

**Military Deployment**  
**Periodic Occupational and Environmental Monitoring Summary (POEMS):**  
**Thumrait Air Base (TRAB), OMAN,**  
**Calendar Years: April 2010 to August 2012**

**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) 0028-07, See REFERENCES.

**PURPOSE:** This POEMS documents the DoD assessment of base camp level Occupational and Environmental Health Surveillance (OEHS) exposure data for TRAB. It presents the identified health risks and assessments along with the possible associated medical implications. The findings were based on information collected from April 2010 through August 2012 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. While this assessment may reflect similar exposures and health risks pertaining to historic or future conditions at this site, the underlying data were limited to the time period(s) and area(s) sampled and thus may not reflect fluctuations or unique occurrences. It also may not have been fully representative of all the fluctuations during the timeframe. To the extent that the data allowed, this summary describes the general ambient conditions at the site and characterizes the health risks at the population-level. While useful to inform providers and others of potential health effects and associated medical implications, it does not represent an individual exposure profile. Actual individual exposures and specific resulting health effects depend on many variables and, should be addressed in individual medical records by providers as appropriate at the time of an evaluation of a unique exposure.

**SITE DESCRIPTION:** TRAB is located in central Oman, approximately 71 kilometers (km) north of Salalah (nearest coastal city). The American encampment is inside the Royal AF of Oman (RAFO) base. In addition, the RAFO base includes Dyncorp Inc, which has a war readiness material (WRM) maintenance mission. The airfield has one runway and is used for Air Force C-17 and KC-10 aircrafts and RAFO F-16 fighters. TRAB has approximately 700 US military and civilian personnel. There are approximately 237 structures on TRAB including tent city, administrative town, Ops Town, and Maintenance. The adjacent property is primarily desert and used for agriculture.

**SUMMARY:** Summarized below are the key health risks estimates along with recommended follow-on medical actions, if any, that providers should be aware of. The following pages provide a list of all the identified health risks at TRAB (Table 1). As indicated in the detailed sections that follow the table, controls that have been effectively established to reduce health risk levels have been factored into this overall assessment.

**Short-term health risks & medical implications:**

The following may have caused acute health effects in some personnel during deployment at TRAB:

Food/waterborne diseases (e.g., bacterial diarrhea, hepatitis A, typhoid/paratyphoid fever, brucellosis, diarrhea-protozoal, hepatitis E); other endemic diseases (cutaneous/visceral leishmaniasis, Crimean-Congo hemorrhagic fever, sandfly fever, typhus-fleaborn, dengue fever, west nile fever, tick-borne rickettsioses, sindbis, leptospirosis, schistosomiasis, Tuberculosis (TB), meningoccal meningitis, rabies, Q fever); venomous animals/insects; and heat stress. For food/waterborne diseases (e.g., bacterial diarrhea, hepatitis A, typhoid fever, brucellosis, diarrhea-protozoal, hepatitis E), if ingesting local food and water, the health effects can temporarily incapacitate personnel (diarrhea) or result in prolonged illness (hepatitis A, typhoid fever, brucellosis, hepatitis E). 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 (cutaneous leishmaniasis, Crimean-Congo hemorrhagic fever, sandfly fever, typhus-fleaborn, dengue fever, west nile fever, tick-borne rickettsioses, sindbis), 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, and appropriate chemoprophylaxis. For water contact diseases (leptospirosis, schistosomiasis) activities involving extensive contact with surface water increase risk. For respiratory diseases (tuberculosis, meningococcal meningitis) 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 venomous animals and insects, if encountered, effects of venom varied with species from mild localized swelling to potentially lethal effects; risks reduced by avoiding contact and proper and timely treatment. For heat stress, risk can be greater 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, and mitigation.

Air quality: 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. For 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 most effects from exposure to particulate matter 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 TRAB. Personnel who reported with symptoms or required treatment while at this site should have exposure/treatment noted in medical record (e.g., electronic medical record and/or on a Standard Form (SF) 600 (Chronological Record of Medical Care).

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Table 1. Population-Based Health Risk Estimates - TRAB, Oman<sup>1,2</sup>

