Military Deployment
Periodic Occupational and Environmental Monitoring Summary (POEMS):
Ahmed Al Jaber Air Base and Vicinity, Kuwait
Calendar Year: 2014-2015

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 Department of Defense (DoD) assessment of Occupational and Environmental Health (OEH) risk for Ahmed Al Jaber Air Base and Vicinity, Kuwait. It includes Ahmed Al Jaber Air Base, Kuwait and other military camps in in the immediate vicinity where U.S. personnel lived or worked. It presents a qualitative estimate of population-based health risks identified at this location and their potential medical implications. The report is based on information collected from October 2014 through December 2015 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 Ahmed Al Jaber Air Base, Kuwait 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 October 2014 through December 2015.

The POEMS can be useful to inform healthcare providers and others of environmental conditions experienced by individuals deployed to Ahmed Al Jaber Air Base and the local 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 Example Text in their medical record on a Standard Form (SF) 600 (Chronological Record of Medical Care).

Health protective exposure assumptions are used in the assessment of all health risks, i.e. the resident population is assumed to be constantly exposed to environmental conditions. Small groups of personnel assigned to Ahmed Al Jaber Air Base or the local vicinity addressed in this summary may be at greater risk than the general population due to operational requirements; these groups are identified when appropriate.

SUMMARY: Conditions with an estimated health risk of Moderate or greater are summarized in Table 1. Table 2 provides population based risk estimates for identified OEH conditions at Ahmed Al Jaber Air Base and/or camps in the vicinity, Kuwait. 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. *Navigable links have been imbedded in both tables and the discussion sections of the POEMS so that the reader can easily move back and forth between the summary tables and detailed discussions*

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

Short-term health risks & medical implications:

Exposures associated with the following environmental stressors may be associated with potential acute health effects in some personnel during deployment at Ahmed Al Jaber Air Base that includes all areas of Ahmed Al Jaber Air Base and the local vicinity, Kuwait:

Food/Waterborne Diseases: For personnel that consume non-approved local food, ice or water, there is a varying potential for food/waterborne diseases, (e.g., bacterial diarrhea, hepatitis A, typhoid fever, diarrhea-protozoal). The health effects of these diseases can temporarily incapacitate personnel (diarrhea) or result in prolonged illness (hepatitis A, typhoid fever, hepatitis E). Risks from food/waterborne diseases should be reduced with preventive medicine controls and mitigation, which includes hepatitis A and typhoid fever vaccinations and only drinking from approved water sources and eating from approved food sources in accordance with standing CENTCOM policy.

Endemic Diseases: (cutaneous/visceral leishmaniasis, sandfly fever, west nile fever, sindbis, leptospirosis, Tuberculosis (TB), meningococcal meningitis, rabies, Q fever, H5N1 fever);

Vector-Borne Endemic Diseases:(cutaneous and visceral leishmaniasis, sandfly fever, typhus-fleaborn, west nile fever, 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 efforts by Pest Management to minimize the biting vectors.

Water Contact Diseases: (leptospirosis) Activities involving extensive contact with surface water increase risk.

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, H5N1 avian influenza) Pose year-round risk. For venomous animals (vipers, scorpions) and insects, effects of venom vary with species from mild localized swelling to potential lethal effects; risks reduced by avoiding contact and proper and timely treatment.

Heat Stress: Risk can be greater for susceptible persons including those older than 45, of low fitness level, un-acclimatized, or with underlying medical conditions. Risks from heat stress may be 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. 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.

Long-term health risks & medical implications:

Exposures associated with the following environmental stressors may be associated with potential chronic health effects in some personnel during deployment at Ahmed Al Jaber Air Base and the local vicinity:

Food/Waterborne Diseases: The long-term effects of foodborne/waterborne diseases are still not fully understood. New findings unfold as research is performed. Illnesses caused by bacteria also increase the risk of developing irritable bowel syndrome. Other potential long-term effects include reactive arthritis and listeria monocytogenes.

Endemic Diseases: Mucosal leishmaniasis usually becomes clinically evident within several years (sometimes as long as decades) of the original cutaneous lesions. Several studies have shown that a relatively large group of patients suffer from persistent fatigue after acute Q-fever. This illness is also known as Post Q-fever Fatigue Syndrome, of which symptoms can last for as long as 10 years.

Water Contact Diseases: (leptospirosis) In approximately 10% of cases, there can be long-term effects after leptospirosis. If the acute phase was not properly diagnosed, the long-term effects may not become apparent until later medical treatment. These effects may be due to leptospirosis persisting in protected regions of the body (i.e., the eyes and brain).

Respiratory Diseases: When Tuberculosis goes unnoticed and it is left untreated for a long duration, it might lead to

permanent damage of the lungs and respiratory tracts.

Heat Stress: NIOSH reports that certain heart, kidney, and liver damage are thought by some researchers to be linked to long-term heat exposure. However, the evidence supporting these associations is not conclusive. Heat exposure has been associated with temporary infertility in both women and men, with the effects being more pronounced in men. Sperm density, motility, and the percentage of normally shaped sperm can decrease significantly when the temperature of the groin is increased above a normal temperature.

Air Quality: For particulate matter (PM), control measures have limited efficacy. Thus the residual risk may be similar or identical to unmitigated risk. Although most effects from exposure to particulate matter should have diminished 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 AJAB. 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).

Table 2: Population-Based Health Risk Estimates – Ahmed Al Jaber Air Base and Vicinity - Kuwait [1, 2]

Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented[5]	Residual Health Risk Estimate[4]
Air			
Particulate matter less than 10 microns in diameter (PM_{10}) (see paragraph 2.3)	Short-term: **Low to High**; due to variability in data.	Most personnel live and work in air conditioned buildings or tents. For those not working in air condition spaces, minimize time outdoors, and keep doors or tent flaps closed. Use of water for dust control on unpaved roads and work areas.	**Low to High** due to variability in data.
	Long-term: **Health guidelines not defined**		Long-term: **Health guidelines not defined**
Particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) (see paragraph 2.4)	Short-term: *Based on the samples and associated exposure information assessed during 2015, the tactical risk estimate for $PM_{2.5}$ on both typical and peak exposure days during the sampled timeframe is **low**.* The majority of the time no acute health effects such as eye, nose, or throat irritation from exposure was anticipated to have occurred. Mild acute (short-term) health effects were possible for those individuals who spent much of their time outdoors. Existing medical conditions (e.g., asthma or respiratory diseases) may be exacerbated.	Limit strenuous physical activities when air quality is poor, minimize time outdoors, and keep doors, windows and tent flaps closed.	Short-term: **Low** (For particulate matter (PM), control measures have limited efficacy. Thus the residual risk may be similar or identical to unmitigated risk).
	Long-term: *Based on the samples and associated exposure information assessed 2015, the tactical risk estimate for PM2.5 on both typical and peak*		Long-term: **Moderate** (For particulate matter (PM), control measures have limited efficacy. Thus the

