



STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

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February 04, 2003

Mr. Orlando Monaco
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FEB 1 2003

RECEIVED

Re: Sites 1, 3 and Eastern Plume; 2001 Annual Report
Naval Air Station, Brunswick

Dear Mr. Monaco:

The Maine Department of Environmental Protection (MEDEP) has reviewed the draft report entitled 2001 Annual Report, Monitoring Event 18 & 19, Sites 1 and 3 and Eastern Plume, dated December 2002, prepared by EA Engineering, Science and Technology. Based on that review the Department has the following comments and issues.

Note: Each of our comments are followed with a code that indicates whether a response is required (RR), no response is required (NR), editorial correction needed (ED); or meeting discussion requested (MTG). No response is required for editorial corrections unless the Navy disagrees with the correction.

General Comments:

1. Due to the terrorist attacks on September 11, 2001, the Navy restricted contractor's access onto BNAS consequently the Groundwater Extraction and Treatment Systems for the Eastern Plume was shut down prior to the September sampling event. It was decided that the extraction wells would remain off until the fall field sample collection could be completed. The result was that sampling was concluded and the pumps were restarted 63 days later on November 13, 2001. A benefit of the delayed sampling event was to learn to what degree the plume would rebound, both hydraulically and chemically, after an unanticipated shutdown period of several weeks. (NR)
2. This annual report does not include a figure that shows the locations of monitoring points that comprises the long-term monitoring network. Instead, the Navy references Figure 2 of the monitoring event reports. This annual report should be able to stand alone without having to refer to other documents for something this basic. Please include the monitoring event Figure 2 in this and all future reports. (ED)

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Specific Comments:

3. Section 2.2, Water Level Gauging Program, p. 2-3, last para:

"Water elevations in MW-311 were relatively consistent with previous data and show a slightly increasing trend."

The increasing trend is not properly characterized as "slightly". The referenced graph shows water elevations in MW-311 fluctuated between 1.3 and 4.4 feet MSL in 1999, and then consistently rose to 8.5 feet MSL by the spring of 2001. This is a change of approximately 4 to 7 feet. When the pumps were off for two months following the September 11, 2001 shutdown, the water level rose another 11 feet. Therefore, the rise occurring prior to the shutdown is at least a third of the total documented rise, which does not seem "slight". This 1999 through spring 2001 rise correlates well with the long-term reduction of extraction well pumping (EW-1 and EW-2A) during this timeframe. Rather than try to subjectively define the rise in groundwater elevation, MEDEP suggests deleting the word "slightly" in the statement and adding the key information as outline above. Then readers can make their own judgement as to the significance of the increase. (ED)

4. Section 2.6, Quality Assurance/Quality Control Procedures, p. 2-5:

Some statement(s) regarding the findings of the data quality reviews for monitoring Events 18 and 19 should be presented here. It should also be noted in the report if all the data collected were determined to be acceptable and usable without qualifications. (ED)

5. Table 2-3, Summary of Aqueous Diffusion Pilot Study – Monitoring Events 18 and 19, 2001:

a.) Please provide the basis for the given ranges of low, moderate and high at the bottom of the table or in the text. The established ranges will affect the overall degree of agreement between Event 18 and Event 19 regarding monitoring intervals. Most importantly, there needs to be further discussion of diffusion sampling in this report that draws upon this table. (RR)

b.) This table is cumbersome and difficult to use. Changes that would improve information presentation are (1) re-order into pilot study group 1 and pilot study group 2 and (2) eliminate a lot of extra words in the table by making two columns to replace "Summary of Monitoring Event # , Diffusion Sampler Total VOC Concentration Study Results". In 1st column give the value measured without parenthesis; in the 2nd column give capital letter signifying Low, Moderate, or High. (ED)

6. Section 3.1, Summary of Ground-Water Extraction and Treatment System Performance, p. 3-1, EW-01:

"The total VOC influent concentration detected in ground-water samples collected from EW-01 (screened from 11.2 to -66.8 ft mean sea level) continue to have a similar order of magnitude compared with total VOC concentrations detected in ground-water samples from nearby monitoring point MW-229A, which is screened exclusively in the deep interval (screen interval from -21.4 to 31.4 ft mean sea level). This similarity in total VOC concentrations suggest the deep ground water being withdrawn by EW-01 does not appear to greatly diluted by ground water extracted from the shallow interval."

