DEPARTMENT OF THE ARMY
US ARMY INSTITUTE OF PUBLIC HEALTH
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MCHB-IP-RDE

02 MAY 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, Phoenix, Afghanistan, 22 November-10 December 2010, U_AFG_PHOENIX_CM_A2.5_20101210

1. The enclosed report details the assessment of particulate matter (PM) air samples collected by 981st Medical Detachment personnel, Phoenix, Afghanistan, 22 November-10 December 2010. The samples were collected for airborne PM less than 2.5 micrometers in diameter ($PM_{2.5}$) and analyzed for a set of metals typically found in PM.

2. Based on the sample results and associated exposure information assessed in this report, the tactical risk estimate for $PM_{2.5}$ at the BBQ and Main Dining Facilities, K5 Transient Housing Area, and Helipad on both typical exposure and peak exposure days during the sampled timeframe is **low**.

3. Based on the sample results and associated exposure information assessed in this report, the tactical risk estimate for $PM_{2.5}$ near the Burn Pit 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

(b) (6)
Portfolio Director, Health Risk Management

CF: (w/encl)
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SUBJECT: Deployment Occupational and Environmental Health Surveillance Sample Report, Airborne Particulate Matter, Phoenix, Afghanistan, 22 November-10 December 2010, U_AFG_PHOENIX_CM_A2.5_20101210

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USAPHC
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_PHOENIX_CM_A2.5_20101210
Health Risk Management Portfolio

Airborne Particulate Matter, Phoenix, Afghanistan

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

Preventive Medicine Surveys: 40-5f1

PHC FORM 432-E (MCHB-CS-IP), SEP 10

ACKNOWLEDGMENTS

DEPLOYMENT OCCUPATIONAL AND ENVIRONMENTAL HEALTH SURVEILLANCE SAMPLE REPORT AIRBORNE PARTICULATE MATTER PHOENIX, AFGHANISTAN 22 NOVEMBER-10 DECEMBER 2010 U_AFG_PHOENIX_CM_A2.5_20101210

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 981st Medical Detachment on 22 November-10 December 2010 at three sites, Phoenix, 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 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 Appendix B.

5 Exposure Setting

Appendix C contains information about the sampling location, environmental conditions, and associated potential population exposure for each sample site. 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 Appendix B. Correction and clarification of exposure assumptions by the sampling unit is encouraged.

6 Prescreen

Table 1 shows parameters identified as potential hazards because their peak single sample concentrations were 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. The prescreening is conducted as described in USAPHC (Prov) TG 230, section 3.4.3. The sample results were compared to MEGs on 5 April 2011.

Table 1. $PM_{2.5}$ Prescreen Results

Parameter	Detections/ Samples	Peak Single Sample Concentration ($\mu g/m^3$)	1-year Negligible MEG ($\mu g/m^3$)	Result
BBQ Dining Facility	1/1	69	15	Retain as potential hazard
Burn Pit	2/2	563	15	Retain as potential hazard
Helipad	1/1	96	15	Retain as potential hazard
Transient Housing	4/4	381	15	Retain as potential hazard
Main Dining Facility	1/1	228	15	Retain as potential hazard

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

7 Acute Risk Assessment

7.1 Acute Screen

Table 2 shows parameters identified as acute hazards because their peak sample day concentrations were greater than their acute screening MEGs. Acute hazards are further assessed to estimate the acute 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 2. $PM_{2.5}$ Acute Screen Results

Parameter	Peak Sample Day Concentration (µg/m^3)	Screening MEG (µg/m^3)	Result
BBQ Dining Facility	69	24-hour Negligible MEG: 65	Retain as acute hazard
Burn Pit	563	24-hour Negligible MEG: 65	Retain as acute hazard
Helipad	96	24-hour Negligible MEG: 65	Retain as acute hazard
Transient Housing	381	24-hour Negligible MEG: 65	Retain as acute hazard
Main Dining Facility	228	24-hour Negligible MEG: 65	Retain as acute hazard

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

7.2 Hazard Severity

Table 3 summarizes 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 3. $PM_{2.5}$ Hazard Severity