Source of Identified Health Risk <sup>3</sup>	Unmitigated Health Risk Estimate <sup>4</sup>	Control Measures Implemented	Residual Health Risk Estimate <sup>4</sup>
<b>AIR</b>			
PM <sub>10</sub>	Short-term: No Data Available	Water sprayed on unpaved/dirt roads	Short-term: No Data Available
	Long-term: No health guidelines		Long-term: No health guidelines
PM <sub>2.5</sub>	Short-term: No Data Available	Water sprayed on unpaved/dirt roads	Short-term: No Data Available
	Long-term: No Data Available		Long-term: No Data Available
Metals	Short-term: No Data Available		Short-term: No Data Available
	Long-term: No Data Available		Long-term: No Data Available
VOCs	Short-term: No Data Available		Short-term: No Data Available
	Long-term: No Data Available		Long-term: No Data Available
<b>Soil</b>			
Various Analytes	Short-term: No health guidelines		Short-term: No health guidelines
	Long-term: No Data Available		Long-term: No Data Available
<b>Water</b>			
Consumed water	Short-term: None Identified	Potable water used from approved sources	Short-term: None Identified
	Long-term: None Identified		Long-term: None Identified
Water used for other purposes	Short-Term: None Identified		Short-term: None Identified
	Long-Term: None Identified		Long-term: None Identified
<b>ENDEMIC DISEASE</b>			
Food borne/ Waterborne	Short-term: Variable: High (Bacterial Diarrhea, Hepatitis A, Typhoid/Paratyphoid fever) to Moderate (Diarrhea -Protozoal, Brucellosis and Hepatitis E). If ingesting local food/water, the health effects could have been temporarily incapacitating to personnel (Diarrhea) or resulted in prolonged illness (Hepatitis A, Typhoid Fever, Brucellosis, Hepatitis E).	Preventive measures included Hepatitis A and Typhoid fever vaccination, consumption of food and water used only from approved sources and routinely monitored. (MOD 11)	Short-term: Low
	Long-term: None Identified		Long-term: None Identified
Arthropod Vector Borne	Short-term: Moderate (Leishmaniasis-Cutaneous/Visceral, Crimean-Congo hemorrhagic fever), Low (Sandfly Fever, Typhus-Fleaborn, Dengue Fever, West Nile Fever, Tick-borne Rickettsioses, Sindbis).	Preventive measures included proper wear of the treated uniform and application of repellent to exposed skin and appropriate chemoprophylaxis.	Short-term: Low
	Long-term: Low (Leishmaniasis-Visceral infection)		Long-term: Low
Water-Contact (e.g. wading, swimming)	Short-term: Moderate (Leptospirosis, Schistosomiasis)		Short-term: Moderate
	Long-term: None Identified		Long-term: None Identified
Respiratory	Short-term: Low (Tuberculosis (TB), Meningococcal Meningitis).	TB evaluated as part of the PDHA (Post Deployment Health Assessment). A TB skin test was required post-deployment if potentially exposed.	Short-term: Low
	Long-term: None Identified		Long-term: None Identified

Animal Contact	Short-term: Moderate (Q-Fever), Low (Rabies)	CENTCOM General Order 1B mitigates rabies exposure risks by prohibiting contact with, adoption, or feeding of feral animals. Risks are further reduced in the event of assessed contact by prompt post-exposure rabies prophylaxis IAW the CDC's ACIP guidelines.	Short-term: Moderate (Q-Fever), Low (Rabies)
	Long-term: Low (Rabies)		Long-term: Low (Rabies)
<b>VENOMOUS ANIMAL/ INSECTS</b>			
Snakes, Scorpions, Fish, Snails	Short-term: Low to High	Risks reduced by avoiding contact and proper and timely treatment.	Short-term: Low to High (If encountered, effects of venom varied with species from mild localized swelling to potentially lethal)
	Long-term: None Identified		Long-term: None Identified
<b>HEAT/COLD STRESS</b>			
Heat	Short-term: Low to High	Risks from heat stress are reduced with preventive medicine controls, work-rest cycles, hydration recommendations and awareness training.	Short-term: Low to High
	Long-term: Low		Long-term: Low
Cold	Short-term: Low	Risks from cold stress are reduced with protective measures such as proper wear of protective clothing.	Short-term: Low
	Long-term: Low		Long-term: Low
<b>NOISE</b>			
Intermittent (Flightline, AGE, Equipment/Tools)	Short-term: Low	Hearing protection used by personnel in higher risk areas	Short-term: Low
	Long-term: Low-Moderate		Long-term: Low-Moderate

<sup>1</sup> This Summary Table provides a qualitative estimate of population-based short- and long-term health risks associated with the general ambient and occupational environment conditions at TRAB. It does not represent a unique 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 have resulted in a significant individual exposure. Any such person seeking medical care should have their specific exposure documented in an SF600.

<sup>2</sup> This assessment was based on specific data and reports obtained from the April 2010 through August 2012 timeframe. It was considered a current representation of general site conditions but may not reflect certain fluctuations or unique exposure incidents. Acute health risk estimates were generally consistent with field-observed health effects.

<sup>3</sup> This Summary Table was organized by major categories of identified sources of health risk. It only lists those sub-categories specifically identified and addressed at the site(s) evaluated. The health risks were presented as Low, Moderate, High or Extremely High for both acute and chronic health effects. The health risk level was 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 APHC/AIPH. Where applicable, "None Identified" was used when an exposure was identified and no health risk of either a specific acute or chronic health effects were determined. More detailed descriptions of OEH exposures that were evaluated but determined to pose no health risk are discussed in the following sections of this report.

<sup>4</sup> Health risks in this Summary Table were 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 TRAB, Oman by Source

The following sections describe the major source categories of potential health risk that were evaluated at TRAB. For each category, the evaluation process includes identifying what, if any, specific sub-categories/health concerns were present.

## 2 Air

### 2.1 Site-Specific Sources Identified

TRAB 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, less than 10 micrometers (PM<sub>10</sub>)

#### 2.2.1 Sample data/Notes:

Exposure Guidelines:

Short-term (24-hour) PM<sub>10</sub> (µg/m<sup>3</sup>): Negligible MEG=250, Marginal MEG=420, Critical MEG=600.  
Long-term PM<sub>10</sub> MEG (µg/m<sup>3</sup>): Not Available.

There were no PM<sub>10</sub> samples collected at TRAB from April 2010 through August 2012.

#### 2.2.2 Short-term health risks:

Not evaluated, no samples collected.

#### 2.2.3 Long-term health risk:

**Not Evaluated-no available health guidelines.** The Environmental Protection Agency has retracted its long-term standard (NAAQS) for PM<sub>10</sub> due to an inability to clearly link chronic health effects with chronic PM<sub>10</sub> exposure levels.

### 2.3 Particulate Matter, less than 2.5 micrometers (PM<sub>2.5</sub>)

#### 2.3.1 Sample data/Notes:

Exposure Guidelines:

Short-term (24-hour) PM<sub>2.5</sub> MEGs (µg/m<sup>3</sup>): Negligible MEG=65, Marginal MEG=250, Critical MEG=500.  
Long-term PM<sub>2.5</sub> MEGs: Negligible MEG=15, Marginal MEG=65.

