TechLaw
Quality & Integrity

1444 Oak Lawn Ave., Suite 606
Dallas, TX 75207
(972) 754-0638
(214) 754-0819 (Fax)
www.techlawinc.com

October 24, 2008 RZ2.R06002.01-ID-019

Ms. Flora Greene
Regional Project Officer
US EPA, Region 6
1455 Ross Avenue, Suite 1200
Dallas, TX 75201-2733

Reference: EPA Contract No. EP-W-07-074; EPA Work Assignment No. R06002: EPA Region 6 RCRA Special Field Investigation; Field Activity Trip Report, Shumaker Naval Ammunition Depot Facility, East Camden, Arkansas; Draft Deliverable; Task 2.5 – Task Order Report

Dear Ms. Greene:

Enclosed please find the Task Order Report for the Shumaker Naval Ammunition Depot Facility (Trip Report). The Trip Report describes the collection and analysis of groundwater, surface water, and isotopic samples at and in the vicinity of the Shumaker Naval Ammunition Depot (SNAD) facility located near East Camden, Arkansas.

Field activities were completed during the course of three field visits. Ten shallow and ten deep groundwater monitoring wells were sampled by TechLaw, Inc (TechLaw) team members during the period of January 7, 2008 through January 11, 2008. TechLaw team members provided logistical support to EPA during their collection of 34 surface water samples during the period of February 11, 2008 through February 14, 2008. In addition, isotopic samples were collected by TechLaw team members using highly perchlorate-selective bifunctional ion exchange resin (Purolite A-53E or equivalent) columns designed for low perchlorate concentrations during the period of May 19, 2008 through May 24, 2008.

Groundwater and surface water samples were sent to TestAmerica Denver for analyses. TechLaw performed data validation on the TestAmerica Denver data packages which were previously submitted to the EPA as a separate deliverable. The analytical reports will be submitted to EPA as a separate deliverable at a later date. Isotopic groundwater samples were sent to University of Illinois Chicago for analysis; however, TechLaw did not perform data validation.

Sample results were compared to the EPA Region 6 Human Health Medium-Specific Screening Levels (MSSL) and the EPA Region III Risk-Based Concentrations (RBCs). The analytical results of the groundwater samples obtained from the shallow monitoring wells indicated low-level detections of perchlorate, RCRA metals, and mercury; whereas, the groundwater samples obtained from the deep monitoring wells indicated low-level detections of perchlorate, explosives, RCRA metals, and mercury. Results indicated exceedences of the MSSL and RBC screening criteria for arsenic and lead in the shallow monitoring wells. No exceedences of the MSSL or RBC screening criteria were detected in the surface water or deep groundwater samples collected.

For your convenience, an electronic copy of this Trip Report on a CD is also being provided. If you have any questions, please contact Wally O'Rear, the TechLaw Task Order Manager at (972) 754-0638.

Sincerely,

Jasmine Schliesmann-Merkle

Jasmine Schliesmann-Merkle
Program Manager

cc: R. Brown, EPA CO
R. Banzon, EPA CS
S. Ellinger, EPA Region 6 TOCOR
W. O'Rear, TechLaw Inc.
B. Smith, TechLaw Central Files
TechLaw Dallas Files (R06002)

TASK ORDER REPORT

SHUMAKER NAVAL AMMUNITION DEPOT FACILITY
EAST CAMDEN, ARKANSAS

Submitted to:

Ms. Flora Greene
Regional Project Officer
U.S. Environmental Protection Agency
Region 6
1455 Ross Avenue, Suite 1200
Dallas, Texas 75201-2733

Submitted by:

TechLaw, Inc.
4100 Ambrosia Lane
Plano, Texas 75093

EPA Task Order No.	**R06002**
Contract No.	**EP-W-07-074**
EPA TOCOR	**Scott Ellinger**
Telephone No.	**(214) 665-8408**
TechLaw TOM	**Wally O'Rear**
Telephone No.	**(972) 754-0638**

October 24, 2008

TASK ORDER REPORT

SHUMAKER NAVAL AMMUNITION DEPOT FACILITY
EAST CAMDEN, ARKANSAS

TABLE OF CONTENTS

DISCLAIMER

TechLaw, Inc., in fulfillment of Contract No. EP-W-07-074, Work Assignment No. R06002, prepared this report for the United States Environmental Protection Agency (EPA), Region 6. Any opinions, findings or conclusions expressed herein are those of the contractor, not necessarily those of EPA or cooperating agencies. The mention of any company or product names is not to be considered an endorsement by EPA.

