DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 377TH AIR BASE WING (AFMC)

FEB 0 6 2012

Mr. Thomas F. Berardinelli
377 ABW/DS
2000 Wyoming Blvd SE
Kirtland AFB NM 87117-5606

Mr. John Kieling, Manager
RCRA Permits Management Program
Hazardous Waste Bureau (HWB)
New Mexico Environment Department (NMED)
2905 Rodeo Park Road
Santa Fe NM 87505

Dear Mr. Kieling

Attached please find Kirtland Air Force Base's (KAFB) response to NMED HWB letter dated 28 September 2011. The attached response from KAFB/Shaw Environmental Inc., dated 26 January 2012 in reference to the occurrences of gas bubbles in groundwater samples, Bulk Fuels Facility Spill, Solid Waste Management Unit ST-106 and SS-111.

Please contact Mr. L. Wayne Bitner at (505)853-3484 or Ludie.bitner@kirtland.af.mil, or Ms. Victoria R. Martinez at (505) 846-6362 or Victoria.martinez@kirtland.af.mil if you have any questions

Sincerely

THOMAS F. BERARDINELLI
Director of Staff

Attachment:
KAFB Response Letter, 26 January 2012

cc:
NMED-RPD (J. Davis)
NMED-HWB (W. Moats, W. McDonald, B. Salem, S. Brandwein)
NMED- GWQB (J. Schoeppner)
NMED OGC– (L. Barnhart)
EPA Region 6 (L. King)
HQ AFMC/A7AQ (Mr. McCann)
/A7A1 (Mr. Fort)
AFCEE/CMSE (Mr. Oyelowo)
/EXEC (Mr. Urrutia)
Public Info Repository (Central New Mexico)
Administrative Record/Information Repository (AR/IR)
File

Shaw Environmental, Inc.

2440 Louisiana Blvd NE, Suite 300
Albuquerque, NM 87110
Phone: 505.262.8928

Shaw Environmental, Inc.

January 26, 2012

Subject: **Occurrences of Gas Bubbles in Groundwater Samples**
Bulk Fuels Facility Spill, Solid Waste Management Units ST-106 and SS-111
Kirtland Air Force Base, New Mexico

This letter is being submitted in response to the NMED letter, dated 28 September 2011 regarding the occurrences of bubbles in groundwater samples at the Kirtland Air Force Base (AFB) Bulk Fuels Facility (BFF). This letter describes the steps taken to determine the source of the bubbles observed, per the direction in the letter. Additionally, this letter outlines the proposed path forward.