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	*exposure days during the sampled timeframe is **moderate**.* Future sampling will be conducted in order to determine seasonal and longer term risks. During periods of **low** risk, when no anticipated chronic health effects from $PM_{2.5}$ were anticipated to have occurred. Future sampling will also aid in determining when there exists **moderate** risk level, a small percentage of individuals may have been at increased risk of developing chronic health conditions. These conditions include reduced lung function, chronic bronchitis, chronic obstructive pulmonary disease (COPD), asthma, and other cardiopulmonary diseases. Those with a history of asthma or pre-existing cardiopulmonary disease have a higher risk for developing these chronic conditions.		residual risk may be similar or identical to unmitigated risk.
Airborne Metals (see paragraph 2.5)	Short-Term: Based on the samples and associated exposure information assessed during 2015, no metals were identified as acute hazards. Long-term: Based on the samples and associated exposure information assessed during 2015, No metals were identified as acute hazards.		For metals associated with ambient dust, control measures have limited efficacy. Thus the residual risk may be similar or identical to unmitigated risk. Short-Term: **Low** Long-term: **Low**
Volatile Organic Compounds (VOC) (see paragraph 2.6)	Short-term: **Not evaluated**; Insufficient data exist upon which to base a risk assessment	Fuel spills cleaned up quickly if they occur.	Based on efficacy of control measure implement regarding the specific source Short-term: **Not evaluated**; Insufficient data exist upon which to base a health risk assessment.
	Long-term: **Not evaluated**; Insufficient data exist upon which to base a health risk assessment.		Long-term: **Not evaluated**; Insufficient data exist upon which to base a health risk assessment.
Soil			
Soil (see paragraph 3)	Short-Term: **None evaluated**: Currently, Soil sampling data not evaluated/assessed during 2015 for Short Term (acute) Health Risks. No incidents or accidents occurred requiring the need for or desire for investigative effort. Exposure to soil contaminants at levels which cause human health	Fuel spills cleaned up quickly if they occur.	Short-Term: Soil contamination at Al Jaber presents a low human health risk. Soil contamination in some areas of Kuwait (primarily in oil production areas, industrial areas, and at landfills and wastewater sites) is significant, but likely

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	effects is not expected. Even in such cases, short-term exposures are likely to result in only minor adverse health effects. Long-term: **None identified**; (Only sparse and insufficient *data is available.)* No incidents or accidents occurred requiring the need for or desire for investigative effort during 2015.		localized at these sites. Deployed personnel involved in or near soil disturbance activities at contaminated locations could receive short-term exposures by inhaling or ingesting windblown dust or vapors. Long-term: **None identified**; (Only sparse and insufficient data exist upon *which to base a health risk assessment.)*
Water			
Consumed Water (Water Used for Drinking) (see paragraph 4.2)	Short-term: **Low** U.S. Army Veterinarian Service approved bottled water and packaged water from the Expeditionary Water Packaging System was provided for drinking.	U.S. Army Veterinary Service approved bottled water and Preventive Medicine/ Army Veterinary approved packaged water were supplied and consumed. Active and ongoing drinking water surveillance program.	No analyte was detected above the 14 day 15L/day negligible drinking water military exposure guidelines. Short-term: **Low**
	Long-term: **Low** U.S. Army Veterinarian Service approved bottled water and packaged water from the Expeditionary Water Packaging System were provided for drinking.		Long-term: **Low**
Water used for other purposes (non-drinking) (see paragraph 4.3)	Short-term health risk: **Low** In 2015 no hazards were identified in the nondrinking water samples because detected chemical concentrations did not exceed military exposure guidelines USAPHC Technical Guide 230, 2013.	Water surveillance programs which routinely monitor for disinfectant residual and bacteriological contamination	Short-term: **Low**
	Long-term health risk: **Low** Detected chemicals met long-term potability standards (LTPS) during field testing with one exception of a single sample. Di(2-ethylhexyl)phthalate did not meet the Department of the Army Technical Bulletin, Medical 577 military long-term potability standards this was due to a single sample taken 23 Jun 2015.		Long-term: **Low**
Military Unique			
Chemical Biological, Radiological Nuclear (CBRN) Weapons (see paragraph 5.1)	Short-term: **None identified;**	None	Short-term: **None identified;** (Insufficient data exist upon *which to base a health risk assessment.)*
	Long-term: **None identified;**		Long-term: **None identified;** (Insufficient data exist upon *which to base a health risk assessment.)*

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Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented[5]	Residual Health Risk Estimate[4]
Depleted Uranium (DU) (see paragraph 5.2)	Short-term: Low based on data. Depleted Uranium munitions exist on this installation as unexpended rounds and are stored within the munitions storage area.	Time, Distance, and Shielding.	Short-term: **Low** based on data
	Long-term: Low based on data. Depleted Uranium munitions exist on this installation as expended rounds in the soil.		Long-term: **Low** based on data
Ionizing Radiation (see paragraph 5.3)	Short-term: **Low**	Administrative controls and ALARA training where specifically advised in the occupational shop site assessments.	Short-term: **Low** based on data
	Long-term: **Low**		Long-term: **Low** based on data
Non-ionizing Radiation (see paragraph 5.4)	Short-term: **None identified**	None	Short-term: **None identified**
	Long-term: **None identified**		Long-term: **None identified**
Endemic Disease			
Gastrointestinal (same as Food borne/Waterborne (e.g., diarrhea-bacteriological) (see paragraph 6.2)	Short-term: **High**. Risk is high for bacterial diarrhea in the absence of control measures. Outbreaks of Noro Virus (viral gastroenteritis have occurred. These outbreaks have been resolved by implementing hand wash stations at the dining facility and mandatory hand washing prior to eating meals and after using the restroom for all base personnel. If ingesting unapproved local food/water, the health effects can temporarily incapacitate personnel (bacterial or viral diarrhea) or result in prolonged illness (hepatitis A, typhoid fever, brucellosis, hepatitis E). Viral gastroenteritis can present due to a high rate of personnel turnover and shared dining, berthing, bathroom facilities, and working spaces.	Standard Preventive Medicine measures: Hand washing, facility sanitation, immunizations (hepatitis A and typhoid fever), the consumption of food and water from approved sources, and habitability inspections to ensure cleanliness/sanitation.	Based on efficacy of control measure as evidenced by lack of disease(s) reported in various medical surveillance data bases e.g., TMDS, MERS, DRSi. Short-term: Appropriately as Low Based on disease incident reporting from Kuwait, bacterial and protozoal gastrointestinal diseases, cholera, brucellosis, and hepatitis E infections present a low risk. Noro Virus and other potential risk have been mitigated effectively through implementation of adequate sanitation and hygiene practices.
	Long-term: **Low.** The majority of gastrointestinal diseases do not cause prolonged illness.		Long-term: **Low**
Arthropod Vector Borne (see paragraph 6.3)	Short-term: Competent vectors and reservoirs for disease are present. Risk is **moderate** for cutaneous leishmaniasis and **low** for sandfly fever, West Nile fever, visceral leishmaniasis, and Sindbis.	Standard Preventive Medicine measures: proper wearing of insecticide-treated uniforms and the application of insect repellent to the skin, chemoprophylaxis in accordance with COCOM	Based on efficacy of control measure as evidenced by lack of disease(s) reported in various medical surveillance data bases e.g., TMDS, MERS, DRSi.