Parameter	Concentration (µg/m^3)	Comparison MEGs (µg/m^3)	Hazard Severity
BBQ Dining Facility	69	Is > 24-hour Negligible MEG: 65, but < 24-hour Marginal MEG: 250	Negligible
Burn Pit	Peak: 563	Is ≥ 24-hour Critical MEG: 500	Critical
	Average: 437	Is ≥ 24-hour Marginal MEG: 250, but < 24-hour Critical MEG: 500	Marginal
Helipad	96	Is > 24-hour Negligible MEG: 65, but < 24-hour Marginal MEG: 250	Negligible
Transient Housing	Peak: 381	Is ≥ 24-hour Marginal MEG: 250, but < 24-hour Critical MEG: 500	Marginal
	Average: 181	Is > 24-hour Negligible MEG: 65, but < 24-hour Marginal MEG: 250	Negligible
Main Dining Facility	228	Is > 24-hour Negligible MEG: 65, but < 24-hour Marginal MEG: 250	Negligible

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

7.3 Hazard Probability

Table 4 summarizes the hazard probability determinations for the acute hazard. Refer to USAPHC (Prov) TG 230, section 3.4.5.3 for additional information about hazard probability scoring methodology.

Table 4. $PM_{2.5}$ Hazard Probability

Parameter	Concentration ($\mu g/m^3$)	Hazard Probability
BBQ Dining Facility	69	Unlikely
Burn Pit	Peak: 563	Seldom
	Average: 437	Unlikely
Helipad	96	Unlikely
Transient Housing	Peak: 381	Seldom
	Average: 181	Seldom
Main Dining Facility	228	Occasional

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

7.4 Tactical Risk Estimate

Table 5 summarizes the acute risk assessment for exposure to the acute hazard. 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 Department of the Army Field Manual 1-02 "Operational Terms and Graphics."

Table 5. $PM_{2.5}$ Risk Assessment Summary

Parameter	Type of Exposure	Hazard Severity	Hazard Probability	Tactical Risk Estimate
BBQ Dining Facility	Single Sample	Negligible	Unlikely	Low
Burn Pit	Peak	Critical	Seldom	Moderate
	Average	Marginal	Unlikely	Low
Helipad	Single Sample	Negligible	Unlikely	Low
Transient Housing	Peak	Marginal	Seldom	Low
	Average	Negligible	Seldom	Low
Main Dining Facility	Single Sample	Negligible	Occasional	Low

Note: Highlighted parameters indicate the Tactical Risk Estimate

8 Conclusion

Refer to USAPHC (Prov) TG 230, Table 3-2 for the potential consequences to military operations and force readiness associated with this risk level.

- Based on the sample results and associated exposure information assessed in this report, the tactical risk estimate for $PM_{2.5}$ at the BBQ and Main Dining Facilities, and Helipad is **low**.

- Based on the sample results and associated exposure information assessed in this report, the tactical risk estimate for $PM_{2.5}$ at the K5 transient housing area on both typical exposure and peak exposure days during the sampled timeframe is **low**.

- Based on the sample results and associated exposure information assessed in this report, the tactical risk estimate for $PM_{2.5}$ near the Burn Pit on a typical exposure day in the sampled timeframe is **low** and on a peak exposure day it is **moderate**.

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 equipment failure and laboratory issues.

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

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

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.

If an OEHSA and/or specific sampling plans have not yet been completed for Phoenix, Afghanistan, collect ambient PM air samples from sites that best represent exposures at least once every 6 days to better characterize conditions over time.

11 Points of Contact

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

(b) (6)

(b) (6)

Environmental Scientist
Deployment Environmental Surveillance Program

Approved by:

(b) (6)

Acting 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.