The second paragraph essentially says that the similarity in total VOC concentrations between EW-01 and nearby MW-229A suggest that water pumped by EW-01 does not appear to be greatly diluted by groundwater extracted from the shallow part of the EW-01 screen. The 10-foot screen of MW-229A is located opposite the mid-section of the 78-foot screen of EW-01, not the bottom section. The chemical data from MW-229A cannot be used to assess dilution in EW-01 pumpage.

Furthermore, when comparing the similarity between these wells, the contaminant pie charts (Figure 3-1) appear quite different in composition. According to this report, two compounds (PCE and TCE) were recorded in water pumped from EW-01 that were not found in MW-229A. The fact that the total VOCs for these wells are within the same order of magnitude does not preclude shallow groundwater dilution in EW-01. Additionally, the groundwater hydraulic gradient in this area is approximately 0.03 ft/ft, which is a significant gradient. In such settings, a pumped well draws most of its discharge from the upgradient side. MW-229A is not located within this upgradient sector, and is over 100 feet away and slightly downgradient. To summarize, chemical and hydraulic evidence does not support the Navy's premise of little to no shallow groundwater inflow into EW-01. Therefore, this paragraph should be deleted. (Also see comment #13.b) (ED)

7. Section 3.1, Summary of Ground-Water Extraction and Treatment System Performance, p. 3-2, EW-02A:

"...and water elevation data indicate a cone of depression surrounding EW-02A is at least 200 ft in diameter."

While the cone of depression surrounding EW-2A is in the order of 200 feet in diameter, as implied, it is relatively narrow in terms of capturing the width of the Eastern Plume, which is approximately 1000 feet wide (Figure 10, Monitoring Event 18 report). The only other extraction well in the plume's southern lobe, EW-01, has a smaller radius of influence. (NR)

8. Section 3.2.1, Ground-Water Flow – General Observations, p. 3-3, 3rd item under 2nd bullet:

"Surface water elevations measured in October at stream gauge GP-6 were higher than those measured in March 2001 by approximately 9 feet. This difference is likely due to changes in the elevation of the lower reach of Mere Brook, possibly due to tidal conditions at the time elevation data were collected. This change is not believed to be related to the shutdown of the ground-water extraction system during October 2001."

A change of 9 feet does not seem reasonable for the reasons given above. The maximum tidal change in Casco Bay at Portland during the April 13 to 18 gauging period was 9.6 feet; it was 6.6 feet over the October 29-30 gauging period. The greatest tidal difference if the maximum tidal stage occurred at one gauging event and the lowest tidal stage occurred at the other gauging event would be 8.1 feet. The time of day of the stream gauge reading is not recorded in the event reports, however it would be very unlikely that the difference would even approach 8 feet.

Measured elevations at GP-6 for Monitoring Events 11-18 range between 4.46 and 6.42 feet MSL. The October 2001 value of 14.42 feet is almost impossible to conceive as valid. The gauge needs to be closely inspected for any physical changes. Is this installation within the stream channel, on its bank, several feet from the surface water. Does the gauge reflect groundwater head, or free stream elevation? The Navy needs to investigate and report this matter more thoroughly, as it may have significance. (RR)

9. Section 3.2.1, Ground-Water Flow – General Observations, p. 3-3, last bullet:

"Ground water immediately south of Mere Brook (near MW-230A and MW-231A) has been interpreted to flow to the northeast in previous monitoring event reports. This has been confirmed by data collected from four new piezometers gauged in October 2001 ... Data from these new piezometers indicated a southeasterly flow potential may be present in the southern boundary area of the Eastern Plume."

The first sentence says "flow to the northeast". The second sentence says "this has been confirmed by data collected from the four new piezometers". The third sentence states that the "new piezometers indicate a southeasterly flow potential may be present". This appears to be a contradiction please correct. (Please check your spelling of piezometer.) (ED)

10. Section 3.2.3, Effects of Remedial Measures – Eastern Plume, p. 3-4, 1st paragraph:

(a) "The effects of the remedial measures at the Eastern Plume are measured primarily by observing the cone of depression near each extraction well."

The size and shape of drawdown cones are important to monitor when initially starting up an extraction system and periodically to assure that plume capture remains optimal. However, the most important indicator of remediation success is the reduction of contaminant concentrations within the plume, and shrinkage of plume expanse. MEDEP believes that this is particularly true for the Eastern Plume, where remedial pumping has not resulted in groundwater elevation contours enclosing the plume, and therefore, drawdown due to pumping is not eliminating all possibility of plume escape downgradient. Please delete this sentence. (ED)

(b) "However, the extraction system shutdown provided an opportunity to observe the shallow and deep aquifers while in equilibrium under non-pumping conditions."

