Military Deployment
Periodic Occupational and Environmental Monitoring Summary (POEMS):
Al Qaim and vicinity, Iraq
Calendar Years: (2003 to 2009)

AUTHORITY: This periodic occupational and environmental monitoring summary (POEMS) has been developed in accordance with Department of Defense (DoD) Instructions 6490.03, 6055.05, and JCSM (MCM) 0017-12, *See REFERENCES.*

PURPOSE: This POEMS documents the DoD assessment of Occupational and Environmental Health (OEH) risk for Al Qaim, Iraq and vicinity that includes Camp Dayton, Camp Gannon, and Ubaydi. It presents a qualitative summary of health risks identified at this location and their potential medical implications. The report is based on information collected from 26 August 2003 through 14 July 2009 to include deployment OEHS sampling and monitoring data (e.g., air, water, and soil), field investigation and health assessment reports, as well as country and area-specific information on endemic diseases.

This assessment assumes that environmental sampling at Al Qaim and vicinity during this period was performed at representative exposure points selected to characterize health risks at the *population–level*. Due to the nature of environmental sampling, the data upon which this report is based may not be fully representative of all the fluctuations in environmental quality or capture unique occurrences. While one might expect health risks pertaining to historic or future conditions at this site to be similar to those described in this report, the health risk assessment is limited to 26 August 2003 through 14 July 2009.

The POEMS can be useful to inform healthcare providers and others of environmental conditions experienced by individuals deployed to Al Qaim and vicinity during the period of this assessment. However, it does not represent an individual exposure profile. Individual exposures depend on many variables such as; how long, how often, where and what someone is doing while working and/or spending time outside. Individual outdoor activities and associated routes of exposure are extremely variable and cannot be identified from or during environmental sampling. Individuals who sought medical treatment related to OEH exposures while deployed should have exposure/treatment noted in their medical record on a Standard Form (SF) 600 (Chronological Record of Medical Care).

SITE DESCRIPTION: Al Qaim is a border town in Iraq, located in the western edge of Anbar Province about one mile from the Syrian border. Al Qaim is located along the Euphrates River about 200 miles northwest of Baghdad. A forward operating base located in Al Qaim provided air support to Marines operating in the region. A chemical fertilizer complex located in Al Qaim was used for processing phosphate. Camp Dayton was located near the city of Al Qaim. Camp Gannon was located in the town of Husaybah, near the Syrian border, and was formerly known as Camp Husaybah. The camp was situated in an abandoned warehouse. Ubaydi is an Iraqi city situated on the southern side of the Euphrates River and it is considered a subdistrict of Al Qaim. A forward operating base was located in Ubaydi. Risk levels are general for the area and may not be specific to particular base camps.

SUMMARY: Conditions that may pose a Moderate or greater health risk are summarized in Table 1. Table 2 provides population based risk estimates for identified OEH conditions at Al Qaim and vicinity. As indicated in the detailed sections that follow Table 2, controls established to reduce health risk were factored into this assessment. In some cases (e.g., ambient air), specific controls are noted, but not routinely available/feasible.

Table 1: Summary of Occupational and Environmental Conditions with MODERATE or Greater Health Risk

Short-term health risks & medical implications:

The following may have caused acute health effects in some personnel during deployment at Al Qaim and vicinity that includes Camp Dayton, Camp Gannon, and Ubaydi:

Food/waterborne diseases (e.g., bacterial diarrhea, hepatitis A, typhoid/paratyphoid fever, brucellosis, diarrhea-cholera, diarrhea-protozoal); other endemic diseases (leishmaniasis – cutaneous, Crimean-Congo hemorrhagic fever, sandfly fever, typhus-miteborne, leptospirosis, schistosomiasis, Tuberculosis (TB), rabies, Q fever); and heat stress. For food/waterborne diseases (e.g., bacterial diarrhea, hepatitis A, typhoid/paratyphoid fever, brucellosis, diarrhea-cholera, diarrhea-protozoal), if ingesting local food and water, the health effects can temporarily incapacitate personnel (diarrhea) or result in prolonged illness (hepatitis A, typhoid fever, brucellosis). Risks from food/waterborne diseases may have been reduced with preventive medicine controls and mitigation, which includes hepatitis A and typhoid fever vaccinations and only drinking from approved water sources in accordance with standing CENTCOM policy. For other vector-borne endemic diseases (leishmaniasis – cutaneous, Crimean-Congo hemorrhagic fever, sandfly fever, typhus-miteborne), these diseases may constitute a significant risk due to exposure to biting vectors; risk reduced to Low by proper wear of the treated uniform, application of repellent to exposed skin and bed net use, minimizing areas of standing water, and appropriate chemoprophylaxis. For water contact diseases (leptospirosis and schistosomiasis) activities involving extensive contact with surface water increase risk. For respiratory diseases (tuberculosis or TB), personnel in close-quarter conditions could have been at risk for person-to-person spread. Animal contact diseases (rabies, Q fever), pose year-round risk. For heat stress, risk can be greater in months April through October, and for susceptible persons including those older than 45, of low fitness level, unacclimatized, or with underlying medical conditions. Risks from heat stress may have been reduced with preventive medicine controls, work-rest cycles, proper hydration and nutrition, and mitigation.

Air quality: Though the overall short-term risk was 'low' for inhalable coarse particulate matter less than 10 micrometers in diameter (PM_{10}) and for inhalable fine particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$), the area is a dusty desert environment and conditions may vary. PM_{10} and $PM_{2.5}$, exposures may result in mild to more serious short-term health effects (e.g., eye, nose or throat and lung irritation) in some personnel while at this site, particularly exposures to high levels of dust such as during high winds or dust storms. For PM_{10} and $PM_{2.5}$, certain subgroups of the deployed forces (e.g., those with pre-existing asthma/cardio-pulmonary conditions) are at greatest risk of developing notable health effects. Although no data on burn pits were available to evaluate short-term risk, there were burn pits on site (a burn pit was located on Camp Gannon. It is unknown whether burn pits were located at the Al Qaim, Camp Dayton, or Ubaydi locations; see Section 10.7). For burn pits, exposures to high levels of PM_{10} and $PM_{2.5}$ in the smoke may also result in mild to more serious short-term health effects (e.g., eye, nose or throat and lung irritation) in some personnel and certain subgroups while at this site. Although most effects from exposure to particulate matter and burn pit smoke should have resolved post-deployment, providers should be prepared to consider the relationship between deployment exposures and current complaints. Some individuals may have sought treatment for acute respiratory irritation during their time at Al Qaim and vicinity. Personnel who reported with symptoms or required treatment while at this site should have exposure and treatment noted in medical record (e.g., electronic medical record and/or on a Standard Form (SF) 600 (*Chronological Record of Medical Care*).

