



DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

18 JAN 2009

MCHB-TS-RDE

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

SUBJECT: Deployment Occupational and Environmental Health Risk Characterization,
Ambient Air Particulate Matter Samples, Adder, Iraq, 4-23 October 2008,
U_IRQ_ADDER_CM_A10_20081023

1. The enclosed assessment details the occupational and environmental health (OEH) risk characterization for eight ambient air samples collected by 71st Medical Detachment—Preventive Medicine personnel, Adder, Iraq, 4-23 October 2008.
2. The OEH risk estimate for exposure to particulate matter less than 10 micrometers in diameter (PM₁₀) and metals in the ambient air at Adder, Iraq, 4-23 October 2008 is low due to PM₁₀. Exposure to the ambient air on days with similar conditions may degrade unit readiness if the conditions occur during the mission.

FOR THE COMMANDER:

(b) (6)

Encl

Director, Health Risk Management

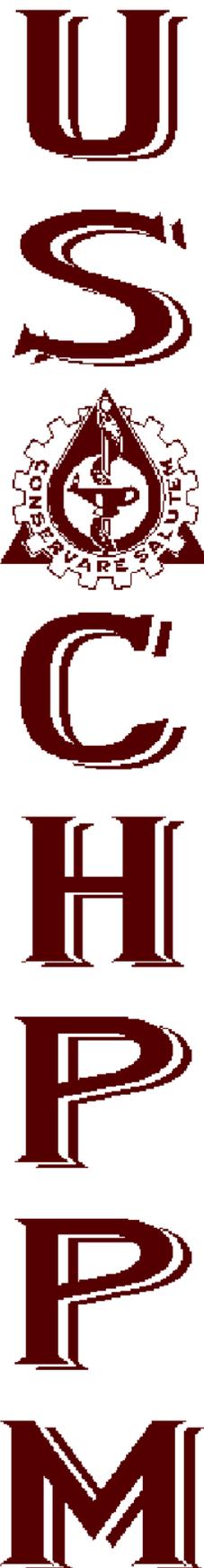
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CF: (w/encl)

485th MED DET PM (Commander/CPT (b) (6))
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485th MED DET PM (SSG (b) (6))
MNC-I (Command Surgeon/LTC (b) (6))
MNF-I CJ148 (Commander/CDR (b) (6))
ARCENT (Command Surgeon/LTC (b) (6))
CFLCC (Command Surgeon/LTC (b) (6))
CFLCC/USA 3RD MDSC (CPT (b) (6))
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U.S. Army Center for Health Promotion and Preventive Medicine



DEPLOYMENT OCCUPATIONAL AND ENVIRONMENTAL
HEALTH RISK CHARACTERIZATION
AMBIENT AIR PARTICULATE MATTER SAMPLES
ADDER, IRAQ
4-23 OCTOBER 2008
U_IRQ_ADDER_CM_A10_20081023

CHPPMFORM 433-E (MCHB-CS-IPD), OCT 03

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Preventive Medicine Survey: 40-5f1

Readiness Thru Health

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DEPLOYMENT OCCUPATIONAL AND ENVIRONMENTAL
HEALTH RISK CHARACTERIZATION
AMBIENT AIR PARTICULATE MATTER SAMPLES
ADDER, IRAQ
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U_IRQ_ADDER_CM_A10_20081023

1. REFERENCES.

- a. Department of the Army, Field Manual (FM) 5–19, Composite Risk Management, 21 August 2006.
- b. U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) Technical Guide (TG) 230, Chemical Exposure Guidelines for Deployed Military Personnel, Version 1.3, May 2003 with the January 2004 addendum.
- c. USACHPPM Reference Document (RD) 230, Chemical Exposure Guidelines for Deployed Military Personnel, Version 1.3, May 2003 with January 2004 addendum
- d. Memorandum, USACHPPM (MCHB-TS-RDE), 27 April 2007, Subject: Deployment Operational Risk Characterization Method for Particulate Matter (PM).