There is inadequate data to conclude that the cones of depression surrounding the extraction wells completely disappeared, and therefore it is cannot be said that the aquifers recovered to equilibrium conditions. The following four bullets focus on anomalies in the shallow aquifer, which are not representative of the Eastern Plume. The return of artesian head at EW-2A is likely a local phenomenon where strong groundwater confinement is evident. The head in EW-2A may or may not have completely recovered. MEDEP suggests the following language: "*However, the extraction system shutdown provided an opportunity to observe the shallow and deep aquifers after a prolonged shutdown of the extraction system.*" (ED)

11. Section 3.2.3, Effects of Remedial Measures – Eastern Plume, p. 3-5, 2nd bullet:

"With the extraction wells off, a ground-water mound was observed at EW-1 in the shallow interval. This indicates that ground water was likely to be flowing inside the well casing from the deep aquifer into the shallow flow system."

Although flow within the 78-foot well screen likely did occur, this flow would not have been fast enough to create a shallow groundwater mound of the size shown on Figure 5. The most obvious explanation for this mound is that EW-01 reflects the head in the deep sandy zone, and not the shallow unconfined zone. The groundwater elevation of EW-01 belongs only on Figure 6 (deep potentiometric surface map) - not on Figure 5. Please delete EW-01 from this and future shallow groundwater potentiometric maps. (ED)

12. Section 3.2.3, Effects of Remedial Measures – Eastern Plume, p. 3-5, 3rd bullet:

“Ground-water data at MW-225B indicate a strong downward flow gradient from the shallow aquifer to the deep aquifer at or near this location. These data are considered to be anomalous (possibly the result of field measurement error or transcription error) and are not considered to be reliable. Flow from the upper sand ...”

a.) The Navy acknowledges that the groundwater elevation measured in MW-225B is anomalously low, and attributes this to field error. The water level is over three feet lower than past elevations measured (specifically, Monitoring Event 17, September 2000). In response to MEDEP comment 8.b, of our letter of July 24, 2002, the Navy stated “There is no well in the Weapons Area, or other potential “sink” of ground water.” If this is the case, the data recorded at MW-225B are likely due to field measurement error, and these data should have been flagged as unreliable on this map. Due to this field error, the elevation for MW-225B should not have been used for contouring on Figure 5 in Monitoring Event 19, the value should be removed from the map with a notation to explain this action. Figure 5 in Monitoring Event 19 must be redrawn and re-issued to avoid erroneous depiction to shallow groundwater potentiometric surface contours. (ED/RR)

b.) Also the first sentence of the bullet should be deleted. (ED)

13. Section 3.3.2.1, Volatile Organic Compound Concentrations and Distribution, Shallow Monitoring Wells, p. 3-7, 4th bullet:

“Data from Monitoring Event 19 indicate that trichloroethene and tetrachloroethene were detected above regulatory criteria in the deep diffusion sampler in this well. The two other diffusion samplers, and the low-flow sample collected from this well ...

a.) While MEDEP believes that the well referenced is MW-231B, the Navy should identify the well in this statement. (ED)

b.) After a thorough examination of groundwater analytical results for Monitoring Events 18, 19, and preliminary data from Monitoring Event 20, MEDEP believes that the second explanation for the anomalous solvent hits in the lower diffusion sample in MW-231B is feasible. That is, the sample was somehow not tracked properly in the field or laboratory, and does not represent water from MW-231B. A review of the last three event results strongly indicates that the sample reported as MW-231B may be MW-229A. The results from Monitoring Event 19 reported for MW-229A are essentially non-detects, whereas the chem graph for this well in Appendix A-4 of the 2001 Annual Report historically show 1,1,1-TCA and TCE at levels above 30 µg/L, and PCE and 1,2-total DCE between approximately 4 and 10 µg/L. These concentrations are a good match for those reported as MW-231B. Furthermore, it is quite difficult to accept that the solvent plume could rise over 30 feet in elevation as it moves southward from the MW-205/MW-229A area.

