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ENVIRONMENTAL

Subject:
Second Response to Agency Comments/Revised Long-Term Groundwater
Monitoring Plan, Woodlawn Landfill Site, Cecil County Maryland Administrative
Order, USEPA Docket No. III 95-05-DC.

Langhorne, PA
14 July 1998

Contact:
Tina Stack

Dear Mr. Eric Newman:

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ARCADIS Geraghty & Miller, Inc. and Bridgestone/Firestone, Inc. have reviewed the U.S. Environmental Protection Agency (USEPA) June 29, 1998 comments on the revised long-term monitoring plan for groundwater at the Woodlawn Landfill Site. The conceptual long-term monitoring proposal was previously submitted on September 17, 1997 as part of the written response to USEPA's and Maryland Department of the Environment's (MDE) second round of comments to the Predesign Investigation Report and Feasibility Study Addendum (PIR/FSA) and the Preliminary Design Report (PDR). The long-term monitoring plan was subsequently revised and re-submitted to the USEPA on May 21, 1998.

The second monitoring plan submittal incorporates suggestions received from the USEPA. Specifically, the new plan incorporated the use of statistical methods to assess attainment of cleanup levels during the ongoing sampling. The June 29, 1998 comment letter from the USEPA conditionally approved the long-term monitoring plan for the site. Comments which address the conditions of the approval are contained in the attached plan.

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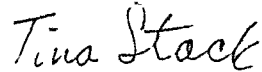
If you have any questions or should you require additional information, please call one of the individuals listed below.

Sincerely,

ARCADIS Geraghty & Miller, Inc.



Jeffrey S. Burdick
Project Scientist/Hydrogeologist



Tina Stack
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Suthan S. Suthersan, P.E. PhD
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Enclosures

cc: Mr. James Gravette, Maryland Department of the Environment (2 copies)
Ms. Mimi Boxwell, U.S. Army Corps of Engineers
Mr. Timothy A. Bent, CPG, Bridgestone/Firestone, Inc.
Mr. Kevin A. Gaynor, Esq., Vinson & Elkins
Mr. Joseph Lewandowski, ERM

Tables

Table 1 Sampling Locations Proposed for Long-Term Monitoring Plan,
Monitored Natural Attenuation Remedy, Woodlawn Landfill Cecil
County, Maryland.

Figures

Figure 1 Wells Proposed for Long-Term Monitoring Plan, Monitored
Natural Attenuation Remedy, Woodlawn Landfill, Cecil County,
Maryland.

**Revised Long-Term Groundwater Monitoring Plan,
Woodlawn Landfill, Cecil County, Maryland.**

Long-Term Monitoring to Demonstrate Natural Attenuation

ARCADIS Geraghty & Miller, Inc. has designed the monitoring program for the monitored natural attenuation (MNA) remedy to be consistent with the intent of published USEPA guidance and technical protocols published by the U.S. Air Force for long-term compliance monitoring practices (USEPA 1992; Wiedemeier 1996) and remedial action objectives for the site. The purpose of the long-term groundwater monitoring plan for the Woodlawn Landfill is: to document that the natural attenuation mechanisms that are currently effective in attenuating contaminants in groundwater at the site continue; to ensure that concentrations of COCs continue to decline and achieve cleanup levels; and to ensure continued protection of human health and the environment.

The wells proposed for sampling fulfill one or more of the following three purposes: (1) to confirm ongoing natural attenuation mechanisms; (2) to ensure that COC concentrations continue to decline toward remediation goals in wells located in the area of attainment; and (3) to monitor for constituents of concern (COC) in groundwater in areas in proximity to (or upgradient of) potential receptors. These three categories of wells are respectively referred to as 1) natural attenuation monitoring wells, 2) area-of-attainment monitoring wells, and 3) point-of-action monitoring wells. Wells that do not fit into one of these three categories will be properly abandoned by a Maryland certified drilling contractor.

Analytical parameters will vary slightly among each of the three categories of wells, but some wells may be monitored for more than one purpose and therefore be analyzed for an expanded list of parameters. Thirty-seven points are initially proposed for the MNA plan, including: 21 wells proposed for natural attenuation monitoring; 21 wells for area-of-attainment monitoring (including one residential well and three new wells which may be included, pending results of the initial groundwater sample analyses), and 12 locations for point-of-action monitoring (including 11 wells and one surface water body). The monitoring wells proposed for the long-term MNA Plan are shown on Figure 1 and are summarized in the attached Table 1.