Long-term health risks & medical implications:

The hazards associated with potential long-term health effects at Al Qaim that includes Camp Dayton, Camp Gannon, and Ubaydi, include:

Air quality: Although fine particulate matter less than 10 micrometers in diameter (PM_{10}) was not evaluated for long-term risk due to no available health guidelines, and the overall long-term risk was 'low' for exposure to inhalable fine particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$), the area was a dusty desert environment and conditions may vary. In addition, though there were no samples taken near the burn pits available for long-term assessment, there were burn pits present on site (a burn pit was located on Camp Gannon. It is unknown whether burn pits were located at the Al Qaim, Camp Dayton, or Ubaydi locations; see Section 10.7)). For inhalational exposure to high levels of dust, $PM_{10,}$ and $PM_{2.5}$, such as during high winds or dust storms, and for exposure to burn pit smoke, it is considered possible that some otherwise healthy personnel who were exposed for a long-term period to dust and particulate matter could develop certain health conditions (e.g., reduced lung function, cardiopulmonary disease). Personnel with a history of asthma or cardiopulmonary disease could potentially be more likely to develop such chronic health conditions. While the dust and particulate matter exposures and exposures to burn pit smoke were acknowledged, at this time there were no specific recommended, post-deployment medical surveillance evaluations or treatments. Providers should still consider overall individual health status (e.g., any underlying conditions/susceptibilities) and any potential unique individual exposures (such as burn pits, occupational or specific personal dosimeter data) when assessing individual concerns.

Certain individuals may need to be followed/evaluated for specific occupational exposures/injuries (e.g., annual audiograms as part of the medical surveillance for those enrolled in the Hearing Conservation Program; and personnel covered by Respiratory Protection Program and/or Hazardous Waste/Emergency Responders Medical Surveillance).

Table 2. Population-Based Health Risk Estimates – Al Qaim and vicinity that includes Camp Dayton, Camp Gannon, and Ubaydi [1, 2]

Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented	Residual Health Risk Estimate[4]
AIR			
Particulate matter less than 10 microns in diameter (PM_{10})	Short-term: Low, A majority of the time mild acute (short term) health effects were anticipated; certain peak levels may have produced mild eye, nose, or throat irritation in some personnel and pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated.	Limiting strenuous physical activities when air quality was especially poor; and actions such as closing tent flaps, windows, and doors.	Short-term: Low, A majority of the time mild acute (short term) health effects were anticipated; certain peak levels may have produced mild eye, nose, or throat irritation in some personnel and pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated.
	Long-term: No health guidelines		Long-term: No health guidelines
Particulate matter less than 2.5 microns in diameter ($PM_{2.5}$)	Short-term: Low, A majority of the time mild acute (short term) health effects were anticipated; certain peak levels may have produced mild eye, nose, or throat irritation in some personnel and pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated.	Limiting strenuous physical activities when air quality was especially poor; and actions such as closing tent flaps, windows, and doors.	Short-term: Low, A majority of the time mild acute (short term) health effects were anticipated; certain peak levels may have produced mild eye, nose, or throat irritation in some personnel and pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated.
	Long-term: Low. A small percentage of personnel may have been at increased risk for developing chronic conditions. Particularly those more susceptible to acute effects (e.g., those with asthma/existing respiratory diseases).		Long-term: Low. A small percentage of personnel may have been at increased risk for developing chronic conditions. Particularly those more susceptible to acute effects (e.g., those with asthma/existing respiratory diseases).
ENDEMIC DISEASE			
Food borne/Waterborne (e.g., diarrhea-bacteriological)	Short-term: Variable. High (bacterial diarrhea, hepatitis A, typhoid fever) to Moderate (diarrhea-cholera, diarrhea-protozoal, brucellosis) and to Low (hepatitis E). If local food/water were consumed, the health effects could have temporarily incapacitated personnel (diarrhea) or result in prolonged illness (Hepatitis A, Typhoid fever, Brucellosis, Hepatitis E).	Preventive measures included Hepatitis A and Typhoid fever vaccination and consumption of food and water only from approved sources.	Short-term: Low to none
	Long-term: none identified		Long-term: No data available
Arthropod Vector Borne	Short-term: Variable, Moderate for leishmaniasis-cutaneous, Crimean-Congo hemorrhagic fever, sandfly fever and typhus-miteborne; Low for West Nile fever, and Plague.	Preventive measures included proper wear of treated uniform, application of repellent to exposed skin, and bed net use, minimizing areas of standing water and appropriate chemoprophylaxis.	Short-term: Low
	Long-term: Low (Leishmaniasis-visceral infection)		Long-term: No data available
Water-Contact (e.g. wading, swimming)	Short-term: Moderate for leptospirosis and schistosomiasis.		Short-term: Moderate for leptospirosis and schistosomiasis.
	Long-term: No data available		Long-term: No data available
Respiratory	Short-term: Variable; Moderate for tuberculosis (TB) to Low for meningococcal meningitis.	Providing adequate living and work space; medical screening; vaccination	Short-term: Low
	Long-term: No data available		Long-term: No data available

Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented	Residual Health Risk Estimate[4]
Animal Contact	Short-term: Variable; Moderate for rabies and Q-fever, and Low for Anthrax and H5N1 avian influenza. Long-term: Low (Rabies)	Prohibiting contact with, adoption, or feeding of feral animals IAW CENTCOM GO 1B. Risks were further reduced in the event of assessed contact by prompt post-exposure rabies prophylaxis IAW The CDC's ACIP guidance.	Short-term: No data available Long-term: No data available
VENOMOUS ANIMAL/ INSECTS			
Snakes, scorpions, and spiders	Short-term: Low; If encountered, effects of venom vary with species from mild localized swelling (e.g. *Scorpiops maurus*) to potentially lethal effects (e.g. *Vipera albicornuta*). Long-term: No data available	Risk reduced by avoiding contact, proper wear of uniform (especially footwear), and proper and timely treatment.	Short-term: Low; If encountered, effects of venom vary with species from mild localized swelling (e.g. *Scorpiops maurus*) to potentially lethal effects (e.g. *Vipera albicornuta*). Long-term: No data available
HEAT/COLD STRESS			
Heat	Short-term: Variable; Risk of heat injury was Extremely High for May – September, High for October, Moderate for April, and Low for all other months. Long-term: Low, The long-term risk was Low. However, the risk may have been greater to certain susceptible persons–those older (i.e., greater than 45 years), in lesser physical shape, or with underlying medical/health conditions.	Work-rest cycles, proper hydration and nutrition, and WBGT monitoring.	Short-term: Variable; Risk of heat injury was Extremely High for May – September, High for October, Moderate for April, and Low for all other months. Long-term: Low, The long-term risk was Low. However, the risk may have been greater to certain susceptible persons–those older (i.e., greater than 45 years), in lesser physical shape, or with underlying medical/health conditions.
Cold	Short-term: Low risk of cold stress/injury. Long-term: Low; Long-term health implications from cold injuries were rare but could occur, especially from more serious injuries such as frost bite.	Risks from cold stress reduced with protective measures such as use of the buddy system, limiting exposure during cold weather, proper hydration and nutrition, and proper wear of issued protective clothing.	Short-term: Low risk of cold stress/injury. Long-term: Low; Long-term health implications from cold injuries were rare but could occur, especially from more serious injuries such as frost bite.

Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented	Residual Health Risk Estimate[4]
Unique Incidents/ Concerns			
Burn Pits	Short-term: No data available	Risks reduced by limiting strenuous physical activities when air quality was especially poor; and action such as closing tent flaps, windows, and doors. Other control measures included locating burn pits downwind of prevailing winds, increased distance from troop populations, and improved waste segregation and management techniques.	Short-term: No data available
	Long-term: No data available		Long-term: No data available

[1]This Summary Table provides a qualitative estimate of population-based short- and long-term health risks associated with the occupational environment conditions at Al Qaim and vicinity that includes Camp Dayton, Camp Gannon, and Ubaydi. It does not represent an individual exposure profile. Actual individual exposures and health effects depend on many variables. For example, while a chemical may have been present in the environment, if a person did not inhale, ingest, or contact a specific dose of the chemical for adequate duration and frequency, then there may have been no health risk. Alternatively, a person at a specific location may have experienced a unique exposure which could result in a significant individual exposure. Any such person seeking medical care should have their specific exposure documented in an SF600.

