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06/25/2003 03:47 PM
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Subject: Wayland post-excavation sediment sampling protocols

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Rachel-

As promised, I have taken another look at the "Verification Sampling" section (4.3.1) of the December 30, 2002 "Phase IV Remedy Implementation Plan" for the former Raytheon facility at 430 Boston Post Road in Wayland. I compared this text to the EPA regulations concerning PCB remediation waste promulgated at 40 CFR 761. Much of the verification sampling outlined in the Phase IV report is consistent with the regulation. However, I would like to mention three inconsistencies:

Ø §761.283(b)(2) specifies that sampling points must be 1.5 meters apart, and ERM has indicated all along that you intend to collect nine-point composites from a grid that is 20×20 feet square. Have you received a specific variance for this from EPA? I am not arguing that you should use the 3-meter grid squares. As shown on the attached PowerPoint file, this would result in ~316 composite bottom samples for closure (most, but not all, would be 9-point composites). Figure 14 in the Phase IV report illustrates ~187 composite sampling locations (if my count is correct), which to me seems adequate to provide good statistics on post-remediation excavation bottom samples.

Ø For reasons that are opaque to me, §761.283(b)(1)(i) requires that you orient the sampling grid to magnetic north. All the remediation figures I recall seeing are oriented to true north. (In the attached PowerPoint file, I followed the magnetic north procedure.)

Ø On page 52 of the Phase IV report, ERM states that "perimeter sample points in excess of 50 ppm total PCBs will be evaluated for additional action." This suggests two things to me – first, that you do not plan on evaluating perimeter sample points that exhibit less than 50 ppm total PCBs; and second, that you are not committing to removal of additional sediment, even if the perimeter sample exceeds 50 ppm. §761.61(a)(4)(i) provides specific guidance values for PCB cleanup levels. I presume that the Site wetlands meet the regulatory definition of a 'low occupancy area.' Therefore, ¶(B) of the cited regulation indicates you cannot leave more than 25 ppm total PCBs in place without some action; at levels up to 50 ppm, the area must be fenced and posted with signs that include the "M_L" labeling prescribed in §761.45(a); at levels up to 100 ppm, the Site must be capped in accordance with §761.61(a)(7) & (8). Please comment on how you reconcile the Phase IV with these regulations.

I am also confused regarding the plan for averaging perimeter samples, which perhaps you can clarify for me –

I am not sure whether ERM intends to group post-excavation perimeter closure samples with (or into) the grid section bottom samples (i.e., the 9-point composites) where a partial grid encompasses a perimeter sample point. Section 4.3.1 (page 51) says that ERM will average samples "in those grid cells with more than one sample (i.e. perimeter samples or duplicates)." Section 4.3.2 (pages 52-53) discusses perimeter sampling, including comparison of the arithmetic mean perimeter concentration to certain threshold value (20.0 ppm). To me, this implies you will not lump the perimeter samples in with the grid composites.

§761.289(b)(1)(i) specifies one must “take all samples in the composite at the same depth.” At our meetings, ERM has consistently stated that the perimeter samples will be collected from the uppermost six inches of sediment beneath leaf litter. Since you are proposing sediment excavation to a depth of 18 inches, this appears to preclude compositing bottom samples and perimeter samples. I do not believe the regulation specifically prohibits averaging individually-analyzed perimeter samples with the bottom grid composites (for statistical analysis measuring remediation success). However, I do not recommend such averaging, as it would likely obscure the relative merits of further remediation at a particular point versus remediation confirmation.

On final point is perimeter sampling. I measure the mapped excavation perimeter (in the primary planned remediation area) as 1,240 feet long. No doubt actual excavation would form a more regular geometry (and hence a shorter perimeter), but this number does not include the perimeter of the outlying planned remediation area. Therefore, I presume my measurement is a fair representation of the total perimeter length. ERM proposes collecting samples from “10 pre-determined locations on the perimeter of the remediation area.” That is only one sample per 124 linear feet of excavation sidewall. If you are able to maintain vertical cuts in the undisturbed sediment (unlikely, given its wetness), 18 inches of excavation would yield an exposed area along the remediation perimeter of ~1,860 square feet. EPA regulations specify one sample per square meter (10.8 square feet) in the remediation area. Sampling at the same relative frequency along the excavation perimeter would yield ±173 individual sample points. Even if you grouped these into composites of nine samples each, this would provide ±19 samples (however, §761.289(b)(1)(i) specifies a maximum dimension of 3 meters for compositing areas, which leads to ±58 points).