The following sections describe the rationale, analyses, and statistical methods proposed for assessing attainment for the long-term performance monitoring program for the monitored natural attenuation remedy.

Natural Attenuation Confirmation Wells

The purpose of monitoring for indicator biogeochemical parameters for natural attenuation is to confirm the ongoing effectiveness of the natural biodegradation and attenuation processes that have been documented at the site (Geraghty & Miller, Inc. 1997a). In addition to the earlier historical biogeochemical indicator data that has been collected, four quarters (March, May, August, and October 1997) of biogeochemical data have been collected to date using USEPA protocols to demonstrate that natural attenuation is an effective remedy at the site. Thirty-two wells were sampled for an expanded list of biogeochemical indicator parameters and daughter products during each quarter of 1997. An ongoing but less frequent assessment of the indicator biogeochemical parameters and natural attenuation mechanisms will continue as part of the long-term sampling plan to further substantiate the continued effectiveness of natural attenuation mechanisms that are active at the site. Twenty-one wells are proposed for natural attenuation confirmation monitoring at the site. Eleven of the proposed natural attenuation confirmation wells also serve as either a point-of-action or area-of-attainment monitoring wells.

The following wells are proposed for sampling to reaffirm sustained effectiveness of natural attenuation mechanisms:

- **Saprolite Monitoring Wells:** B-3, B-4, B-6, F-2, F-3, F-6, F-8, MW-103A, MW-105A, MW-106A, MW-109A, and proposed to be installed MW-110A.
- **Bedrock Monitoring Wells:** ITB-1, ITB-3, ITB-4, ITB-5, MW-105B, MW-109B, MW-106B, and proposed to be installed MW-110B and MW-111B.

The natural attenuation confirmation wells will be sampled on an annual basis for vinyl chloride and dissolved manganese, plus some key indicator biogeochemical parameters, including dissolved organic carbon, nitrate, sulfate, iron II/III, ethane, ethene, carbon dioxide, and methane. These data will be collected using low-flow purging and sampling procedures, while monitoring for dissolved oxygen and oxidation-reduction potential (ORP) at the well head using a flow-through cell.

An annual review will be conducted of the natural attenuation data collected, and wells, individual parameters, and classes of parameters may be added or removed from the monitoring plan based on this evaluation, as appropriate. Individual wells will be removed from area-of-attainment monitoring status when all parameter classes (e.g. VOCs, PAHs, etc.) achieve site cleanup levels. It is anticipated that summary statistics and a program review will continue at least on an annual basis.

Area-of-Attainment Compliance Wells

Groundwater concentrations in samples from wells located outside the landfill waste boundary (the area-of-attainment) collected during recent sampling events were compared to the COC cleanup levels stated in the Record of Decision (ROD). This evaluation identified 21 wells that contained COCs at concentrations above the cleanup levels. These wells are referred to as the "area-of-attainment wells." Eight of these wells are defined by dissolved concentrations of manganese exceeding the proposed cleanup level, while four of the wells exceed the cleanup level for vinyl chloride. Three of the wells contained sporadic detections of bis(2-ethylhexyl) phthalate, a pesticide or PAH compound at a concentration above cleanup levels. Each of the area-of-attainment wells will therefore be sampled for these site-specific groundwater COCs. Proposed Monitoring Wells MW-110A, 110B and 111B will be included as area-of attainment wells if the initial groundwater sampling results for these wells show concentrations of COCs above the cleanup levels.

The following is a list of the 21 area-of-attainment monitoring wells and one residential well defined for future long-term groundwater monitoring at the site:

- **Saprolite Monitoring Wells:** B-6, F-2, F-5, MW-103A, MW-104A, MW-105A, MW-110A (pending groundwater sampling results), ITS-1, OW-1, OW-2, OW-4, SW-1 and TSW-1.
- **Bedrock Monitoring Wells:** ITB-1, ITB-2, ITB-3, ITB-4, MW-105B, and MW-110B and MW-111B (pending groundwater sampling results).
- **Residential Wells:** P-506 (Kraft).