[2] This assessment is based on specific environmental sampling data and reports obtained from 26 August 2003 through 14 July 2009. Sampling locations are assumed to be representative of exposure points for the camp population but may not reflect all the fluctuations in environmental quality or capture unique exposure incidents.

[3]This Summary Table is organized by major categories of identified sources of health risk. It only lists those sub-categories specifically identified and addressed at Al Qaim and vicinity. The health risks are presented as Low, Moderate, High or Extremely High for both acute and chronic health effects. The health risk level is based on an assessment of both the potential severity of the health effects that could be caused and probability of the exposure that would produce such health effects. Details can be obtained from the Army Public Health Center (Provisional). Where applicable, "None Identified" is used when though a potential exposure is identified, and no health risks of either a specific acute or chronic health effects are determined. More detailed descriptions of OEH exposures that are evaluated but determined to pose no health risk are discussed in the following sections of this report.

[4]Health risks in this Summary Table are based on quantitative surveillance thresholds (e.g. endemic disease rates; host/vector/pathogen surveillance) or screening levels, e.g., Military Exposure Guidelines (MEGs) for chemicals. Some previous assessment reports may provide slightly inconsistent health risk estimates because quantitative criteria such as MEGs may have changed since the samples were originally evaluated and/or because this assessment makes use of all historic site data while previous reports may have only been based on a select few samples.

1 Discussion of Health Risks at Al Qaim and vicinity, Iraq by Source

The following sections provide additional information about the OEH conditions summarized above. All risk assessments were performed using the methodology described in the U.S. Army Public Health Command (USAPHC) Technical Guide 230, *Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel* (USAPHC TG 230, Reference 9). All OEH risk estimates represent residual risk after accounting for preventive controls in place. Occupational exposures and exposures to endemic diseases are greatly reduced by preventive measures. For environmental exposures related to airborne dust, there are limited preventive measures available, and available measures have little efficacy in reducing exposure to ambient conditions.

2 Air

2.1 Site-Specific Sources Identified

Al Qaim and vicinity is situated in a dusty semi-arid desert environment. Inhalational exposure to high levels of dust and particulate matter, such as during high winds or dust storms, may have resulted in mild to more serious short-term health effects (e.g., eye, nose or throat and lung irritation) in some personnel. Additionally, certain subgroups of the deployed forces (e.g., those with pre-existing asthma/cardio pulmonary conditions) were at greatest risk of developing notable health effects.

2.2 Particulate matter

Particulate matter (PM) is a complex mixture of extremely small particles suspended in the air. The PM included 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 sand, soil, metals, volatile organic compounds (VOC), allergens, and other compounds such as nitrates or sulfates that are formed by condensation or transformation of combustion exhaust. The PM composition and particle size vary considerably depending on the source. Generally, PM of health concern is divided into two fractions: coarse particles with a diameter of 10 micrometers or less (PM_{10}) and fine particles less than 2.5 micron ($PM_{2.5}$), which can reach the deepest regions of the lungs when inhaled. Exposure to excessive PM is linked to a variety of potential health effects.

2.3 Particulate matter, less than10 micrometers (PM_{10})

2.3.1 Exposure Guidelines:

Short Term (24-hour) PM_{10} ($\mu g/m^3$):

- Negligible MEG = 250
- Marginal MEG = 420
- Critical MEG = 600

Long-term PM_{10} MEG ($\mu g/m^3$):

- Not defined and not available.

2.3.2 Sample data/Notes:

A total of 13 valid PM_{10} air samples were collected from 12 May 2004 to 18 December 2004. The range of 24-hour PM_{10} concentrations was 14 $\mu g/m^3$ – 384 $\mu g/m^3$ with an average concentration of 128 $\mu g/m^3$.

2.3.3 Short-term health risks:

Low: The short-term PM_{10} health risk was Low based on average and peak PM_{10} sample concentrations, and the likelihood of exposure at these hazard severity levels. A Low health risk assessment was expected to have little to no in-theater medical resources anticipated for protection and treatment. However, a summary of any negative or low level sampling results should be documented and archived particularly if some personnel express concerns (Reference 9, Table 3-2). Daily average health risk levels for PM_{10} showed no hazard for 92.9% and low health risk for 7.1% of the time. Confidence in the short-term PM_{10} health risk assessment is low (Reference 9, Table 3-6).

The hazard severity for average PM_{10} concentrations in samples was negligible. The results indicate that a few personnel may experience notable mild eye, nose, or throat irritation; most personnel will experience only mild effects. Pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated. (Reference 9, Table 3-10).

For the highest observed PM_{10} sample concentration, the hazard severity was negligible. During peak exposures at the negligible hazard severity level, few personnel may experience notable mild eye, nose, or throat irritation; most personnel will experience only mild effects. Pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated. (Reference 9, Table 3-10).

2.3.4 Long-term health risk:

Not Evaluated-no available health guidelines. The U.S. Environmental Protection Agency (USEPA) has retracted its long-term standard (national ambient air quality standards, NAAQS) for PM_{10} due to an inability to clearly link chronic health effects with chronic PM_{10} exposure levels.

2.4 Particulate Matter, less than 2.5 *micrometers* ($PM_{2.5}$)

2.4.1 Exposure Guidelines:

Short Term (24-hour) $PM_{2.5}$ ($\mu g/m^3$):

- Negligible MEG = 65
- Marginal MEG = 250
- Critical MEG = 500

Long-term (1year) $PM_{2.5}$ MEGs ($\mu g/m^3$):

- Negligible MEG = 15
- Marginal MEG = 65.

2.4.2 Sample data/Notes:

Al Qaim: A total of nine valid $PM_{2.5}$ air samples were collected from 24 May 2004 to 12 July 2009. The range of 24-hour $PM_{2.5}$ concentrations was 31 $\mu g/m^3$ – 81 $\mu g/m^3$ with an average concentration of 46 $\mu g/m^3$.

2.4.3 Short-term health risks:

Low: The short-term $PM_{2.5}$ health risk assessment was Low based on average and peak $PM_{2.5}$ sample concentrations, and the likelihood of exposure at these hazard severity levels. A Low health risk is expected to have little to no in-theater medical resources anticipated for protection and treatment. However, a summary of any negative or low level sampling results should be documented and archived particularly if some personnel express concerns (Reference 9, Table 3-2). Daily average health risk levels for $PM_{2.5}$ showed no hazard for 80% and low health risk for 20% of the time. Confidence in the short-term $PM_{2.5}$ health risk assessment was low (Reference 9, Table 3-6).

The hazard severity was negligible for average $PM_{2.5}$ sample concentrations. The results indicate that a few personnel may experience notable mild eye, nose, or throat irritation; most personnel will experience only mild effects. Pre-existing health conditions (e.g., asthma or cardiopulmonary diseases) may be exacerbated (Reference 9, Table 3-10).

