DEPARTMENT OF THE ARMY
US ARMY INSTITUTE OF PUBLIC HEALTH
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MARYLAND 21010-5403

MCHB-IP-RDE

21 JUN 2011

MEMORANDUM FOR Office of the Command Surgeon (LTC (b) (6)), U.S. Central Command, 7115 South Boundary Boulevard, MacDill Air Force Base, FL 33621-5101

SUBJECT: Deployment Occupational and Environmental Health Surveillance Sample Report, Airborne Particulate Matter, Bagram, Afghanistan, 26 October 2010-6 January 2011, U_AFG_BAGRAM_CM_A10_20110106

1. The enclosed report details the assessment of particulate matter (PM) air samples collected by 71st Medical Detachment personnel, Bagram, Afghanistan, 26 October 2010-6 January 2011.

2. The samples were collected for airborne PM less than 10 micrometers in diameter (PM_{10}) and analyzed for a set of metals typically found in PM. PM_{10} was identified as an acute hazard during the assumed exposure timeframe. Based on the samples and associated exposure information assessed in the enclosed report, the tactical risk estimate for PM_{10} during daytime sampling on a typical exposure day in the sampled timeframe is **low** and on a peak exposure day it is **moderate**. The tactical risk estimate for PM_{10} during nighttime sampling on a typical exposure day in the sampled timeframe is **low** and on a peak exposure day it is **moderate**.

FOR THE DIRECTOR:

(b) (6)

Encl

Portfolio Director, Health Risk Management

CF: (w/encl)
71st MED DET (Commander/MAJ (b) (6))
71st MED DET (XO/CPT (b) (6))
CJTF-101 (Command Surgeon Office/CPT (b) (6))
ARCENT (Command Surgeon Office/MAJ (b) (6))
CSTC-A (Command Surgeon Office/Maj (b) (6))
ARCENT (Force Health Protection Officer/LTC (b) (6))
USAFSAM (LtCol (b)
(CONT)

MCHB-IP-RDE
SUBJECT: Deployment Occupational and Environmental Health Surveillance Sample Report, Airborne Particulate Matter, Bagram, Afghanistan, 26 October 2010-6 January 2011, U_AFG_BAGRAM_CM_A10_20110106

CF: (w/encl) (CONT)
44th MED BDE (Force Health Protection Officer/MAJ [redacted])
CFLCC/USA 3D MDSC (Force Health Protection Officer/CPT [redacted])
NMCPHC (Expeditionary Preventive Medicine/Mr. [redacted])

U.S. ARMY PUBLIC HEALTH COMMAND (Provisional)
5158 Blackhawk Road, Aberdeen Proving Ground, Maryland 21010-5403

Deployment Occupational and Environmental Health Surveillance Sample Report,
U_AFG_BAGRAM_CM_A10_20110106
Health Risk Management Portfolio

Airborne Particulate Matter, Bagram, Afghanistan

Prepared by (b) (6)
Deployment Environmental Surveillance Program

Preventive Medicine Surveys: 40-5f1

ACKNOWLEDGMENTS

DEPLOYMENT OCCUPATIONAL AND ENVIRONMENTAL HEALTH SURVEILLANCE SAMPLE REPORT AIRBORNE PARTICULATE MATTER BAGRAM, AFGHANISTAN 26 OCTOBER 2010-6 JANUARY 2011 U_AFG_BAGRAM_CM_A10_20110106

1 References

See Appendix A for a list of references.

2 Purpose

This report provides the U.S. Army Public Health Command (Provisional) (USAPHC (Prov)), Army Institute of Public Health (AIPH) assessment of the laboratory analytical results and exposure information associated with the samples collected by 71st Medical Detachment on 26 October 2010-6 January 2011 at Bagram, Afghanistan according to the U.S. Department of Defense deployment occupational and environmental health (DOEH) surveillance requirements. The assessment serves several purposes. It identifies DOEH hazards that may be related to acute health effects that could occur in personnel during their deployment. It provides an official record of observed exposure conditions for use in future site evaluations. It identifies whether or not there is a potential for chronic health concerns which may require additional characterization. Finally, this report includes preventive steps to reduce or eliminate occupational and environmental exposures, and surveillance and/or sampling recommendations, as necessary.

