



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
NEW ENGLAND - REGION I  
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BOSTON, MASSACHUSETTS 02114-2023

February 3, 2005

Lonnie Monaco (monacolj@efane.northdiv.navy.mil)  
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**R : Monitoring Event #24 Report for Sites 1,3 & the Eastern Plume Long Term  
Monitoring, dated December 2004, Naval Air Station Brunswick, Maine**

Dear Mr. Monaco:

Pursuant to § 6 of the Naval Air Station Brunswick, Maine Federal Facility Agreement dated October 19, 1990, as amended (FFA), the Environmental Protection Agency has reviewed the subject document and comments are enclosed.

EPA is willing to discuss and finalize responses to these comments with all parties at the technical meeting in April or during a regularly scheduled conference call after a draft response is reviewed.

If you have any questions with regard to this letter, please contact me at (617) 918-1384.

Sincerely,

A handwritten signature in cursive script, appearing to read "Christine Williams".

Christine A.P. Williams, RPM  
Federal Facilities Superfund Section

Enclosure

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### General Comments:

1. Results from Event 24 are generally consistent with recent trends (see, e.g., Appendix C), particularly for VOCs. Mid-plume well MW-331 had exhibited the maximum total VOCs in recent rounds, reaching a peak of about 1800 ppb in Fall 2002. However, there is some suggestion of a decreasing trend since that peak; over the past three rounds, spring decreases have been larger than fall increases, resulting in an overall decline. Although it is too early to draw firm conclusions, it seems possible that (at least) a local VOC maximum has been advected past this monitoring point. It is interesting to note, however, that P-106 (located farther upgradient), which formerly showed the highest total VOC concentrations, was approximately equal to MW-331 in this event (MW-331: 1024 ppb; P-106: 1051 ppb). Concentrations of most individual COCs were comparable at the two wells, with the exception of total 1,2-DCE, which was much higher at MW-331 (247 ppb) than at P-106 (15.3 ppb). The two wells showed comparable ORP (MW-331: 107.7 mV in downhole measurements accompanying PDB sampling; P-106: 149.1 mV in low-flow sampling); the difference in the concentration of the daughter product 1,2-DCE apparently is not due to a current difference in redox conditions.
2. It might be noted in the general material presented in the document (e.g., in sec. 1.5) that sampling and analysis for 1,4-dioxane was added to the monitoring program for the first time in ME24. This will serve to highlight a change to the program, as well as to explain some differences seen in reported results. For example, a sharp increase in total VOCs was noted at MW-313 (see, e.g., p. 2-8, sec. 2.3.3, where the report acknowledges this), but this is due in large measure to the first-time addition of 1,4-dioxane analysis.
3. It appears that the MNA assessment is in error because of the use analytical results for methane in micrograms per liter rather than milligrams per liter when comparing to the scoring criterion. This results in points being scored at seven monitoring wells for methanogenic conditions when the support is not as strong as implied. Three wells in the suite of wells evaluated for MNA are shown as ranking in the "adequate evidence of biodegradation" category. Without the three points awarded for elevated methane, all of these wells drop into the category of "limited evidence," and none remain in the "adequate" category. The implications for the MNA assessment should be reconsidered.
4. The recommendations presented in section 3.1 generally are well motivated, and are endorsed.

### Specific Comments:

5. **p. 1-6, sec. 1.5:** The text summary states, "The GWETS was operational for 93.2 percent of available hours in April 2004." This statement should be qualified by noting that the reported figure is for the "current month operating system," i.e., based on the capacity of the *operating*

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wells (EW-1, EW-2A, and EW-5A), but excluding inoperative wells (EW-4). Performance based on total well capacity was only 31.6% (see, e.g., Table 5). Perhaps both figures should be repeated here in the text for objectivity.