There were no PM<sub>2.5</sub> samples collected at TRAB from April 2010 through August 2012.

#### 2.3.2 Short-term and long-term health risks:

Not evaluated, no samples collected.

## 2.4 Airborne Metals from PM<sub>10</sub>

### 2.4.1 Sample data/Notes:

There were no airborne metal samples collected at TRAB from April 2010 through August 2012.

### 2.4.2 Short-term and Long-term health risks:

Not evaluated, no samples collected.

## 2.5 Volatile Organic Compounds (VOC)

### 2.5.1 Sample data/Notes:

There were no VOC samples collected at TRAB from April 2010 through August 2012.

### 2.5.2 Short and long-term health risks:

Not evaluated, no samples collected.

## 3 Soil

### 3.1 Site-Specific Sources Identified

#### 3.2 Sample data/Notes:

No soil samples were collected at TRAB from April 2010 through August 2012.

#### 3.3 Short-term health risk:

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

#### 3.4 Long-term health risk:

Not evaluated, no samples collected.

## 4 Water

In order to assess the health risk to US personnel from exposure to water in theater, the APHC 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. Bottled water is the primary source of drinking water for all deployed personnel at TRAB. Water is piped from the Royal Air Force of Oman (RAFO) water treatment plant (WTP) to hardened showers and latrine facilities located inside the cantonment area. Another water source is from the Thumrait Municipal Utility Company where water is transported by truck to holding tanks supplying water to hardened showers and latrines. These facilities are located outside the cantonment area and by the flightline.

### 4.1 Drinking Water: Bottled

#### 4.1.1 Site-Specific Sources Identified

The distributors and all brands of bottled water utilized on TRAB are approved by the U.S.A. Public Health Command. The current bottles water contracts are provided by Seven Seas Shiphandlers and Tanuf Water. Each shipment of bottled water purchased for TRAB is tested upon receipt IAW AFMAN 48-138. The monitoring includes total coliform presence/absence and E. coli. In addition, 1 broad spectrum analysis sample was collected May 2011.

#### 4.1.2 Sample data/Notes:

All broad spectrum analysis from the May 2011 sample was below the short and long-term Negligible MEGs. Routine monitoring results are within acceptable limits. Records of these measurements are available in DOEHRS.

#### 4.1.3 Short-term and long-term health risks:

**None identified based on available sample data.**

## 4.2 Non-Drinking Water: Treated/Disinfected

### 4.2.1 Site-Specific Sources Identified

Water from the RAFO WTP is monitored to ensure compliance with AFMAN 48-138 and the Sultanate of Oman Final Governing Standards. During the Water Vulnerability Assessment (WVA), monthly compliance reports kept by the WTP manager are reviewed to ensure water quality parameters are within these standards. Routine monitoring conducted by 405 AEG/EMDF/SGPB includes bacteriological, free available chlorine (FAC) and other sanitation surveillance parameters per AFMAN 48-138.

Although primary route of exposure for most microorganisms is ingestion, dermal exposure to some microorganisms, chemicals and biological contaminants may cause adverse health effects. Complete exposure pathways include drinking, brushing teeth, personal hygiene, cooking or providing medical or dental care off base using a contaminated water supply.

#### 4.2.2 Sample data/Notes:

##### Exposure Guidelines:

2 samples from 1 sampling event in May 2011 were evaluated for this health risk assessment.

All analytes were not detected at levels above the short or long term MEGs.

Records indicate that the routinely monitored parameters (pH, chlorine, bacteriological) are typically within acceptable limits. Deviations from acceptable limits are investigated and corrected as they occur.

Records of these measurements are available in DOEHRS.

#### 4.2.3 Short and long-term health risks:

**None identified based on available sample data:** All sample analytes were below the short and long-term Negligible MEGs.

## 5 Military Unique

### 5.1 Chemical Biological, Radiological Nuclear (CBRN) Weapons

No specific hazard sources were documented in Defense Occupational and Environmental Health Readiness System (DOEHRS), or the Military Exposure Surveillance Library (MESL) data portal between April 2010 and August 2012.

### 5.2 Depleted Uranium (DU)

No specific hazard sources were documented in DOEHRS or MESL data portal between April 2010 and August 2012.

### 5.3 Ionizing Radiation

Ionizing radiation sources include 1 portable X-ray unit located at the medical clinic, 1 portable x-ray unit used by Explosive Ordnance Disposal (EOD) personnel, 1 stationary unit located at the Commercial Processing Area (CPA) and 1 portable unit used by Security Forces (SF) personnel.). Safety Operating Instruction and unit specific administrative and personal protective equipment (PPE) controls are in place to protect service members.

### 5.4 Non-Ionizing Radiation

#### 5.4.1 Lasers:

C-17 aircraft are equipped with Infrared Countermeasure Systems and aircraft maintenance personnel only clean the sensor as part of the preventive maintenance inspection. These systems are no when aircraft are on the ground. There is no potential exposure to these systems. There are Class 3A lasers utilized by personnel in 2 work centers. EOD have a bore sight finder on their robot and Emergency Management personnel use a CBRN detector, First Defender containing a laser. Administrative procedures and operating procedures are in place to protect service members.

#### 5.4.2 Radio Frequency (RF) Radiation:

Aircraft and ground-based emitters have administrative procedures in place to reduce the potential for exposures and ensure personnel are not within the uncontrolled environment hazard distance.

