



Shaw Environmental and Infrastructure, Inc.

June 13, 2012

**Subject: Additional Groundwater Monitoring Wells
Addendum to Groundwater Investigation Work Plan, March 2011
Bulk Fuels Facility Spill, Solid Waste Management Units ST-106 and SS-111
Kirtland Air Force Base, New Mexico**

This letter is being submitted as an addendum to the Groundwater Investigation Work Plan, prepared by Shaw Environmental and Infrastructure, Inc. (Shaw) for the U.S. Army Corps of Engineers (USACE) under contract W912DY-10-D-0014, Delivery Order 0002. This letter describes nine additional groundwater monitoring wells at three cluster locations as directed in the April 13, 2012 and May 15, 2012 letters from the New Mexico Environment Department (NMED) (Attachment A). The nine additional groundwater monitoring wells will address data gaps identified in the characterization of the dissolved-phase groundwater plume as part of the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) for groundwater.

During the analysis and evaluation of data collected during the Third Quarter 2011 (July – August) sampling event, it was determined that additional data are needed at the downgradient portion of the 1,2-dibromomethane (EDB) dissolved phase plume. Concentrations of EDB were greater than the maximum contaminant level (MCL) in the northeastern most groundwater monitoring wells (Figure 1).

As part of the evaluation, Shaw conducted an internal review of data which included site-specific data collected as part of the Groundwater Investigation Work Plan. This data includes hydraulic conductivity obtained from slug tests performed on 38 monitoring wells, bucket sample analyses for the screened interval of each groundwater monitoring well, lithology logs, and the results of the pumping test conducted at the Nitrate Abatement site that were included in the model. Shaw obtained recent, daily pumping rates for Ridgecrest Wells 3 and 5, as well as for KAFB-3, to evaluate the influence of the three water supply wells on the movement of the downgradient plume. Additionally, the United States Geological Survey (USGS) has continuous recording water level piezometers in the vicinity of the site and the data from these wells were evaluated. Figure 2 is a plot of the USGS water level contours from 2002 monitoring well data. This map illustrates that the general groundwater flow direction, and therefore the direction of flow for the dissolved phase EDB plume, is north-northeast towards the Ridgecrest 5 water supply well. This conceptual model is consistent with 2011 water levels measured in new wells at the site. These data, as well as numerical model-predicted flow contours, are presented in Figure 3.

Table 1 summarizes the EDB data from Fourth Quarter 2011 for all of the groundwater monitoring wells; the Fourth Quarter 2011 is the first dataset with data from all newly installed groundwater monitoring wells. EDB was detected in 16 shallow groundwater monitoring wells, 13 intermediate wells, and 2 deep wells. The two deep wells with detected concentrations of EDB are KAFB-106037 and KAFB-106058 and in both cases, there are also detected EDB concentrations in the shallow and intermediate wells of the clusters. Only one cluster (GWM-22) has an intermediate detection of EDB and no detection of EDB in the shallow monitoring well. All remaining 27 clusters also have shallow EDB concentrations where there is

intermediate and deep detections of EDB. Clusters located in the plume core indicate that there is minimal to no vertical EDB gradient between the shallow, intermediate, and deep well intervals. Wells located outside of the plume core have concentrations of EDB in the three intervals that are on average ± 0.2 $\mu\text{g/L}$. The largest upward EDB gradient in the wells outside of the plume core is observed at cluster GWM 15 between the shallow (KAFB-106070) and intermediate (KAFB106072) wells and is on the order of 1.1; no EDB was detected in the deep well at this cluster location. The trends observed in the Fourth Quarter 2011 data shows similar trends at each individual well cluster in the previous quarterly data (Third Quarter 2011).

Table 5-1 from the Fourth Quarter 2011 report is included as Attachment B to this letter. This table includes the complete groundwater monitoring analytical data for Fourth Quarter 2011.

The USGS 2002 water level data (Figure 2) was used to inform the placement of the proposed locations of the additional groundwater monitoring wells (Figure 3). There are no existing monitoring wells in the vicinity of the three water supply wells of interest (Ridgecrest wells 3 and 5 and KAFB-3) and therefore additional data is required to verify groundwater elevations near the wells. Additionally, there is no monitoring well data for EDB in that area and additional data is required to verify the simulated current conditions with regard to the extent of the EDB plume.

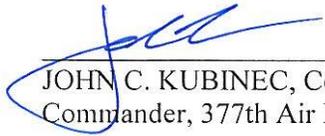
Figure 3 illustrates the proposed locations of nine new groundwater monitoring wells (KAFB-106201 through -106209). Table 2 summarizes the well locations and screen depths, as directed in the NMED April 13, 2012 letter. The shallow groundwater monitoring wells will have the same construction (Figure 4) as the shallow monitoring wells described in Sections 4.2.3 and 4.2.4 of the Groundwater Investigation Work Plan. Shallow well construction will include the change to a 30-foot screen length as approved in the June 24, 2011 NMED letter. The intermediate groundwater monitoring wells will have the same construction (Figure 5) as the intermediate wells described in Sections 4.2.3 and 4.2.4 of the Groundwater Investigation Work Plan. Deep wells will have similar construction (Figure 6) to what is described in the work plan with the NMED directed change in screen depth (per April 13, 2012 letter); deep wells will be constructed with the top of screen located 115 feet below the measured water table. Only the deep well of each cluster will be geophysically logged following Section 4.2.5 of the work plan.

Once installed and developed, the wells will be integrated into the monitoring well program and sampled on a quarterly basis. Dedicated pumps will be installed in the new wells.