Given the strong indications that the laboratory results were incorrectly assigned to the sampled well, the results needed to be flagged throughout the report and the text changed appropriately. It also appears likely that the chemical results for MW-229A belong with MW-230A based on their chemical graphs. However, it is not so apparent which well the MW-230A sample represents. MEDEP recommends that Figure 8 and Table A-3 in Monitoring Event 19 and Figure 3-1 in the 2001 Annual Report be corrected and footnotes provided to indicate the re-assignments and any degree of associated uncertainty. Also, the entire fourth bullet (on page 3-7 and 3-8) should be deleted from the report. (ED)

c. Should laboratory results from future sampling events indicate a sudden presence of plume contaminants at a sentinel well at concentrations greater than the MEGs/MCLs, the Navy needs to immediately discuss this with the stakeholders and, if necessary, resample the well, and not wait until the next scheduled monitoring event. (RR)

14. Section 3.3.2.1, Volatile Organic Compound Concentrations and Distribution, Shallow Monitoring Wells, p. 3-8, 5th bullet:

"Although concentrations remain below regulatory criteria, the noted rise in VOC concentrations indicates that the Eastern Plume is migrating in the shallow interval along the leading edge of the plume."

This statement might be somewhat misleading in that it has not been previously established that the plume is moving eastward toward MW-313, although admittedly, the fall 2001 shallow potentiometric contour map suggests that this was happening during the cessation of pumping following September 11. The contamination increase at MW-313 may well be the result of migration of the shallow contamination documented at MW-332, caused by MW-311 overflowing its casing in the early 1990s. That subsequent small plume appears not to be directly connected to the main body of the Eastern Plume. Alternatively, under remedial pumping conditions, the eastern side of the deeper Eastern Plume may be diffusing cross-gradient to engulf the MW-313 screen, located just above the top of the clay. Until the leading edge direct-push sampling is completed this summer and the results evaluated, the Navy should not implicate MW-313 as located within the direct pathway of the Eastern Plume. Therefore please delete this sentence. (ED)

15. Section 3.3.2.1, Volatile Organic Compound Concentrations and Distribution, Deep Monitoring Wells, p. 3-9, last three bullets:

"Samples from six monitoring wells located along the leading edge of the Eastern Plume showed an increase in total VOC concentrations based on data collected ... These results indicated consistent increases in VOC portion of the Eastern Plume. These results indicated consistent increases in VOC concentrations on the leading edge of the plume..."

"Samples from deep monitoring wells MW-NASB-212, MW-229A, and MW-306 (all perimeter wells) show stable or decreasing VOC trends based on data collected ..."

"Ground-water samples collected from shallow and deep sentinel wells MW-231-B, MW-313, MW-318, MW-230A, MW-231A, MW-303, MW-305, MW-333, MW-334, MW-308, MW-309, and P-132) did not detect VOCs above the State MEGs or Federal MCLs."

a.) These characterizations of general contaminant concentrations at points other than MW-311 and MW-NASB-212 indicate that the vast majority of monitoring wells have shown no significant trend over the past 2-3 years. The only other well showing a discernable decrease over time is MW-229A. MW-331 and P-106 should be added to the stable category. The steady decline at MW-311 was the subject of an earlier comment (comment # 3), whereby MEDEP does not presently regard this well as a reliable indicator of the general progress of contaminant reduction of the Eastern Plume. (ED & RR)

b.) MW 231B could be added to the last bullet since table A-3 and Figure 3-1 are to be corrected as discussed above. (ED)

16. Section 3.3.2.1, Volatile Organic Compound Concentrations and Distribution, Deep Monitoring Wells, p. 3-9, 1st complete bullet:

"Trend data collected between 1995 and 2001 indicated total VOC concentrations have continued to decrease at monitoring points MW-311 and MW-NASB-212. These declining VOC concentration are likely the result of natural ground-water flow and natural attenuation,..."

One attenuation mechanism that the MEDEP believes is partially to largely responsible for the orders-of-magnitude decline in measured VOCs in well MW-311 is dilution from relatively uncontaminated groundwater captured by the EW-02A drawdown cone. A general long-term temperature increase in water pumped by EW-02A could indicate that warm summer surface (or near surface) water has been induced into the deeper screened sand layer. Dilution should be added to the second sentence. (ED)

17. Section 3.6, Conclusions and Recommendations, p 3-13 through 3-15:

MEDEP agrees with the conclusions and recommendations in this section except as noted. (NR)

18. Section 3.6.1, Ground-Water Sampling Program, p. 3-13, 2nd Conclusion and Recommendation:

a.) "The migration of the main body of the Eastern Plume appears to be slowing."