## 6 Endemic Disease<sup>1</sup>

All information was taken directly from the National Center for Medical Intelligence (NCMI) (<https://www.intelink.gov/ncmi>). Baseline Infectious Disease Risk Assessment for Oman - dated in 27 May 2010. This document lists the endemic disease reported in the region, its specific risks and severity and general health information about the disease. The general information on meningococcal meningitis regarding how it is transmitted from person to person came from the World Health Organization's Fact Sheet No. 141 on Meningococcal Meningitis. USCENTCOM MOD 11 (Reference 12 of this document) lists deployment requirements, to include immunization and chemoprophylaxis, in effect during the time frame covered by this POEMS.

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<sup>1</sup> NOTE: "Risk" level refers to both severity of disease (without controls, for example vaccinations) and probability of disease based on local rates/endemic status. Diseases described are those presenting greater risk when compared with U.S. conditions. Most identified disease risks can and are being mitigated with military preventive medicine measures/policies.

## 6.1 Foodborne and Waterborne Diseases

Food borne and waterborne diseases in the area were potentially transmitted through the consumption of local food and water. Sanitation was poor throughout the country, including major urban areas. Local food and water sources were heavily contaminated with pathogenic bacteria, parasites, and viruses to which most U.S. Service members have 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 could have been expected to temporarily incapacitate a very high percentage of U.S. personnel within days if local food or water was consumed. Hepatitis A and typhoid fever could have caused prolonged illness in a smaller percentage of unvaccinated personnel. Vaccination was required for DOD personnel and contractors. In addition, although not specifically assessed in this document, viral gastroenteritis (e.g., norovirus) and food poisoning (e.g., *Bacillus cereus*, *Clostridium perfringens*, and *Staphylococcus*) may have caused significant outbreaks. Key disease risks are summarized below:

### 6.1.1 Diarrheal Diseases (Bacteriological)

**Unmitigated High - Mitigated Low:** Mitigation was in place, U.S. Forces were provided food and water from approved sources. Diarrheal diseases can be expected to temporarily incapacitate a very high percentage of personnel (potentially over 50 percent per month) within days if local food, water, or ice is consumed. Field conditions (including lack of hand washing and primitive sanitation) may facilitate 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 require greater than 72 hours limited duty, or hospitalization.

### 6.1.2 Hepatitis A

**Unmitigated High - Mitigated Low:** Unmitigated health risk to U.S. personnel was high year round. Mitigation was in place, US Personnel did not drink untreated water and vaccination with Hepatitis A vaccine is required for deployment into the CENTCOM AOR. Water consumed by US/DOD personnel was treated on military camps. Typical case involves 1 to 3 weeks of debilitating symptoms, sometimes initially requiring inpatient care; recovery and return to duty may require a month or more.

### 6.1.3 Typhoid / Paratyphoid Fever

**Unmitigated High – Mitigated Low:** Unmitigated health risk to U.S. personnel was high year round. Mitigation measures include mandatory Typhoid vaccination for US deployers to the CENTCOM AOR. Risk was typically highest following spring floods. Typhoid and paratyphoid were potentially acquired through the consumption of fecally contaminated food or water. Asymptomatic carriers are common with typhoid and contribute to sustained transmission. A small number of cases (less than 1% per month attack rate) could have occurred among unvaccinated personnel who consumed local food, water, or ice. Common source outbreaks may have occurred. Mitigation was in place, US personnel did not drink untreated water. With appropriate treatment, typhoid and paratyphoid fever are debilitating febrile illnesses typically requiring 1 to 7 days of supportive care, followed by return to duty.

### 6.1.4 Diarrhea - Protozoal

**Unmitigated Moderate – Mitigated Low:** Mitigation was in place, US personnel do did not drink untreated water. Risk was typically highest following spring floods. In general, *Cryptosporidium* spp., *entamoeba histolytica*, and *giardia lamblia* were the most common protozoal causes of diarrhea wherever sanitary conditions are significantly below U.S. standards. A small number of cases (less than 1% per month attack rate) could have occurred among personnel consuming local food, water, or

ice. Outbreaks affecting a higher percentage of personnel were possible with *Cryptosporidium*. Symptomatic cases varied in severity; typically mild disease demonstrating recovery and return to duty in less than 72 hours with appropriate therapy; severe cases may require 1 to 7 days of supportive care, followed by return to duty.

#### 6.1.5 Brucellosis

**Unmitigated Moderate – Mitigated Low:** Mitigation was in place, U.S. Forces were provided food and water from approved sources. Brucellosis was a common disease in cattle, sheep, goats, swine, and some wildlife species in most developing countries. Humans may have contracted brucellosis through consumption of contaminated dairy products (or foods made with such products) or by occupational exposures to infected animals. The health risk from direct animal contact was likely to be highest in rural areas where livestock are present. However, the health risk from contaminated dairy products was presented countrywide, including urban areas. Rare cases (less than 0.1% per month attack rate) could have occurred among personnel consuming local dairy products or having direct contact with livestock. With appropriate treatment, brucellosis is a febrile illness of variable severity, potentially requiring inpatient care; convalescence is usually over 7 days even with appropriate treatment.