Appendix B

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
00003UBU	AFG_PHOENI_PM2.5DPS	K5 (Transient Housing)	2010/11/22 1305	No
00003UIP	AFG_PHOENI_10332_PM2.5DPS	K5 (Transient Housing)	2010/11/28 1305	No
00003UIS	AFG_PHOENI_10332_PM2.5DPS	Helipad	2010/11/28 1343	No
00003UK6	AFG_PHOENI_10332_PM2.5DPS	BBQ Dining Facility (DFAC)	2010/11/28 1355	Flow Differential
00003UJW	AFG_PHOENI_10332_PM2.5DPS	Burn Pit	2010/11/28 1400	No
00003UK2	AFG_PHOENI_10332_PM2.5DPS	Main DFAC	2010/11/28 1410	No
00003UKF	AFG_PHOENI_10339_PM2.5DPS	Helipad	2010/12/05 1343	Sample Malfunction
00003UK7	AFG_PHOENI_10339_PM2.5DPS	Burn Pit	2010/12/05 1405	Sample Malfunction
00003UIO	AFG_PHOENI_10339_PM2.5DPS	BBQ DFAC	2010/12/05 1410	No
00003UK0	AFG_PHOENI_10339_PM2.5DPS	K5 (Transient Housing)	2010/12/05 1432	No
00003UIX	AFG_PHOENI_10345_PM2.5DPS	Main DFAC	2010/12/10 0000	Sample Malfunction
00003UK8	AFG_PHOENI_10345_PM2.5DPS	BBQ DFAC	2010/12/10 1320	Sample Malfunction
00003UKH	AFG_PHOENI_10345_PM2.5DPS	Helipad	2010/12/10 1331	Lab Issue
00003UIU	AFG_PHOENI_10345_PM2.5DPS	Burn Pit	2010/12/10 1345	No
00003UIN	AFG_PHOENI_10345_PM2.5DPS	K5 (Transient Housing)	2010/12/10 1418	No

Appendix C

Exposure Setting Information

Table C-1. Exposure Information at the BBQ Dining Facility

Questions About Exposure	Information Provided and Assumptions
What is the exposure event or ambient environmental condition under consideration?	Exposure to PM less than 2.5 micrometers in diameter ($PM_{2.5}$) and metals in the ambient air at this location.
What is the population at risk?	The population at the dining facility site.
What is the timeframe under consideration?	The samples were collected on 22 November-10 December 2010. This encompasses a timeframe of approximately eighteen days. Although personnel will be deployed to this location for approximately 1 year, only this timeframe is being considered.
What are the activity patterns of the exposed population?	Typical exertion across the base camp.
What is known about sources of potential contamination?	None provided.
What is known about the exposure setting?	Common dining facility.
What are the exposure pathways?	Inhalation.
Where are the sampling sites relative to where exposure occurs?	None provided.

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

Table C-2. Exposure Information at the Burn Pit

Questions About Exposure	Information Provided and Assumptions
What is the exposure event or ambient environmental condition under consideration?	Exposure to PM less than 2.5 micrometers in diameter ($PM_{2.5}$) and metals in the ambient air at this location.
What is the population at risk?	The population at the Burn Pit.
What is the timeframe under consideration?	The samples were collected on 22 November-10 December 2010. This encompasses a timeframe of approximately eighteen days. Although personnel will be deployed to this location for approximately 1 year, only this timeframe is being considered.
What are the activity patterns of the exposed population?	Typical exertion across the base camp.
What is known about sources of potential contamination?	Waste incineration.
What is known about the exposure setting?	Active burn pit.
What are the exposure pathways?	Inhalation.
Where are the sampling sites relative to where exposure occurs?	None provided.

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

Table C-3. Exposure Information at the Helipad

Questions About Exposure	Information Provided and Assumptions
What is the exposure event or ambient environmental condition under consideration?	Exposure to PM less than 2.5 micrometers in diameter ($PM_{2.5}$) and metals in the ambient air at this location.
What is the population at risk?	The population at the Helipad.
What is the timeframe under consideration?	The samples were collected on 22 November-10 December 2010. This encompasses a timeframe of approximately eighteen days. Although personnel will be deployed to this location for approximately 1 year, only this timeframe is being considered.
What are the activity patterns of the exposed population?	Typical exertion across the base camp.
What is known about sources of potential contamination?	None provided.
What is known about the exposure setting?	Area used for physical training and vehicle maintenance.
What are the exposure pathways?	Inhalation.
Where are the sampling sites relative to where exposure occurs?	None provided.