6. **p. 1-8, sec. 1.7:** *typo:* Please change "... yellow springs ..." to "... Yellow Springs ... ."
7. **p. 1-9, sec. 1.8.3:** *typo:* Please change "summery" to "summary."
8. **p. 1-10, sec. 1.9:** *typo:* Please change "... encased in concrete and burrows ..." to "... encased in concrete ... ."
9. **p. 2-1, sec. 2.1:** The text states, "Table 5 summarizes the monthly flow rates for the four extraction wells ... ," suggesting that the table shows rates *by the month* for the reporting period (e.g., November 2003 through April 2004). However, the table shows *daily* flow rates for the month of April 2004 only. A summary of the monthly flow rates since the previous semi-annual report would be informative. While the daily performance during the month of the groundwater sampling event is useful, the "bigger picture" afforded by monthly figures is also relevant to the interpretation of the monitoring data (e.g., Have long-term changes in the extraction rates affected concentrations at monitoring wells downgradient of the extraction wells?).
10. **p. 2-1, sec. 2.1:** The text states that the extraction wells "... were operational during the majority of time since the last monitoring event (October 2003)." However, this is not apparent from the data provided in Table 5, which show that EW-4 was down for the entire month of April. A monthly summary would provide a better perspective on long-term operations, and would presumably support the statement made here.
11. **p. 2-2, sec. 2.1:** The second plot on this page shows the mass extraction rate (kg/month) for the GWETS. Please note that, although the specific rates shown above the plotted line for March and April 2004 are 0.4 and 0.3 kg/month, respectively, the plotted line appears to be level. Please check plot for consistency.
12. **p. 2-3, sec. 2.2:** The last sentence on this page notes that only one well in the Sites 1 and 3 gauging program, MW-201R, showed a water level in excess of its specified trigger elevation. The figures cited are, at first glance, rather startling: trigger elevation: 35 ft msl; observed water level: 46.78 ft msl. However, Table 3 lists this well as being *outside* the slurry wall, consistent with the location shown on Figure 2. Why is there a "trigger elevation" for a monitoring point outside the slurry wall? Please check the agreement of 9 October 2003 for consistency.
13. **p. 2-4, sec. 2.3.1:** The discussion of analytical results for MW-217B notes that 1,4-DCB rose to 17.3 ppb in ME24. Table B-1, provided in Appendix B, shows that this figure is the

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result for 1,2-DCB, and the entry in the table for 1,4-DCB is 21.6 ppb. Note that the latter approaches the MEG of 27 ppb. Please check table and text for consistency.

14. **p. 2-6, sec. 2.3.2:** The text notes that arsenic exceeded the MCL at MW-217B, and that Fe, Al, and Mn were also in exceedance of relevant benchmarks. Al, Ba, Pb, and As increased over concentrations detected in ME23. Because these observations may cause some concern in the absence of further discussion, it is appropriate to note that the sample from this well was turbid. Table 6 indicates that the well purged dry, and the sample was “cloudy with particles.” Iron, in particular, is extremely high at 173 mg/L, two orders of magnitude higher than at any other well within the site. It seems likely that the elevated inorganics are associated, at least in part, with the turbidity, and not a reliable indicator of water quality at this point, or of a trend of increasing metals.
15. **p. 2-8, sec. 2.3.3:** The discussion of trends at MW-311 notes that total VOC concentrations have increased since May 2003, which is apparent from the trend plot. Both TCE and 1,1,1-TCA have followed this pattern. In order to put this trend in perspective, it would be useful here to include some comment on changes in the extraction rate at nearby EW-2A.
16. **p. 2-8, sec. 2.3.3:** The description of results for MW-313 notes that total VOCs increased sharply due to the detection of 1,4-dioxane, and notes further that, “This is the first detection of 1,4-dioxane.” It might be added that this is the first time that a sample from MW-313 was *analyzed* for 1,4-dioxane, so that it is clear that the “first detection” likely is not due to a first-time arrival of the compound from upgradient.
17. **p. 2-15, sec. 2.4.4.1:** The summary of results for LT-01 states that historical VOC detections have ranged to 100 *milligrams* per kilogram. Should this read *micrograms* per kilogram? Please check.
18. **p. 2-16, sec. 2.4.4.2:** The summary of results for LT-04 gives As and Pb concentrations in *micrograms* per kilogram. Should this read *milligrams* per kilogram? Please check.
19. **p. 2-18, sec. 2.5.1:** The discussion of results for the “background” well, MW-1104, notes that chloride was detected at a concentration of 18.1 mg/L. This serves as a reminder that chloride can be quite high in NASB groundwater that is believed to be unimpacted by hazardous chemical releases. Presumably, this is due to other phenomena, such as winter road salting and seepage from underlying marine sediments. (Maximum sodium detected at Sites 1 and 3 in ME24 was 210 mg/L at MW-218. One can expect that chloride is similarly high in the same locations.) This makes chloride a poor indicator of reductive dechlorination, as it is used in the EPA MNA “scoring” scheme. Complete dechlorination of the CVOCs present in the Eastern Plume would represent only a small perturbation to the ambient chloride, and probably could not be discriminated.