Pneumatic slug testing will be conducted at each of the nine new wells, in accordance with the NMED April 13, 2012 letter and with Section 5.1.2 of the LNAPL Containment Interim Measures Work Plan Part I – Characterization. The data of the slug tests will be analyzed to determine hydraulic conductivity values.

**40 CFR 270.11
DOCUMENT CERTIFICATION
JUNE 2012**

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.



JOHN C. KUBINEC, Colonel, USAF
Commander, 377th Air Base Wing

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Table 1. EDB Concentration Comparison – Fourth Quarter 2011

NMED GMW Locations	Well ID	Interval	EDB Sample Result Oct-Dec 2011 (µg/kg)	Validation Qualifier	Δ Shallow/ Intermediate	Δ Intermediate/ Deep	Notes
3	KAFB-106035	Shallow	0.43		0.150	0.0360	
	KAFB-106036	Intermediate	0.277				
	KAFB-106037	Deep	0.241				
5	KAFB-106041*	Not Measured			NA	NA	*KAFB-106041 was not sampled (dry well)
	KAFB-106042	Shallow	0.645	J+			
	KAFB-106043	Deep	ND	U			
10	KAFB-106055	Shallow	0.645		-0.125	0.204	
	KAFB-106057	Intermediate	0.77				
	KAFB-106058	Deep	0.566				
11	KAFB-106059	Shallow	186		NA	NA	
	KAFB-106060	Intermediate	ND	U			
	KAFB-106061	Deep	ND	U			
12	KAFB-106064	Shallow	5.26		NA	NA	
	KAFB-106063	Intermediate	ND	U			
	KAFB-106062	Deep	ND	U			
13	KAFB-10628	Shallow	8.42		NA	NA	
	KAFB-106065	Intermediate	ND	U			
	KAFB-106066	Deep	ND	U			
14	KAFB-106067	Shallow	0.097		-0.120	NA	
	KAFB-106069	Intermediate	0.217				
	KAFB-106068	Deep	ND	U			
15	KAFB-106070	Shallow	0.0618		-1.08	NA	
	KAFB-106072	Intermediate	1.14				
	KAFB-106071	Deep	ND	U			
16	KAFB-106075	Shallow	0.207		0.154	NA	
	KAFB-106073	Intermediate	0.0531				
	KAFB-106074	Deep	ND	U			
17	KAFB-106076	Shallow	110	D	110	NA	The sample from KAFB-106078 was rejected due to site contamination
	KAFB-106077	Intermediate	0.0208	J			
	KAFB-106078	Deep	R	R			
18	KAFB-106079	Shallow	162		162	NA	
	KAFB-106080	Intermediate	0.246				
	KAFB-106081	Deep	ND	U			
19	KAFB-106082	Shallow	1.01		0.321	NA	
	KAFB-106083	Intermediate	0.689				
	KAFB-106084	Deep	ND	U			
20	KAFB-106085	Shallow	0.0387		-0.513	NA	
	KAFB-106086	Intermediate	0.552				
	KAFB-106087	Deep	ND	U			
21	KAFB-106088	Shallow	0.262		-0.0690	NA	
	KAFB-106089	Intermediate	0.331				
	KAFB-106090	Deep	ND	U			
22	KAFB-106091	Shallow	ND	U	NA	NA	
	KAFB-106092	Intermediate	0.146	J			
	KAFB-106093	Deep	ND	U			

Table 1. EDB Concentration Comparison – Fourth Quarter 2011 (concluded)

NMED GMW Locations	Well ID	Interval	EDB Sample Result Oct-Dec 2011 (µg/kg)	Validation Qualifier	Δ Shallow/ Intermediate	Δ Intermediate/ Deep	Notes
23	KAFB-106094	Shallow	2.32		2.28	NA	
	KAFB-106095	Intermediate	0.0375	J			
	KAFB-106096	Deep	ND	U			
28	KAFB-106106	Shallow	0.203	J	0.126	NA	
	KAFB-106105	Intermediate	0.0775	J			
	KAFB-106107	Deep	ND	U			

Plume core groundwater monitoring wells

0.15 Calculated downward EDB gradient

-0.125 Calculated upward EDB gradient

Bold indicated analyte detected greater than regulatory standard.

Δ = Delta/difference

EDB Ethylene dibromide.

GMW Groundwater monitoring well.

ID Identification.

J Estimated value, concentration is less than RL but greater than laboratory method detection limit (MDL).

J+ Estimated value, concentration is less than RL but greater than laboratory method detection limit (MDL); biased high.

J- Estimated value, concentration is less than RL but greater than laboratory method detection limit (MDL); biased high.

ND Not detected.

NMED New Mexico Environment Department.

U Analyte was not detected. The reported numerical value is at or below the RL.

UJ Analyte was *tentatively* not detected. The reported numerical value is at or below the RL.

R Sample data rejected due to site contamination.

Table 2. Well Location and Screen Depth Summary

Well ID	Easting	Northing	Screen Depth (feet below water table)
KAFB-106201	1546600	1478980	0
KAFB-106202			15
KAFB-106203			115
KAFB-106204	1544684	1478877	0
KAFB-106205			15
KAFB-106206			115
KAFB-106207	1546003	1480080	0
KAFB-106208			15
KAFB-106209			115

ATTACHMENT A

**NMED Correspondence Regarding
Additional Groundwater Monitoring Wells**

ATTACHMENT B

Fourth Quarter 2011 Groundwater Analytical Results