3 Scope

The assessment of sample results and exposure information in this report follows the process published in the USAPHC (Prov) Technical Guide (TG) 230 "Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel, June 2010 Revision." The assessment is based on limited data representing a specific time period and assesses short-term exposure risks only. Therefore, this report cannot be used alone to estimate the risk of chronic health effects from exposures. In addition, this assessment does not address all DOEH hazards to which U.S. personnel may be exposed.

4 Laboratory Analysis

Filters used to collect deployment air samples of particulate matter (PM) are shipped to the USAPHC (Prov), AIPH, and weighed to determine particulate mass and calculate ambient concentrations. The USAPHC (Prov), AIPH laboratory also analyzes the PM for a standard set of metals typically found in PM. The complete analytical sample results can be viewed in the Defense Occupational and Environmental Health Readiness System-Environmental Health (DOEHRS-EH). Log into the DOEHRS-EH and search for the samples using the DOEHRS sample identification numbers (IDs) provided in Table 1.

Table 1. Sample Identification Information

DOEHRS-EH Sample ID	Sample ID Reported on Field Data Sheet	Sample Site	Date and Time Sample Collected	Sample Invalid (Yes/No) Reason for Invalid Sample
00003R8P	AFG_BAGRAM_PM10 DPS_10348	Landfill Corner	2010/12/14 0600	No
00003YLP	AFG_BAGRAM_PM10 DPS_10358	Landfill Corner	2010/12/24 0600	No
00003R8E	AFG_BAGRAM_PM10 DPS_10299	Landfill Guard Tower	2010/10/26 1100	Yes, Timer Malfunction
00003R96	AFG_BAGRAM_PM10 DPS_10348	Landfill Guard Tower	2010/12/14 0600	No
00003YHL	AFG_BAGRAM_PM10 DPS_10358	Landfill Guard Tower	2010/12/24 0600	No
00003YLI	AFG_BAGRAM_PM10 DPS_11006	Landfill Guard Tower	2011/01/06 0800	No
00003R83	AFG_BAGRAM_PM10 DPS_10299	Warrior Base Camp	2010/10/26 1214	Yes, Timer Malfunction
00003R8J	AFG_BAGRAM_PM10 DPS_10348	Warrior Base Camp	2010/12/14 0600	No
00003YLH	AFG_BAGRAM_PM10 DPS_10358	Warrior Base Camp	2010/12/24 0600	No
00003YLK	AFG_BAGRAM_PM10 DPS_11006	Warrior Base Camp	2011/01/06 0800	Yes, Damaged Sampling Media
00003R8G	AFG_BAGRAM_PM10 DPS_10302	Warrior Base Camp	2010/10/29 1800	No
00003R8H	AFG_BAGRAM_PM10 DPS_10302	Landfill Corner	2010/10/29 1800	No
00003R9F	AFG_BAGRAM_PM10 DPS_10302	Landfill Guard Tower	2010/10/29 1800	No
00003YLM	AFG_BAGRAM_PM10 DPS_10350	Landfill Corner	2010/12/16 1800	No
00003YLN	AFG_BAGRAM_PM10 DPS_10350	Landfill Guard Tower	2010/12/16 1800	No
00003YLO	AFG_BAGRAM_PM10 DPS_10350	Warrior Base Camp	2010/12/16 1800	No
00003YLL	AFG_BAGRAM_PM10 DPS_10364	Landfill Corner	2010/12/30 1800	Yes, Sample Malfunction
00003YLY	AFG_BAGRAM_PM10 DPS_10364	Warrior Base Camp	2010/12/30 1800	Yes, Flow Differential
00003YLZ	AFG_BAGRAM_PM10 DPS_10364	Landfill Guard Tower	2010/12/30 1800	Yes, Flow Differential

5 Exposure Setting

Tables 2 and 3 contain information about the sampling location, environmental conditions, and associated potential population exposure. The information was provided on the field data sheets submitted with the sample set unless otherwise noted. Information about the individual samples including sample date and site, is provided in Table 1. Correction and clarification of exposure assumptions by the sampling unit is encouraged.