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Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented[5]	Residual Health Risk Estimate[4]
		policy (i.e., malaria), avoidance of peak vector feeding times, use of bed nets if sleeping outdoors, removal of vector harborages within camps, and the application of pesticides.	Short-term: **Moderate** for cutaneous leishmaniasis
	Long-term: **Low.** It is possible to be infected during deployment with leishmaniasis, but not to have clinically evident disease until redeployed.		Long-term: **Low** based on disease incident reporting from Kuwait.
Water-Contact e.g. wading, swimming (see paragraph 6.4)	Short-term: **Moderate**. The occurrence of flooding after heavy rainfall can facilitate the spread of leptospirosis already present in the soil	Avoidance of fresh water sources, such as puddles/ standing water, drainage areas, etc. Treatment (primarily chlorination) process for non-drinking water (water used for bathing, cooking, etc.).	This is based on efficacy of control measure as evidenced by lack of disease(s) reported in various medical surveillance data bases e.g., TMDS, MERS, DRSi. Short-term: **Low** based on disease incident reporting from Kuwait.
	Long-term: **None**		Long-term: **None**
Respiratory (see paragraph 6.5)	Short-term: **Moderate** for TB and **Low** for meningococcal meningitis and upper respiratory infections such as influenza.	Influenza immunizations are given either before or during deployment. Local and third country national workers/contractors are required to complete health screening prior to employment. Potential tuberculosis exposure is addressed in the Post Deployment Health Assessment.	Based on efficacy of control measure as evidenced by lack of disease(s) reported in various medical surveillance data bases e.g, TMDS, MERS, DRSi. Short-term: **Low** for upper respiratory infections and tuberculosis.
	Long-term: **Low**. The majority of respiratory diseases do not cause prolonged illness.		Long-term: **Low** based on disease incident reporting from Kuwait.
Animal Contact (see paragraph 6.6	Short-term: **Low to moderate. Q-fever** risk is considered **moderate**. There are a significant number of vectors within the living areas. (i.e. stray cats, dogs, etc.) **Rabies** risk is considered **low** based on disease incident reporting from Kuwait. **H5N1 avian influenza** risk is considered **low**.	Standard Preventive Medicine measures, as well as COCOM policy, generally prohibit contact with, adoption, or feeding of feral animals. All food and water sources are from approved sources. Immunizations for anthrax and rabies (rabies vaccination and/or immune globulin given if clinically directed).	Based on efficacy of control measure as evidenced by lack of disease(s) reported in various medical surveillance data bases e.g, TMDS, MERS, DRSi. Short-term: **Low to moderate** based on disease incident reporting from Kuwait.
	Long-term: **Low** based on disease incident reporting from Kuwait.		Long-term: **Low** based on disease incident reporting from Kuwait.
Venomous Animal/ Insects			
Snakes, scorpions, and spiders (see paragraph 7)	Regular snake sightings at this location include: horned viper, false horned and blunt nosed viper, black desert cobra.	Standard Preventive Education on how to avoid them (shake out boots before donning, etc.) and reporting	Based on efficacy of control measure as evidenced by lack of disease(s) reported in various medical surveillance

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Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented[5]	Residual Health Risk Estimate[4]
	Regular scorpion sightings at this location include: Black and sand color fat-tailed scorpions. Regular spider sightings at this location include: Camel, black widow, and brown recluse Short-term: **High.** If encountered, effects of venom vary with species from mild localized swelling (e.g. scorpion species e.g *Scorpiops lindbergi*)) to potentially lethal (e.g. saw-scaled viper or *Gloydius halys*) based on disease incident reporting from Kuwait.	sightings to the appropriate personnel (CE pest management and Medical) form removal reduce the risk of exposure. Personnel are also educated to immediately report any contact to their leadership and medical and seek immediate medical attention for any bites and stings. No anti-venom is available at Ahmed Al Jaber and cannot be implemented until a critical care treatment capability is established in order to adequately treat side-effects of the anti-venom/venin. Antivenin is available at U.S. Army Camp Arifjan.	data bases e.g, TMDS, MERS, DRSi. Short-term: **High.** The installation has a significant infestation of scorpions, snakes, and spiders as the base was dormant and people moved in over the already existing scorpion, snake, and spider population.
	Long-term: **Low**		Long-term: **Low**
Heat/Cold Stress			
Heat (see paragraph 8.2)	Short-term: **Low to High** as per measured seasonal data) risk of heat injury in summer months (appropriately to region of concern e.g. May-September) for un-acclimatized personnel.	Adequate periods of acclimatization for newly reporting or returning personnel. Adjustment of work-rest cycles based on monitoring of climatic conditions.	Based on efficacy of control measure and incidence of heat/cold injury(ies) reported in various medical surveillance data bases e.g, TMDS, MERS, DRSi. Short-term: **Low to High**
	Long-term: **Low**		Long-term: **Low**
Cold (see paragraph 8.3)	Short-term: **Low** as per measured seasonal data. The risk for cold stress/injuries is largely dependent on clothing/equipment worn, operational work intensity and individual factors rather than environmental factors alone.	Provision of adequate foul weather clothing Appropriate work/rest cycles during cold weather	Short-term: **Low**
	Long-term: **Low**		Long-term: **Low**
Noise			
Noise (Continuous) (Flightline, Power Production) (see paragraph 9.1)	Short-term: **Not evaluated. Hazardous noise conditions in deployment settings tend to mirror home station assessment.**	Use of hearing protection. Labeling noise hazardous areas. Leadership enforcement of compliance with available PPE.	Short-Term: **Not evaluated**:
	Long-term: **Data not available**		Long-Term: **Data not available**
Noise Impulse (see paragraph 9.2)	Short-term: **Not evaluated**: Deployment environments tend to introduce additional non-routine noise exposure sources to the exposure environment.		Short-term: **Not evaluated**: Insufficient data exist upon which to base a risk assessment
	Long-term: **Data not available**		Long-term: **Data not available**
Unique Concerns			

