	261	817	2,607	8,163	26,068	81,623	260,680	816,227



Well A is in the ¼ to ½ TDL and serves an apportioned population of 2,966 which equates to a distance-weighted population of 1,013. Wells B and C are in the ½ to 1 mile TDL and serve an apportioned population of 5,932 which equates to a distance-weighted population of 1,669.

Distance Category	ce Nun ory					People Wit	hin the Di	n the Distance Category				
(miles)	1 -10	11-30	31-100	101-300	301- 1,000	1,001- 3,000	3,001- 10,000	10,001- 30,000	30,001- 100,000	100,001- 300,000	300,001- 1,000,000	1,000,001- 3,000,000
Other than	Karst <sup>b</sup>							•			•	• • •
0 to $^{1}/_{4}$	4	17	53	164	522	1,633	5,214	16,325	52,137	163,246	521,360	1,632,455
$>^{1}/_{4}$ to $^{1}/_{2}$	2	11	33	102	324	1,013	3,233	10,122	32,325	101,213	323,243	1,012,122
$>^{1}/_{2}$ to 1	1	5	17	52	167	523	1,669	5,224	16,684	52,239	166,835	522,385
> 1 to 2	0.7	3	10	30	94	294	939	2,939	9,385	29,384	93,845	293,842
> 2 to 3	0.5	2	7	21	68	212	678	2,122	6,778	21,222	67,777	212,219
> 3 to 4	0.3	1	4	13	42	131	417	1,306	4,171	13,060	41,709	130,596
Karst <sup>c</sup>												
0 to $^{1}/_{4}$	4	17	53	164	522	1,633	5,214	16,325	52,137	163,246	521,360	1,632,455
$>^{1}/_{4}$ to $^{1}/_{2}$	2	11	33	102	324	1,013	3,233	10,122	32,325	101,213	323,243	1,012,122
$>^{1}/_{2}$ to 1	2	9	26	82	261	817	2,607	8,163	26,068	81,623	260,680	816,227
> 1 to 2	2	9	26	82	261	817	2,607	8,163	26,068	81,623	260,680	816,227
> 2 to 3	2	9	26	82	261	817	2,607	8,163	26,068	81,623	260,680	816,227
> 3 to 4	2	9	26	82	261	817	2,607	8,163	26,068	81,623	260,680	816,227

### Table 3-12: Distance-Weighted Population Values for Potential Contamination Factor for Groundwater Migration Pathway<sup>a</sup>

<sup>a</sup> Round the number of people present within a distance category to nearest integer. Do not round the assigned distance-weighted population value to nearest integer.

<sup>b</sup> Use for all aquifers, except karst aquifers underlying any portion of the sources at the site.

<sup>c</sup> Use only for karst aquifers underlying any portion of the sources at the site.

-Assign a distance-weighted population value for each distance category based on the number of people included within the distance category. -Use the "Other Than Karst" portion of table 3-12 for the remainder of the population served by points of withdrawal subject to potential contamination.

-For this portion of the population, determine the number of people included within each "Other Than Karst" distance category in table 3-12. -Assign a distance-weighted population value for each distance category based on the number of people included within the distance category. -Calculate the value for the potential contamination factor (PC) as follows:

where:  $PC = 1/10 \times (Wi + Ki)$ 

Wi	=	Distance-weighted population from	'Other Than Karst" portion of table	3-12 for distance category i.
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Ki = Distance-weighted population from "Karst" portion of table 3-12 for distance category i.

n = Number of distance categories.

If PC is less than 1, do not round it to the nearest integer; if PC is 1 or more, round to the nearest integer. Enter this value in table 3-1.

Well Identification	Distance from Site	Population Apportionment	Table 3-12 Weighting
Vell A	2,600 ft (0.45 miles)	2,966	1,013
Vells B and C	4,000 ft (0.76 miles)	5,932	1,669