Subject to EPA approval, I recommend collecting discrete samples every 10 feet along the excavation perimeter, and compositing each sequence of three points. That would yield ±124 individual samples and ±42 two- or three-point composites. In the spirit of §761.283(a), I would also caveat that if ERM intends to conduct additional manual remediation of isolated areas, you collect no fewer than three perimeter samples (as well as no fewer than three bottom samples), regardless of overall excavation size or compositing strategy.

If you do go with ±42 perimeter composite samples, then I believe you should revise your estimate that the average perimeter sample concentration cannot exceed 20.0 ppm downward by approximately a factor of four, to 5 ppm. Furthermore, to ensure (with 95% confidence) that no single sample point exceeds 50 ppm, I recommend a ceiling limit of 10 ppm (average) total PCB for any three-point composite.

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- EPA Sampling.ppt

MW-315S/D 3.27

1.40
S-5

T-7-B
2.41

T-8-1
4.80

Step 3: Composite a maximum of nine samples for each type of bulk remediation waste. The maximum dimensions of the area enclosing a nine point grid composite is two grid intervals bounded by three collinear grid points (3.0 meters long). Take all samples in the composite at the same depth.

T-9-5
1.30

T-8-3
5.80

S-3

T-9-6
2.52

BDL
WS-16

T-5-A
4.77

T-3-2
4.30

T-8-5
0.97

T-9-7
1.60

T-8-6
4.00

T-8-7
4.42

T-10-10
2.12

WS-23
BDL

MW-307

T-10-11
3.87

T-1-6
2.96

T-10-12
6.46

WS-24
BDL

WS-5
0.0373

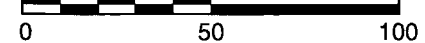
T-9-13
1.27

WS-19
BDL

WS-13
BDL

2.23
T-7-12

**40 CFR 761
SAMPLING SCHEME**
SCALE (FEET)



MW-315S/D 3.27

1.40
S-5

T-7-B
2.41

T-8-1
4.80

Step 2: Use a square-based grid system to overlay the entire area to be sampled. Mark out a series of sampling points 1.5 meters apart oriented to the grid axes. The sampling points shall proceed in every direction sufficiently to result in a two-dimensional grid completely overlaying the sampling area.

T-9-5
1.30

T-8-3
5.80

S-3
1.00

T-9-6
2.52

BDL
WS-16

T-8-5
0.97

T-5-A
4.77

T-6-1

T-3-2
4.30

T-9-7
1.60

T-8-6
4.00

T-6-2

T-5-1

T-3-3

T-8-5

T-8-6

T-6-3

T-5-2

T-4-2

T-7-5

T-6-4

T-5-3

T-4-3

T-7-6

T-6-5

T-4-4

T-3-4

T-7-6

T-6-6

T-4-4

T-3-5

T-7-6

T-6-6

T-5-3

T-4-5

T-8-7

T-6-6

T-5-3

T-4-5

T-8-7

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T-4-5

T-8-7

T-6-6

T-5-3

T-4-5

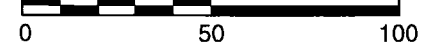
T-8-7

T-6-6

T-5-3

T-4-5

**40 CFR 761
SAMPLING SCHEME**
SCALE (FEET)



T-9-13
1.27

WS-19
BDL

2.23
T-7-12

WS-13
BDL

WS-5
0.0373

T-1-16
2.96

T-10-10
2.12

T-10-11
3.87

T-10-12
6.46

T-9-5
1.30

T-9-6
2.52

T-8-5
0.97

T-8-6
4.00

T-8-7
4.42

T-8-8

T-8-9

T-8-10

T-8-11

T-9-13
1.27

WS-19
BDL

T-6-1

T-6-2

T-6-3

T-6-4

T-6-5

T-6-6

T-6-7

T-6-8

T-6-9

T-7-12
2.23

T-5-A
4.77

T-5-1

T-5-2

T-5-3

T-5-4

T-5-5

T-5-6

T-5-7

T-5-8

T-5-9

T-3-2
4.30

T-3-3

T-3-4

T-3-5

T-3-6

T-3-7

T-3-8

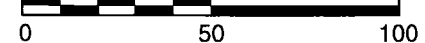
T-3-9

T-3-10

MW-307

WS-5
0.0373

**40 CFR 761
SAMPLING SCHEME**
SCALE (FEET)



MW-315S/D 3.27

Step 1: Orient the grid axes on magnetic north-south line centered in the area and an east-west axis perpendicular to the magnetic north-south axis also centered in the area.