For the highest observed $PM_{2.5}$ exposure, the hazard severity was negligible. During peak exposures at the negligible hazard severity level, a few personnel may experience notable mild eye, nose, or throat irritation; most personnel will experience only mild effects. Pre-existing health conditions (e.g., asthma or cardiopulmonary diseases) may be exacerbated (Reference 9, Table 3-10).

2.4.4 Long-term health risks:

Low: The long-term health risk assessment was Low based on average $PM_{2.5}$ concentration, and the likelihood of exposure at this hazard severity level. A Low health risk suggests that long-term exposure to $PM_{2.5}$ is expected to require no specific medical action (Reference 9, Table 3-3). Confidence in the long-term $PM_{2.5}$ health risk assessment was low (Reference 9, Table 3-6).

The hazard severity was negligible for average $PM_{2.5}$ sample concentrations. The results suggest that with repeated exposures above the negligible hazard severity threshold, it is considered possible that a small percentage of personnel may have increased risk for developing chronic conditions, such as reduced lung function or exacerbated chronic bronchitis, chronic obstructive pulmonary disease, asthma, atherosclerosis, or other cardiopulmonary diseases. Personnel with history of asthma or cardiopulmonary disease were considered to be at particular risk. Exposures below this were not expected to result in development of chronic health conditions in generally healthy troops (Reference 9, Table 3-11).

2.5 Airborne Metals from PM_{10} and $PM_{2.5}$

2.5.1 Sample data/Notes:

A total of 13 valid PM_{10} airborne metal samples were collected at Al Qaim and vicinity from 12 May 2004 to 24 July 2004. A total of nine valid $PM_{2.5}$ airborne metal samples were collected at Al Qaim and vicinity from 24 May 2004 to 12 July 2009. None of the analyzed metals were found at concentrations above short or long-term MEGs.

2.5.2 Short- and long-term health risks:

None identified based on the available sampling data. No parameters exceeded 1-year Negligible MEGs.

2.6 Volatile Organic Compounds (VOC)

2.6.1 Sample data/Notes:

The health risk assessment was based on average and peak concentration of 11 valid volatile organic chemical (VOC) air samples collected from 10 May 2004 to 19 December 2004, and the likelihood of exposure. None of the analyzed VOC pollutants were found at concentrations above short or long-term MEGs.

2.6.3 Short and long-term health risks:

None identified based on the available sampling data. No parameters exceeded 1-year Negligible MEGs.

3 Soil

3.1 Site-Specific Sources Identified

3.2 Sample data/Notes:

A total of 18 valid surface soil samples were collected from 26 August 2003 to 14 July 2009, to assess OEH health risk to deployed personnel. The primary soil contamination exposure pathways were dermal contact and dust inhalation. Typical parameters analyzed for included SVOCs, heavy metals, PCBs, pesticides, herbicides. If the contaminant was known or suspected, other parameters may have been analyzed for (i.e. total petroleum hydrocarbons (TPH) and polycyclic aromatic hydrocarbons (PAH) near fuel spills). The percent of the population exposed to soil and associated dust in the sampled areas was > 75% for two samples, 50 – 75% for one sample, 10 > 25% for 13 samples, and < 10% for one sample. For the risk assessment, personnel were assumed to remain at this location for 6 months to 1 year.

3.3 Short-term health risk:

Not an identified source of health risk. Currently, sampling data for soil were not evaluated for short term (acute) health risks**.**

3.4 Long-term health risk:

None identified based on available sample data. No parameters exceeded 1-year Negligible MEGs.

4 Water

In order to assess the health risk to U.S. personnel from exposure to water in theater, the APHC (Provisional) identified the most probable exposure pathways. These were based on the administrative information provided on the field data sheets submitted with the samples taken over the time period being evaluated. Based on the information provided from the field, all samples for treated and untreated water samples were associated with personal hygiene, showering, and cooking. Field data sheets indicated that bottled water was the only approved source of drinking water. Bottled water samples were not available; therefore drinking water was not assessed.

4.1 Non-Drinking Water

4.1.1 Site-Specific Sources Identified

Although the primary route of exposure for most microorganisms was ingestion of contaminated water, dermal exposure to some microorganisms, chemicals, and biologicals may have also caused adverse health effects. Complete exposure pathways would have included drinking, brushing teeth, personal hygiene, cooking, providing medical and dental care using a contaminated water supply.

4.1.2 Sample data/Notes:

To assess the potential for adverse health effects to troops the following assumptions were made about dose and duration: All U.S. personnel at this location were expected to remain at this site for approximately 1 year. A conservative (protective) assumption was that personnel routinely consumed

less than 5 liters per day (L/day) of non-drinking water for up to 365 days (1-year). It was further assumed that control measures and/or personal protective equipment were not used. A total of nine non-drinking bulk water samples from 24 May 2004 to 14 July 2009 were evaluated for this health risk assessment. No chemicals were detected at levels above the short or long-term MEGs.

4.1.3 Short and long-term health risks:

None identified based on available sample data. All collected samples were below the short and long-term Negligible MEGs.

5 Military Unique

5.1 Chemical Biological, Radiological Nuclear (CBRN) Weapons

Iraq's yellowcake production capability was eliminated as a result of the destruction of the Al Qaim Superphosphate Fertilizer Plant during Desert Storm and subsequent years of inspections. In May 2003, coalition forces visited the yellowcake extraction plant at Al Qaim and found 16 drums of yellowcake and radioactive waste. This material was believed to be part of Iraq's pre-1991 nuclear weapons program. The drums were properly sealed and presented no hazard (References 12 and 13).

No specific hazard sources were documented in the Defense Occupational and Environmental Health Readiness System (DOEHRS) or the Military Exposure Surveillance Library (MESL) from the 26 August 2003 through 14 July 2009 timeframe.

5.2 Depleted Uranium (DU)

No specific hazard sources were documented in the DOEHRS or MESL from the 26 August 2003 through 14 July 2009 timeframe.

5.3 Ionizing Radiation

No specific hazard sources were documented in the DOEHRS or MESL the 26 August 2003 through 14 July 2009 timeframe.

5.4 Non-Ionizing Radiation

No specific hazard sources were documented in the DOEHRS or MESL from the 26 August 2003 through 14 July 2009 timeframe.

6 Endemic Disease

This document lists the endemic diseases reported in the region, its specific health risks and severity and general health information about the diseases. USCENTCOM MOD 11 (Reference 14) lists deployment requirements, to include immunizations and chemoprophylaxis, in effect during the timeframe of this POEMS.

6.1 Foodborne and Waterborne Diseases

Foodborne and waterborne diseases in the area were transmitted through the consumption of local food and water. Local unapproved food and water sources (including ice) were heavily contaminated with pathogenic bacteria, parasites, and viruses to which most U.S. Service Members had little or no natural immunity. Effective host nation disease surveillance did not exist within the country. Only a

small fraction of diseases were identified or reported in host nation personnel. Diarrheal diseases were expected to temporarily incapacitate a very high percentage of U.S. personnel within days if local food, water, or ice was consumed. Hepatitis A and typhoid fever infections typically caused prolonged illness in a smaller percentage of unvaccinated personnel. Vaccinations were required for DOD personnel and contractors. In addition, although not specifically assessed in this document, significant outbreaks of viral gastroenteritis (e.g., norovirus) and food poisoning (e.g., *Bacillus cereus*, *Clostridium perfringens*, *Staphylococcus*) may have occurred. Key disease risks are summarized below:

Mitigation strategies were in place and included consuming food and water from approved sources, vaccinations (when available), frequent hand washing and general sanitation practices.