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Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented[5]	Residual Health Risk Estimate[4]
Special Incidents or Spills: (see paragraph 10.1)	In November 2014. 80 gal of JP-8 on the flight line. On 12 May 2015 a Marine unit spilled a 55 gal drum of 15W-40. The spill was contained across the loose surface sand while the hard packed layer approximately 6 inches below the surface sand was unaffected. It is uncertain if any spills or fire incidents may have occurred that have health risks as a result of the Iraqi invasion and occupation of Kuwait during the first Gulf War. **Not evaluated**: Insufficient data exist upon which to base a risk assessment	November 2014 Incident: Fire Dept. was able to contain spill area and clean up. May 2015 Incident: The area of contaminated sand was shoveled into palletized box crates and removed for disposal. CE maintained oversight of the cleanup and then URS provided removal and oversight of the palletized dirt-filled crates.	Short and Long Term: **No data available**
Waste Sites/Waste Disposal (see paragraph 10.2)	Four sources of waste exist on base, medical, non-hazardous solid waste, hazardous industrial waste, and sanitary sewer/latrine waste. Base personnel have minimal contact with this waste and risk to any exposure is Low Short-term: **Low** based on available data**.**		Short-term: **Low** based on available data**.**
	Long-term: **Low** based on available data**.**		Long-term: **Low** based on available data**.**
Potential Environmental Contamination Sources: (see paragraph 10.3)	There are two dirt mounds along munitions road, one on each side of the road. The mounds are known to have the potential for containing UXOs left over from the Gulf War in the 1990s era. DU projectiles were found in these mounds. Additional UXOs were found near the waste lagoon in late 2015.	The areas were appropriately marked with UXO warning signage.	Short-term (acute) and Long-term (chronic) health risks: **Low** – Based on radiation surveys, there is no exposure expected since personnel only traverse through the area.
Pesticides/Pest Control (see paragraph 10.4)	The integrated pest management plan emphasizes non-chemical control over the use of chemical pesticides. The potential for base residents to come in contact with improperly formulated insecticides is remote.	See Section 10.4	Long and Short-term: No long or short-term health risk was identified based on available data
Asbestos (see paragraph 10.5)	Long and Short-term: Risk is **negligible** based on available data	All structures occupied by U.S. personnel during the period were erected as new. Therefore, there was no exposure to potential sources of asbestos containing material (ACM) or peeling paint that could contain lead.	Long and Short-term: Risk is **negligible** based on available data
Lead Based Paint (see paragraph 10.6)	Long and Short-term: Risk is **negligible** based on available	All structures occupied by U.S. personnel during the	Long and Short-term: Risk is **negligible** based on

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	data	period were erected as new. Therefore, there was no exposure to potential sources of asbestos containing material (ACM) or peeling paint that could contain lead.	available data
Burn Pits (see paragraph 10.7)	Short-term: **Low** based on available data There is a small burn barrel behind the fire department. Used only for classified paper until shredders are acquired. No covered waste is permitted to be burned. The burning of paper as permitted is not expected to produce any adverse health effects.	Control measures included improved waste segregation and management techniques.	Short-term: **Low** based on available data
	Long-term: **Low**		Long-term: **Low**

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Table 2: Population-Based Health Risk Estimates – Ahmed Al Jaber Air Base and Vicinity, Kuwait

[1] This Summary Table provides a qualitative estimate of population-based short-and long-term health risks associated with the occupational and environment conditions at Ahmed Al Jaber Air Base and other locations frequented by U.S. military personnel in the immediate vicinity of Ahmed Al Jaber Air Base, Kuwait. It does not represent an individual exposure profile. Actual individual exposures and health effects depend on many variables. For example, while a chemical may be present in the environment, if a person does not inhale, ingest, or contact a specific dose of the chemical for adequate duration and frequency, then there may be no health risk. Alternatively, a person at a specific location may experience a unique exposure, such as at the burn pit, which could result in a significant individual exposure. Any such person seeking medical care should have their specific conditions of exposure documented on Form SF600.

[2] This assessment is based on specific environmental sampling data and reports obtained in 2015. 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 Ahmed Al Jaber Air Base. The health risks are presented as Low, Moderate, High or Extremely High for both acute and chronic health effects. The risk level is based on an assessment of both the potential severity of the health effects that could be caused and probability that exposure would occur at a level to produce such health effects. Details can be obtained from the Army/AF/Navy/DHA Public Health Center. More detailed descriptions of OEH exposures that were evaluated are discussed in the following sections of this report.

[4] Risks in this Summary Table are based on quantitative surveillance thresholds (e.g. review of disease surveillance data) or screening levels (e.g. Military Exposure Guidelines (MEGs) for chemicals). Some previous assessment reports may provide slightly inconsistent 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 few samples.

[5] 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 in place. 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.

SITE DESCRIPTION:

Ahmed Al Jaber Air Base, Kuwait: The country is generally low lying with the highest point being 306 meters above sea level. The topography is mostly flat. The base is located in a rural area. The installation is separated into two main areas. There are two main areas to U.S. operations on AJAB, a living support area called the "LSA" and the operational/industrial closer to the flight line. The flight line area extends from the northwest to south east portion of existing infrastructure. The main compound is on the north portion of pre-existing infrastructure. There is minimal topographical rise and fall between areas across base and extending around the perimeter. The only significant low lying area is the waste water lagoon known as the "green mile". It is located about 75 meters behind the main dining facility Bldg. 195.

Local Climate: The spring season in March is warm with occasional thunderstorms. Frequent winds

from the northwest are cold in winter and hot in summer, while southeasterly damp winds spring up between July and October. Hot and dry south winds prevail in spring and early summer and northwesterly wind common during June and July causes dramatic sandstorms. Temperature in the summer ranges from 77 to 130 degrees Fahrenheit. Prevailing winds are from the NW at an average 9 knots. However, strong winds with dust and dirt may occur weekly. The more severe dust storms occur during the summer months. Annual rainfall varies from 10 mm (0.4 in) to 370 mm (14.6 in). Significant temperatures variations are experienced between day and night. Particularly during January which is generally the coldest month; temperatures range between 2.8 and 28.3 degrees C (27 to 85 degrees F).

1 Discussion of Health Risks at Ahmed Al Jaber Air Base, Kuwait 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 Technical Guide 230, *Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel* (USAPHC TG 230). All OEH risk estimates represent residual risk after accounting for controls measures 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 Area-Specific Sources Identified

a. At Ahmed Al Jaber Air Base, Kuwait, the general condition of the local ambient air is often dusty with a high potential for air particulate due to the lack of vegetation and soil moisture content. During high winds and dust storms, visibility may be significantly decreased. When the weather is such, potential exists for respiratory irritation and eye injury caused by wind-blown debris. The dust during these storms is so fine that piles of dust will accumulate inside of buildings and is difficult to seal out.

Particulate matter and dust debris are kicked up into the air by vehicles on both paved and unpaved roads. Even paved road become so covered with sand and dust as to result in a dust cloud forming behind a vehicle as it drives. Sand drifts also are normally seen forming across roads deep enough to hinder driving.

Local oil fields and refineries produce constant discharges of black smoke into the air. Most of these pollutants are expected to be burned as gasses by the flares. However, there are also frequently large black plume clouds produced from both from the flares and from the ground in addition to the flares. This black smoke may be from the refineries or other areas. The large black plumes have occasionally covered over base or reduced visibility. Otherwise, a black plume may cover across a significant portion of the skyline. The source and contents of these large plume clouds are not all known. The information was not made available for this survey. Further research may be requested via the U.S. Embassy. It is known that the Kuwaiti nationals may also frequently burn trash or other debris outside of base nearby which may further degrade air quality.

A single burn barrel exists on base. The only contents permitted for burning in the burn barrel is classified or sensitive paper documents. No other burning is authorized on base.