Table 2. Exposure Information for Daytime Sampling

Questions About Exposure	Information Provided and Assumptions
What is the exposure event or ambient environmental condition under consideration?	Exposure to PM less than 10 micrometers in diameter (PM_{10}) and metals in the ambient air at this location.
What is the population at risk?	Entire base camp population.
What is the timeframe under consideration?	The samples were collected on 26 October, 14 December, 24 December 2010 and 6 January 2011. This encompasses a timeframe of approximately 10 weeks from the first day of sampling to the last. Although personnel will be deployed to this location for approximately 1 year, only this timeframe of 10 weeks is being considered.
What are the activity patterns of the exposed population?	Typical exertion across the base camp. It is assumed personnel spend part of each day indoors.
What is known about sources of potential contamination?	Smoke from the burn pit at the forward operating base (FOB) landfill.
What is known about the exposure setting?	The Bagram burn pit is run 24 hours a day, 7 days a week while the tower guards operate in 12-hour shifts.
What are the exposure pathways?	Inhalation.
Where are the sampling sites relative to where exposure occurs?	Samplers were placed at the Landfill corner and landfill guard tower near the burn pit, while another sampler was placed at the Warrior Base Camp near the living area, dining facility and other commercial activities.

Note: Questions are extracted from USAPHC (Prov) TG 230

Table 3. Exposure Information for Nighttime Sampling

Questions About Exposure	Information Provided and Assumptions
What is the exposure event or ambient environmental condition under consideration?	Exposure to PM less than 10 micrometers in diameter (PM_{10}) and metals in the ambient air at this location.
What is the population at risk?	Entire base camp population.
What is the timeframe under consideration?	The samples were collected on 29 October and 16 December 2010. This encompasses a timeframe of approximately 2 days from the first day of sampling to the last. Although personnel will be deployed to this location for approximately 1 year, only this timeframe of 2 days is being considered.
What are the activity patterns of the exposed population?	Typical exertion across the base camp. It is assumed personnel spend part of each day indoors.
What is known about sources of potential contamination?	Smoke from the burn pit at the (FOB) landfill.
What is known about the exposure setting?	The Bagram burn pit is run 24 hours a day, 7 days a week while the tower guards operate in 12-hour shifts.
What are the exposure pathways?	Inhalation.
Where are the sampling sites relative to where exposure occurs?	Samplers were placed at the Landfill corner and landfill guard tower near the burn pit, while another sampler was placed at the Warrior Base Camp near the living area, dining facility and other commercial activities.

Note: Questions are extracted from USAPHC (Prov) TG 230

6 Prescreen

Tables 4 and 5 shows whether parameters are identified as potential hazards because their peak single sample concentrations are greater than their most health-protective screening level USAPHC (Prov) TG 230 military exposure guidelines (MEGs). Potential hazards are further assessed to determine if they are acute hazards. Parameters analyzed but not shown in Tables 4 and 5 are not considered hazards. The prescreening is conducted as described in USAPHC (Prov) TG 230, section 3.4.3. The sample results were compared to MEGs on 3 May 2011.

Table 4. Results of Prescreen for Daytime Sampling

Parameter	Detections/ Samples	Peak Single Sample Concentration ($\mu g/m^3$)	1-year Negligible MEG ($\mu g/m^3$)	Result
PM_{10}	7/7	716	Not available	Retain as potential hazard

Legend: $\mu g/m^3$ = micrograms per cubic meter

Table 5. Results of Prescreen for Nighttime Sampling

Parameter	Detections/ Samples	Peak Single Sample Concentration (µg/m^3)	1-year Negligible MEG (µg/m^3)	Result
PM_{10}	6/6	784	Not available	Retain as potential hazard

Legend: µg/m^3 = micrograms per cubic meter

7 Acute Risk Assessment

7.1 Acute Screen

Tables 6 and 7 show whether parameters identified as potential hazards after prescreening are considered acute hazards because their peak sample day concentrations are greater than their acute screening MEGs. Acute hazards are further assessed to estimate the tactical risk from exposure to these parameters in the ambient air. The acute screening is conducted as described in USAPHC (Prov) TG 230, section 3.4.5.1.

