



STATE OF MAINE  
DEPARTMENT OF ENVIRONMENTAL PROTECTION

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ANGUS S KING, JR

EDWARD O. SULLIVAN

December 11, 1998

COMMISSIONER

Mr. Emil Klawitter  
Code 1823 EK  
Department of the Navy, Northern Division  
Naval Facilities Engineering Command  
10 Industrial Highway, Mail Stop 82  
Lester, PA 19113-2090

Re: Summary Report Biosparging System Operations  
at Old Navy Fuel Farm, January-June 1998  
Naval Air Station, Brunswick, Maine  
November 1998, Final

Dear Mr. Klawitter;

The Department of Environmental Protection (DEP or Department) has reviewed the report entitled "Summary Report Biosparging System Operations at Old Navy Fuel Farm, January-June 1998", dated November 1998, prepared by EA Engineering, Science and Technology. Based on that review the Department has the following comments and issues.

**General Comments**

1. Departmental records indicate a review for a summary report dated April 1997. It covered the monitoring period from August 1996 through December 1996. Comments were forwarded to the Navy in a letter dated July 28, 1997. The current report includes data from January 1998 through June 1998. The reference section of the current report includes two summary reports for 1997. The Department has not received either of the two summary reports for 1997.
2. In the future, the Navy must submit the summary reports in a more timely fashion. This report arrived nearly five months after the Navy collected the June round of groundwater samples. In order for the Department to provide meaningful input a shorter turn around is necessary. Otherwise the report's recommendations have already been implemented without agreement from the DEP.
3. Future summary reports should include a section detailing the Navy's responses to the Department's comments regarding the previous summary report.
4. In the letter from the Department dated July 29, 1997 (copy attached) the Navy was asked to consider methods to determine respiration rates within the saturated zone. The Department still contents that this may be useful and have some suggestions for how oxygen consumption rates might be determined at this site.
5. Based on review of the summary report, it would be useful to meet with the Navy and its consultant to discuss the ongoing remedial efforts at this site.

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**Specific Comments:**

6. Introduction, Section 1.1, page 1-1

It would be helpful if Figure 1-1 depicted the location of the Old Navy Fuel Farm.

7. Water Quality Indicator Parameter Measurement Methodology, Section 2.1.2, Pg 2-1

Every couple of weeks EA Engineering, Science, and Technology (EA) obtains field measurements from many of the well points and monitor wells at this site. The in-situ measurements include pH, specific conductance, redox potential, dissolved oxygen, and temperature. EA obtains the data by lowering the field instrument below the water table in each well point/monitor well. Because the well points and monitor wells are not purged, most of the data is of limited value.

To evaluate the data, Department staff compared in-situ data collected from 9 monitor wells on June 16, 1998, with low flow data collected from the same wells a day later after purging the wells. The attached table contains data for dissolved oxygen and redox potential. In all wells, the dissolved oxygen concentration data obtained after purging was lower than the in-situ data (see attached figure). Dissolved oxygen concentration data from MW-61R and MW-211 are of particular significance. In MW-61R and MW-211, the concentration of dissolved oxygen in the purged samples was essentially zero while the no purge data revealed 6.74 mg/L in MW-61R and 2.47 mg/L in MW-211. Redox potential was often much lower in the purged samples.

The explanation is pretty simple. The water within the screened interval is stagnant and not representative of groundwater. The higher dissolved oxygen and redox potential are a direct result of the stagnant water's direct contact with the atmosphere. Only after the purging the stagnant water can one obtain meaningful data about the in-situ concentrations at this site. Therefore, it is not worthwhile to continue this sampling unless the wells are purged.

8. Sampling Methodology, Section 2.3.2, Pg 2-2:

It appears there are some sampling problems relating to the inability to reduce flow rates below 1000 ml/min using the Grundfos Rediflo submersible pump. As recommended for the NEX Service Station monitoring program, it is acceptable to use peristaltic pumps for low flow groundwater sampling.

9. Water Quality Indicator Parameter Data, Section 3.1.3, Pg 3-2:

This section includes statements regarding seasonal trends in the average oxygen concentration in groundwater. Unfortunately, for the reasons stated above, trend analyses based on the non-purge data are not representative of the in-situ oxygen concentrations at this site.