Other factors that introduce potential ambient air hazards include: second hand smoke, vehicle and aircraft exhaust, industrial chemical fumes/gases, welding fumes, and other industrial operations as described in individual shop surveys.

b. Burgan oil field covers a large portion of land located North East of the base. Industrial operations involving several collection points and initial processing of Kuwaiti Crude Oil exists near the base. The nearest known major industrial operation is 4 km Southwest of Ahmed Al Jaber Air Base, Kuwait. However, onsite electric power generation by numerous tactical generators located throughout the camp base may have contributed air pollutants such as nitrogen oxide, carbon monoxide, hydrocarbons and particulates. A central power generation plant was constructed in 2015 which reduced the use of tactical generators; however, exhaust products associated with diesel fuel for electric power generation persist.

c. Open air burning was used only for destruction of classified documents at Ahmed Al Jaber Air Base, Kuwait. Burning was not used for any other waste or refuse disposal during the period covered by this POEMS. The burning was limited to a single site behind the fire department using a lower half of a 55 gal metal barrel.

d. Vehicle and aircraft emissions can be other major contributors to the air pollution. Emissions from military vehicles and aircraft as well as vehicles in surrounding communities, especially in developing countries, may have significant impacts on air quality.

2.2 Particulate Matter

Particulate matter (PM) is a complex mixture of extremely small particles suspended in the air. PM includes solid particles and liquid droplets emitted directly into the air by sources such as: power plants, motor vehicles, aircraft, tactical generators, construction activities, fires, and natural windblown dust. PM can include sand, soil, metals, volatile organic compounds, allergens, and other compounds such as nitrates or sulfates that are formed by condensation or transformation of combustion exhaust. PM composition and particle size vary considerably depending on the source. Generally particulate matter of health concern is divided into two fractions: PM_{10}, which includes coarse particles with a diameter of 10 micrometers or less (0.0004 inches or one-seventh the width of a human hair), 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 than 10 microns (PM_{10})

2.3.1 Exposure Guidelines:

Short-term (24-hour) PM_{10} (mg/m^3):	Long-term PM_{10} MEG (mg/m^3):
Negligible MEG=0.250	Not defined.
Marginal MEG=0.420	
Critical MEG=0.600	

2.3.2 Sample data: Ten PM_{10} samples were previously collected in March 2003. They had concentrations between 0.09 – 3.71 mg/m^3 with an average concentration of 0.68 mg/m^3.

2.3.3 Short-term (acute) health risk for PM_{10}:

Approach:

To assess acute risk associated with PM10, the peak concentrations of PM10 were used to arrive at the acute risk. The peak concentration was 3.71 mg/m3. A risk estimate for the highest peak concentration was calculated. If the highest peak posed a moderated or higher health risk, risk estimates for the next highest concentrations were repeated until the calculated risk dropped to low. Peaks with an estimated risk of moderate or higher are reported as periods of elevated risk.

Risk Summary: **Low to High,** short term risk is based on comparison of daily concentrations to 24-hr MEGs. The variability in the risk is due to significant fluctuation in the daily concentrations.

Overall 6/10 (60%) of the sampling days had concentrations below the 24-hour negligible MEG (LOW Risk); 1/10 (10%) of the sampling days were between the 24-hour negligible MEG and the 24- hour marginal MEG (LOW Risk); 0/10 (0%) of the sampling days were between the 24-hour marginal and the 24-hour critical MEG (MODERATE Risk); 3/10 (30%) of the sampling days were greater than the critical MEG (HIGH risk).

Medical implications: At the **low** risk level, a small number of individuals may have experienced eye, nose, and throat irritation and sought medical attention assuming the levels detected during the limited sampling are representative of general environmental conditions. In most of these individuals, the symptoms would have been mild and temporary requiring no medical treatment. During periods when airborne dust concentrations were higher than those detected, more individuals may have been affected and the severity of symptoms increased. It is likely that more individuals may have sought medical attention with higher airborne dust concentrations. Symptoms associated with exposure to PM_{10} would be expected to resolve after exposure ceased. Health effects in persons with pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated. Respiratory effects can increasingly impact real-time health and mission capabilities as they exceed higher levels of MEGs. Acute effects to relatively healthy troops are mostly eye, nose, and throat irritation, and respirator effects (sneezing, adaptive responses such as coughing, sinus congestion and drainage) that can be exacerbated by increased activity.

Confidence in the Risk Assessment: Confidence in the risk assessment is **low** based on the number of PM_{10} air samples taken.

2.3.4 Long-term (chronic) health risk for PM_{10}:

Health guidelines are not defined for PM_{10}. The United States Environmental Protection Agency has retracted its long-term standard (NAAQS) for PM_{10} due to an inability to clearly link chronic health effects with PM_{10} exposures.

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

2.4.1 Exposure Guidelines:

Short-term (24-hour) $PM_{2.5}$ MEGs (mg/m3):
Negligible MEG=0.065
Marginal MEG=0.250
Critical MEG=0.500

Long-term (1year) $PM_{2.5}$ MEGs (mg/m3):
Negligible MEG=0.015
Marginal MEG=0.065.

2.4.2 Sample data:

From September through December 2015, 32 ambient air $PM_{2.5}$ samples were collected at Ahmed Al Jaber Air Base for $PM_{2.5}$. No air sampling data was available previously. Sample results ranged from 0.034 mg/m^3 to 0.26 mg/m^3 with an average of 0.09 mg/m^3.

2.4.3 Short-term (acute) health risk for $PM_{2.5}$:

Approach: To assess acute risk associated with $PM_{2.5}$, the peak concentrations of $PM_{2.5}$ were used to arrive at the acute risk for the period from October 2014-Decemeber 2015. A risk estimate for the highest peak concentration was calculated. If the highest peak posed a moderated or higher health risk, risk estimates for the next highest concentrations would be repeated until the calculated risk

dropped to low. Peaks with an estimated risk of moderate or higher are reported as periods of elevated risk.

Risk Summary: Based on the samples and associated exposure information assessed, the tactical risk estimate for $PM_{2.5}$ on both typical and peak exposure days during the sampled timeframe is **low**.

Overall 13/21 (62%) of the sampling days had concentrations below the 24-hour negligible MEG (LOW Risk); 8/21 (38%) of the sampling days were between the 24-hour negligible MEG and the 24-hour marginal MEG (LOW Risk); 0/21 (0%) of the sampling days were between the 24-hour marginal and the 24-hour critical MEG (MODERATE Risk); 0/21 (0%) of the sampling days were greater than the critical MEG (HIGH risk). As a result, risk is LOW for short-term (acute) health risk for $PM_{2.5}$:

Medical implications: At the **low** risk level, a small percentage of individuals may experience short-term health effects such as eye, nose, throat and lung irritation, coughing, sneezing, runny nose and shortness of breath. Some individuals might seek outpatient medical care although most individuals would have experienced only mild effects which would have typically resolve when exposure ceased. A small number of individuals may experience more pronounced effects such as decreased lung function and worsening of pre-existing medical conditions such as asthma.