2. PURPOSE. According to U.S. Department of Defense medical surveillance requirements, this occupational and environmental health (OEH) risk characterization documents the identification and assessment of chemical hazards that pose potential health and operational risks to deployed troops. Specifically, the samples and information provided on the associated field data sheets were used to estimate the operational health risk associated with exposure to identified chemical hazards in the air at Adder, Iraq.

3. SCOPE. This assessment addresses the analytical results for eight ambient air samples collected from Adder, Iraq, 4–23 October 2008. These samples are limited in time, area, and media. Therefore, this report should not be considered a complete assessment of the overall OEH hazards to which troops may be exposed at this location. However, this assessment has been performed using operational risk management (ORM) doctrine FM 5–19, and the relatively conservative (protective) assumptions and methods provided in TG 230, to facilitate decision making that can minimize the likelihood of significant risks.

4. BACKGROUND AND EXPOSURE ASSUMPTIONS. The samples were collected to assess the potential for adverse health effects to troops routinely and continuously breathing the ambient air at Adder, Iraq. Four samples were collected by Building 208 and four samples were collected between the waste water lagoons and vector control area. The field data sheets indicated that there is a cement batch plant and bulk waste incinerators to the west of the vector

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control area and to the east of Building 208. Open burns pits are also located nearby. Strong winds and frequent sand storms were reported during the sampling event. All personnel are expected to remain at this location for greater than 1 year. A conservative (protective) assumption is that all personnel inhale the ambient air for 24 hours/day for 365 days (1 year). In addition, it is assumed that control measures and/or personal protective equipment are not used.

5. METHOD.

a. General. The USACHPPM Deployment Environmental Surveillance Program uses the TG 230 methodology and associated military exposure guidelines (MEGs) to assess identified hazards and estimate risk in a manner consistent with doctrinal risk management procedures and terminology. This method includes identification of the hazard(s), assessment of the hazard severity and probability, and determination of a risk estimate and associated level of confidence. As part of the hazard identification step, the long-term (1-year) MEGs are used as screening criteria to identify those hazards that are potential health threats. These 1-year MEGs represent exposure concentrations at or below which no significant health effects (including delayed or chronic disease or significant increased risk of cancer) are anticipated even after 1 year of continuous daily exposures. Short-term MEGs are used to assess one time or intermittent exposures. The underlying toxicological basis for the MEGs is addressed in RD 230. Since toxicological information about potential health effects varies among different chemicals, the determination of severity of effects when MEGs are exceeded involves professional judgment. Hazards with exposure concentrations greater than MEGs are identified as potential health threats, carried through the hazard assessment process, and assigned a risk estimate consistent with ORM methodology. Hazards that are either not detected or are present only at levels below the 1-year MEGs are not considered health threats and, therefore, are automatically assigned a low operational risk estimate.

b. Assessment of Ambient Air Particulate Matter. The PM is one of six air pollutants for which the U.S. Environmental Protection Agency (USEPA) has promulgated National Ambient Air Quality Standards in the interest of protecting public health. In addition, the USEPA developed the Air Quality Index (AQI) to communicate daily air quality to the public using six descriptive categories ranging from “good” to “hazardous.” The AQI categories for PM are based on concentration ranges that are grouped according to the severity of health concerns. The USACHPPM uses the AQI categories to characterize the operational risk from PM. If any PM sample concentration is above the threshold of the AQI good quality air category, it is identified as a hazard. Hazard severity is determined by comparing the average PM concentration for a specific location and timeframe to PM concentration ranges identified as either negligible or marginal. Negligible concentration levels correspond to mild respiratory effects among generally healthy troops, with more significant effects among sensitive persons, such as, asthmatics or those with existing cardiopulmonary disease. Marginal concentration levels are expected to pose more significant health effects among both healthy personnel, and those with

pre-existing sensitivities. Hazard probability is based on the frequency that anticipated exposures are above a threshold that is representative of the hazard severity category.