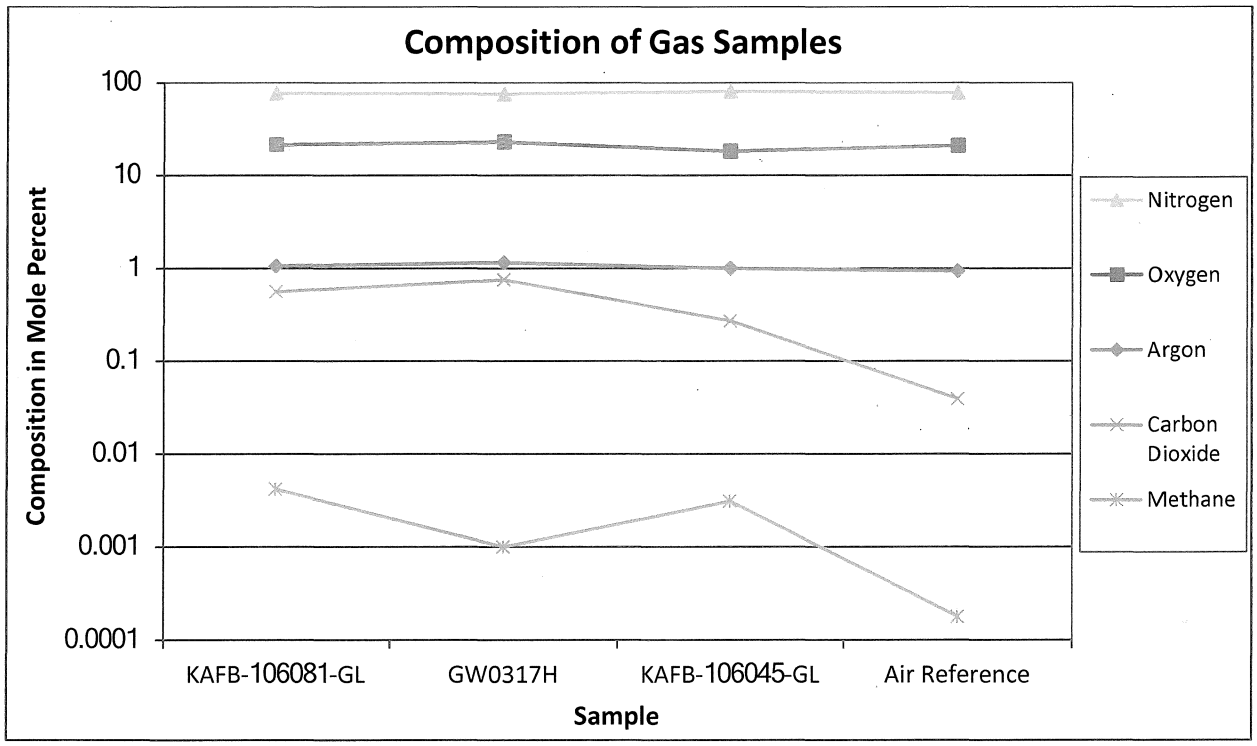
Shaw collected and analyzed gas samples at three different well locations: KAFB-106045, -106061, and -106081. The gas samples were collected and analyzed at the Isotech Laboratories, following the lab protocol for "Collecting Ground Water Samples from Domestic and Municipal Water Wells for Dissolved Gas Analysis." The samples were collected in 1-liter pre-evacuated IsoBags™ that contained a bactericide preservative in the bag. All samples were analyzed for complete gas composition by GC which includes fixed gases (N_2, CO_2, O_2, CO, Ar, H_2, H_2S, He) and hydrocarbons (CH_4, C_2H_6, C_2H_4, C_3H_8, C_3H_6, iC_4H_{10}, nC_4H_{10}, iC_5H_{12}, nC_5H_{12}, C_6+). The results of these analyses are included in Attachment A of this letter.

The following table summarizes the lab results with a column on the right providing a standard air composition for comparison. The lab results are provided in units of mole percent and the results are normalized to 100 mole percent; the results are interpreted as mole fractions rather than absolute concentrations.

Also included in this letter is a graph comparing the compositions of the five main gas components in the three samples, along with air, as a reference. The graph is plotted on a log scale so that all of the values can be seen. The comparison shows that the major components of nitrogen, oxygen, and argon are similar to air. When comparing the results of the three samples to the air composition, the samples are enriched in carbon dioxide (CO_2) and methane. The bottom of the table below shows the "enrichment factors" as the ratios of the compositions in the samples verses the air reference composition.

The gas sample results show that the samples are predominantly air with small amounts of carbon dioxide and methane added. The extra carbon dioxide and methane in the samples are definitively exolved from the water when the hydrostatic pressure was relieved as the samples were brought to the surface.

Gas Compositions in Mole Percent				
Component	KAFB-106081-GL	GW0317H	KAFB-106045-GL	Air Reference
Carbon Monoxide	nd	nd	nd	0.00001
Helium	na	na	0.0156	0.000524
Hydrogen	na	nd	nd	0.000055
Argon	1.06	1.15	0.997	0.934
Oxygen	21.45	22.75	18.26	20.946
Nitrogen	76.93	75.35	80.45	78.084
Carbon Dioxide	0.56	0.75	0.27	0.039
Methane	0.0042	0.001	0.0031	0.000179
Ethane	nd	nd	nd	
Ethylene	nd	nd	nd	
Propane	nd	nd	nd	
Iso-butane	nd	nd	nd	
N-butane	0.0002	0.0003	0.0001	
Iso-pentane	nd	0.0003	nd	
N-pentane	0.0002	0.0003	nd	
Hexanes	nd	nd	0.0001	
Sum	100.00	100.00	100.00	100.00
Enrichment Factors				
Carbon Dioxide	14.4	19.2	6.9	1.0
Methane	23.5	5.6	17.3	1.0



The results of the gas sample analyses indicate that the samples were predominantly atmospheric composition with a slight elevation of CO_2 and methane. The results indicate that atmospheric air was present in the sample streams which could be the result of:

- Sample collection method error – there is the potential that during sample collection, air entered the gas bag, contaminating the sample and resulting in the atmospheric signature in the results; and/or

- Faulty pump operation – atmospheric air could potentially enter the sample stream if there is a broken seal between the air drive cylinder and the water-side piston. There is also the potential for air to enter the discharge line through leaks in the tubing.