6.1.1 Diarrheal diseases (bacteriological)

High, mitigated to Low: Diarrheal diseases were expected to temporarily incapacitate a very high percentage of personnel (potentially over 50% per month) within days if local food, water, or ice was consumed. Field conditions (including lack of hand washing and primitive sanitation) may have facilitated person-to-person spread and epidemics. Typically mild disease treated in outpatient setting; recovery and return to duty in less than 72 hours with appropriate therapy. A small proportion of infections may have required greater than 72 hours limited duty, or hospitalization.

6.1.2 Hepatitis A, typhoid/paratyphoid fever, and diarrhea-protozoal

High, mitigated to Low: Unmitigated health risk to U.S. personnel was high year round for hepatitis A and typhoid/paratyphoid fever, and Moderate for diarrhea-protozoal. Mitigation was in place to reduce the risks to low. Hepatitis A, typhoid/paratyphoid fever, and diarrhea-protozoal disease may have caused prolonged illness in a small percentage of personnel (less than 1% per month). Although much rarer, other potential diseases in this area that were also considered a Moderate risk include: hepatitis E, diarrhea-cholera, and brucellosis.

6.1.3 Short-term Health Risks:

Low: The overall unmitigated short-term risk associated with food borne and waterborne diseases were considered High (bacterial diarrhea, hepatitis A, typhoid/paratyphoid fever) to Moderate (diarrhea-cholera, diarrhea-protozoal, brucellosis) to Low (hepatitis E) if local food or water was consumed. Preventive Medicine measures reduced the risk to Low. Confidence in the health risk estimate was high.

6.1.4 Long-term Health Risks:

None identified based on available data.

6.2 Arthropod Vector-Borne Diseases

During the warmer months, the climate and ecological habitat supported populations of arthropod vectors, including mosquitoes, ticks, mites, and sandflies. Significant disease transmission was sustained countrywide, including urban areas. Mitigation strategies were in place and included proper wear of treated uniforms, application of repellent to exposed skin, and use of bed nets and chemoprophylaxis (when applicable). Additional methods included the use of pesticides, reduction of pest/breeding habitats, and engineering controls.

6.2.1 Malaria

None: Indigenous transmission of malaria in Iraq was eliminated as of 2008 reducing risk among personnel exposed to mosquito bites to None.

6.2.2 Leishmaniasis

Moderate, mitigated to Low: The disease risk was Moderate during the warmer months when sandflies are most prevalent, but reduced to low with mitigation measures. Leishmaniasis is transmitted by sand flies. There are two forms of the disease; cutaneous (acute form) and visceral (a more latent form of the disease). The leishmaniasis parasites may survive for years in infected individuals and this infection may go unrecognized by physicians in the U.S. when infections become symptomatic years later. Cutaneous infection was unlikely to be debilitating, though lesions may be disfiguring. Visceral leishmaniasis disease can cause severe febrile illness which typically required hospitalization with convalescence over 7 days.

6.2.3 Crimean-Congo hemorrhagic fever

Moderate, mitigated to Low: Unmitigated risk was moderate, but reduced to low with mitigation measures. Crimean-Congo hemorrhagic fever occurred in rare cases (less than 0.1% per month attack rate in indigenous personnel) and was transmitted by tick bites or occupational contact with blood or secretions from infected animals. The disease typically required intensive care with fatality rates from 5% to 50%.

6.2.4 Sandfly fever

Moderate, mitigated to Low: Sandfly fever had a Moderate risk with potential disease rates from 1% to 10% per month under worst case conditions. Mitigation measures reduced the risk to low. The disease was transmitted by sandflies and occurred more commonly in children though adults were still at risk. Sandfly fever disease typically resulted in debilitating febrile illness requiring 1 to 7 days of supportive care followed by return to duty.

6.2.5 Sindbis (and Sindbis-like viruses)

Low: Sindbis and sindbis-like viruses were maintained in a bird-mosquito cycle in rural areas and occasionally caused limited outbreaks among humans. The viruses are transmitted by a variety of *Culex* mosquito species found primarily in rural areas. A variety of bird species may serve as reservoir or amplifying hosts. Extremely rare cases (less than 0.01% per month attack rate) could have occurred seasonally (April - November). Debilitating febrile illness often accompanied by rash, typically required 1 to 7 days of supportive care; significant arthralgias may have persisted for several weeks or more in some cases. This disease was associated with a low health risk estimate.

6.2.6 Rickettsioses, tickborne (spotted fever group)

Low: Rare cases (less than 0.1% per month) of rickettsioses disease were possible among personnel exposed to tick bites. Rickettsioses were transmitted by multiple species of hard ticks, including *Rhipicephalus* spp., which were associated with dogs. Other species of ticks, including *Ixodes* were also capable of transmitting rickettsial pathogens in this group. In addition to dogs, various rodents and other animals also may have served as reservoirs. Ticks were most prevalent from April through November. Incidents could have resulted in debilitating febrile illness, which may have required 1 to 7 days of supportive care followed by return to duty. The health risk of rickettsial disease was Low.

6.2.7 Typhus-murine (fleaborne)

Low: Typhus-murine had a Low risk estimate and as assessed as present, but at unknown levels. Rare cases were possible among personnel exposed to rodents (particularly rats) and flea bites. Incidents may have resulted in debilitating febrile illness typically requiring 1 to 7 days of supportive care followed by return to duty.

6.2.8 West Nile fever

Low: West Nile fever was present. The disease was maintained by the bird population and transmitted to humans via mosquito vector. Typically, infections in young, healthy adults were asymptomatic although fever, headache, tiredness, body aches (occasionally with a skin rash on trunk of body), and swollen lymph glands could have occurred. This disease was associated with a low risk estimate.

6.2.9 Short -term health risks:

Low: The unmitigated risk was moderate for leishmaniasis - cutaneous (acute), Crimean-Congo hemorrhagic fever, and sandfly fever; Low for, sindbis, rickettsioses-tickborne, typhus-fleaborne, and West Nile fever. No hazard from malaria (2008 - 2011). Risk was reduced to Low by proper wear of the uniform and application of repellent to exposed skin. Confidence in the risk estimate was high.

6.2.10 Long -term health risks:

Low: The unmitigated risk was moderate for leishmaniasis-visceral (chronic). Risk was reduced to Low by proper wear of the uniform and application of repellent to exposed skin. Confidence in the risk estimate was high.

6.3 Water Contact Diseases

Tactical operations or recreational activities that involved extensive contact with surface water such as lakes, streams, rivers, or flooded fields may have resulted in significant exposure to leptospirosis and schistosomiasis. Arid portions of Iraq without permanent or persistent bodies of surface water did not support transmission of leptospirosis or schistosomiasis. Risk was restricted primarily to areas along rivers and lakes. These diseases could have debilitated personnel for up to a week or more. Leptospirosis risk typically increased during flooding. In addition, although not specifically assessed in this document, bodies of surface water were likely to be contaminated with human and animal waste. Activities such as wading or swimming may have resulted in exposure to enteric diseases including diarrhea and hepatitis via incidental ingestion of water. Prolonged water contact also may have lead to the development of a variety of potentially debilitating skin conditions including bacterial or fungal dermatitis. Mitigation strategies were in place and included avoiding water contact and recreational water activities, proper wear of uniform (especially footwear), and protective coverings for cuts/abraded skin.

