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

05 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, 6 September-4 October 2010, U_AFG_PHOENIX_CM_A25_20101004

1. The enclosed report details the assessment of particulate matter (PM) air samples collected by 186th Brigade Support Battalion personnel, Burn Barrels, Serving Tent and Troop Medical Clinic (TMC), Phoenix, Afghanistan, 14 August-4 October 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 Burn Barrels on both typical exposure and peak exposure days during the sampled timeframe is **moderate.**

3. Based on the sample results and associated exposure information assessed in this report, the tactical risk estimate for $PM_{2.5}$ at the Serving Tent and TMC, on both typical exposure and peak exposure days during the sampled timeframe is **low.**

FOR THE DIRECTOR:

(b) (6)

Encl

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

CF: (w/encl)
981st Preventive Medicine (Commander/MAJ (b) (6)
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(CONT)

MCHB-IP-RDE
SUBJECT: Deployment Occupational and Environmental Health Surveillance Sample Report, Airborne Particulate Matter, Phoenix, Afghanistan, 14 August-4 October 2010, U_AFG_PHOENIX_CM_A25_20101004

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USAPHC
U.S. ARMY PUBLIC HEALTH COMMAND (Provisional)
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Deployment Occupational and Environmental Health Surveillance Sample Report,
U_AFG_PHOENIX_CM_A25_20101004
Health Risk Management Portfolio

Airborne Particulate Matter, Phoenix, 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 PHOENIX, AFGHANISTAN 14 AUGUST-4 OCTOBER 2010 U_AFG_PHOENIX_CM_A25_20101004

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 186th Brigade Support Battalion on 14 August-4 October 2010 at three sites, Burn Barrels, Serving Tent and Troop Medical Clinic (TMC), 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. This report, therefore, 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 25 February 2011.

Table 1. Results of Prescreen

Parameter	Detections/ Samples	Peak Single Sample Concentration (µg/m^3)	1-year Negligible MEG (µg/m^3)	Result
$PM_{2.5}$ at Burn Barrels	11/11	1,289	15	Retain as potential hazard
$PM_{2.5}$ at Serving Tent	12/12	231	15	Retain as potential hazard
$PM_{2.5}$ at TMC	10/10	348	15	Retain as potential hazard

Legend: µg/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. Results of Acute Screen

Parameter	Peak Sample Day Concentration (µg/m^3)	Screening MEG (µg/m^3)	Result
$PM_{2.5}$ at Burn Barrels	1,289	24-hour Negligible MEG: 65	Retain as acute hazard
$PM_{2.5}$ at Serving Tent	231	24-hour Negligible MEG: 65	Retain as acute hazard
$PM_{2.5}$ at TMC	348	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. Hazard Severity

Parameter	Concentration (µg/m^3)	Comparison MEGs (µg/m^3)	Hazard Severity
$PM_{2.5}$ at Burn Barrels	Peak: 1,289	Is ≥ 24-hour Critical MEG: 500	Critical
	Average: 448	Is ≥ 24-hour Marginal MEG: 250, but < 24-hour Critical MEG: 500	Marginal
$PM_{2.5}$ at Serving Tent	Peak: 231	Is > 24-hour Negligible MEG: 65, but < 24-hour Marginal MEG: 250	Negligible
	Average: 97	Is > 24-hour Negligible MEG: 65, but < 24-hour Marginal MEG: 250	Negligible
$PM_{2.5}$ at TMC	Peak: 348	Is ≥ 24-hour Marginal MEG: 250, but < 24-hour Critical MEG: 500	Marginal
	Average: 123	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. Hazard Probability

Parameter	Concentration ($\mu g/m^3$)	Hazard Probability
$PM_{2.5}$ at Burn Barrels	Peak: 1,289	Seldom
	Average: 448	Occasional
$PM_{2.5}$ at Serving Tent	Peak: 231	Occasional
	Average: 97	Unlikely
$PM_{2.5}$ at TMC	Peak: 348	Seldom
	Average: 123	Seldom

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. Risk Assessment Summary

Parameter	Type of Exposure	Hazard Severity	Hazard Probability	Tactical Risk Estimate
$PM_{2.5}$ at Burn Barrels	Peak	Critical	Seldom	Moderate
	Average	Marginal	Occasional	Moderate
$PM_{2.5}$ at Serving Tent	Peak	Negligible	Occasional	Low
	Average	Negligible	Unlikely	Low
$PM_{2.5}$ at TMC	Peak	Marginal	Seldom	Low
	Average	Negligible	Seldom	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 Burn Barrels on both typical exposure and peak exposure days during the sampled timeframe is **moderate**.

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

9 Limitations

9.1 Field Data Quality

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

One of the samples was invalid due to a damaged filter.