Starting at the beginning of the third quarter of sampling in 2011, Shaw sampling crews were trained to document the occurrence of bubbles in the purge and sample collection logs. The level of detail of documentation varied in the logs but the following general observations were made in most cases:

- No documentation of bubbles occurring in the pump discharge line;
- Air bubbles were observed on the inside of the VOAs that contained preservative; and
- When size was noted, bubbles were tiny and described as effervescence.

Attachment B of this letter is a table of wells where bubbles were observed during third quarter sampling. The table also indicates well interval (shallow, intermediate, or deep) and whether the samples were collected using a dedicated sample pump or the portable pump.

In order to evaluate the functionality of the pumps, Shaw sent pumps back to the manufacturer and contacted them about the gas bubble concerns and results of the gas analyses. After an inspection of the pumps by the manufacturer, they determined that none of the pumps had bad rod seals. The pumps installed in the three wells in question in the letter (KAFB-106045, -106061, and -106081) were new, dedicated pumps. Each of the pumps went through thorough testing and quality assurance testing at the manufacturer in order to obtain a rating for use and to be distributed to Shaw for installation. It is not likely that all three pumps had failing rod seals at the same time, within months of installation.

The following path forward is proposed in order to resolve the question on occurrences of the gas bubbles in groundwater samples:

1. Recollect the Isotech gas samples and improve our field documentation and field quality control. A dedicated technical staff member will be assigned the task of collecting the samples and will be trained on the protocol, working closely with the laboratory. Field forms will be revised and teams trained for more thorough documentation of gas sampling.

2. In addition to the IsoBags™ Shaw also proposes collecting samples using the traditional two-valve sample cylinders and upflow filling. This will reduce the potential for atmospheric air to enter the sample stream during gas sample collection.

3. Argon gas will be used to drive gas, in place of the air compressor, during sample collection. This will allow us to definitively determine pump functionality.

4. Continue documenting occurrence of gas bubbles in the purge and sample collection logs, including bubble size and bubble behavior.

The results of the additional sampling will be reported to the NMED within 60 days of sample collection.

ATTACHMENT A

ISOTECH®
ISOTECH LABORATORIES INC

ANALYSIS REPORT

Lab #:	224261	Job #:	16609
Sample Name/Number:	KAFB-106081-GL-GW0340H-Reg		
Company:	Shaw Environmental & Infrastructure		
Date Sampled:	10/24/2011		
Container:	IsoBag		
Field/Site Name:	140705 / Kirtland AFB		
Location:			
Formation/Depth:			
Sampling Point:			
Date Received:	10/25/2011	Date Reported:	11/09/2011

Component	Chemical mol. %	$\delta^{13}C$ ‰	δD ‰	$\delta^{18}O$ ‰
Carbon Monoxide	nd			
Hydrogen Sulfide	na			
Helium	na			
Hydrogen	na			
Argon	1.06			
Oxygen	21.45			
Nitrogen	76.93			
Carbon Dioxide	0.56			
Methane	0.0042			
Ethane	nd			
Ethylene	nd			
Propane	nd			
Iso-butane	nd			
N-butane	0.0002			
Iso-pentane	nd			
N-pentane	0.0002			
Hexanes +	nd			

Total BTU/cu.ft. dry @ 60deg F & 14.7psia, calculated: 0 Specific gravity, calculated: 1.004

Remarks:
Analysis is of gas extracted from water by headspace equilibration. Analysis has been corrected for helium added to create headspace. Helium dilution factor = 0.57
*Addition of helium negates the ability to detect native helium or hydrogen.

nd = not detected. na = not analyzed. Isotopic composition of carbon is relative to VPDB. Isotopic composition of hydrogen and oxygen are relative to VSMOW. Calculations for BTU and specific gravity per D3588. Chemical compositions are normalized to 100%. Mol. % is approximately equal to vol. %.