Table 6. Results of Acute Screen for Daytime Sampling

Parameter	Peak Sample Day Concentration (µg/m^3)	Screening MEG (µg/m^3)	Result
PM_{10}	716	24-hour Negligible MEG: 250	Retain as acute hazard

Legend: µg/m^3 = micrograms per cubic meter

Table 7. Results of Acute Screen for Nighttime Sampling

Parameter	Peak Sample Day Concentration (µg/m^3)	Screening MEG (µg/m^3)	Result
PM_{10}	784	24-hour Negligible MEG: 250	Retain as acute hazard

Legend: µg/m^3 = micrograms per cubic meter

7.2 Hazard Severity

Tables 8 and 9 summarize the hazard severity levels determined by comparing the peak and average sample day concentrations of the acute hazards to the appropriate MEGs. The peak concentration is intended to represent the worst exposure conditions and the average concentration is intended to represent typical exposure conditions. Hazard severity is determined using USAPHC (Prov) TG 230, section 3.4.5.2.

Table 8. Hazard Severity for Daytime Sampling

Parameter	Concentration ($\mu g/m^3$)	Comparison MEGs ($\mu g/m^3$)	Hazard Severity
PM_{10}	Peak: 716	Is ≥ 24-hour Critical MEG: 600	Critical
	Average: 401	Is > 24-hour Negligible MEG: 250, but < 24-hour Marginal MEG: 420	Negligible

Legend: $\mu g/m^3$ = micrograms per cubic meter

Table 9. Hazard Severity for Nighttime Sampling

Parameter	Concentration ($\mu g/m^3$)	Comparison MEGs ($\mu g/m^3$)	Hazard Severity
PM_{10}	Peak: 784	Is ≥ 24-hour Critical MEG: 600	Critical
	Average: 484	Is ≥ 24-hour Marginal MEG: 420 but < 24-hour Critical MEG: 600	Marginal

Legend: $\mu g/m^3$ = micrograms per cubic meter

7.3 Hazard Probability

Tables 10 and 11 summarize the hazard probability determinations for each acute hazard. Refer to USAPHC (Prov) TG 230, section 3.4.5.3 for additional information about hazard probability scoring methodology.

Table 10. Hazard Probability Scoring for PM_{10} Daytime Sampling

Concentration ($\mu g/m^3$)	Hazard Probability Scoring for Exposure Factors				Hazard Probability
	Degree of Exposure	Represent-ativeness of Sample Data	Duration of Exposure	Rate of Exposure	
Peak: 716	Score 2: Concentration is >Critical MEG and next higher severity MEG does not exist.	Score 2: Field data adequately estimate population exposure (Routine Sampling).	Score 1: Field exposure duration to MEG exposure duration ratio is <1 (<24-hour exposure compared to 24-hour MEG).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 7: Seldom
Average: 401	Score 3: Concentration is >75th percentile of severity range.	Score 2: Field data adequately estimate population exposure (Routine Sampling).	Score 1: Field exposure duration to MEG exposure duration ratio is <1 (<24-hour exposure compared to 24-hour MEG).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 8: Occasional

Legend: $\mu g/m^3$ = micrograms per cubic meter

Table 11. Hazard Probability Scoring for PM_{10} Nighttime Sampling

Concentration ($\mu g/m^3$)	Hazard Probability Scoring for Exposure Factors				Hazard Probability
	Degree of Exposure	Represent-ativeness of Sample Data	Duration of Exposure	Rate of Exposure	
Peak: 784	Score 2: Concentration is >Critical MEG and next higher severity MEG does not exist.	Score 2: Field data adequately estimate population exposure (Routine Sampling).	Score 1: Field exposure duration to MEG exposure duration ratio is <1 (<24-hour exposure compared to 24-hour MEG).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 7: Seldom
Average: 484	Score 2: Concentration is at or between 25th and 75th percentiles of severity range.	Score 2: Field data adequately estimate population exposure (Routine Sampling).	Score 1: Field exposure duration to MEG exposure duration ratio is <1 (<24-hour exposure compared to 24-hour MEG).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 7: Seldom