6. HAZARD IDENTIFICATION.

a. Sample Information. Eight valid samples were collected with the Mini-Vol™ apparatus. A field blank was also submitted with the samples. (Mini-Vol™ is a registered trademark of Airmetrics.)

b. Laboratory Analysis. The eight valid samples were analyzed for PM less than or equal to 10 micrometers in diameter (PM₁₀) and metals. Detected metals identified above the laboratory reportable limit were compared to MEGs presented in TG 230, while PM₁₀ concentrations were compared to the AQI. Appendix A shows a summary of the samples assessed in this report. Appendix B shows a sample results summary table. Appendix C shows complete analytical results.

c. Assessment.

(1) Particulate Matter. Since PM₁₀ was measured at a concentration above the AQI good range, PM₁₀ is identified as a potential health threat requiring further assessment. The PM air pollutants include solid particles and liquid droplets, emitted directly into the air by sources, such as, power plants, motor vehicles, aircraft, generators, construction activities, fires, and natural windblown dust. The PM can include dust, silica, soil, metals, organic compounds, allergens, and compounds, such as, nitrates or sulfates that are formed by condensation or transformation of combustion exhaust. The PM chemical composition and size vary considerably depending on the source.

(2) Metals. No detected metals were found at concentrations greater than their respective MEGs. Therefore, the OEH risk estimate for exposure to metals completed in the lab analysis in the ambient air at this location is considered **low**.

7. HAZARD ASSESSMENT.

a. Hazard Severity. The average concentration of PM₁₀ was 504 micrograms per cubic meter (µg/m³). This concentration falls within the range of concentrations that are believed to pose significant respiratory effects in generally healthy troops causing some operational impact, particularly if the exposures are repeated or continuous. Uniquely susceptible personnel, such as those with asthma have an even greater risk—as exposures may induce asthma attacks. Heavy aerobic activity may exacerbate health effects caused by PM. Therefore, the hazard severity is considered **marginal**.

b. Hazard Probability. The hazard probability reflects the likelihood that the exposures at the location are represented by the concentrations used to determine the hazard severity. The probability that the severity of a hazard is marginal is based on a comparison of individual sample concentrations to the lowest bound of the marginal category (350 µg/m³). During this sampling event, the range of PM₁₀ sample concentrations was 145–2461 µg/m³, and 2 of 8 (25 percent) of samples were above 350 µg/m³; therefore, the probability that personnel in the sampled areas will be exposed to PM₁₀ greater than 350 µg/m³ is considered **seldom**.

c. Risk Estimate and Confidence. The hazard severity and probability levels described above were used with the ORM matrix in TG 230, Table 3–3, or FM 5–19 to provide a risk estimate for exposure to each identified hazard. Table 1 summarizes the risk estimate for each identified hazard. The risk estimate for exposure to PM₁₀ in the ambient air at Adder, Iraq on the sampled dates is considered **low** due to PM₁₀. Using TG 230, Table 3–5 as a guide, confidence in the risk estimate is considered **medium**. In this sampling event, the sample results and risk estimate are consistent with historical analyses for this location. In general, the confidence level in risk estimates is usually low to medium due to consistent lack of specific exposure information associated with troop movement and activity patterns; other routes/sources of potential OEH hazards not identified; and uncertainty regarding impacts of multiple chemicals present, particularly those affecting the same body organs/systems.

Table 1. Risk Estimate Summary for Exposure to PM₁₀ in the Ambient Air, 4–23 October 2008, Adder, Iraq

Parameter	Hazard Severity	Hazard Probability	Hazard-Specific Risk Estimate	Operational Risk Estimate	Confidence
PM ₁₀	MARGINAL	SELDOM	LOW	LOW	MEDIUM
Metals	No parameters detected above a MEG		LOW		

8. **CONCLUSION**. The OEH risk estimate for exposure to PM₁₀ and metals in the ambient air at Adder, Iraq, 4–23 October 2008 is **low** due to PM₁₀. However, exposure to the ambient air on days with similar conditions may degrade unit readiness if the conditions occur during the mission.

9. RECOMMENDATIONS AND NOTE.

a. Recommendations.

(1) Consider collecting PM less than 2.5 microns in diameter (PM_{2.5}) samples as well as PM₁₀ samples from this location at least once every 6 days for the deployment duration (or as long as possible) to better characterize the PM_{2.5} and/or PM₁₀ and metals ambient air concentrations to which personnel are typically exposed.