6.3.1 Leptospirosis

Moderate, mitigated to Low: Human infections occurred seasonally (typically April through November) through exposure to water or soil contaminated by infected animals and was associated with wading, and swimming in contaminated, untreated open water. The occurrence of flooding after heavy rainfall facilitated the spread of the organism because as water saturated the environment leptospirosis present in the soil passed directly into surface waters. Leptospirosis can enter the body through cut or abraded skin, mucous membranes, and conjunctivae. Infection may have also occurred from ingestion of contaminated water. The acute, generalized illness associated with infection may

have mimicked other tropical diseases (for example, dengue fever, malaria, and typhus), and common symptoms could have included fever, chills, myalgia, nausea, diarrhea, cough, and conjunctival suffusion. Manifestations of severe disease could have included jaundice, renal failure, hemorrhage, pneumonitis, and hemodynamic collapse. Recreational activities involving extensive water contact may have resulted in personnel being temporarily debilitated with leptospirosis. This disease was associated with a Moderate health risk estimate.

6.3.2 Schistosomiasis

Moderate, mitigated to Low: Humans were the principal reservoir for schistosomes; humans shed schistosome eggs in urine or feces. Animals such as cattle and water buffalo may have also been significant reservoirs. Rare cases (less than 0.1% per month attack rate) may have occurred seasonally (typically April through November) among personnel wading or swimming in lakes, streams, or irrigated fields which were frequently contaminated with human and animal waste containing schistosome eggs. In groups with prolonged exposure to heavily contaminated foci, attack rates may have exceeded 10%. Exceptionally heavy concentrations of schistosomes may have occurred in discrete foci, which were difficult to distinguish from less contaminated areas. In non-immune personnel exposed to such foci, rates of acute schistosomiasis may have been over 50%. Mild infections were generally asymptomatic. In very heavy acute infections, a febrile illness (acute schistosomiasis) may have occurred, especially with *Schistosoma japonicum* and *S. mansoni*, requiring hospitalization and convalescence over 7 days. This disease was associated with a Moderate health risk estimate.

6.3.3 Short -term health risks:

Low: Unmitigated Health risk of schistosomiasis and leptospirosis was Moderate during warmer months. Mitigation measures reduced the risk to Low. Confidence in the health risk estimate was high.

6.3.4 Long -term health risks:

None identified based on available data.

6.4 Respiratory Diseases

Although not specifically assessed in this document, deployed U.S. Forces may have been exposed to a wide variety of common respiratory infections in the local population. These included influenza, pertussis, viral upper respiratory infections, viral and bacterial pneumonia, and others. The U.S. military populations living in close-quarter conditions were at risk for substantial person-to-person spread of respiratory pathogens. Influenza was of particular concern because of its ability to debilitate large numbers of unvaccinated personnel for several days. Mitigation strategies were in place and included routine medical screenings, vaccination, enforcing minimum space allocation in housing units, implementing head-to-toe sleeping in crowded housing units, implementation of proper PPE when necessary for healthcare providers and detention facility personnel.

6.4.1 Tuberculosis (TB)

Moderate, mitigated to Low: Potential health risk to U.S. personnel was Moderate, mitigated to Low, year round. Transmission typically required close and prolonged contact with an active case of pulmonary or laryngeal tuberculosis (TB), although it also could have occurred with more incidental contact. The Army Surgeon General defined increased risk in deployed Soldiers as indoor exposure to locals or third country nationals of greater than one hour per week in a highly endemic active TB region. Additional mitigation included active case isolation in negative pressure rooms, where available.

6.4.2 Meningococcal meningitis

Low: Meningococcal meningitis posed a Low risk and was transmitted from person to person through droplets of respiratory or throat secretions. Close and prolonged contact facilitated the spread of this disease. Meningococcal meningitis was potentially a very severe disease typically requiring intensive care; fatalities may have occurred in 5-15% of cases.

6.4.3 Short-term health risks:

Low: Moderate (TB) to Low (for meningococcal meningitis). Overall risk was reduced to Low with mitigation measures. Confidence in the health risk estimate was high.

6.4.4 Long-term health risks:

None identified based on available data. Tuberculosis was evaluated as part of the Post Deployment Health Assessment (PDHA). A TB skin test is required post-deployment if potentially exposed and is based upon individual service policies.

6.5 Animal-Contact Diseases

6.5.1 Rabies

Moderate, mitigated to Low: Rabies posed a year-round moderate risk. Occurrence in local animals was well above U.S. levels due to the lack of organized control programs. Dogs were the primary reservoir of rabies in Iraq, and a frequent source of human exposure. In June 2008, the New Jersey Health department in The United States reported a confirmed case of rabies in a mixed-breed dog recently imported from Iraq. Rabies is transmitted by exposure to the virus-laden saliva of an infected animal, typically through bites, but could occur from scratches contaminated with the saliva. No cases of rabies acquired in Iraq have been identified in U.S. Service members to date. The vast majority (>99%) of persons who develop rabies disease will do so within a year after a risk exposure, there have been rare reports of individuals presenting with rabies disease up to six years or more after their last known risk exposure. Mitigation strategies included command emphasis of CENTCOM GO 1B, reduction of animal habitats, active pest management programs, and timely treatment of feral animal scratches/bites.

6.5.2 Anthrax

Low: Anthrax cases were rare in indigenous personnel, and posed a Low risk to U.S. personnel. Anthrax is a naturally occurring infection; cutaneous anthrax is transmitted by direct contact with infected animals or carcasses, including hides. Eating undercooked infected meat may have resulted in contracting gastrointestinal anthrax. Pulmonary anthrax is contracted through inhalation of spores and is extremely rare. Mitigation measures included consuming approved food sources, proper food preparation and cooking temperatures, avoidance of animals and farms, dust abatement when working in these areas, vaccinations, and proper PPE for personnel working with animals.

6.5.3 Q-Fever

Moderate, mitigated to Low: Potential health risk to U.S. personnel was Moderate, but mitigated to Low, year round. Rare cases were possible among personnel exposed to aerosols from infected animals, with clusters of cases possible in some situations. Significant outbreaks (affecting 1-50%) could have occurred in personnel with heavy exposure to barnyards or other areas where animals are kept. Unpasteurized milk may also have transmitted infection. The primary route of exposure was

respiratory, with an infectious dose as low as a single organism. Incidence could result in debilitating febrile illness, sometimes presenting as pneumonia, typically requiring 1 to 7 days of inpatient care followed by return to duty. Mitigation strategies in place as listed in paragraph 6.5.2 except for vaccinations.

6.5.4 H5N1 avian influenza

Low: Potential health risk to U.S. personnel was Low. Although H5N1 avian influenza (AI) is easily transmitted among birds, bird-to-human transmission is extremely inefficient. Human-to-human transmission appeared to be exceedingly rare, even with relatively close contact. Extremely rare cases (less than 0.01% per month attack rate) could have occurred. Incidence could have resulted in very severe illness with fatality rate higher than 50 percent in symptomatic cases. Mitigation strategies included avoidance of birds/poultry and proper cooking temperatures for poultry products.

6.5.5 Short-term health risks:

Low: The short-term unmitigated risk was Moderate for rabies, and Q-fever, to Low for anthrax, and H5N1 avian influenza. Mitigation measures reduced the overall risk to Low. Confidence in risk estimate was high.

