



St. Patty's Day, 1997

**Advanced
Environmental
Interface, Inc.**
8 Old Indian Trail
Middlefield, CT 06455
(860) 349-3559

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INSIGHTS is published on an as-needed basis to inform our clients and friends in the industrial community about environmental topics of high current interest

Pathways through Connecticut's New Environmental Cleanup Standards

This issue of *Insights* deals with the Connecticut Department of Environmental Protection (DEP) environmental cleanup requirements for contaminated properties. These are called the remediation standards regulations ("RSRs", or just the "cleanup standards"). They have been in place for just over a year. As is our tradition (perpetrating *Insights* on holidays), this one is issued on St. Patty's Day.

There is no religious connotation. There is no Gaelic connotation. But while St. Patrick was engaged in doing good deeds in Ireland, he was doubted by his followers, ridiculed by his friends, and afflicted by his government. If he were alive today, he'd be cleaning up environmental contamination.



The RSRs came about mostly because business and industry were uncomfortable with the lack of certainty in cleanup targets for environmental contamination. A series of discussions in 1994 and 1995 led to a DEP advisory task force comprised of a cross-section of interested parties (manufacturers, business people, bankers, insurers, attorneys, environmental advocacy groups, and environmental consultants). Rush Limbaugh never showed, but neither did Ralph Nader, so the standards probably represent a reasonable melding of different philosophical and technical views.

The RSRs are 66 pages long. The pathways through the RSRs can be complex. This *Insights* attempts to clarify things, and provides several tools for visualizing and understanding some of the pathways and cleanup options:

- a series of pictures giving an example of a very common soil cleanup situation; and
- an example of the different cleanup options for this common situation, viewed as a vertical soil section.



Also, for those folks we thought would be interested in more detail, we've enclosed:

- an outcome-based pathway diagram for soil cleanup options (ways to meet RSR direct exposure criteria, pollutant mobility criteria, and soil volatilization criteria); and on the reverse, an outcome-based pathway diagram for groundwater cleanup options (ways to meet RSR groundwater protection criteria, surface water protection criteria, and groundwater volatilization criteria);
- a table listing all the above numerical criteria in one place, with a summary of the rationale behind the different cleanup criteria (if you need bifocals as a result of reading this fine print, we've arranged a group rate at LensCrafters).

Please note that the soil and groundwater pathway diagrams enclosed should be used as *roadmaps* through the RSRs, not as substitutes for the RSRs. We've put the relevant regulation citation beside each element in the diagrams, and we encourage anybody using these diagrams to read the cited RSR sections simultaneously.

Also note that you should check first to make sure the RSRs apply to a site. They apply by statute to cleanup of properties ("establishments") transferred under the Connecticut property transfer statute. They also apply by statute to voluntary cleanups for which DEP approval (or approval of a Licensed Environmental Professional) is sought. But not all sites fall into these two categories.

Example Soil Contamination Problem. Here's an example of a very common soil contamination problem (as revealed by backhoe trenching) in which a heating fuel leak created contamination above direct exposure criteria and above pollutant mobility criteria in an industrial park with a GB groundwater classification.

You could do a lot of cleanup for this situation, or you could do very little, depending on how you choose the options and pathways through the RSRs. See the diagram on page 4 for the applicability of direct exposure criteria and pollutant mobility criteria as viewed in the context of a vertical cross-section through the contaminated soil shown in these pictures. In this simple example, volatilization criteria, groundwater protection criteria, and surface water protection criteria were




Please note that while we believe this information to be accurate, we cannot absolutely guarantee that, and accept no liability whatever for any untoward outcome resulting from your use of this information. Consult the RSRs directly, the DEP or your environmental attorney if you are concerned about implications based on this information. Apologies for the lack of contrast in the photos; they were taken from digitized video clips and look much better in color on our web page (for which they were intended). Our web page is coming along nicely, we'll let you know when it's up.



not issues: heating oil does not contain volatile organics in concentrations high enough to present a problem; groundwater protection criteria do not apply because of the GB groundwater classification and no domestic or industrial uses; and the contaminant plume is too far away from the nearest potential conduit (storm drain line) to a surface water body.

The only contaminant of concern in this example is total petroleum hydrocarbons (TPH).




Note the layering of the sands below the 2-ft depth. This indicates an undisturbed condition since glacier meltwaters and other events deposited the sand. This area was a large shallow lake in the last ice age.

The smear zone is observed to extend from the 5-ft depth down to the 11-ft deep bottom of the excavation (several feet deeper than expected), where a clay layer is encountered.

Different sand layers may have somewhat different permeabilities for water and oil, so you don't expect contaminant levels to be the same throughout the smear zone. If there is a highly permeable layer, such as gravel, contamination will spread more rapidly. A relatively impermeable layer (such as clay) will retard or stop the spread of contamination.

TPH is above the GB pollutant mobility criterion (2500 ppm) in a large portion of the contaminated area, but is above the seasonal high water table in only a very small portion of that area.