#### 6.1.6 Hepatitis E

**Unmitigated Moderate – Mitigated Low:** Mitigation was in place to reduce the residual health risk to low, US personnel did not drink untreated water. Potential health risk to U.S. personnel was Moderate year round. Risk was typically highest following spring floods. Hepatitis E occurs in 4 major genotypes. Genotypes 1 and 2, found primarily in Africa and Asia, cause large numbers of sporadic cases, as well as large outbreaks. Fecal contamination of drinking water is the most common source of exposure for these genotypes. Large outbreaks are usually associated with particularly severe breakdowns in baseline sanitation, as often occurs during heavy rainfall which increases mixing of sewage and drinking water sources. Secondary household cases from person-to-person transmission are uncommon. Unlike hepatitis A, where local populations living in poor sanitary conditions are usually highly immune from childhood exposures, immunity levels for hepatitis E are often much lower, even in areas of extremely poor sanitation. Typically, outbreaks of hepatitis E occur primarily among adults. Although data is insufficient to assess potential disease rates, we could not rule out rates approaching 1 percent per month among personnel consuming local food, water, or ice. Rates may have exceeded 1 percent per month for personnel heavily exposed during outbreaks in the local population. Typical cases involve 1 to 3 weeks of debilitating symptoms, sometimes initially requiring inpatient care; recovery and return to duty may require a month or more.

#### 6.1.7 Short-term Health Risks:

**Unmitigated Moderate to High – Mitigated Low:** The overall short-term unmitigated risk associated with food borne and waterborne diseases was considered High (for bacterial diarrhea, hepatitis A, typhoid fever / paratyphoid fever) to Moderate (for diarrhea-protozoal, brucellosis, hepatitis E) if local food or water is consumed. Preventive Medicine measures such as vaccinations reduce the risk estimate to none (for Hepatitis A and Typhoid fever). Additionally, U.S. Forces were provided food and water from approved sources. Confidence in the health risk estimate was Medium

#### 6.1.8 Long-term Health Risks:

**None identified based on available data.**

### 6.2 Arthropod Vector-Borne Diseases

During warmer months (approximately March to October), ecological conditions in rural and periurban areas support arthropod vectors, including mosquitoes, ticks, and sandflies, with variable rates of disease transmission. Because Oman lacks adequate diagnostic capability, vector-borne diseases frequently are underreported, and there is a reliance on clinical (symptom-based, vs. laboratory confirmation-based) diagnosis. Vector-borne diseases were transmitted at low or unknown levels and may have constituted a significant health risk in the absence of mitigation measures. See Section 10.4 for more information about pesticides and pest control measures.

#### 6.2.1 Leishmaniasis – Cutaneous/Visceral

**Unmitigated Moderate – Mitigated Low:** Potential unmitigated health risk to U.S. personnel was Moderate year round. For U.S. personnel, risk mitigation included proper wear of treated uniforms, application of repellent to exposed skin, and minimizing outdoor activities (when possible) between dusk and dawn. Leishmaniasis is transmitted by sandflies. Transmission generally was limited to the warmer months. A small number of cases (less than 1% per month attack rate) could occur among personnel exposed to sand fly bites in areas with infected people, rodents, dogs, or other reservoir animals. Asymptomatic chronic infections may have occurred, which may become symptomatic years later. Cutaneous infection was unlikely to be debilitating, though lesions can be disfiguring. Definitive treatment previously required non-urgent evacuation to the continental United States; currently, not all cases require evacuation.

#### 6.2.2 Crimean-Congo Hemorrhagic Fever

**Unmitigated Moderate – Mitigated Low:** Potential unmitigated health risk to U.S. personnel was Moderate year round with peak transmission from March through November, but reduced to low with mitigation measures. For U.S. personnel, risk mitigation included proper wear of treated uniforms and application of repellent to exposed skin. Risk from tick-borne transmission was limited primarily to warmer months. Risk of transmission from animal contact was present year-round. Most primary Crimean-Congo hemorrhagic fever (CCHF) infections occur as sporadic cases or clusters of cases, and are associated with tick bites or occupational contact with blood or secretions from infected animals. Outbreaks of CCHF occur infrequently, but may be associated with changes in agricultural land use that increase tick contact or incursions of susceptible populations into areas where the disease is endemic. Rare cases (less than 0.1% per month attack rate) could have occurred among personnel exposed to tick bites. Direct contact with blood and body fluids of an infected animal or person may also have transmitted infection. It is a very severe illness typically requiring intensive care with fatality rates from five to fifty percent.

#### 6.2.3 Sand fly Fever

**Unmitigated Low – Mitigated Negligible:** Sand fly fever had a low health risk, and transmission generally was limited to the warmer months. The disease is transmitted by sandflies, which typically bite at night and breed in dark places rich in organic matter, particularly in rodent or other animal burrows. Other suitable habitats include leaf litter, rubble, loose earth, caves, and rock holes. Sandflies may be common in peridomestic settings. Abandoned dwellings, sometimes used by troops as temporary quarters, also can harbor significant numbers of sandflies. Stables and poultry pens in peridomestic areas also may harbor sandflies. Although data were insufficient to assess potential disease rates, 1 to 10 percent of personnel could have been affected per month under worst case conditions. In small groups, exposed to heavily infected sand fly populations in focal areas, attack rates could have been very high (over 50 percent). Incidents can result in debilitating febrile illness typically requiring 1 to 7 days of supportive care followed by return to duty.

#### 6.2.4 Typhus-Fleaborn

**Unmitigated Low – Mitigated Negligible:** The disease is transmitted by fleas, usually on rats. While rat fleas are the most common vectors, cat fleas and mouse fleas are less common modes of transmission. These fleas are not affected by the infection. Human infection occurs because of flea-fecal contamination of the bites on human skin.

#### 6.2.5 Dengue Fever

**Unmitigated Low – Mitigated Negligible:** Dengue fever is a low risk with sporadic outbreaks possible. Dengue fever is transmitted to humans by the bite of an *Aedes* mosquito that is infected with a dengue virus. The principal symptoms of dengue fever are high fever, severe headache, severe pain behind the eyes, joint pain, muscle and bone pain, rash, and mild bleeding (e.g., nose or gums bleed, easy bruising).