This report is intended to assist EPA personnel in documenting surface and groundwater conditions at the Shumaker Naval Ammunition Depot (SNAD) located in East Camden, Arkansas. Sampling activities took place during the periods of January 7, 2008 through January 11, 2008, February 11, 2008 through February 14, 2008, and May 19, 2008 through May 24, 2008.

TASK ORDER REPORT

SHUMAKER NAVAL AMMUNITION DEPOT FACILITY
EAST CAMDEN, ARKANSAS

1.0 INTRODUCTION

The purpose of this Field Activity Trip Report (Report) is to summarize the collection and analysis of groundwater, surface water, and isotopic samples at and in the vicinity of the former Shumaker Naval Ammunition Deport (SNAD). The United States Environmental Protection Agency (EPA) requested TechLaw, Inc. (TechLaw) support in the assessment of groundwater flow and the current nature and extent of groundwater and surface water contamination in the vicinity of the SNAD facility located near East Camden, Arkansas.

Groundwater sampling of ten (10) shallow (alluvial) and ten (10) deep (Sparta Sand) groundwater monitoring wells at the SNAD facility took place during the period of January 7, 2008 through January 11, 2008. TechLaw team members collected shallow groundwater samples through the use of a Waterra® Foot Valve. Deep wells were sampled with a bladder submersible pump. Groundwater samples were analyzed for perchlorate, explosives, Resource Conservation and Recovery Act (RCRA) metals, and mercury. Chemical analysis of the samples was conducted by TestAmerica Denver of Arvada, Colorado (TestAmerica).

Surface water samples were collected by EPA personnel with logistical support provided by a TechLaw team member during the period of February 11, 2008 through February 14, 2008. Surface water samples were collected from 34 locations, as determined by EPA. The locations of these surface water samples were recorded by TechLaw using a global positioning system (GPS). Chemical analysis of the samples was conducted by TestAmerica.

Isotopic samples for perchlorate were collected by TechLaw team members during the period of May 19, 2008 through May 24, 2008. Isotopic samples were collected from three shallow (alluvial) groundwater monitoring wells. Chemical analysis of the samples was conducted by the University of Illinois-Chicago (UIC).

A copy of the photograph log and field log books are presented as Appendices A (Shumaker Photographs) and B (Shumaker Log Books) of this trip report. Appendix C (Shallow and Deep Groundwater Monitor Well Data Sheets) contains documentation specific to the groundwater sampling process for both the shallow and deep groundwater wells. Appendix D contains chain-of-custody forms.

2.0 SITE DESCRIPTION AND HISTORY

The SNAD facility is located in East Camden, Arkansas, at 33 degrees (°), 38 minutes (') North, and 92°, 42' West. Figures 1 (Site Location Shumaker Naval Ammunition Depot) and 2 (Monitoring Well Locations Shumaker Naval Ammunition Depot) show the site location and the groundwater monitoring well locations, respectively. The SNAD facility extends into Calhoun and Ouachita counties. The U.S. Navy (Navy) operated at the SNAD facility from 1944 until

1957 for the manufacture, testing, storage, distribution, disassembly, reworking, and destruction of ammunition, bombs, and explosives (principally rockets). It was operated by the National Fireworks Ordnance Corporation as a government owned - contractor operated (GOCO) facility under the supervision of Navy personnel. Improvements to the site included an elaborate railroad track and spurline system, hundreds of reinforced concrete storage magazines, loading dock facilities, headquarters and administration buildings, and an eight mile long rocket test range in addition to production and handling facilities for all types of high explosive admixtures, including trinitrotoluene (TNT), Composition "B", Ammonium Nitrate, cyclotrimethylene trinitramine (RDX) Base and aluminum powder.

In 1961, International Paper bought 40,000 acres of forest at SNAD. The Brown family of Texas, later famous for its partnership in the global Brown and Root construction company, bought the remaining 25,000 acres. The purchase included the headquarters buildings, the depot's extensive network of railways, hundreds of warehouses, production facilities and bunkers where the Navy stored explosives and ammunition. Highland Resources Inc., a subsidiary of Brown Engineering, then began operating the depot as an industrial park and defense contractors began taking over the old facilities. The Navy's housing area became the town of East Camden. The depot commander's house became a guest house for visiting consultants, executives and engineers.

3.0 SITE ACTIVITIES

The TechLaw team mobilized to East Camden, Arkansas for three field sampling events. Groundwater sampling activities were performed on January 7, 2008 through January 11, 2008. Surface water sampling activities were performed on February 11, 2008 through February 14, 2008. Isotopic sampling activities were performed on May 19, 2008 through May 24, 2008. Daily field activities were recorded in field log books. Copies of the field log books are presented as Appendix B (Shumaker Log Books) to this trip report.