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20. **p. 2-19, sec. 2.5.1:** The discussion of degradation of chlorinated solvents includes methane in the list of potential daughter products of PCE. Methane is analyzed in MNA assessments primarily as an indicator of redox conditions, rather than as a degradation byproduct; methanogenic conditions are favorable to reductive dechlorination.
21. **p. 2-19, sec. 2.5.1:** The discussion of chloride correctly notes that chloride can be present from sources other than dechlorination of solvents. As noted in a previous comment (p. 2-18, sec. 2.5.1), this is particularly problematic for NASB, where “background” chloride can be very high, and changes due to degradation of CVOCs may be indistinguishable. Three wells scored points in the MNA assessment for chloride greater than twice that detected at reference well MW-1104. Mid-plume wells MW-319 and MW-331 scored 10 and 12 points, respectively, in the “limited evidence” range (6-14 points). Discounting the 2-point contribution due to elevated chloride would not change their classification. Downgradient well MW-338A scored 15 points, in the “adequate evidence” range (15-20 points). Discounting the 2-point contribution due to elevated chloride at this well would lower its classification to the “limited evidence” category.
22. **p. 2-20, sec. 2.5.1:** The section discussing results for Fe(II) analyses is titled “*Ferric* Iron,” but would be more appropriately labeled “*Ferrous* Iron.”
23. **p. 2-20, sec. 2.5.1:** The text states that two wells and one piezometer showed reduced iron equal to or above 1 mg/L. However, Table 17 shows that only P-111 showed Fe<sup>2+</sup> at 1 mg/L; wells MW-NASB-212 and MW-313 showed detectable Fe<sup>2+</sup> at 0.82 and 0.1 mg/L, respectively, but these values are below the MNA screening threshold (the scoring in the table is done correctly). Please correct the text to agree with the tabulated results.
24. **p. 2-20, sec. 2.5.1:** The discussion of analytical results for reduced iron includes a comparison of results from MEs 23 and 24, which is useful and welcome. Discussion of sampling for reduced iron in the teleconference of January 19 revealed that the methodology used was changed between MEs 23 and 24. In ME 23, reduced iron was analyzed in the field with a Hach kit. In ME 24, reduced iron was analyzed at an off-site laboratory. The text should be expanded to note this difference in sampling and analysis, as it bears on the interpretation and comparison. Note, for example, that four samples showed Fe(II) at or above 1 mg/L in ME 23, while only one well showed Fe(II) > 1 mg/L in ME 24. It is possible that some of this difference is due to the change in methodology (e.g., some of the reduced iron may have oxidized prior to lab analysis). Please see attached plots, which show the apparently greater prevalence of reduced iron in ME 23. (Non-detects (<0.1 mg/L) are plotted as zeroes.) In ME 24, under reducing conditions (e.g., ORP in the range ~-100 to -200 mV), when one might expect iron to be reduced and mobile, the ferrous iron results are low.
25. **p. 2-20, sec. 2.5.1:** The last sentence in the discussion of reduced iron results suggests that the presence of Fe(II) and methane are contradictory. It is not clear that this is the case. Ferric