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

Table C-4. Exposure Information at K5 Transient Housing

Questions About Exposure	Information Provided and Assumptions
What is the exposure event or ambient environmental condition under consideration?	Exposure to PM less than 2.5 micrometers in diameter ($PM_{2.5}$) and metals in the ambient air at this location.
What is the population at risk?	The population at K5 Transient Housing.
What is the timeframe under consideration?	The samples were collected on 22 November-10 December 2010. This encompasses a timeframe of approximately eighteen days. Although personnel will be deployed to this location for approximately 1 year, only this timeframe is being considered.
What are the activity patterns of the exposed population?	Typical exertion across the base camp.
What is known about sources of potential contamination?	None provided.
What is known about the exposure setting?	Living area.
What are the exposure pathways?	Inhalation.
Where are the sampling sites relative to where exposure occurs?	None provided.

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

Table C-5. Exposure Information at the Main Dining Facility

Questions About Exposure	Information Provided and Assumptions
What is the exposure event or ambient environmental condition under consideration?	Exposure to PM less than 2.5 micrometers in diameter ($PM_{2.5}$) and metals in the ambient air at this location.
What is the population at risk?	The population at the Main Dining Facility.
What is the timeframe under consideration?	The samples were collected on 22 November-10 December 2010. This encompasses a timeframe of approximately eighteen days. Although personnel will be deployed to this location for approximately 1 year, only this timeframe is being considered.
What are the activity patterns of the exposed population?	Typical exertion across the base camp.
What is known about sources of potential contamination?	None provided.
What is known about the exposure setting?	Common dining area.
What are the exposure pathways?	Inhalation.
Where are the sampling sites relative to where exposure occurs?	None provided.

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

Appendix D

Hazard Probability Scoring Tables

Table D-1. Hazard Probability Scoring for $PM_{2.5}$ at the BBQ Dining Facility

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: 69	Score 1: Concentration is <25th percentile of severity range.	Score 2: Field data adequately estimates population exposure (Routine Sampling).	Score 1: Field exposure duration to MEG exposure duration is <1 (Personnel will not remain in this location for a continuous 24-hour period).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 6: Unlikely

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

Table D-2. Hazard Probability Scoring for $PM_{2.5}$ at the Burn Pit

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: 563	Score 3: Concentration is >75th percentile of severity range.	Score 1: Field data overestimate population exposure (This area is not a common area for most personnel.	Score 1: Field exposure duration to MEG exposure duration is <1 (Personnel will not spend the entire 24-hours at the sampling location).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 7: Seldom
Average: 437	Score 2: Concentration is at or between 25th and 75th percentiles of severity range.	Score 1: Field data overestimate population exposure (This area is not a common area for most personnel.	Score 1: Field exposure duration to MEG exposure duration is <1 (Personnel will not spend the entire 24-hours at the sampling location).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 6: Unlikely

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

Table D-3. Hazard Probability Scoring for $PM_{2.5}$ at the Helipad

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: 96	Score 1: Concentration is <25th percentile of severity range.	Score 2: Field data adequately estimates population exposure (Routine Sampling).	Score 1: Field exposure duration to MEG exposure duration is <1 (Personnel will not spend the entire 24-hours at the sampling location).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 6: Unlikely

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

Table D-4. Hazard Probability Scoring for $PM_{2.5}$ at the Transient Housing

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: 381	Score 2: Concentration is at or between 25th and 75th percentiles of severity range.	Score 2: Field data adequately estimates population exposure (Routine Sampling).	Score 1: Field exposure duration to MEG exposure duration is <1 (Personnel will not spend the entire 24-hours at the sampling location).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 7: Seldom
Average: 181	Score 2: Concentration is at or between 25th and 75th percentiles of severity range.	Score 2: Field data adequately estimates population exposure (Routine Sampling).	Score 1: Field exposure duration to MEG exposure duration is <1 (Personnel will not spend the entire 24-hours at the sampling location).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 7: Seldom

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

Table D-5. Hazard Probability Scoring for $PM_{2.5}$ at the Main Dining Facility

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: 228	Score 3: Concentration is >75th percentile of severity range.	Score 2: Field data adequately estimates population exposure (Routine Sampling).	Score 1: Field exposure duration to MEG exposure duration is <1 (Personnel will not spend the entire 24-hours at the sampling location).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 8: Occasional

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