(2) Restrict outdoor physical activities where possible during periods of visibly high particulate levels.

(3) Inform preventive medicine and medical personnel of potential health effects resulting from exposures to the measured levels of ambient PM and associated heavy metals. Disease Non-Battle Injury (DNBI) rates of respiratory diseases, particularly asthma, should be followed and assessed during periods of high PM levels. If elevated DNBI respiratory illness rates (that is, above two standard deviations), or an increase in the incidence or severity of asthma, are noted during periods of high PM levels, ensure appropriate medical surveillance-related items are documents. If assistance and/or information are needed on environmental health effects and/or medical implications from exposure to PM and associated heavy metals, please contact the USACHPPM–Headquarters Environmental Medicine Program at commercial 001 (410) 436-2714.

b. Note. This OEH risk assessment is specific to the exposure assumptions identified above and the sample results assessed in this report. If the assumed exposure scenario changes or additional information is available, provide the updated information so that the risk estimate can be reassessed. If additional samples from this site and/or area are collected, a new OEH risk assessment will be completed.

Deployment OEH Risk Characterization, Ambient Air PM Samples, Adder, Iraq, 4–23 Oct 08,
U_IRQ_ADDER_CM_A10_20081023

10. POINTS OF CONTACT. The USACHPPM points of contact for this assessment are Mr. (b) (6) and Mr. (b) (6). Mr. (b) (6) may be contacted at e-mail (b) (6); Ms. (b) (6) 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)

MAJ, MS
Program Manager
Deployment Environmental Surveillance

APPENDIX A
SAMPLING SUMMARY

Table A–1. Summary for Eight Ambient Air Samples Collected, Adder, Iraq, 4–23 October 2008

Sample ID	Field/Local Sample ID	Location	Start Date/Time	Exposure Notes	Sample Time	PM Mini-Vol Sampler Serial #
00000HVL	IRQ ADDER 08248 PM10MV	ADDER	2008/10/04 1030	Prevailing wind out of the west; frequent sand storms. Cement batch plant 2 kilometers (km) east bulk waste incinerator 2 km east open burn pit 2.5 km east	1434.0 min	3274
00000HVO	IRQ ADDER 08279	ADDER	2008/10/05 1000	Prevailing wind out of the west; frequent sand storms. Cement batch plant 2km east bulk waste incinerator 2 km east open burn pit 2.5 km east	1440.0 min	3647
00000HWV	IRQ ADDER 08284 PM10MV	ADDER	2008/10/10 0921	Prevailing wind out of the west; frequent sand storms. Cement batch plant 2 km east bulk waste incinerator 2 km east open burn pit 2.5 km east	1440.0 min	3647
00000HVX	IRQ ADDER 08285 PM10MV	ADDER	2008/10/11 0930	Prevailing wind out of the west; frequent sand storms. Cement batch plant 2 km east bulk waste incinerator 2 km east open burn pit 2.5 km east	1440.0 min	3274
00000HW0	IRQ ADDER 08290 PM10MV	ADDER	2008/10/16 1415	Prevailing wind out of the west; frequent sand storms. Cement batch plant 2 km east bulk waste incinerator 2 km east open burn pit 2.5 km east	1440.0 min	3647
00000HW7	IRQ ADDER 08291 PM10MV	ADDER	2008/10/17 1400	Prevailing wind out of the west; frequent sand storms. Cement batch plant 2 km east bulk waste incinerator 2 km east open burn pit 2.5 km east	1440.0 min	3274

Table A–1. Summary for Eight Ambient Air Samples Collected, Adder, Iraq, 4–23 October 2008 (continued)

Sample ID	Field/Local Sample ID	Location	Start Date/Time	Exposure Notes	Sample Time	PM Mini-Vol Sampler Serial #
00000HWA	IRQ ADDER 08296 PM10MV	ADDER	2008/10/22 1000	Prevailing wind out of the west; frequent sand storms. Cement batch plant 2 km east bulk waste incinerator 2 km east open burn pit 2.5 km east	1446.0 min	3274
00000HWK	IRQ ADDER 08297 PM10MV	ADDER	2008/10/23 0920	Prevailing wind out of the west; frequent sand storms. Cement batch plant 2 km east bulk waste incinerator 2 km east open burn pit 2.5 km east	1440.0 min	3647