Strain HRS Quickscore								X	
Quick						Quickscore Ho	Quick	score H	
SCORE									
Action Toolbar: Save A	s Import Export Undo	Redo Print Calc	ulator						
	Site/Scenario Informati	on Source Inform	nation Pathway Sco	resheets					
Create New Si	Site Name: ABC Scenario Name: Initia	C Vacuum	Site Score: 0						
Create New S		in site scoring							
	Scenario Summary (0)	GW Scoresheet	(100) SW Scoreshe	et (0) SE :	Program	n makes cal	culation	for	
View/Edit Existing			Ground Water Migratio	n Pathwav S	pote	ential contam	nination		
🚞 LPQ Auto Parts	Aquifer Name or Path	way Scenario: * ABC	C Vacuum Aquifer		*=Require	ed			
Quickscore Lutorial Tutorial EX/IM Try	Check to use this	Aquifer in Site Score		Targets:					
🗎 ABC Vacuum	Likelihood of Relea	ase to an Aquifer:			7. Nearest Well 8. Population	(3-11) 50	<b>•</b>	_	
	1. Observed Release	e	550 💌		8a. Level I Conce	entrati 20	x 10	= 200	
	2. Potential to Rele	ase	10		8b. Level II Conc	entra 0	x1	= 0	
	2a. Containmen: 2b. Not Brosieit	(3-2)	10		8c. Potential Con	itaminati( <b>3-1</b> 2) ( <u>2682</u>	x 0.	1 = 268.20	
	20. Net Precipito 2c. Depth to ac	uifer (3-5)	5 🔻		8d. Population [I	ines 8a+8b+8c] 468.2	20		
	2d. Travel Time	(3-7)	35		9. Resources 10. Wollhood Protoc	tion Area	-		
	2e. Potential to	Release	460		11. Targets [7 + 8d +	+ 9 + 10] 518.2	20		
	Times 2a x (2D + 2c	+ 20)			Ground Water Migra	ation Score for an Aqu	ifer		
	3. Likelihood of Release 550     Fider of lines 1 and 2e1     Waste Characteristics:     4. Toxicity/Mobility Assign Mobility (3-9) 10000     Using Substance:     Trichlor▼ 5. Hazardnus Waste Quantity     (2.6) 100				12. Acuiter Score 100 [(lines 3 x 6 x 11)/82,500)]				
					Ground Water Migration Pathway Score 13. Pathway Score (Scov) 100				
					[Highest value from line 12 for all aquifers evaluated]				
	6. Waste Characteristics 32				Uncapped Score: 110.55				
	[lines 4 x 5, then us	e Table 2-7 ]	Calcula	te	Add New Aquifi	er Delete A	Aquifier		
	Scoresheets	Likelihood of Releas	se Waste Characteri	stics	Targets	Pathway Score	Date Last	Jpdated	
	GW Scoresheet	550.0	0	0	0		10/10/2009	<b>^</b>	
	GW to SW Scoresheet								
	Drinking Water								
	Human Food Chain								
	Soil Scoresheet				0		10/10/2009		
	Residential Ponulation		n	n					
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 Record 2,682 in the Potential Contamination box. Quickscore will perform the division that is required.