Sampling procedures are described in Section 6.0 (Sample Collection Activities) of this trip report. Analytical parameters were selected based on historical contaminant data.

EPA representative, Mr. Scott Ellinger was present during all sampling activities. EPA representatives, Mr. Tim Townsend and Mr. Linh Nguyen were present during surface water sampling activities on February 11, 2008 through February 14, 2008.

Arkansas Department of Environmental Quality (ADEQ) representative, Mrs. Dianna Kilburn was present during groundwater sampling activities on January 11, 2008.

Access

EPA representative, Mr. Scott Ellinger provided access to groundwater monitoring wells [Shallow Wells (SW) SW-1, SW-2, SW-3, SW-4, SW-5, SW-6, SW-7, SW-8, SW-9, and SW-10 and deep groundwater monitoring wells (DW) DW-1, DW-2, DW-2L, DW-3, DW-3L, DW-4, DW-4L, DW-5, DW-6, and DW-7], surface water sampling locations, and isotopic sampling locations [SW-5 and SW-7].

Meetings

Safety briefings were held with TechLaw team members prior to daily field activities throughout the project.

4.0 COLLECTION ACTIVITIES

Groundwater collection activities were performed on January 7, 2008 through January 11, 2008 by TechLaw team members. TechLaw team members collected, handled, prepared and delivered samples collected from groundwater monitoring wells in accordance with the site-specific Sampling and Analysis Plan (SAP) and the Quality Assurance Project Plan (QAPP).

Surface water collection activities were performed on February 11, 2008 through February 14, 2008 by EPA representatives and TechLaw team members. EPA representatives collected samples from surface water locations and a TechLaw team member handled, prepared and delivered the collected samples in accordance with the site-specific SAP and the QAPP.

Isotopic groundwater collection activities were performed on May 19, 2008 through May 24, 2008 by TechLaw team members. TechLaw team members collected, handled, prepared and delivered samples collected from groundwater monitoring wells in accordance with the site-specific SAP and the QAPP. Descriptions of each type of sampling are included below.

Based on previous analytical results and discussion with EPA, all liquid investigation-derived water (IDW) was discharged to the ground surface. All other IDW (i.e., nitrile gloves, paper towels) was containerized and properly disposed of off site.

4.1 GROUNDWATER

Groundwater sampling activities were performed on January 7, 2008 through January 11, 2008 by TechLaw team members, Mr. Wally O'Rear and Ms. Nicole Goers. Prior to collecting the groundwater samples, the static water levels were measured and recorded in each monitoring well (see Table 4.4). All monitoring wells appeared in good condition during groundwater sampling activities.

Samples from ten shallow and ten deep groundwater wells were collected using a Waterra® sampler (SS-10 Micro Flow Foot Valve) while the remaining eight deep groundwater wells required the use of a submersible bladder pump. The Waterra® sampler was screwed into the bottom of the length of polyethylene tubing which was inserted into the well to the middle of the well screen. Similarly, the low-flow air-operated submersible bladder pump was connected to two lengths of polyethylene tubing and inserted into the well to the middle of the well screen.

All groundwater samples were collected from the SNAD site by the TechLaw team following the general guidelines set forth in TechLaw's SOP No. 06-04-00, Groundwater Sampling/Monitoring and Analysis-Sampling Activities. Prior to sampling, groundwater parameters including temperature, pH, specific conductivity, dissolved oxygen (DO), oxidation-reduction potential (ORP), and turbidity were measured with a Horiba U-22 water quality meter

and flow-through cell. Stabilization was considered achieved when the pH measurements were within 0.1 standard units, the temperature measurements were within 0.1 degree, turbidity was less than 10 nephelometric turbidity units (NTUs), and the DO, ORP and specific conductivity values were within 10 percent (%) over three consecutive readings. Field observations were made for each monitoring well and are listed in Table 4.1, Sample Field Parameters for Shallow Groundwater Well Samples and Table 4.2, Sample Field Parameters for Deep Groundwater Well Samples.

Groundwater samples were analyzed for perchlorate, explosives, RCRA metals and mercury. The perchlorate samples were collected into two 40 milliliter (mL) glass vials. The explosive samples were collected into two 1-liter (L) amber glass jars, while the samples for RCRA metals and mercury were collected into one 250-mL polyethylene bottle pre-preserved with nitric acid (HNO_3). Several QC samples were collected including two duplicate, one field blank, one equipment blank, and one matrix spike (MS) samples. Duplicate samples were collected from monitoring wells DW1 and DW2L and were labeled GW-D22 and GW-D21, respectively. The matrix spike sample was collected from monitoring well DW1.