APPENDIX B

SAMPLE RESULTS SUMMARY

Table B–1. Results Summary for Eight Ambient Air Samples Collected, Adder, Iraq, 4–23 October 2008

Parameter	Units	Result		Samples (Valid)		USACHPPM TG230 Military Exposure Guidelines	
		Max	Avg	#	# > Reporting Limit	1yr	
						# > MEG	MEG
Chromium	µg/m ³	0.15103	0.049668	8	1	0	12
Manganese	µg/m ³	1.1495	0.26685	8	1	0	3.4
Nickel	µg/m ³	0.22935	0.059457	8	1	0	37
PM10	µg/m ³	2461	504	8	8	8	50

Note:

Highlighted values indicate the parameter was detected at a concentration above a MEG

APPENDIX C

DETAILED SAMPLE RESULTS

Table C–1. Analytical Results for Eight Ambient Air Samples Collected, Adder, Iraq, 4–23 October 2008

Sample ID			00000HVL	00000HVO	00000HVW	00000HVX	00000HW0	00000HW7	00000HWA	00000HWK
Field/Local Sample ID			IRQ ADDER 08248 PM10MV	IRQ ADDER 08279	IRQ ADDER 08284 PM10MV	IRQ ADDER 08285 PM10MV	IRQ ADDER 08290 PM10MV	IRQ ADDER 08291 PM10MV	IRQ ADDER 08296 PM10MV	IRQ ADDER 08297 PM10MV
Country			Iraq	Iraq	Iraq	Iraq	Iraq	Iraq	Iraq	Iraq
Location			ADDER	ADDER	ADDER	ADDER	ADDER	ADDER	ADDER	ADDER
Start Date			2008/10/04 1030	2008/10/05 1000	2008/10/10 0921	2008/10/11 0930	2008/10/16 1415	2008/10/17 1400	2008/10/22 1000	2008/10/23 0920
Analyte	Class	Units	Results							
Antimony	Metals	µg/m ³	< 0.14110	< 0.14036	< 0.14194	< 0.14103	< 0.13985	< 0.13935	< 0.13967	< 0.14180
Arsenic	Metals	µg/m ³	< 0.070548	< 0.070180	< 0.070969	< 0.070517	< 0.069923	< 0.069673	< 0.069836	< 0.070898
Beryllium	Metals	µg/m ³	< 0.070548	< 0.070180	< 0.070969	< 0.070517	< 0.069923	< 0.069673	< 0.069836	< 0.070898
Cadmium	Metals	µg/m ³	< 0.070548	< 0.070180	< 0.070969	< 0.070517	< 0.069923	< 0.069673	< 0.069836	< 0.070898
Chromium	Metals	µg/m ³	< 0.070548	< 0.070180	< 0.070969	< 0.070517	0.15103	< 0.069673	< 0.069836	< 0.070898
Lead	Metals	µg/m ³	< 0.14110	< 0.14036	< 0.14194	< 0.14103	< 0.13985	< 0.13935	< 0.13967	< 0.14180
Manganese	Metals	µg/m ³	< 0.28219	< 0.28072	< 0.28388	< 0.28207	1.1495	< 0.27869	< 0.27934	< 0.28359
Nickel	Metals	µg/m ³	< 0.070548	< 0.070180	< 0.070969	< 0.070517	0.22935	< 0.069673	< 0.069836	< 0.070898
PM10		µg/m ³	145	353	215	159	2461	190	226	280
Vanadium	Metals	µg/m ³	< 0.28219	< 0.28072	< 0.28388	< 0.28207	< 0.27969	< 0.27869	< 0.27934	< 0.28359
Zinc	Metals	µg/m ³	< 0.70548	< 0.70180	< 0.70969	< 0.70517	< 0.69923	< 0.69673	< 0.69836	< 0.70898