🗱 HRS Quickscore										
Quick		Quickscore Ho Quickscore H								
SCORE										
Action Toolbar: Save As Import Export Undo Redo Print Calculator										
	Site/Scenario Information Source Information Pathway Scoresheets	Evaluate Resources and								
Create New Si	Site Name: ABC Vacuum	WHPA next								
Create New S	Scenario Name: Initial Site Scoring									
	Scenario Summary (0) GW Scoresheet (100) SW Scoresheet (0) SE Scoresheet (0)	Air Scoresheet (0)								
View/Edit Existing	Ground Water Migration Dathway Scoreeboot									
LPQ Auto Parts	Aguifar Name or Dathway Scenario: APC Vocuum Aguifor	equired 🦯								
Quickscore Tutorial	Chack to use this Aguifer in Site Score calculations     Targets:	cyun cu								
ABC Vacuum	Likelihood of Release to an Aquifer: 7. Near st We	(3-11) 50 💌								
	1. Observed Release 550 V 8a Level I	Concentrati 20 x 10 = 200								
	2. Potential to Release 50. Level II	Concentra 0 x 1 = 0								
	2a. Containment (3-2) 10 💌 Bc. Potenti	al Contaminati(3-12) 2682 x 0.1 = 268.20								
	2b. Net Precipitation (3-4) 6 V 8d. Populat	ion [lines 8a+8b+8c] 468.20								
	2c. Debth to Adulter (3-3) 5 9. Resources	0 💌								
	20. Have Time (3*7) 35 ▼ 10. Wellhead P	rotection Area 0 💌								
	[ines 2a x (2b + 2c + 2d)]	+ 8d + 9 + 10] 518.20								
	3. Likelihood of Release 550 Ground Water 12. Aquiter Sci	Ground water Migration Score for an Aquifer 12. Aquifer Score 100								
	[Higher of lines 1 and 2e] [(lines 3 x )	IC [(Imas 3 × 6 × 11)/82.500)]      Ground Water Migration Pathway Score     13. Pathway Score (Sgw)     100     [Pidyhet value from ine 12 for all aquifers avalued]     Imcanned Score     1055								
	4. Toxicity/Mobility Assign Mobility (3-9) 10000 Ground Water									
	Using Substance: Trichlor   13. Pathway S									
	5. Hazardous Waste Quantity (2-6) 100 Uncanned Sco									
	b. Waste Characteristics 32 Calculate Add New	Aquifier Delete Aquifier								
	Scoresheets Likelihood of Release Waste Characteristics Targets GW Scoresheet 550.0 0 0	Pathway Score Date Last Updated								
	SW/OL Scoresheet									
	GW to SW Scoresheet									
	Urinking water Human Food Chain									
	Environmental									
	Soil Scoresheet	0 10/10/2009								
	Residential Ronulation   In In									
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Action Toolbar: Save As	Import Export Undo Redo Print Calculator				
	Site/Scenario Information Source Information Pathway Scoresheets	Crayfish farm uses GW = 5			
Create New Si Create New S	Site Name: ABC Vacuum Scenario Name: Initial Site Scoring	points No WHPA noted = 0 points			
	Scenario Summary (0) GW Scoresheet (100) SW Scoresheet (0) SE S				
View/Edit Existing	Ground Water Micration Pathwav So Aquifer Name or Pathway Scenario: * [ABC Vacuum Aquifer	coresheet			
a Tutorial EX/IM Try	Check to use this Aquifer in Site Score calculations Likelihood of Release to an Aquifer:	Targets:       7. Nearest Well       8. Population			
	1. Observed Release     2. Potential to Release     2a. Containment     (3-2)     10	Ba. Level I Concentrat         20         x 10 = 200           8b. Level II Concentra         0         x 1 = 0           8c. Potential Contaminati(3-12)         2682         x 0.4 = 369.20			
	2b. Net Precipitation (3-4) 6 2c. Depth to Aquifer (3-5) 5 (3-5) 7 (3-5) 7 (3-5) 7 (3-7) 7 (3-	8d. Population [lines 8a+8b+8c] 468.20 9. Resources 5			
	2d. Iravel Ime (3-7) 35 ▼ 2e. Potential to Release 460 lines 2a x (2b + 2c + 2d)	10. Wellhead Protection Area 11. Targets (7 + 8d + 9 + 10)			
	3. Likelihood of Release 550 Friigher of lines 1 and 2a) Waste Characteristics	Ground Water Migration Score for an Aquiter 12. Aquiter Score 100 [(lines 3 × 6 × 11)/82,500)]			
	4. Toxicity/Mobility Assign Mobility (3-9) 10000 Using Substance: Trichlor • 5. Hazardous Waste Quantity (2-6) 100	Ground Water Migration Pathway Score 13. Pathway Score (Sgw) [Highest value from the 12 for all aquifers valuated] Uncanned Score: 111.62			
	6. Waste Characteristics 32 [lines 4 x 5, then use Table 2-7.] Calculate				
	Scoresheets Likelihood of Release Waste Characteristics	Targets Pathway Score Date Last Updated			
	GW to SW Scoresheet	0 10/10/2003			
	Drinking Water Human Food Chain Foundation Providence P				
	Soil Scoresheet	0 10/10/2009			
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Determine if groundwater within 4 miles of the site is used for any resources. Groundwater is used at the commercial cray fish farm. The site information indicated there was no WHPA. Resources gets a score of 5 and WHPA gets a score of 0.






- Using worst case assumptions guided by BPJ, the ground water pathway for ABC gets a score of 62.79. This indicates that the ground water pathway may be the only one needed to score the site.
- Quickscore can be used to run various scenarios to evaluate the minimum amount of information that needs to be collected. For example, a potential contamination scenario could be run to see if the site would score on potential alone if the shallow and deeper aquifers are connected. Other scenarios involving use of fewer private wells could also be evaluated.



## Next Webinar – Friday, July 11, 2014