All samples were properly labeled by indicating the date and time of collection. After labeling, the sample bottles were placed into separate plastic bags, wrapped and sealed with tape. The sample bottles were placed into coolers lined with a heavy duty garbage bag, and packed with ice to keep the samples cooled to 4 degrees (^{o}) Celsius (C). The garbage bag was then tied into a knot and secured with tape. Chain-of-custody forms (copies are included in Appendix D of this Report) were placed in clear plastic bags and were taped to the inner side of the cooler lids. The coolers were sealed with strapping tape and secured with custody seals. Samples were shipped overnight, via Federal Express, to TestAmerica in Arvada, Colorado.

4.2 SURFACE WATER

Surface water samples were collected by EPA representatives, with logistical support provide by TechLaw team member Mr. Wally O'Rear, on February 11, 2008 through February 14, 2008. Samples from 34 surface water samples were collected from the SNAD site by EPA representatives, Mr. Scott Ellinger, Mr. Tim Townsend and Mr. Linh Nguyen, following the general guidelines set forth in EPA Region 9 Field Sampling Guidance Document #1225, *Surface Water Sampling*. Prior to collecting the surface water samples, global positioning system (GPS) data (i.e., longitude and latitude coordinates) and pH were collected and recorded at each sampling location. In addition, the flow rate (i.e., laminar, no flow pond, turbulent) at the sampling location was recorded. Field observations were made for each surface water sampling location and are listed in Table 4.3, Sample Field Parameters for Surface Water Samples.

Surface water samples were analyzed for perchlorate, explosives, RCRA metals and mercury. The perchlorate samples were collected into two 40 mL glass vials. The explosive samples were collected into two 1-L amber glass jars, while the samples for RCRA metals and mercury were collected into one 250-mL polyethylene bottle pre-preserved with nitric acid (HNO_3). Several QC samples were collected including five duplicate, one field blank, two equipment blank, and one MS samples. Duplicate samples were collected from surface water sample locations SW-06,

SW-10, SW-17, SW-27, and SW-28 and were labeled SW-35, SW-39, SW-38, SW-37, and SW-36, respectively. The matrix spike sample was collected from surface water sample SW-20.

All samples were properly labeled by indicating the date and time of collection. After labeling, the sample bottles were placed into separate plastic bags, wrapped and sealed with tape. The sample bottles were placed into coolers lined with a heavy duty garbage bag, and packed with ice to keep the samples cooled to 4 ^{o}C. The garbage bag was then tied into a knot and secured with tape. Chain-of-custody forms (copies are included in Appendix D of this Report) were placed in clear plastic bags and were taped to the inner side of the cooler lids. The coolers were sealed with strapping tape and secured with custody seals. Samples were shipped overnight, via Federal Express, to TestAmerica in Arvada, Colorado.

4.3 ISOTOPIC

Isotopic sampling activities were performed on May 19, 2008 through May 24, 2008 by TechLaw team members, Mr. Wally O'Rear and Ms. Amanda Delgado. Three shallow (alluvial) groundwater monitoring wells were selected with consultation with the EPA Task Order Contract Officer Representative (TOCOR) after the groundwater samples results had been reported. One of the three groundwater monitoring wells was maintained by Aero-Jet (AJ). Five gallon groundwater samples were collected directly from Aero-Jet monitoring well-25s. This well is identified as AJ-01, and properly labeled, iced and shipped.

Prior to collecting the isotopic samples, the static water levels of all SNAD groundwater monitoring wells were measured and recorded in each monitoring well. All monitoring wells appeared in good condition during static water level measurement activities. The SNAD groundwater monitoring well water levels are listed in Table 4.4, Water Level Readings.

Sampling for isotopic samples was completed using highly perchlorate-selective bifunctional ion exchange resin (Purolite A-53E or equivalent) in columns designed for low perchlorate concentrations. TechLaw team members pumped groundwater from three shallow (alluvial) groundwater monitoring wells using a grundfos pump to the ion-exchange column through polyethylene tubing. In addition, a whirlpool whole-house pre-filtration filter (with 5-15 micron sand/sediment filter insert) was used between the grundfos pump and ion-exchange column to reduce the sand/sediment particulates in the groundwater entering the ion-exchange column. The pump flow rate was set at one to two liters per minute, without exceeding two liters per minute per column. Water pressure was set not to exceed 30 pounds per square inch (psi). TechLaw and EPA personnel observed the samples 24 hours a day for two to twelve hour, rotating shifts for approximately five days. The resin columns were collected as samples. No additional QC samples were required.