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), and Mr. (b) 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, 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
3766	AFG PHOENI 14226PM25	Serving Tent	2010/08/14 1213	No
3722	AFG_PHOENI_14226	TMC	2010/08/14 1233	No
0000374L	AFGPHOENI17229	TMC	2010/08/17 0932	No
0000373Y	AFGPHOENI17229	Serving Tent	2010/08/17 0942	No
0000374P	AFGPHOENI17229	Burn Barrel	2010/08/17 1002	No
3779	AFG PHOENI 20232	TMC	2010/08/20 0951	No
0000376K	AFG PHOENI 20232	Serving Tent	2010/08/20 0957	No
0000377D	AFG PHOENI 20232	Burn Barrel	2010/08/20 1004	No
3764	AFG PHOENI 23235	TMC	2010/08/23 0910	No
3763	AFG PHOENI 23235	Serving Tent	2010/08/23 0916	No
3765	AFG PHOENI 23235	Burn Barrel	2010/08/23 0923	No
0000377N	AFG PHOENI 25237	TMC	2010/08/25 0726	Yes, Damaged Sampling Media
0000378L	AFG PHOENI 25237	Serving Tent	2010/08/25 0930	No
0000378N	AFG PHOENI 25237	Burn Barrel	2010/08/25 0939	No
0000378Y	AFG PHOENI 27239	TMC	2010/08/27 0928	No
0000375Z	AFG PHOENI 27239	Serving Tent	2010/08/27 0941	No
0000374X	AFGPHOENI 27239	Burn Barrel	2010/08/27 0953	No
0000373X	AFGPHOENI30242	TMC	2010/08/30 0948	No
3728	AFGPHOENI30242	Serving Tent	2010/08/30 0957	No
3723	AFG_PHOENI_30242	Burn Barrel	2010/08/30 1004	No

DOEH Surveillance Sample Report, Airborne PM, Phoenix, Afghanistan, 14 Aug-4 Oct 10, U_AFG_PHOENIX_CM_A25_20101004

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
00003P8A	AFG PHOENI 06249	TMC	2010/09/06 0936	No
00003P84	AFG PHOENI 06249	Serving Tent	2010/09/06 0948	No
00003PWM	AFG PHOENI 06249	Burn Barrel	2010/09/06 1001	No
00003P85	AFG PHOENI 13256	Serving Tent	2010/09/13 0854	No
00003PWG	AFG PHOENI 13256	Burn Barrel	2010/09/13 0913	No
00003PGL	AFG PHOENI 20263	TMC	2010/09/20 0814	No
00003PFL	AFG PHOENI 20263	Serving Tent	2010/09/20 0822	No
00003P81	AFG PHOENI 20263	Burn Barrel	2010/09/20 0841	No
00003POD	AFG PHOENI 27270	TMC	2010/09/27 0812	No
00003PK8	AFG PHOENI 27270	Serving Tent	2010/09/27 0818	No
00003PLA	AFG PHOENI 27270	Burn Barrel	2010/09/27 0834	No
00003PPB	AFG PHOENI 04278	TMC	2010/10/04 0817	No
00003PPE	AFG PHOENI 04278	Serving Tent	2010/10/04 0827	No
00003PLS	AFG PHOENI 04278	Burn Barrel	2010/10/04 0842	No

Appendix C

Exposure Setting Information

Table C-1. Exposure Information at the Burn Barrels

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 Barrels site.
What is the timeframe under consideration?	The samples were collected on 14 August-4 October 2010. This encompasses a timeframe of approximately 2 months 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 months 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?	BURN PIT.
What is known about the exposure setting?	The burn barrels are a sample site at Phoenix, Afghanistan.
What are the exposure pathways?	Inhalation.
Where are the sampling sites relative to where exposure occurs?	The sampler at the burn barrel was placed on a barrier by the burn pit.

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

Table C-2. Exposure Information at the Serving Tent

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 Serving Tent.
What is the timeframe under consideration?	The samples were collected on 14 August-4 October 2010. This encompasses a timeframe of approximately 2 months 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 months 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?	The Serving Tent is a sample site at Phoenix, Afghanistan.
What are the exposure pathways?	Inhalation.
Where are the sampling sites relative to where exposure occurs?	The sampler was placed on a pole in the eating area.

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

Table C-3. Exposure Information at the TMC

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 TMC.
What is the timeframe under consideration?	The samples were collected on 14 August-4 October 2010. This encompasses a timeframe of approximately 2 months 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 months 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?	The TMC is a sample site at Phoenix, Afghanistan.
What are the exposure pathways?	Inhalation.
Where are the sampling sites relative to where exposure occurs?	The sampler was placed on a barrier in front of the TMC.

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 Burn Barrels

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: 1,289	Score 2: Concentration is >Critical MEG and next higher severity MEG does not exist.	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 7: Seldom
Average: 448	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 remain in this location for a continuous 24-hour period).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 8: Occasional

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

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

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: 231	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
Average: 97	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-3. Hazard Probability Scoring for $PM_{2.5}$ at the Fuel Point

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: 348	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: 123	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