10. Well Point Headspace Vapor Measurements, Section 3.1.4, Pg 3-2:

The Department questions the usefulness of the headspace data measurements made on selected well points. The character of the headspace vapor is interesting, but it is not clear how the Navy uses the information to modify system operation.

11. In Situ Biodegradation Conditions, Section 3.3.1, Pg 3-6:

The assessment of the biosparging system's ability to enhance oxygen concentrations is too optimistic. The analysis of oxygen distribution at this site should rely exclusively on data obtained using low flow sampling techniques. In fact, the distribution of methane as measured in the well points clearly indicate anaerobic conditions occur throughout the system.

12. Assessment of Dissolved-Phase Hydrocarbon Removal, Section 3.3.2, Pg 3-8:

Since initiation of the sparging system in August 1996 there has been a decrease in both GRO and DRO concentration within the source area. In addition to monitoring the dissolved phase petroleum concentration within the source area it is also important to determine the behavior of the dissolved phase plume downgradient of the Old Tank Farm. We must not lose sight of the primary goal of biosparging: to reduce the extent and magnitude of groundwater contamination.

To further assess the biosparging effort, the Navy needs to provide the chromatograms for all DRO and GRO groundwater samples.

13. Conclusions and Recommendations, Section 3.4, Pg 3-10

The report states reduction in MTBE concentration results primarily from volatilization. Because MTBE is extremely water soluble, it is likely groundwater movement through the contaminant zone also contributed to reductions in MTBE contamination through advection.

According to the report, the system modifications outlined in this section were to be performed during the July – December 1998 operational period. Because the Department didn't receive this report until late November it's impossible to provide meaningful input. The Navy's response to these comments should detail the implemented changes.

The report indicates several well points and at least one monitor well are no longer operational. What are the Navy's plans to replace these points?

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

Respectfully,



Claudia Sait  
Project Manager-Federal Facilities  
Bureau of Remediation & Waste Management