#### 6.2.6 West Nile Fever

**Unmitigated Low – Mitigated Negligible:** Potential unmitigated health risk to U.S. personnel was Low with transmission generally limited to the warmer months. West Nile fever was present and was maintained by bird populations and multiple species of *Culex* mosquitoes that help to transfer the diseases from birds to humans. The majority of infections in young, healthy adults are asymptomatic although it can result in fever, headache, tiredness, and body aches, occasionally with a skin rash (on the trunk of the body) and swollen lymph glands.

#### 6.2.7 Tick-borne Rickettsioses (Spotted fever group)

**Unmitigated Low – Mitigated Negligible:** Tick-borne rickettsioses are a low risk with rare cases present. The disease is transmitted to humans through bites of certain species of ticks.

#### 6.2.8 Sindbis (and Sindbis-like virus)

**Unmitigated Low – Mitigated Negligible:** Sindbis is a low risk with rare cases present. The virus is transmitted by mosquitoes and is maintained in nature by transmission between vertebrate (bird) hosts and invertebrate (mosquito) vectors. Humans are infected with Sindbis virus when bitten by an infected mosquito.

#### 6.2.9 Short and long-term health risks:

**Unmitigated Low to Moderate – Mitigated Negligible:** The unmitigated health risk estimate was low to moderate. Health risk was reduced to low by proper wear of the uniform, application of repellent to exposed skin, and appropriate chemoprophylaxis. Confidence in health risk estimate was medium.

### 6.3 Water Contact Diseases

Operations or activities that involved extensive water contact may have resulted in personnel being temporarily debilitated with leptospirosis in some locations. Leptospirosis health risk typically increases 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 exposures to enteric diseases such as diarrhea and hepatitis via incidental ingestion of water. Prolonged water contact also may have also lead to the development of a variety of potentially debilitating skin conditions such as bacterial or fungal dermatitis.

### 6.3.1 Leptospirosis

**Moderate:** Leptospirosis unmitigated risk is moderate year-round with peak season April through October. The disease is present in Oman, but at unknown levels. Data are insufficient to assess potential disease rates, up to 1-10 percent of personnel wading or swimming in bodies of water such as lakes, streams, or irrigated fields could be affected per month. Human infection occurs through exposure to water or soil contaminated by infected animals and has been associated with wading, and swimming in contaminated, untreated open water. Leptospirosis can enter the body through cut or abraded skin, mucous membranes, and conjunctivae. Ingestion of contaminated water can also lead to infection. The acute generalized illness associated with infection can mimic other tropical diseases (for example, dengue fever, malaria, and typhus), and common symptoms include fever, chills, myalgia, nausea, diarrhea, cough, and conjunctival suffusion. Manifestations of severe disease can include jaundice, renal failure, hemorrhage, pneumonitis, and hemodynamic collapse. Recreational activities involving extensive water contact may result in personnel being temporarily debilitated with leptospirosis.

### 6.3.2 Schistosomiasis

**Moderate:** Schistosomiasis unmitigated risk is moderate with peak season April through November. Human release schistosome eggs through urine and feces, which may be contaminating surface water. When water temperatures in lakes, streams, and rivers are at or above 68°F, the eggs hatch and release the larvae into the water. If the right type of freshwater snail is present, the larvae penetrate the snail, develop, and emerge as free-swimming cercariae that can infect humans by penetrating the skin of people while wading or swimming.

### 6.3.3 Short-term health risks:

**Moderate:** Health risk of leptospirosis and Schistosomiasis was moderate without mitigation strategies in place. Confidence in the health risk estimate was medium

### 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. 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.

### 6.4.1 Tuberculosis (TB)

**Low:** Potential unmitigated health risk to U.S. personnel was Low year round. Transmission typically requires close and prolonged contact with an active case of pulmonary or laryngeal tuberculosis (TB), although it also can occur with more incidental contact. The likelihood of exposure to an active case varies with the overall incidence and the degree of contact with the local population, particularly those living in conditions of crowding and poverty. Tuberculin skin test (TST) conversion rates may have

been elevated over baseline for personnel with prolonged close exposure to local populations. A TST screening to detect latent infection may have been warranted in personnel with a history of prolonged close exposure to local populations. Tuberculosis exposure and infection is evaluated as part of the Post Deployment Health Assessment (PDHA) process.

#### 6.4.2 Meningococcal Meningitis

**Low:** Potential unmitigated health risk to U.S. personnel was Low year round. However, the health risk may have been elevated during cooler months. Asymptomatic colonization and carriage of meningococcal bacteria was common worldwide, including within U.S. military populations; rare symptomatic cases may have occurred periodically in military populations, regardless of geographic location. Meningococcal meningitis is potentially a very severe disease typically requiring intensive care; fatalities may occur in 5-15% of cases.

#### 6.4.3 Short-term health risks:

**Low:** Confidence in the health risk estimate was Medium

#### 6.4.4 Long-term health risks:

**None identified based on available data.**

### 6.5 Animal-Contact Diseases

#### 6.5.1 Q-Fever

**Moderate:** Potential unmitigated health risk to U.S. personnel was Moderate 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 is 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.