The USEPA has requested quarterly sampling of all area-of-attainment wells for three years in order to assess long-term attainment of cleanup levels. Since February 1996, quarterly groundwater sampling of site monitoring wells and two residential wells (P-309 and P-506) has been conducted at the site. Since February 1997, the quarterly sampling program has included samples collected from 13 additional monitoring wells installed during the predesign investigation. The sampling program conducted since February 1997 has involved low-flow sampling procedures, and monitoring and analysis of biogeochemical parameters to demonstrate the mechanisms and effectiveness of natural attenuation in groundwater at the site. These previous sampling results as well as additional quarterly monitoring for the parameters presented above will be initiated after Agency approval of this revised monitoring plan is received. Statistical methods specified by the approved plan will be used to assess the attainment of cleanup levels from groundwater at these 21 wells.

Methods Proposed to Assess Attainment

The statistical methods proposed to assess and demonstrate attainment are consistent with the USEPA 1992 guidance (Methods for Evaluating the Attainment of Cleanup standards - Volume 2: Groundwater). The concentration data for each parameter will be pooled into groups of wells based on the geochemical zones that have been identified for the site: anaerobic and reducing; transitional; and aerobic. Separate evaluations will be performed for each parameter. Data collected to date indicate that it will not be necessary to include seasonal affects in the attainment determination. In addition to demonstrating that the measured concentrations are below the cleanup standard, the data will also be evaluated to ensure that no statistically increasing trends exist.

Data from the previous and current monitoring programs will be tabulated and summarized graphically. Once sufficient data have been collected, the first statistical evaluation will be performed. As part of this statistical evaluation, a determination will be made as to whether sufficient data are available to conclude that either attainment has or has not been achieved. If attainment has not been statistically achieved, the next statistical evaluation will be performed upon completion of the next round of monitoring or as frequently as necessary to acquire sufficient data to demonstrate attainment. This process will continue until sufficient data are available to conclude that attainment has been achieved.

For those parameters where there is a limited number of non-detected results, averages and standard deviations for the concentrations of each parameter will be calculated for each year of monitoring, and a grand average and standard deviation will be calculated for these yearly values for the entire three year period. Since it is expected that a low number of non-detected concentrations will be measured for vinyl chloride and manganese, the attainment of the cleanup standard calculations will be performed from those calculated averages and standard deviations. For those parameters where a large number of non-detected concentrations are measured (this has been observed for the pesticides, PAHs and bis (2-ethylhexyl) phthalate, the 90-th percentile concentration will be determined for the entire 3-year period. The comparison to the cleanup standard will be based on using this 90th-percentile concentration.

As described in the USEPA 1992 technical guidance document, the statistical evaluation will determine if the grand average or the 90-th percentile concentration is less than the cleanup standard. Once this has been demonstrated, it is necessary to determine if sufficient data were available to conclude that the attainment had been reached considering false positive and negative error rates of 10 percent. If data are deemed insufficient based on this analysis, then monitoring will continue for another year or for as long as necessary to acquire sufficient data to demonstrate attainment.

If data are sufficient, a trend analysis will be performed to demonstrate that the data do not exhibit a statistically increasing trend at the 90-percent significance rate.

For these types of analyses, the samples must be collected in each well for each sampling event, and thus the same number of samples will be collected from all wells within the group. The population mean or upper percentile calculated for the group on an annual basis will be the statistical parameter used to assess attainment. For wells with non-detectable concentrations of COCs reported, the method detection limit will be used in the calculations of the mean.

Point-of-Action Wells

Point-of-action wells are located in proximity to (or upgradient of) potential receptors, and are utilized to demonstrate continued compliance and detect any significant change in groundwater conditions at points that could present an increased level of potential exposure to potential receptors. The five years travel time upgradient from potential receptors suggested in EPA's previous comments is not readily applicable as an effective method to select compliance wells at this site. Since the concentrations and areal extent of COCs are declining or in equilibrium, and the groundwater flow and transport modeling for Woodlawn has indicated that no receptors (other than the un-named creek) are within the contaminant flow path, it is not feasible to calculate a location "5 years upgradient" from a receptor at this site. Furthermore, some of the COCs detected in the area of attainment are sporadic detections of low solubility pesticides or SVOCs that are virtually immobile in groundwater. As discussed, point-of-action monitoring wells were selected to monitor groundwater quality at locations in proximity to (or upgradient of) potential groundwater receptors. Wells were selected along the primary flow paths identified at the site. Four shallow monitoring wells, seven bedrock monitoring wells and one surface-water body (the unnamed creek southwest of the landfill) were selected for point-of-action monitoring.