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iron is reduced to ferrous iron at Eh  $\sim$ -50 mV, and methanogenesis occurs at Eh  $\sim$ -240 mV, according to Fig. B.3.3 in the EPA MNA Protocol document (1998). (Note that these specific values vary depending upon a number of factors, including biological mediation of the reactions.) Reduced iron may remain in solution at the lower redox potential at which methane is generated. (At very low Eh, it is possible that new, relatively insoluble iron phases (e.g., sulfides) will form, and dissolved ferrous iron concentrations will drop again.) It is interesting to note that the ORPs measured in the low-flow sampling of MW-NASB-212 and MW-313 were -160 and -131 mV, respectively, and both Fe(II) and methane were detected at these wells. At P-111, Fe(II) was detected, methane was not, and the ORP was measured at -27 mV. These relationships are generally consistent with the appearance of methane at lower ORP than that required to mobilize ferrous iron.

	ORP	Fe(II)	total Fe	CH <sub>4</sub>
well	mV	mg/L	mg/L	μg/L
MW-NASB-212	-160	0.82	4.03	19.6
P-111	-27	1.0	0.994	<10 U
MW-313	-131	0.1	2.72	47.2

**26. p. 2-21, sec. 2.5.1:** The discussion of methane as a MNA parameter defines methanogenesis as "... the anaerobic fermentation of VOCs ... ." In many cases, methanogenesis does not require VOCs as electron acceptors. Rather, the carbon source can be any organic compounds, naturally occurring or otherwise. Perhaps a more comprehensive definition would be, "... the anaerobic fermentation of organic carbon ... ."

**27. p. 2-21, sec. 2.5.1 and Table 17:** The MNA scoring system awards three points for methane greater than 0.5 mg/L because this is a strong indicator of redox conditions favorable to reductive dechlorination. Table 17 shows that 7 wells received points for elevated methane: MW-207AR, MW-313, MW-NASB-212, MW-303, MW-315A, MW-335, and MW-338A. Please note, however, that methane concentrations are reported in micrograms per liter (see Table B-5), rather than milligrams per liter. The maximum methane detected is 141 micrograms per liter at MW-303, or 0.141 mg/L, well below the threshold concentration used to discriminate a favorable condition in the scoring scheme (0.5 mg/L). Therefore, all points awarded for methane detection in Table 17 are in error. This causes the total score for each of the 7 wells listed here to drop by three points. Three of the wells, MW-207AR, MW-313, and MW-338A, then drop from the category of "adequate evidence of biodegradation" to "limited evidence."

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These are the only three wells that fell in this category in the assessment, as shown on Figure 14. Correction of this error will eliminate all red stippled areas shown on the map. Corresponding statements in the text (e.g., p. 2-22, sec. 2.5.2) should be modified accordingly.

28. **p. 3-1, sec. 3.1:** The first bullet in this section states that concentrations at MW-331 continue to increase, and that this well exhibits the highest total VOCs in the plume. However, in this round, MW-331 showed total VOCs nearly identical to that at P-106 (MW-331: 1024 ppb; P-106: 1051 ppb), acknowledging that detection of 1,4-dioxane at P-106 at 42.7 ppb is what gives P-106 a higher total than MW-331. Also, there is some suggestion that MW-331 is starting show a decline in concentrations; in ME21, 1,1,1-TCA was measured at ~1000 ppb, while in this round, 1,1,1-TCA was detected at 442 ppb; in ME21, TCE was found at nearly 400 ppb, and in ME24 TCE was measured at 226 ppb. A trend is not yet well defined here, but it is not clear that the pattern is still increasing. These observations do not affect the recommendation presented here (i.e., to pursue an update to the extraction system to improve mass removal and efficiency), which is endorsed.

29. **Tables 8 and 10:** It appears that the many of the field parameters entered for the PDB sampling (Table 8) and for the low-flow sampling (Table 10) are identical, although they were measured by independent methods. For example, it is noted that the ORP recorded in Table 8 for MW-313 is -131 mV, while the field sheets provided in Appendix E show that a value of -105 mV was recorded in conjunction with the PDB sampling. Therefore, it appears that the low-flow field parameters were entered in Table 8 for a number of wells. Please cross-check the tables with the field sheets, and update accordingly.