#### 6.5.2 Rabies

**Low:** Potential unmitigated health risk to U.S. personnel was Low year round. Rabies is transmitted by exposure to virus-laden saliva of an infected animal, typically through bites. Prevalence in feral and wildlife populations was well above U.S. levels due to the lack of organized control programs. Personnel bitten by potentially infected reservoir species may have developed rabies in the absence of appropriate prophylaxis. The circumstances of the bite should have been considered in evaluating individual health risk; in addition to dogs and cats, bats or wild carnivores should also have been regarded as rabid unless proven otherwise. General Order 1B mitigated rabies risk by prohibiting contact with or adoption or feeding of feral animals. Very severe illness with near 100% fatality rate could have occurred in the absence of post-exposure prophylaxis. Typically the time period from exposure to the onset of symptoms is 2 – 12 weeks, but can rarely take several years.

#### 6.5.3 Short-term health risks:

**Variable (Low to Moderate):** Low for rabies and Moderate for Q-fever. Confidence in the health risk estimate was Medium.

#### 6.5.4 Long-term health risks:

**Low:** The long term risk for rabies was Low.

### 7 Venomous Animal/Insect

All information was taken directly from the Clinical Toxicology Resources web site (C from the University of Adelaide, Australia and from the Armed Forces Pest Management Board Living Hazards Database (<http://www.afpmb.org/content/living-hazards-database>). The species listed below have home ranges that overlap the location of Oman and may have presented a health risk if they were encountered by personnel. Personnel at TRAB experience minimal sightings or contact.

#### 7.1 Scorpions

- *Androctonus crassicauda* (Black Scorpion): Severe envenoming possible, potentially lethal. Cardiotoxicity may be direct or indirect, but is a feature of severe envenoming, with cardiac arrhythmias, cardiac failure.
- *Nebo franckei*, *Nebo omanensis*, *Nebo whitei*: Severe envenoming possible, potentially lethal. Sting likely to cause local pain, then variable development of systemic effects, which could include respiratory failure, cardiac failure and evidence of haemorrhage into vital organs.
- *Apistobuthus pterygocercus*, *Babycurus exquisitus*, *Buthacus yotvatensis*, *Butheolus gallagheri*, *Compsobuthus acutecarinatus*, *Compsobuthus arabicus*, *Compsobuthus maindroni*, *Compsobuthus polisi*, *Microbuthus pusillus*, *Odontobuthus odonturus*, *Orthochirus innesi*, *Paraorthochirus glabifrons*, *Paraorthochirus kinzelbachi*, *Vachoniolus globimanus*: There are a number of dangerous Buthid scorpions, but also others known to cause minimal effects only. Without clinical data it is unclear where this species fits within that spectrum.

#### 7.2 Snakes

- *Astrotia stokesii* (Stokes' Sea Snake), *Enhydrina schistose* (Beaked Sea Snake), *Hydrophis cyanocinctus* (Asian Annulated Sea Snake), *Hydrophis gracilis* (Graceful Small-headed Sea Snake), *Hydrophis lapemoides* (Persian Gulf Sea Snake), *Hydrophis ornatus* (Reef Sea Snake), *Hydrophis spiralis* (Yellow Sea Snake), *Lapemis curtus* (Shaw's Sea Snake), *Pelamis platurus* (Yellow Bellied Sea Snake), *Thalassophina viperina* (Olive Sea Snake): Sea snake bites vary from trivial to lethal envenoming.
- *Atractaspis microlepidota* (Burrowing Asp), *Aspis micropholis* (Sahelian Burrowing Asp): Burrowing asp bites mostly cause minor effects, but severe local effects, including necrosis, can occur, as can potentially lethal systemic effects.
- *Cerastes cerastes* (Horned Viper), *Cerastes gasperettii* (Gasperetti's Horned Sand Viper): Both significant local effects and systemic effects, including coagulopathy can occur.
- *Bitis arietans* (Puff Adder), *Echis khosatskii* (Dhofar Carpet Viper), *Echis omanensis* (Oman Saw-scaled Viper), *Echis pyramidum* (Geoffroy's Carpet Viper), *Echis sochureki* (Sochurek's Saw-scaled Viper), *Naja haje* (Arabian Cobra): Severe envenoming possible, potentially lethal.

#### 7.3 Fish/Snails

- *Conus geographus*, *Conus Textile* (snails): Serious & painful envenomations (sometimes fatal)

usually occur when swimmers (waders) pick up shells with live snails still inside

- Pterois volitans (Lion Fish), Synaceja trachynis (Stone Fish): Serious & painful envenomations (sometimes fatal)

#### 7.4 Short-term health risk:

**Low to High:** If encountered, effects of venom varied with species from mild localized swelling (to potentially lethal effects. See effects of venom above. Confidence in the health risk estimate was low (TG 230 Table 3-6).

#### 7.5 Long-term health risk:

None identified.

## 8 Heat/Cold Stress

Oman's climate is hot and dry in the interior and humid along the coast. TRAB is located in southern Oman, Dhofar region, approximately 71 kilometers (km) north of Salalah (nearest coastal city). The Dhofar region's climate is dramatically different to the rest of Oman due to the effects of the monsoon rains which arrive during the summer months, creating humidity and moderate temperatures of around 86°F.

### 8.1 Heat

The health risk of heat stress/injury based on temperatures alone is Low (< 78 °F) in January and December, High (82-87.9°F) in February and November and extremely high (≥ 88°F) from March – October. The monsoon season lasts from the end of June through the end of August. During this time, temperatures can be up to 10 degrees lower. However, work intensity and clothing/equipment worn pose greater health risk of heat stress/injury than environmental factors alone (Goldman, 2001).

Personnel are educated on dangers of heat stress, water intake and work/rest cycles.

#### 8.1.1 Short-term health risk:

**Low to High:** High health risk of heat injury in unacclimatized personnel from March to October, and Low from November to February. The risk of heat injury was reduced through preventive measures. Because the occurrence of heat stress/injury is strongly dependent on operational factors (work intensity and clothing), confidence in the health risk estimate was low (TG 230, Table 3-6).