attachments

Cf: File

Larry Dearborn-DEP

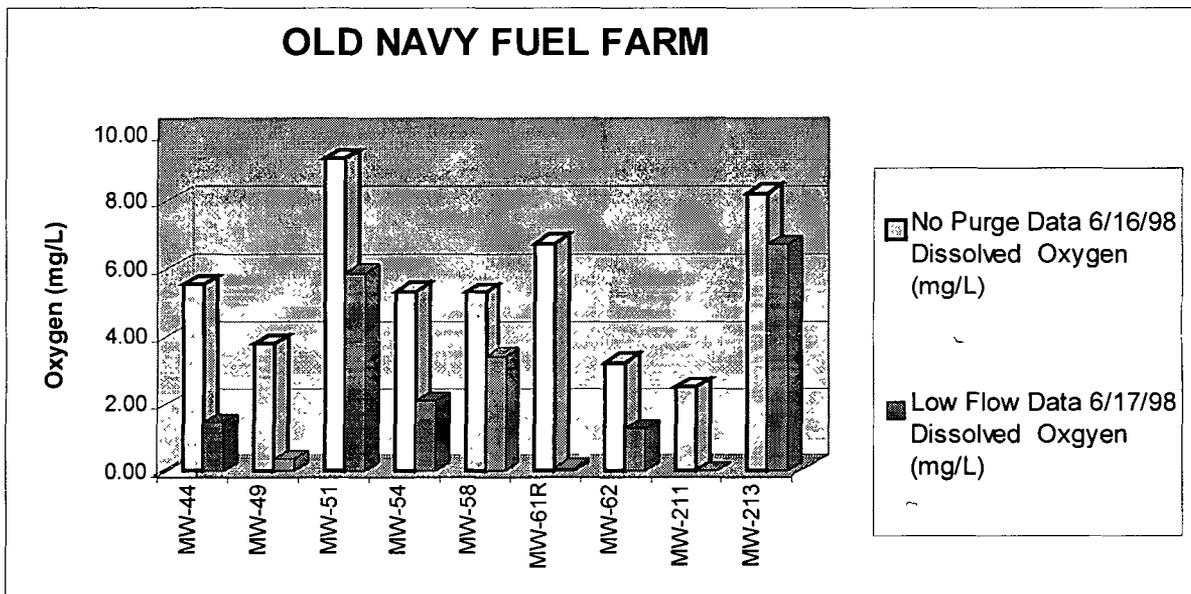
Richard Behr-DEP

Anthony Williams-BNAS

Peter Nimmer-EA

Brunswick Naval Air Station  
 Old Navy Fuel Farm  
 Biosparging System

Well ID	No Purge Data	Low Flow Data	No Purge Data	Low Flow Data
	6/16/98 Dissolved Oxygen (mg/L)	6/17/98 Dissolved Oxygen (mg/L)	6/16/98 Redox Potential (mV)	6/17/98 Redox Potential (mV)
MW-44	5.54	1.40	165	23
MW-49	3.77	0.36	156	43
MW-51	9.26	5.86	134	138
MW-54	5.33	2.06	261	271
MW-58	5.28	3.38	159	103
MW-61R	6.74	0.07	252	-41
MW-62	3.20	1.24	189	51
MW-211	2.47	-0.03	135	-85
MW-213	8.21	6.69	119	120





STATE OF MAINE  
DEPARTMENT OF ENVIRONMENTAL PROTECTION

ANGUS S. KING, JR.  
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EDWARD O. SULLIVAN  
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July 29, 1997

Mr. Jim Caruthers  
IR Coordinator  
Naval Air Station  
Box 33  
400 Orion Street North  
Brunswick, Maine 04011

Re: Summary Report: Biosparging System Operations at Old Fuel Farm, August-December 1996  
Naval Air Station, Brunswick, Maine

Dear Jim,

The Department of Environmental Protection (Department or DEP) has received and reviewed the Summary Report: Biosparging System Operations at Old Fuel Farm, August-December 1996. (While the Department understands that these comments will not effect the most recent sampling event at the Old Fuel Farm, the comments should be considered and addressed for future sampling events.) Based on the review of this report the Department has the following comments.

**General Comments:**

1. The DEP questions the usefulness of the characterization of the microbial community and it is unclear how this data can be used to evaluate the effectiveness of the remedial effort based on the following reasons.

Petroleum degrading microorganism are ubiquitous, therefore it is reasonable to assume that the microorganisms would be found at this site.

It is also reasonable to assume that the introduction of oxygen to a previously anaerobic environment would stimulate aerobic degradation.

The majority of subsurface microorganisms are attached to soil particles, therefore it is also problematic to characterize a subsurface populations with groundwater samples based on enumerations of microorganisms

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recovered in groundwater samples. Clearly this would result in a biased estimate; it would make more sense to collect subsurface soil samples for enumeration studies.

The comparison of the pre and post microbial population estimates is questionable. The enumerations techniques for total heterotrophic and petroleum degrading microorganisms select for aerobic or facultative bugs only. Prior to biosparging and the consequent introduction of oxygen, the population of aerobic microorganisms would be significantly suppressed due to the anaerobic conditions. Therefore, once the biosparging began, aerobic microorganisms would naturally be expected to increase.

Based on the above comments it is unclear how additional microbial data can be used to refine the operation of the sparging system. Estimating the petroleum degradation rates at the site would be more useful. Perhaps, the Navy could estimate degradation rates based on knowledge of the mass of oxygen introduced and consumed.

The DEP has reviewed studies performed at the former Loring Air Force Base (AFB) in Limestone, Maine, where a respiration test was used to estimate the in situ biodegradation rates of petroleum contaminated soils in the vadose zone. We would be happy to discuss these studies with you and aid you in assessing a viable approach to estimating degradation rates at the Old Fuel Farm: (A literature search may also reveal methods to estimate degradation rates. Some variation of the respiration test conducted at bioventing sites could be used to estimate petroleum degradation.)