ISOTECH®
ISOTECH LABORATORIES INC

ANALYSIS REPORT

Lab #: 223841 Job #: 16580
Sample Name: KAFB-106045-GL-GW0300H-Reg Co. Lab#:
Company: Shaw Environmental & Infrastructure
Date Sampled: 10/19/2011
Container: IsoBag
Field/Site Name: 140705 / Kirtland AFB
Location:
Formation/Depth:
Sampling Point:
Date Received: 10/21/2011 Date Reported: 10/25/2011

Component	Chemical mol. %	$\delta^{13}C$ ‰	δD ‰	$\delta^{15}N$ ‰
Carbon Monoxide	nd			
Hydrogen Sulfide	na			
Helium	0.0156			
Hydrogen	nd			
Argon	0.997			
Oxygen	18.26			
Nitrogen	80.45			
Carbon Dioxide	0.27			
Methane	0.0031			
Ethane	nd			
Ethylene	nd			
Propane	nd			
Iso-butane	nd			
N-butane	0.0001			
Iso-pentane	nd			
N-pentane	nd			
Hexanes +	0.0001			

Total BTU/cu.ft. dry @ 60deg F & 14.7psia, calculated: 0
Specific gravity, calculated: 0.998

nd = not detected. na = not analyzed. Isotopic composition of carbon is relative to VPDB. Isotopic composition of hydrogen is relative to VSMOW. Calculations for BTU and specific gravity per ASTM D3588. Chemical compositions are normalized to 100%. Mol. % is approximately equal to vol. %.

ISOTECH®
ISOTECH LABORATORIES INC

ANALYSIS REPORT

Lab #:	224398	Job #:	16627
Sample Name/Number:	GW0317H		
Company:	Shaw Environmental & Infrastructure		
Date Sampled:	10/25/2011		
Container:	IsoBag		
Field/Site Name:	140705 / Kirtland AFB		
Location:			
Formation/Depth:			
Sampling Point:			
Date Received:	10/26/2011	Date Reported:	11/10/2011

Component	Chemical mol. %	$\delta^{13}C$ ‰	δD ‰	$\delta^{18}O$ ‰
Carbon Monoxide	nd			
Hydrogen Sulfide	na			
Helium	na			
Hydrogen	nd			
Argon	1.15			
Oxygen	22.75			
Nitrogen	75.35			
Carbon Dioxide	0.75			
Methane	0.0010			
Ethane	nd			
Ethylene	nd			
Propane	nd			
Iso-butane	nd			
N-butane	0.0003			
Iso-pentane	0.0003			
N-pentane	0.0003			
Hexanes +	nd			

Total BTU/cu.ft. dry @ 60deg F & 14.7psia, calculated: 0 Specific gravity, calculated: 1.007

Remarks:
Analysis is of gas extracted from water by headspace equilibration. Analysis has been corrected for helium added to create headspace. Helium dilution factor = 0.71
*Addition of helium negates the ability to detect native helium or hydrogen.

nd = not detected. na = not analyzed. Isotopic composition of carbon is relative to VPDB. Isotopic composition of hydrogen and oxygen are relative to VSMOW. Calculations for BTU and specific gravity per D3588. Chemical compositions are normalized to 100%. Mol. % is approximately equal to vol. %.

ATTACHMENT B

WELL ID	SCREEN INTERVAL	PUMP TYPE
KAFB-106045	DEEP (550 ft)	Dedicated
KAFB-106061	DEEP (590 ft)	Dedicated
KAFB-106081	DEEP (590 ft)	Portable
		Portable
KAFB-106080	INTERMEDIATE	Portable
KAFB-106068	DEEP (590 ft)	Portable
KAFB-106071	DEEP (590 ft)	Dedicated
KAFB-106099	INTERMEDIATE	Dedicated
KAFB-106090	DEEP (590 ft)	Portable
		Portable
KAFB-106092	INTERMEDIATE	Dedicated
KAFB-106096	DEEP (590 ft)	Portable
KAFB-106104	DEEP (550 ft)	Portable
KAFB-106033	INTERMEDIATE	Portable
KAFB-106057	INTERMEDIATE	Portable
KAFB-106103	INTERMEDIATE	Portable
KAFB-106094	SHALLOW	Portable
		Portable
KAFB-106054	DEEP (550 ft)	Portable
KAFB-106040	DEEP (550 ft)	Portable
KAFB-106053	INTERMEDIATE	Portable
KAFB-106039	INTERMEDIATE	Portable
KAFB-003		Pump house
KAFB-016		Pump house

40 CFR 270.11
DOCUMENT CERTIFICATION
JANUARY 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

This document has been approved for public release.

KIRTLAND AIR FORCE BASE
377 ABW Public Affairs