#### 8.1.2 Long-term health risk:

**Low:** Long-term health implications from heat injuries are rare but can occur, especially from more serious injuries such as heat stroke. However, the health risk may be greater to certain susceptible persons—those older (i.e., greater than 45 years), in lesser physical shape, or with underlying medical/health conditions. The long-term health risk was Low; confidence in the health risk estimates was medium (TG 230, Table 3-6).

### 8.2 Cold

Even on warm days there can be a significant drop in temperature after sunset by as much as 40 °F. There is a risk of cold stress/injury when temperatures fall below 60 °F, which can occur from November to February. The health risk assessment for non-freezing cold injuries (chilblain, trench foot, and hypothermia) is Low based on historical temperature and precipitation data. Frostbite is unlikely to occur because temperatures rarely drop below freezing. As with heat stress/injuries, cold stress/injuries are largely dependent on operational and individual factors instead of environmental factors alone. With protective measures in place the health risk assessment is low for cold stress/injury; confidence in the health risk estimate is medium.

8.2.1 Short-term health risks:

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

8.2.2 Long-term health risk:

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

**9 Noise**

9.1 Continuous

Occupational and Environmental Health Assessments at TRAB indicate the potential for noise exposure when working on or near the flightline and/or industrial shops. Appropriate hearing protection is provided for all individuals in shops which generate or are exposed to hazardous noise.

9.1.1 Short-term health risks:

**Low:** Short-term risk of noise injury with appropriate hearing protection use is Low. Confidence in the health risk assessment is medium (TG 230, Table 3-6).

9.1.2 Long-term health risks:

**Low-Moderate:** Long-term risk of noise injury with appropriate hearing protection use is Low to Moderate. Confidence in the health risk assessment is medium (TG 230, Table 3-6).

9.2 Impulse

No specific hazard sources were documented in DOEHRS or MESL data portal between April 2010 and August 2012.

**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. These process and hazards are identified and evaluated in DOEHRS for the corresponding work centers. 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

As of the 2010 Occupational and Environmental Health Site Assessment, hazardous materials disposal was still in the planning phase. Several unit controlled satellite collection points exist on base including one maintained by a contractor. This waste is then transferred to a central waste collection area for final disposition. Trash is collected by a contractor and taken to an off-base landfill for disposal.

When needed, expired medicines were burned at an Omani Air Force burn site on base. Burning occurred near the flight line on the Omani side of the base in the burn pit. AF Fire Department personnel conduct AF burning operations. This practice was discontinued in 2011.

No specific health risks associated with these waste management operations have been identified.

## 10.3 Fuel/petroleum products/industrial chemical spills:

No significant incidents have occurred at TRAB regarding fuel, petroleum or industrial chemical spills.

## 10.4 Pesticides/Pest Control:

TRAB has an Entomology shop. Minimal amounts of pesticides are used and small amounts are maintained at the CE K-Span. Insect traps and baits are mainly used for pest control. Rogue cats are trapped by Entomology personnel and released in areas that are not populated by base personnel.

### 10.4.1 Short-term and Long-term health risks

**Low:** Long term health risk is Low. Confidence in the health risk assessment is medium (TG 230 Table 3-6).

## 10.5 Asbestos

3 samples were collected in May 2011 to determine the presence of asbestos in floor tiles located inside of a host nation building (bldg 542). Sampled material is 12" x 12" floor tile and associated mastic, material was non-friable and in good condition. No asbestos was identified in sampled tiles.

### 10.5.1 Short-term and Long-term health risks

**Low:** Long term health risk is Low. Confidence in the health risk assessment is medium (TG 230 Table 3-6).

## 11 References<sup>2</sup>

1. Armed Forces Pest Management Board Living Hazards Database: <http://www.afpmb.org/content/living-hazards-database>
2. Casarett and Doull's Toxicology: the Basic Science of Exposures, Chapter 2- Principles of Toxicology; Fifth Edition, McGraw Hill, New York.
3. Clinical Toxicology Resources: <http://www.toxinology.com/>. University of Adelaide, Australia.
4. Defense Occupational and Environmental Health Readiness System (referred to as the DOEHRs-EH database) at <https://doehrs-ih.csd.disa.mil/Doehrs/>.
5. Department of Defense (DoD) Instruction 6490.03, Deployment Health, 2006.
6. DoDI 6055.05, Occupational and Environmental Health, 2008.
7. 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.
8. 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.
9. Joint Staff Memorandum (MCM) 0028-07, Procedures for Deployment Health Surveillance, 2007.
10. Occupational and Environmental Health Site Assessment (OEHS), Thumrait Air Base, April 2011.
11. National Center for Medical Intelligence (NCMI): <https://www.intelink.gov/ncmi/index.php>.
12. Modification 11 to United States Central Command Individual Protection and Individual, Unit Deployment Policy, 2 December 2011.
13. USA PHC TG230, June 2010 Revision.
14. USACHPPM 2008 Particulate Matter Factsheet; 64-009-0708, 2008.

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<sup>2</sup> 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 DoD Force Health Protection and Readiness (FHP & R).

**Army Institute of Public Health** 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-nehc.med.navy.mil>

**U.S. Air Force School of Aerospace Medicine (USAFSAM)** (formerly AFIOH) Phone: (888) 232-3764. <http://www.wpafb.af.mil/afri/711hpw/usafsam.asp>

**DoD Force Health Protection and Readiness (FHP & R)** Phone: (800) 497-6261. <http://fhp.osd.mil>