Confidence in the risk assessment: Confidence in the risk assessment is low based on the limited $PM_{2.5}$ air sampling data available and inconsistency of sampling.

2.4.4 Long-term (chronic) health risk for $PM_{2.5}$:

Approach: For chronic health risk, it was assumed that the longest deployment lasted twelve to fifteen months. To assess chronic risk associated with $PM_{2.5}$, the overall yearly average concentration of $PM_{2.5}$ was used to arrive at a long term health risk for October 2014-December 2015. The average $PM_{2.5}$ concentration during this period was 0.09 mg/m^3.

Risk Summary: Based on the samples and associated exposure information assessed, the tactical risk estimate for $PM_{2.5}$ on both typical and peak exposure days during the sampled timeframe is moderate.

Medical implications: Repeated exposures to airborne concentrations of $PM_{2.5}$ that carry a low to moderate long-term health risk may increase the probability for development of chronic health conditions in generally healthy troops. These conditions include reduced lung function, chronic bronchitis, chronic obstructive pulmonary disease (COPD), asthma, and certain cardiopulmonary diseases. Those with a history of asthma or pre-existing cardiopulmonary disease have a higher risk for exacerbating these chronic conditions.

Confidence in the risk assessment: Confidence in the risk assessment is low based on the limited $PM_{2.5}$ air sampling data available.

2.5 Airborne Metals

2.5.1 Sample data:

From October 2014-December 2015, metals analysis was performed on 42 ambient air particulate matter samples (including PM_{10} and $PM_{2.5}$) collected at Ahmed Al Jaber Air Base, Kuwait. Additionally, 10 samples from 2003 were assessed for metals.

Approach: For screening purposes, both peak and average concentrations of all airborne metals detected were compared to their corresponding 1-year negligible MEG. Risk estimates based on the

USAPHC TG 230 methodology are calculated for any compound detected at a concentration greater than its 1-year MEG in 5% or more of the samples collected.

2.5.2 Short-term (acute) health risk: Low. No short-term health risk was identified based on available sampling data.

Risk Summary: Based on the samples and associated exposure information no metals were identified as acute hazards. Chromium, manganese, and nickel were detected in samples but below their respective MEGs.

2.5.3 Long-term (chronic) Health risk: Low. No long-term health risk was identified based on available sampling data.

Confidence in the risk assessment: Confidence in this risk assessment is medium based on limited number of patient incident reports and sampling data within this region of Kuwait.

2.6 Volatile Organic Compounds (VOC)

2.6.1 Sample data:

In 2015, no air samples were collected at Ahmed Al Jaber Air Base, Kuwait for VOC analysis.

Approach: Typically, most VOC sampling is either associated with a specific source or incident driven. Data of this type, especially when there is sparse sampling data exist, is generally not representative of exposure to an entire camp population.

For screening purposes, peak and average concentrations of all airborne VOCs detected were compared to their corresponding 1-year negligible MEG. Short-term risk estimates based on the USAPHC TG 230 methodology are determined for any compound detected at a concentration greater than its 1-year MEG and long-term risk estimates were determined where VOC were detected above their respective 1-year MEG in 5% or more of the samples collected.

2.6.3 Short-term (acute) health risk of VOCs*:*

Risk Summary: Not evaluated; no data exist upon which to base a risk assessment.

Medical Implications: All of sampled concentrations generally will not be representative of possible exposures to the entire camp population. Rather they only represent the population residing or working in proximity to the sample location. The overwhelming majority of others will have far less potential for exposure at the measured levels.

Confidence in the risk assessment: Confidence in this risk assessment is low based on the few samples taken and the laboratory's limited capability to quantify some VOC compounds.

2.6.4 Long-term (chronic) health risk of VOCs*:*

Approach: For screening purposes, sample results for each detected VOCs were compared with each of the corresponding Yearly (Long Term) MEG for each respective VOCs published in the USAPHC TG 230

Risk Summary: No long-term health risk was identified based on available sampling data.

Medical Implications: Not evaluated; no data exist upon which to base a risk assessment.

Confidence in risk estimate: Confidence in the risk assessment is low based on lack of samples collected at Ahmed Al Jaber Air Base, Kuwait.

3 Soil

3.1 Site-Specific Sources Identified

3.1.2 Sample data*:*

From October 2014-December 2015, a total of zero surface soil samples were collected at Ahmed Al Jaber Air Base, Kuwait.

Laboratory analysis of soil samples would include semi-volatile organic compounds (SVOCs), heavy metals, polychlorinated biphenyls (PCB), pesticides, herbicides and radionuclides. The primary exposure pathways associated with soil are dermal contact and incidental ingestion. Individuals involved in construction, maintenance and post fire clean-up activities were at greatest potential for exposure to soil. These individuals comprise a relatively small proportion of the overall camp population.

According to field data sheets, all samples were collected from areas and/or activities where there was high potential for soil exposure such as in maintenance areas, physical training (PT) areas, during excavation, while filling sand bags and/or during construction activities. Laboratory analysis of soil samples included volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polycyclic aromatic hydrocarbons (PAHs), heavy metals, polychlorinated biphenyls (PCB), pesticides, fungicides, herbicides, insecticides, and radionuclides. The primary exposure pathways associated with soil are dermal contact and incidental ingestion.

Individuals involved in construction, maintenance and post-fire clean-up activities were at greatest potential for exposure to soil. These individuals comprise a relatively small proportion of the overall camp population.

Approach: Sampling data for soil have not been collected or evaluated for short term (acute) health risks.

For long-term health risk, sample results are compared with each of the corresponding long-term MEGs published in the USAPHC TG 230 screening purposes. Compounds detected without a single exceedance of the 1-year MEG were excluded from further consideration. Long-term risk estimates were based on the probability of exposure to the concentrations detected.

3.1.3 Short-term (acute) health risk for soil:

Risk Summary: No available data exists upon which to base a risk assessment specific to Ahmed Al Jaber Air Base, Kuwait.

Medical Implications: Not evaluated; insufficient data exist upon which to base a risk assessment.

Confidence in the Risk Assessment: Confidence in the risk assessment is low based on lack of samples collected.

3.1.4 Long-term (chronic) health risk for soil:

Long-Term: Not evaluated; no data exist upon which to base a risk assessment.

Risk Summary: No available data exists upon which to base a risk assessment specific to Ahmed Al Jaber Air Base, Kuwait.

Medical Implications: Not evaluated; insufficient data exist upon which to base a risk assessment.

Confidence in risk estimate: Confidence in the risk assessment is low based on zero samples collected at the installation.