7.4 Tactical Risk Estimate

Tables 12 and 13 summarize the acute risk assessment for exposure to each of the acute hazards. The tactical risk estimate was determined using the USAPHC (Prov) TG 230, Table 3-1 “Military Risk Assessment Matrix.” The tactical risk estimates are color-coded consistent with the black, red, amber, green system described in Field Manual 1-02 "Operational Terms and Graphics."

Table 12. Risk Assessment Summary for Daytime Sampling

Parameter	Type of Exposure	Hazard Severity	Hazard Probability	Tactical Risk Estimate
PM_{10}	Peak	Critical	Seldom	Moderate
	Average	Negligible	Occasional	Low
Metals	None identified as acute hazards.			

Table 13. Risk Assessment Summary for Nighttime Sampling

Parameter	Type of Exposure	Hazard Severity	Hazard Probability	Tactical Risk Estimate
PM_{10}	Peak	Critical	Seldom	Moderate
	Average	Marginal	Seldom	Low
Metals	None identified as acute hazards.			

8 Conclusion

Based on the sample results and associated exposure information assessed in this report, the tactical risk estimate for PM_{10} during daytime sampling on a typical exposure day in the sampled timeframe is **low** and on a peak exposure day it is **moderate**. The tactical risk estimate for PM_{10} during nighttime sampling on a typical exposure day in the sampled timeframe is **low** and on a peak exposure day it is **moderate**. Refer to USAPHC (Prov) TG 230, Table 3-2 for the potential consequences to military operations and force readiness associated with these risk levels.

9 Limitations

9.1 Field Data Quality

The field data sheets provided with the sample set were adequately filled out.

Some of the samples were invalid due to improper sample collection and damaged filters.

9.2 Sample Receipt at USAPHC (Prov) Laboratory

The sample set was packaged correctly.

9.3 Laboratory Data Quality

Some parameters in this data set are flagged with a J code (^{J}). This code indicates an estimated value that was detected above the Method Detection Limit but below the Method Reporting Limit (also known as Limit of Quantitation or Practical Quantitation Limit).

9.4 Risk Assessment

Parameter concentrations on days with multiple samples were averaged together to determine a single concentration for the day.

If a parameter was not detected in all samples, half of the laboratory reporting limit was used to calculate an average.

Although the sample concentration was assessed using a 24-hour MEG the samples were not collected for a full 24 hours and may not represent conditions for a full 24 hours.

10 Recommendations and Notes

Maintain communication with USAPHC (Prov), AIPH points of contact (POCs) and continue standard surveillance of airborne PM and metals in accordance with defined Occupational and Environmental Health Site Assessment (OEHSA) Exposure Pathways and sampling plans for your location.

11 Points of Contact

The USAPHC (Prov), AIPH POCs for this assessment are Ms. Nikki (b) (6) and Mr. (b) (6). Ms. (b) (6) may be contacted at e-mail (b) (6) and Mr (b) may be contacted at e-mail (b) (6) or DSN (b) (6) or commercial (b) (6).

(b) (6)
Environmental Scientist
Deployment Environmental Surveillance Program

Approved by:

(b) (6)
LTC, MS
Program Manager
Deployment Environmental Surveillance

Appendix A

References

1. Department of Defense Directive (DoDD) 6490.02E, Comprehensive Health Surveillance, 21 October 2004.

2. Department of Defense Instruction (DoDI) 6490.03, Deployment Health, 11 August 2006.

3. Department of the Army (DA) Field Manual (FM) 5-19, Composite Risk Management, 21 August 2006.

4. DA FM 1-02, Operational Terms and Graphics, 21 September 2004.

5. USAPHC (Prov) Technical Guide (TG) 230, Chemical Exposure Guidelines for Deployed Military Personnel, June 2010.