The Navy needs to provide the basis for this statement since there has been virtually no reported documentation of plume migration rates in terms of distance per year. The rate of plume movement southward likely has been variable depending on volume of extraction pumpage and rates of individual wells on line. (RR)

b.) " Begin discussions with the project Technical Evaluation Group and regulators for optimization of the Eastern Plume sampling network to determine which sampling points may be candidates for yearly sampling (as opposed to the current twice per year sampling), or which points are determined to be redundant and can be eliminated from the program. In addition, these discussion could also be used to assess if other monitoring points are needed to track movements of the hotspots areas within the Eastern Plume."

MEDEP looks forward to discussing this with the Navy however at this time MEDEP does not believe that there is an excess of wells being monitored at the Eastern Plume, although through optimization, perhaps several new monitoring wells could replace a few existing wells. (RR)

19. Section 3.6.2, Extraction System, p.3-14, 1st Conclusion and Recommendation:

MEDEP agrees with the stated conclusion, and the recommendation that collection of natural attenuation parameters should be initiated soon. However, before setting a time for abandoning the groundwater extraction system, a thorough analysis of concentrations versus time and pumpage history (volumes and locations) needs to be performed, and a consensus reached among stakeholders that optimization of VOC removal has been achieved and the point of diminishing returns has been reached. (RR)

20. Section 3.6.2, Extraction System, p.3-14, 2nd Conclusion and Recommendation:

a.) "...However, influent total VOC concentrations have been stable at approximately 50 $\mu\text{g/L}$ since 1998."

MEDEP cannot relate these figures to EW-02A; please provide the context of and basis for this statement. (RR)

b.)"Following the 3-month long plant shutdown between September and November 2001, VOC influent concentrations did not increase (i.e., no rebound effect was observed following the cessation of ground-water extraction). The trend graphs for this well and for MW-311 suggests that a significant mass of VOCs is no longer present in this portion of the Eastern Plume."

MEDEP will take this under consideration once the Monitoring Event 20 data is received. (NR)

c.) EW-2A should be considered for decommissioning and/or conversion into a monitoring point with potential future use as an extraction well, if needed.

EW-02A should not be decommissioned anytime soon. (NR)

21. Section 3.6.2, Extraction System, p.3-15, 3rd Conclusion and Recommendation:

"EA recommends abandonment of extraction well EW-01 ..."

MEDEP agrees with this conclusion, but cannot agree with the recommendation to decommission this well unless a suitable replacement well is installed and put into operation. EW-01 is pumping at a rate of 8 gal/min (Monthly Operations Report for 1-30-November 2002-Ground-Water Extraction and Treatment System), and is the only remedial well near the southern leading edge of the Eastern Plume. Unfortunately, the radius of drawdown is relatively small and would not be expected to exert much hydraulic control over plume movement. However, its pumpage may be important as it is removing approximately 100 $\mu\text{g/L}$ of VOC, including TCE at nearly one order-of-magnitude higher than its MCL/MEG of 5g/L. The Navy's suggested action needs to be discussed at the next regular scheduled conference call or meeting. (MGT)

22. Figure 3-1:

Providing that errors are not present (see earlier comment 13.b), this map portrayal of contaminant distribution is very valuable to the reviewer. Please continue to include this type of figure in each future Eastern Plume report. Can a way be found to show the full pie diagram for EW-02A? (ED)

23. Appendix A-4, Long-Term Monitoring Trend Results:

Graphs for two wells (MW-229A and MW-NASB-212) show one date where the total VOC value is less than the sum of the constituent values. Please correct these graphs. (ED)

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24. Appendix B-3, Navy's Response of MEDEP Comment 9, July 24, 2002:

Upon re-examination, MEDEP stands by its original statement that the water-level measurement for MW-231A is incorrect in Table 4, and that when corrected, a value of 23.66 feet above sea level will result. The value of 23.66 feet needs to replace 20.70 feet on Figure 6 in the Monitoring Event 19 Report, and contours redrawn. (ED)

25. Appendix B-3, Navy's Response of MEDEP Comment 10, July 24, 2002:

The Navy's response says that the revised and updated Table 5 would be included in the 2001 Annual Report. MEDEP could not find this revised and updated Table. Please correct. (ED)

Thank you for the opportunity to review this report. If you have any questions or comments please call me at (207) 287-7713.

Respectfully,



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