6.5.6 Long-term health risks:

Low: A Low long term risk existed for rabies because, in rare cases, the incubation period for rabies can be several years.

7 Venomous Animal/Insect

All information was taken directly from the Clinical Toxinology Resources web site from the University of Adelaide, Australia (Reference 2). The species listed below have home ranges that overlap the location of Al Qaim and vicinity, and may have presented a health risk if they were encountered by personnel. See Section 9 for more information about pesticides and pest control measures.

7.1 Spiders

- *Latrodectus pallidus*: Clinical effects uncertain, but related to medically important species, therefore major envenoming cannot be excluded.

7.2 Scorpions

- *Androctonus crassicauda (black scorpion): Severe envenoming possible and potentially lethal, however most stings cause only severe local pain.*

- *Buthacus leptochelys*, *Buthacus macrocentrus*, *Compsobuthus werneri, Odontobuthus doriae*, and *Orthochirus scrobiculosus*: Clinical effects unknown; there are a number of dangerous Buthid scorpions, but there are also some known to cause minimal effects only. Without clinical data it is unclear where this species fits within that spectrum.

- *Scorpio maurus*: Mild envenoming only, not likely to prove lethal.

- *Hemiscorpius lepturus*: Severe envenoming possible, potentially lethal.

- *Hottentotta saulcyi*, *Hottentotta scaber*, and *Hottentotta schach*: Moderate envenoming possible but unlikely to prove lethal.

7.3 Snakes

- *Cerastes gasperettii*: Potentially lethal envenoming, though unlikely.

- *Hemorrhois ravergieri*, *Malpolon monspessulanus*, *Psammophis schokari*, *Pseudocyclophis persicus,* and *Telescopus fallax*: Clinical effects unknown, but unlikely to cause significant envenoming.

- *Macrovipera lebetina* subspecies e*uphratica* and subspecies *obtusa*, and *Vipera albicornuta*: Severe envenoming possible, potentially lethal.

- *Platyceps rhodorachis* and *Psammophis lineolatus*: Mild envenoming only, not likely to prove lethal.

- *Walterinnesia aegyptia*: Clinical effects unknown, but potentially lethal envenoming, though unlikely, cannot be excluded.

7.4 Short-term health risk:

Low: If encountered, effects of venom varied with species from mild localized swelling (e.g. *S. maurus*) to potentially lethal effects (e.g. *V. albicornuta*). See effects of venom above. Mitigation strategies included avoiding contact, proper wear of uniform (especially footwear), and timely medical treatment. Confidence in the health risk estimate was low (Reference 9, Table 3-6).

7.5 Long-term health risk:

None identified.

8 Heat/Cold Stress

8.1 Heat

Summer (June - September) monthly mean temperatures ranged from 71 degrees Fahrenheit (°F) to 106 °F based on historical climatological data. The health risk of heat stress/injury based on temperatures alone was Low (< 78 °F) from November – March, Moderate (78-81.9°F) in April, high (82-87.9°F) in October, and extremely high (≥ 88°F) from May – September. However, work intensity and clothing/equipment worn posed greater health risk of heat stress/injury than environmental factors alone (Reference 6). Managing risk of hot weather operations included monitoring work/rest periods, proper hydration, and taking individual risk factors (e.g., acclimation, weight, and physical conditioning) into consideration. Risk of heat stress/injury was reduced with preventive measures.

8.1.1 Short-term health risk:

Low to Extremely High, mitigated to Low: Risk of heat injury in unacclimatized or susceptible populations (older, previous history of heat injury, poor physical condition, underlying medical/health conditions), and those under operational constraints (equipment, PPE, vehicles) was Extremely High from May – September, High in October, Moderate in April, and Low from November – March. The risk of heat injury was reduced to low through preventive measures such as work/rest cycles, proper

hydration and nutrition, and monitoring WBGT. Confidence in the health risk estimate was low (Reference 9, Table 3-6).

8.1.2 Long-term health risk:

Low: The long-term risk was Low. However, the risk may have been greater for certain susceptible persons–those older (i.e., greater than 45 years), in lesser physical shape, or with underlying medical/health conditions. Long-term health implications from heat injuries were rare but may occur, especially from more serious injuries such as heat stroke. It is possible that high heat in conjunction with various chemical exposures may have increased long-term health risks, though specific scientific evidence was not conclusive. Confidence in these risk estimates was medium (Reference 9, Table 3-6).

8.2 Cold

8.2.1 Short-term health risks:

Winter (December - March) temperatures range from 38°F to 70°F. Because even on warm days a significant drop in temperature after sunset by as much as 40 °F could have occurred, there was a risk of cold stress/injury when temperatures fall below 60 °F, which could have occurred from November – April. The risk assessment for Non-Freezing Cold Injuries (NFCI), such as chilblain, trench foot, and hypothermia, was Low based on historical temperature and precipitation data. Frostbite was unlikely to occur because temperatures rarely drop below freezing. However, personnel may have encountered significantly lower temperatures during field operations at higher altitudes. As with heat stress/injuries, cold stress/injuries were largely dependent on operational and individual factors instead of environmental factors alone.

Low: The health risk of cold injury was Low. Confidence in the health risk estimate was medium.

8.2.2 Long-term health risk:

Low: The health risk of cold injury was Low. Confidence in the health risk estimate was high.

9 Noise

9.1 Continuous

No specific hazard sources were documented in the DOEHRS or MESL from the 26 August 2003 through 14 July 2009 timeframe.

9.1.1 Short and long-term health risks:

Not evaluated

9.2 Impulse

No specific hazard sources were documented in the DOEHRS or MESL from the 26 August 2003 through 14 July 2009 timeframe.

9.2.1 Short-term and Long-term health risks:

Not evaluated.

10 Unique Incidents/Concerns

10.1 Potential environmental contamination sources

DoD personnel are exposed to various chemical, physical, ergonomic, and biological hazards in the course of performing their mission. These types of hazards depend on the mission of the unit and the operations and tasks which the personnel are required to perform to complete their mission. The health risk associated with these hazards depends on a number of elements including what materials are used, how long the exposure last, what is done to the material, the environment where the task or operation is performed, and what controls are used. The hazards can include exposures to heavy metal particulates (e.g., lead, cadmium, manganese, chromium, and iron oxide), solvents, fuels, oils, and gases (e.g., carbon monoxide, carbon dioxide, oxides of nitrogen, and oxides of sulfur). Most of these exposures occur when performing maintenance task such as painting, grinding, welding, engine repair, or movement through contaminated areas. Exposures to these occupational hazards can occur through inhalation (air), skin contact, or ingestion; however exposures through air are generally associated with the highest health risk.

10.2 Waste Sites/Waste Disposal

Trash and rubbish were burned twice daily in a burn pit at Camp Gannon (Reference 14).

10.3 Fuel/petroleum products/industrial chemical spills

No specific hazard sources were documented in the DOEHRS or MESL from the 26 August 2003 through 14 July 2009 timeframe.