TPH is above the residential direct exposure criterion (500 ppm) across an area of 6000 square feet, in an (estimated) volume of 1200 cubic yards. TPH also exceeds the industrial/commercial direct exposure criterion over about 90% of that area and volume.

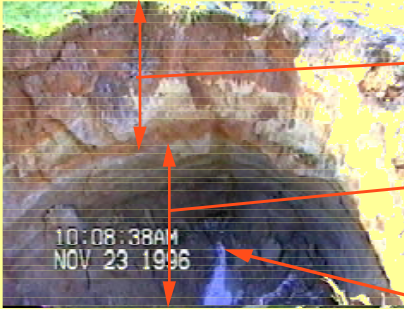


Here, the excavation stayed open long enough to collect a sample of the groundwater running into the open hole.

When a jar sample of this groundwater was allowed to sit in a quiet location, it developed a thin (1/32-inch) layer of floating oil. Laboratory analysis of the water sample showed 1,200 ppm of total petroleum hydrocarbons (TPH).

TPH concentrations in the soil in the middle of the smear zone averaged 15,000 ppm. This is well above the Connecticut cleanup criteria.

One option to get to a clean site is to dig out all the contaminated soil to meet the TPH residential direct exposure criterion. This is expensive. Another option is to excavate only the contaminated soil above the seasonal high water table to meet the TPH pollutant mobility criterion for GB areas, and then take a land use restriction, committing not to disturb the deeper residuals. This is a lot cheaper. See the diagram on page 4 for other options. The option selected depends on the transaction.



A good view of the southwest corner of the excavation:

Clean sandy soil from the surface down to the 5-ft depth, with natural layering indicating it's historically undisturbed.

Oil contamination in a smear zone between the 5-ft depth and the 11-ft depth of the clay layer in this excavation.

Groundwater entering the hole at the 8-ft depth, in preferential weep areas that represent more permeable layers.

The sidewalls of vertical excavations above the water table tend to slough into the hole as they dry out. The sidewalls below the water table can also collapse because of the groundwater movement into the hole undermining them. These effects can happen relatively quickly in sandy soil, and can affect the pace of an investigation by this trenching method.



OPTIONS AND PATHWAYS THROUGH THE REMEDIATION STANDARDS FOR AN EXAMPLE SITUATION

Depth	Options and Pathways	TPH Direct Exposure Criteria	TPH Pollutant Mobility Criteria
0	0	For TPH contamination surface to 4 ft depth: 1. Dig it out to 500 ppm (resident standard) [22a-133k-2(a)(1)(A) and 2(b)(1)]; or 2. Dig it out to some <i>achievable</i> <i>reasonable</i> approved by DEPHHS [22a-133k-2(a)(1)(A)]; or 3. Dig it out to some <i>achievable</i> <i>reasonable</i> (higher than 500 ppm) as noticed to DEF [22a-133k-2(a)(2)]; or 4. Dig it out to 2500 ppm industrial/commercial standard) and limit access plus take an ELLUR [22a-133k-2(b)(2)(A)]. (Note: applies to 0-2 ft depth if pavement.)	For TPH contamination surface down to seasonal high water table (6 ft in this example): 1. Dig it out to 2500 ppm (GB standard) [22a-133k-2(c)(1)(A)(ii)]; or 2. Dig it out to some <i>achievable</i> <i>reasonable</i> approved by DEP [22a-133k-2(a)(1)(A)]; or 3. Dig to some <i>achievable</i> <i>reasonable</i> (higher than 2500 ppm) as noticed to DEF [22a-133k-2(a)(2)]; or 4. Demonstrate that it's "environmentally isolated" (i.e., source had between the high water table and the floor slab, not in grating into ground or ground not offsetting up through slab penetrations or cracks, etc.) (take an ELLUR [22a-133k-2(b)(2)(A)]. (Note: <i>achievable</i> <i>reasonable</i> appears to be allowed for <i>PH</i> specifically under 22a-133k-2(b)(2)(B).)
-1 ft	1		
-2 ft	2		
-3 ft	3		
-4 ft	4		
-5 ft	5		
-6 ft	6		
-7 ft	7		
-8 ft	8		
-9 ft	9		
-10 ft	10		
-11 ft	11		
-12 ft	12		
-13 ft	13		
-14 ft	14		
-15 ft	15		
-16 ft	16		
-17 ft	17		

EXAMPLE SITUATION:
Oil tank return line leak. Industrial park setting. Groundwater classification is GB. Oil contamination (TPH) of soil exists in an area of several thousand square feet. Top of contaminated zone is at 3 ft deep near the leak, at 5 ft deep over rest of area. Bottom of zone is between 8 ft deep and 11 ft deep and steps at a clay layer. Dredrock is deep, and not an issue. TPH concentrations will have criteria levels of 300 ppm residential direct exposure) and 2,500 ppm (GB pollutant mobility) detected in both soil borings and test trenches. Lower portions of this contaminated zone (where water table rises and falls seasonally between 7-ft and 9-ft depths) have quite high TPH levels, ranging from 5,000 ppm to 20,000 ppm.