All samples were properly labeled by indicating the date and time of collection. After labeling, the samples were placed into separate plastic bags, wrapped and sealed with tape. The samples were placed into coolers lined with a heavy duty garbage bag, and packed with ice to keep the samples cooled to 4^{o} C. The garbage bag was then tied into a knot and secured with tape. Chain-of-custody forms (copies are included in Appendix D of this Report) were placed in clear plastic bags and were taped to the inner side of the cooler lids. The coolers were sealed with

strapping tape and secured with custody seals. The coolers were shipped via express carrier, to UIC in Chicago, Illinois.

5.0 ANALYTICAL RESULTS

All analytical results were compared to EPA Region III Risk Based Concentration (RBC) Levels and EPA Region VI Media Specific Screening Levels (MSSL). Table 5.1 (Sample Information) provides a summary of the TestAmerica analytical activities.

A field blank sample was collected as proposed in the QAPP. As can be seen in Table 5.2 (Summary of Analytical Results for Quality Control Samples), the field blank sample did not exceed either the MSSL or RBC screening levels.

Twenty groundwater samples were collected from the ten shallow and deep well locations and were analyzed for perchlorate, explosives, RCRA metals, and mercury. Samples collected from shallow wells SW2, SW7, and SW8 showed arsenic concentrations exceeding both the MSSL and RBC screening levels with a maximum concentration of 29 micrograms per liter (µg/L) at shallow well SW7. Samples collected from shallow wells SW2, SW4, SW7, SW8, and SW9 showed lead concentrations exceeding the MSSL screening level with a maximum concentration of 41 µg/L at shallow well SW7. Table 5.3 (Summary of Exceedances for Shallow Groundwater Well Samples) provides the analytical results from the shallow groundwater samples. Table 5.4 (Summary of Analytical Results for Shallow Groundwater Well Samples) provides a comparison of the shallow groundwater samples with the screening levels.

Thirteen deep groundwater samples were collected from the seven deep water locations and were analyzed for the identical analytical suite as the shallow well groundwater samples. Similar results were observed for the deep well groundwater samples. Arsenic, lead and bis(2-ethylhexyl)phthalate exceeded their constituent-specific screening levels. The sample collected from deep well DW3L showed an arsenic concentration of 17 µg/L which exceeds both the MSSL and RBC screening levels. The samples collected from deep well DW2L showed lead concentrations exceeding the MSSL screening level with a maximum concentration of 20 µg/L. Table 5.5 (Summary of Exceedances for Deep Groundwater Well Samples) provides the analytical results from the deep groundwater samples. Table 5.6 (Summary of Analytical Results for Deep Groundwater Well Samples) provides a comparison of the deep groundwater samples with the screening levels.

Thirty-four surface water samples were collected and analyzed for perchlorate, explosives, RCRA metals, and mercury. No exceedences of the MSSL or RBC screening criteria were detected in the surface water samples collected. Table 5.7 (Summary of Analytical Results for Surface Water Samples) provides a comparison of the surface water samples with the screening levels.

Three isotopic water samples were collected for perchlorate isotope analyses. Based on perchlorate isotope forensics, the analytical results indicate that the three perchlorate samples are isotopically distinct. The sample collected from AJ-01 was found to be typical of synthetic perchlorate used in aerospace industry. The sample collected from shallow well SW-07 was

found to be typical of perchlorate extracted from Atacama nitrate ore and Chilean nitrate fertilizer products. The sample collected from shallow well SW-05 was found to have an isotopic composition consistent with a 2:1 mixture of the perchlorate isotopes found in samples AJ-01 and SW-07, where the mixture experienced a minor extent of biodegradation after being mixed. Table 5.8 (Summary of Analytical Results for Isotopic Samples) provides a summary of perchlorate isotope analytical results.

6.0 REFERENCES

Surface Water: U.S. EPA Region 9 Field Sampling Guidance Document #1225, *Surface Water Sampling*, U.S. Environmental Protection Agency, 1999.

Final Decision Document, Former Shumaker Naval Munitions Site, U.S. Army Corp of Engineers, 2003.

Bohlke, J.K.; Sturchio, N.; Baohua, G; Horita, J.; Brown, G.; Jackson, W. A.; Batista, J.; Hatzinger, P. *Perchlorate Isotope Forensics*; Anal. Chem. 2005, 77, 7838 – 78423.

Gu, B.; Coates, J. *Perchlorate: Environmental Occurrence, Interactions and Treatment*; Springer 2005.

Arkansas Water Well Construction Commission Rules and Regulations (January 28, 2006): http://www.accessarkansas.org/awwcc/UPDATEDRULESWITHDXREVISIONS2005doc.pdf