10.4 Pesticides/Pest Control:

The health risk of exposure to pesticide residues is considered within the framework of typical residential exposure scenarios, based on the types of equipment, techniques, and pesticide products that have been employed, such as enclosed bait stations for rodenticides, various handheld equipment for spot treatments of insecticides and herbicides, and a number of ready-to-use (RTU) methods such as aerosol cans and baits. The control of rodents required the majority of pest management inputs, with the acutely toxic rodenticides staged as solid formulation lethal baits placed in tamper-resistant bait stations indoors and outdoors throughout cantonment areas. Nuisance insects, including biting and stinging insects such as bees, wasps, and ants, also required significant pest management inputs. Use of pesticides targeting against these pests generally involved selection of compounds with low mammalian toxicity and short-term residual using pinpoint rather than broadcast application techniques. No specific hazard sources were documented in DOEHRS or MESL data portal. A total of four monthly pesticide application reports in the MESL data portal for Al Qaim listed the usage of pesticides on the site. For each pesticide product applied during this period, the USEPA approved label has been archived, providing a framework how each pesticide handled and applied (see below).

10.4.1 Rodenticides

Brodifacoum and bromadiolone were used to control rodents.

10.4.2 Insecticides

Insecticides used to control ants, biting midges, flies, mosquitoes, sand flies, scorpions, and spiders, termites included: (S)-Methoprene larva, *Bacillus thuringiensis* subspecies *israelensis*, bifenthrin,

cypermethrin, fipronil, lambda-cyhalothrin, malathion, methomyl, Z-9 tricosene, methoprene, polybutylenes, polyisobutylenes, pyrethrins, piperonyl butoxide, resmerithrin , and ß-Cyfluthrin.

10.4.3 Avians

4-aminopyridine was used to control avians.

10.4.4 Short-term and Long-term health risks

Low: Long term health risk is Low. Confidence in the health risk assessment was low (Reference 9, Table 3-6).

10.5 Asbestos

No specific hazard sources were documented in the DOEHRS or MESL from the 26 August 2003 through 14 July 2009 timeframe.

10.6 Lead Based Paint

No specific hazard sources were documented in the DOEHRS or MESL from the 26 August 2003 through 14 July 2009 timeframe.

10.7 Burn Pit

While not specific to Al Qaim and vicinity, the consolidated epidemiological and environmental sampling and studies on burn pits that have been conducted as of the date of this publication have been unable to determine whether an association does or does not exist between exposures to emissions from the burn pits and long-term health effects (Reference 7). The committee's review of the literature and the data suggests that service in Iraq or Afghanistan (i.e., a broader consideration of air pollution than exposure only to burn pit emissions) may be associated with long-term health effects, particularly in susceptible (e.g., those who have asthma) or highly exposed subpopulations, such as those who worked at the burn pit. Such health effects would be due mainly to high ambient concentrations of PM from both natural and anthropogenic sources, including military sources. If that broader exposure to air pollution turns out to be relevant, potentially related health effects of concern are respiratory and cardiovascular effects and cancer. Susceptibility to the PM health effects could be exacerbated by other exposures, such as stress, smoking, local climatic conditions, and co-exposures to other chemicals that affect the same biologic or chemical processes. Individually, the chemicals measured at burn pit sites in the study were generally below concentrations of health concern for general populations in the United States. However, the possibility of exposure to mixtures of the chemicals raises the potential for health outcomes associated with cumulative exposure to combinations of the constituents of burn pit emissions and emissions from other sources. A burn pit was located on Camp Gannon (Reference 14). It is unknown whether burn pits were located at the Al Qaim, Camp Dayton, or Ubaydi locations.

11 References[1]

1. Casarett and Doull's Toxicology: the Basic Science of Poisons, Chapter 2- Principles of Toxicology; Fifth Edition, McGraw Hill, New York.

2. Clinical Toxinology Resources: http://www.toxinology.com/. University of Adelaide, Australia.

3. Defense Occupational and Environmental Health Readiness System (referred to as the DOEHRS-EH database) at https://doehrs-ih.csd.disa.mil/Doehrs/. Department of Defense (DoD) Instruction 6490.03, *Deployment Health*, 2006.

4. DoDI 6055.05, Occupational and Environmental Health, 2008.

5. DoD MESL Data Portal: https://mesl.apgea.army.mil/mesl/.Some of the data and reports used may be classified or otherwise have some restricted distribution.

6. Goldman RF. 2001. Introduction to heat-related problems in military operations. *In*: Textbook of military medicine: medical aspects of harsh environments Vol. 1, Pandolf KB, and Burr RE (Eds.), Office of the Surgeon General, Department of the Army, Washington DC.

7. IOM (Institute of Medicine). 2011. Long-term health consequences of exposure to burn pits in Iraq and Afghanistan. Washington, DC: The National Academies Press.

8. Joint Staff Memorandum (MCM) 0017-12, Procedures for Deployment Health Surveillance, 2012.

9. USAPHC TG230, June 2010 Revision.

10. USACHPPM. 2008. Particulate Matter Factsheet; 64-009-0708, 2008.

11. Modification 11 to United States Central Command Individual Protection and Individual Unit Deployment Policy, 2 December 2011.

12. Comprehensive Report of the Special Advisor to the DCI on Iraq's WMD. 30 September 2004.

13. Environmental Health Site Assessment for Camp Al Qaim, Iraq for Deployed Forces in Support of Operation Iraqi Freedom II. 7 June 2005.

14. Camp Gannon Dump Site. Dumpster Inspection Form. 13 November 2007.

[1] NOTE. The data are currently assessed using the 2010 TG230. The general method involves an initial review of the data which eliminates all chemical substances not detected above 1-yr negligible MEGs. Those substances screened out are not considered acute or chronic health hazards so are not assessed further. For remaining substances, acute and chronic health effects are evaluated separately for air water (soil is only evaluated for long term risk). This is performed by deriving separate short-term and long term population exposure level and estimates (referred to as population exposure point concentrations (PEPC)) that are compared to MEGs derived for similar exposure durations. If less than or equal to negligible MEG the risk is Low. If levels are higher than negligible then there is a chemical-specific toxicity and exposure evaluation by appropriate SMEs, which includes comparison to any available marginal, critical or catastrophic MEGs. For drinking water 15 L/day MEGs are used for the screening while site specific 5-15 L/day are used for more detailed assessment. For nondrinking water (such as that used for personal hygiene or cooking) the 'consumption rate' is limited to 2 L/day (similar to the EPA) which is derived by multiplying the 5 L/day MEG by a factor of 2.5. This value is used to conservatively assess non drinking uses of water.

12 Where Do I Get More Information?

If a provider feels that the Service member's or Veteran's current medical condition may be attributed to specific OEH exposures at this deployment location, he/she can contact the Service-specific organization below. Organizations external to DoD should contact Deputy Assistant Secretary of Defense forDoD Force Health Protection and Readiness Policy and Oversight (HRP&O (FHP & R)).
Army Public Health Center Phone: (800) 222-9698. http://phc.amedd.army.mil/
Navy and Marine Corps Public Health Center (NMCPHC) (formerly NEHC) Phone: (757) 953-0700. http://www.med.navy.mil/sites/nmcphc/Pages/Home.aspxhttp://www-nehc.med.navy.mil
U.S. Air Force School of Aerospace Medicine (USAFSAM) (formerly AFIOH) Phone: (888) 232-3764. http://www.wpafb.af.mil/afrl/711hpw/usafsam/ http://www.wpafb.af.mil/afrl/711hpw/usafsam.asp
DoD, Deputy Assistant Secretary of Defense for Health Readiness Policy and Oversight (HRP&O) Phone: (800) 497-6261. http://fhpr.dhhq.health.mil/home.aspx