2. Microbial activity is often significantly reduced at lower temperatures. The microbiologist's rule of thumb: expect a 2X decrease in metabolic rates for every 10 degree C drop in temperature. At Loring AFB, several of the respiration tests conducted at one bioventing site revealed a significant decrease in degradation rates during the winter months. It is likely this is also occurring at the Old Fuel Farm Site. If degradation rates drop significantly during the winter months it may not be necessary to continue to operate the bioventing wells during this period if the microorganisms do not rapidly consume available oxygen. Also, when the ground is frozen there is concern that the introduction of air through the sparging wells may move contaminants laterally. (See comment 4 below.)

3. Please provide the boring logs and/or well construction logs for monitoring wells and well points installed at the Old Fuel Farm.

4. A review of the light non aqueous phase liquids (LNAPL) data in Table 3-1 indicates product has accumulated in a couple of well points that did not previously contain LNAPL (WP-04 & WP-07). However, one well (MW-7) no longer contains LNAPL. The report needs to address how biosparging is impacting the distribution of LNAPL.

5. Just a clarification. At one time gasoline range organics (GRO) and diesel range organics (DRO) methods were considered Maine DEP methods. Now they are Department of Human Services, Health & Environmental Testing Laboratory (HETL) methods.

6. The Navy has estimated iron and manganese concentrations in groundwater using field test kits. The Department has observed discrepancies between some field kit data and laboratory analyzed samples. To evaluate the accuracy of the analytical data obtained with the field kits, it may be worthwhile to submit a portion of the next round of iron and manganese samples for laboratory analysis.

The Navy should field filter the iron and manganese samples. Field filtration followed by acidification, assures that the concentration data truly represents dissolved phase concentrations. This is particularly important since we are only interested in the reduced form of iron and manganese produced by microbial reduction.

#### **Specific Comments .**

7. 2.3.2 Sampling Methodology, Page 2-3, Para 2

"Sampling at the well points was performed without purging since the points would go dry if steadily purged."

It should be noted that the integrity of the groundwater samples collected from the well points would be lower than those collected from monitoring well were proper sample collection techniques were performed.

8. 2.3.2.2 Summary of Ground-Water Sampling conducted on 4-5 December 1996, Page 2-5, Para 2

"One ground-water sample was collected from each of the

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wells/well points (24 total); in addition, duplicate ground-water samples were collected from well WP-3 and monitoring well MW-43."

Monitoring well MW-43 is not shown on any of the figures in the report.

9. 3.1 Summary of Baseline Sampling Program Results, Page 3-1, Para 2

"Water level and water quality indicator parameter data were collected from 4 monitoring wells (MW-44, MW-51, MW-56, and MW-211)..."

Monitoring well MW-211 is not shown on any of the figures in the report.

10. Section 3.5.1 In Situ Biodegradation Conditions

The Navy indicated four months of sparging is converting a predominantly anaerobic environment to an aerobic environment. Agreed. However, the report then implies air sparging produced a viable heterotrophic microbial population, but according to the pre sparging data the indigenous microorganisms were all ready at work. (For example, based on the concentration of methane observed in the headspace of the monitoring wells, it was evident petroleum degradation was all ready underway. Also the iron data indicated degradation.)

Also, if microorganisms were not operating before sparging, a much larger petroleum plume would be expected. (Estimates of groundwater flow velocities coupled with a guess of the release date will give one an idea of where the plume front would be if natural attenuation was not occurring.) Care must be taken when making overly broad interpretations.

11. Section 3.5.1 In Situ Biodegradation Conditions, Pg 3-16, Para 2

"Ferric iron is not directly measured for microbial assessments since it is not possible to quantify its availability to the microbial population without knowing its degree of crystallinity."

There are methods available to estimate the amount of ferric iron available for microbial reduction. The Department will supply applicable references if the Navy is interested.

page 5 of 5

Please call me at (207) 287-2651 if you have any questions or comments regarding this matter.

Respectfully,

A handwritten signature in cursive script that reads "Claudia Sait". The signature is written in black ink and is positioned to the right of the typed name.

Claudia Sait

Project Manager-Federal Facilities  
Bureau of Remediation & Waste Management

cc: file

Richard Heath-DEP

Mike Battle-EA