4 Water

In order to assess the health risk to U.S. personnel from exposure to water in theater, the U.S. Army Public Health Command (USAPHC) 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 in Kuwait. Desalinated seawater is the primary source of potable water for the people of Kuwait. The water is filtered and treated to meet Kuwaiti Environmental Public Authority standards. The water distribution system on Ahmed Al Jaber Air Base is used for personal hygiene, cooking, and dishwashing. The system may become contaminated during distribution because of aging or corroded pipes, poor system integrity, pressure fluctuations from power shortages causing back siphoning, and subsequent microbial or chemical infiltration. A complete assessment of the Kuwait water distribution system is not possible due to access and travel restrictions

4.1 Site-Specific Sources Identified

The non-potable water distribution system is supplied via two sources. The main source is from 10K gallons water tanker trucks which pick up water from 1 of 4 alternating water source locations owned by Kuwait's Ministry of Water. They then deliver this water to the water receiving point just outside of the main gate behind the wastewater pond. The current provision has been approximately 20-25 trucks per day. These trucks pump the water directly onto the installation LSA via a pipeline that extends from the Hwy directly to the 4 - 100K gal storage tanks.

The second source of water is provided by the Kuwaiti Air Base's water pump house which operates for 4 hours in the morning from approximately 0900 to noon. This pump house provides water to the entire Kuwait Base. The water is believed to be received onto the Kuwaiti installation from the Kuwaiti Ministry of Water via a water pipeline which feeds into the water reservoir located beside the pump house. The underground reservoir consists of two semi-circle tanks separated by a solid concrete centered catwalk and separated again into halves by a concrete wall; thereby creating four tanks total. The storage tanks are believed to hold approximately 500K gallons on each side of the catwalk. The water is not treated by the Kuwaiti Base. The water is classified as non-potable water.

There is also a well on the installation near the reservoir. This well is active. There may be a second well for Kuwaiti nationals as deemed "sweet water" and the other is for "fire suppression only". The source of water into the Kuwaiti storage tanks and the status of the well(s) have not yet been confirmed. Nor has the source of the fire suppression water been confirmed. However, the Kuwaiti engineer, Engineer Ali, stated that the well provided only brackish, non-potable water, and that the water was received into the Kuwaiti tanks from the Kuwaiti Ministry of Water. Therefore, it is believed that only one well exists which provides water to the fire suppression system.

The four main storage tanks on the LSA are treated using batch hand chlorination with trichloroisocyanuric acid. A contactor has performed this task in the past but is expected to transfer this responsibility to the Air Force in the near future. Due to the batch chlorination, the levels of chlorine have varied significantly from day to day depending upon temperatures, water consumption and

dilution, and time from the last batch. However, no positive bacterial samples were collected during 2014-2015.

Historically, commercial bottled water was provided for drinking at Ahmed Al Jaber Air Base, Kuwait. At least two vendors were identified as having provided bottled water at Ahmed Al Jaber Air Base at some point during military operations in Kuwait including; Aqua Gulf and Rawdatain. Both of these brands of bottled water have been approved by U.S. Army Public Health Center. Bioenvironmental Engineering tests the water for bacteriological quality for every production date received.

Disinfected fresh water from onsite wells was also supplied for non-drinking purposes at Ahmed Al Jaber Air Base, Kuwait. The disinfected fresh water was used only for personal hygiene such as hand washing, showering, laundry, and cleaning.

Based on the information provided from the field, all samples for untreated water were associated with source water for treatment and no exposure pathways were associated with those samples. Therefore, untreated samples are not assessed as potential health hazards.

4.2 Consumed Water (Water for drinking or cooking consumption)

The distributors and all brands of bottled water utilized on AJAB are approved by the U.S. Army Public Health Command. Each shipment of bottled water purchased for AJAB is tested by Bioenvironmental Engineering upon receipt IAW AFMAN 48-138. The monitoring includes total coliform presence/absence and E. coli for four bottles per lot.

4.2.1 Sample data/notes:

From October 2014 to December 2015, only coliform sampling was completed on bottled water at Ahmed Al Jaber, Kuwait.

4.2.2 Short-term (acute) health risk for drinking bottled water:

Approach: In order to determine acute health risk associated with consumption of bottled water the following assumptions were made.

- Base residents ingest 15 liters of bottled water per day or less.
- All U.S. personnel at this location were expected to remain at this site for approximately 180 day rotations.

Based on these assumptions, the maximum detected concentration for each analyte was compared to its respective 14-day, Negligible MEG for consumption of up to 15 liters of water per day (15L/day) and/or the short-term Field water standards published in TB MED 577, Sanitary Control and Surveillance of Field Water Supplies.

Risk Summary: Based on the above approach, the short-term risk associated with consumption of bottled water at Ahmed Al Jaber Air Base, Kuwait is low.

Medical implications: Not evaluated; insufficient data exist upon which to base a risk assessment.

Confidence in the risk assessment: Despite the lack of bottled water samples, confidence in the risk assessment is **high** because U.S. Army veterinary personnel performed quarterly audits of all bottled water suppliers to ensure consistency of quality throughout the area of responsibility.

4.2.3 Long-term (chronic) health risk:

Approach: Bottled water was supplied to Ahmed Al Jaber Air Base, Kuwait in distinct lots and from multiple vendors. Thus it is inappropriate to average analytical results across the spectrum of water samples/suppliers. As a result, the maximum detected concentration for each analyte was used to perform the long-term health risk screening. This process could result in overestimation of the long-term health risk as it assumes that camp residents consume water at the maximum detected concentration consistently during their deployment.

Risk Summary: **No health risk identified;** based on available sampling data. Analytical results of the water samples collected at Ahmed Al Jaber Air Base, Kuwait revealed that no analytes were detected above their respective 1-year, 15 L/day drinking water MEG or the respective long-term potability standard published in TB MED 577.

Medical implications: Not evaluated; insufficient data exist upon which to base a risk assessment.

Confidence in the risk assessment: Despite the relatively limited number of bottled water samples, confidence in the risk assessment is **medium** for other analytes because U.S. Army veterinary personnel performed quarterly audits of all bottled water suppliers to ensure consistency of quality throughout the deployment.

4.3 Water for Non-Drinking/Other purposes (RO and other sources of treated water)

Monitoring includes total coliform presence/absence and *E. coli*, pH, chlorine residual, and monthly M272. Additionally, an annual comprehensive screening analysis is taken and submitted to USAPHC IAW *TB Med 577*. All Results are loaded in DOEHRS DoD Surveillance program office. While the water provided in the distribution systems meets *TB Med 577* for water potability, the systems are classified as non-potable due to lack of backflow prevention devices and the risk of infiltration to the aging system. The system can be used for brushing teeth, washing clothes, washing dishes, and taking showers.

Although the primary route of exposure for most microorganisms was ingestion of the contaminated water, dermal exposure to some microorganisms, chemicals, and biological contaminants 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 or during dermal contact at vehicle or aircraft wash racks.

4.3.1 Sample data/notes:

From October 2014- December 2015, 21 treated and disinfected fresh water samples were collected at Ahmed Al Jaber Air Base, Kuwait. Water samples were analyzed for inorganic compounds, VOC, SVOC and various physical characteristics.

Detected chemicals met long-term potability standards (LTPS) during field testing with one exception of a single sample. Di(2-ethylhexyl)phthalate did not meet the Department of the Army Technical Bulletin, Medical 577 military long-term potability standards; this was due to a single sample taken 23 Jun 2015.