The following wells are proposed as point-of-action monitoring wells:

- **Saprolite Monitoring Wells:** ITS-2, MW-105A, MW-108A, and the proposed well MW-110A.
- **Bedrock Monitoring Wells:** TSTA-1, ITB-2, ITB-6, MW-105B, MW-108B, and the proposed wells MW-110B and MW-111B.
- **Surface-water:** the unnamed creek located southwest of the landfill.

These wells and the unnamed creek will be sampled quarterly for COCs with an annual review. Analytical results for these wells will be reviewed and concentration trends analyzed as part of a contingency remedy for the monitored natural

attenuation groundwater remedy at the site. Conceptually, the determination of a response action trigger will be based on two consecutive quarters. If these criteria for the response action trigger are met, the following general response action process will be initiated:

- **Step 1: Exposure Pathway Analysis.** The level of the exceedance will be reviewed and analyzed with respect to historical data trends for the particular COC, and an analysis of the exposure pathway will be performed to determine whether the level of the particular exceedance poses a significant exposure risk to a potential groundwater receptor. Sampling from residential wells will be considered as part of this plan. If the COC trends and exposure pathway analysis warrant concern and a potential exposure risk is evident, then Step 2 of the response action will be initiated.
- **Step 2: Initiation of a Response Plan.** The response plan will consist of three components: a focused feasibility study (FFS), a focused remedial design (FRD), and a focused remedial action (FRA). The purpose of the response plan will be to identify an appropriate response remedy to ensure the exposure risk is mitigated and continued protection of the human health and the environment assured. The presumptive response action will be groundwater pumping and treatment and provision of an alternate water supply as necessary. Additional responses will also be evaluated in a timely manner, and the most effective and cost-efficient remedial action will be proposed for implementation.

Methods and Field Procedures:

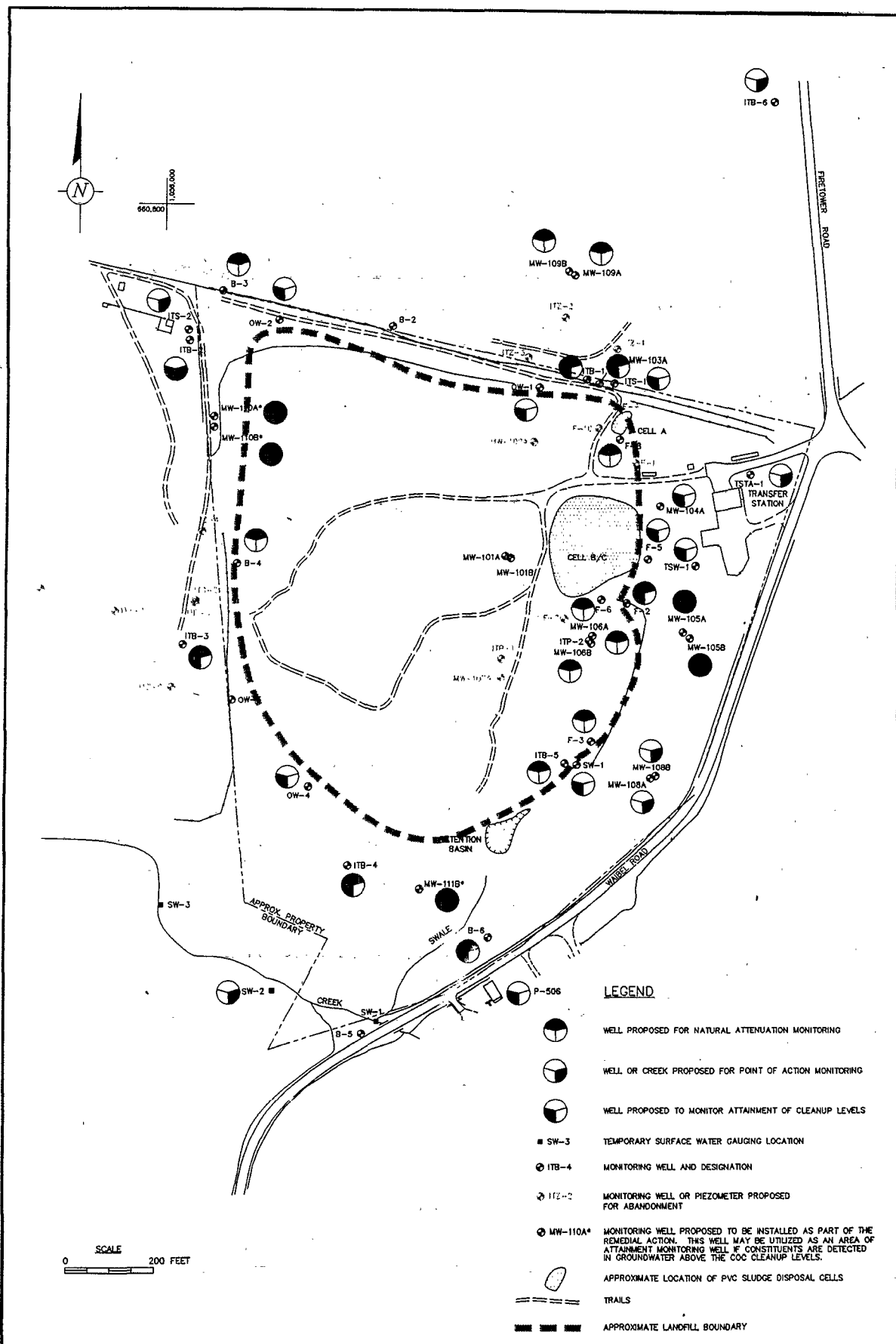
Water-level measurements will be collected for all site wells on a quarterly basis with an annual review. Low-flow purging and sampling methods will be utilized during the compliance monitoring events. Field parameters such as dissolved oxygen, oxidation-reduction potential, specific conductance, turbidity and temperature will be collected for all sampled wells. The procedures will be consistent with those methods previously approved in the *Sampling and Analysis Plan for Groundwater Monitoring and Natural Attenuation Evaluation* prepared for the site (Geraghty & Miller, Inc. 1997a, 1997b) and the approved Remedial Design Work Plan for the site.

Table 1. Sampling Locations Proposed for Performance Monitoring, Monitored Natural Attenuation Plan, Woodlawn Landfill

	Natural Attenuation Confirmation	Area of Attainment	Point of Action
<u>Saprolite Monitoring Wells</u>			
B-3	X		
B-4	X		
B-6	X	X	
F-2	X	X	
F-3	X		
F-5		X	
F-6	X		
F-8	X		
SW-1		X	
TSW-1		X	
ITS-1		X	
ITS-2			X
OW-1		X	
OW-2		X	
OW-4		X	
MW-103A	X	X	
MW-104A		X	
MW-105A	X	X	X
MW-106A	X		
MW-108A			X
MW-109A	X		
MW-110A	X	X ¹	X
<u>Surface-Water</u>			
Unnamed Creek			X
<u>Bedrock Monitoring Wells</u>			
ITB-1	X	X	
ITB-2		X	X
ITB-3	X	X	
ITB-4	X	X	
ITB-5	X		
ITB-6			X
MW-105B	X	X	X
MW-106B	X		
MW-108B			X
MW-109B	X		
MW-110B	X	X ¹	X
MW-111B	X	X ¹	X
P-506		X ²	
TSTA-1			X

¹ Wells MW-110A, MW-110B, and MW-111B will be incorporated into the area of attainment monitoring analyses, if constituents are detected above the COC Cleanup Level.

² Well P-506 will be sampled quarterly to monitor groundwater quality.



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Copyright © 1996 PROJECT/DESIGN/CONSTRUCTION	ARCADIS GERAGHTY & MILLER		DRAWN BY D.SCHABELE	DATE 14MAY96	PROJECT MANAGER J.S.MITH	DEPARTMENT MANAGER D.SOLSA
			WELLS PROPOSED FOR REMEDIAL ACTION MONITORING PLAN		LEAD DESIGN PROJ. J.BURROCK	CHECKED J.BURROCK
					PROJECT NUMBER NP000344.0002	DRAWING NUMBER 1