4.3.2 Short-term (acute) and long-term (chronic) health risks associated with water uses other than drinking:

Approach: In order to assess the health risk associated with water uses other than drinking, the following assumptions were made:

- Treated water was used for personal hygiene purposes.

- Deployments lasted is service specific (Army personnel 9 months, AF personnel 6 months and Navy and Marine personnel from 12 to15 months or less if personnel were forward deployed).
- The primary routes of exposure associated with treated water were incidental ingestion through personal hygiene (i.e., brushing teeth/oral hygiene) and dermal contact when showering.
- Camp residents ingest far less than 5 liters (food preparation) of RO treated water per day.
- Disinfected fresh water was used only for showering and hand washing.

Based on guidance provided in USAPHC Technical Guide 230, *Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel* (USAPHC TG 230), any compound with a peak concentration less than or equal to 2.5 times the 14-day negligible MEG for consuming 5 liters of water per day/ (5-L/day) may be eliminated from further consideration. If a 14 day, 5-L/day negligible MEG was not available, the more conservative 1-year, 5-L/day negligible was used for screening purposes.

4.3.2.1 **Reversed Osmosis (RO) Treated Water (used for food preparation and personal hygiene).**

4.3.2.2 Sample data/notes:

From October 2014-December 2015, treated and disinfected fresh water samples were collected at Ahmed Al Jaber Air Base, Kuwait. Water samples were analyzed for inorganic compounds, VOC, SVOC and various physical characteristics. Preventive medicine surveillance for microbiological contaminants (coliforms/E.coli) is standard operating procedure, but data associated with bacteriological analyses was not available to review for this timeframe.

Risk Summary: No acute or chronic health risks associated with incidental ingestion of RO treated water were identified at Ahmed Al Jaber Air Base, Kuwait.

Medical Implications: None identified.

Confidence in the Risk Assessment: Confidence in the risk assessment is medium based on a limited number of samples. However, there was an active and ongoing drinking water surveillance program at Ahmed Al Jaber Air Base, Kuwait which increases confidence in this assessment.

4.3.2.1 **Disinfected Fresh Water (used for personal hygiene)**.

Evaluation of the samples of disinfected fresh water did not reveal any exceedances of USAPHC TG 230 health risk screening criteria.

Risk Summary: Moderate acute or chronic health risks associated with incidental ingestion of disinfected fresh water during showering were identified at Ahmed Al Jaber Air Base, Kuwait.

Medical Implications: None identified.

Confidence in the Assessment: Even though there are relatively few samples in the data set, confidence in this risk assessment is **medium** based on the limited potential for ingestion of host nation treated water.

5 Military Unique

5.1 Chemical Biological, Radiological Nuclear (CBRN) Weapons

There were no specific hazard sources or exposure incidents documented in the Defense Occupational and Environmental Health Readiness System (DOEHRS) or the Military Exposure Surveillance Library (MESL).

5.1.1 Short and long-term health risks:

Not Evaluated - No data was available upon which to base a risk assessment specific to Ahmed Al Jaber Air Base, Kuwait.

Risk Summary: None - insufficient data exists upon which to base a risk assessment specific to Ahmed Al Jaber Air Base, Kuwait.

Medical Implications: None - insufficient data exists upon which to base a risk assessment specific to Ahmed Al Jaber Air Base, Kuwait.

Confidence in the Risk Assessment: None - No data was available upon which to base a risk assessment specific to Ahmed Al Jaber Air Base, Kuwait.

5.2 Depleted Uranium (DU)

Depleted Uranium (DU) was stored at Ahmed Al Jaber Air Base, Kuwait from November 2014 to present. There were no exposure incidents documented in the Defense Occupational and Environmental Health Readiness System (DOEHRS) or the MESL. The DU was stored in the form of 30 mm rounds contained within sealed and marked metal ammo storage cans at the munitions storage site. Radiations surveys were conducted on 30 December 2014 and 17 February 2015 and are documented in DOEHRS. The DU was stored under permit provided by the Air Force radioisotope committee (RIC) during this time frame. The DU rounds were stored in a munitions controlled site with a guarded gate. The majority of base personnel were unauthorized enter the area. The DU was not moved from its single storage pad during this time period. The storage pad was an asphalt pad surrounded by dirt berms along three sides with the fourth side facing a road. There were more berms along the road as the DU pad was to the rear of the munitions storage pad sites. Background readings were measured across the street from the sources. Also, there were some projectiles found in a pile of UXO left over from the Gulf War time frame. **Personnel are not expected to enter the revetment pad except to conduct monthly inventories or load trailers for 1 hour or less.**

In addition, there is a large, locked red Conex on the left side of the road that leads out to the Munitions Storage Area, containing DU. This Conex belongs to the Kuwaiti host nation, and contains DU fragments in the form of two plastic 55 gallon drums and a few miscellaneous boxes. EOD conducted an operation to removed aforementioned DU projectiles, and all the resulting capsules and soil are stored in a plastic tri-wall near the Conex.

5.2.1 Short and long-term health risks:

The highest exposure rate inside the revetment was measured to be 2.0 mR per hour. Based on worst-case scenario calculations, the projected annual radiation dose for an individual inside the revetment will be above the general public dose limit (100 mrem per year) and has the potential to exceed the annual occupational exposure dose limit (5000 mrem per year). Thus, **the area will be restricted access to the general public**. Personnel enter the bunker on a monthly to conduct inventories or load trailers. This work usually lasts less than one hour.

Risk Summary: Low. Based on this workload, **personnel will not be exposed to radiation levels above the occupational exposure dose limits** specific to Ahmed Al Jaber Air Base, Kuwait.

Medical Implications: The highest exposure rate measured was 1.98 mR/hr at one inch from the container. Therefore, the highest dose someone can receive in any given hour would be 2.0 mrem. The 1.98 mR/hr reading is just below the federal occupational limit of 2 mrem in any given hour for a member of the general public. General public dose limits: 2 mrem in any given hour, 100 mrem in a year (10 CFR 20.1301).

Confidence in the Risk Assessment: Confidence in this risk is **medium** based on sampling data and the limited access to the munitions storage area.

5.3 Ionizing Radiation

5.3.1 Industrial Radiography

Medical radiography was utilized in the EMEDS Clinic. Industrial radiography was utilized by explosive ordnance disposal (EOD) and the Non-Destructive Imaging (NDI) aircraft maintenance shop. A future project was to use radiography at the vehicle search area and would be operated by security forces personnel. However, the equipment had not yet been received at the time of this report. The thermoluminescent dosimetry (TLD) program was implemented in July 2015. The medical radiology technician and the (NDI) aircraft maintenance technicians were enrolled in the program.

5.3.2 Radioactive Material

There are no permitted radioactive materials or generally licensed devices at Ahmed Al Jaber Air Base, Kuwait other than the DU listed above. All ionizing sources are limited to check sources for BE, EOD, NDI or CEX equipment, and those contained in aircraft.

5.3.3 Short and long-term health risks:

TLDs results show workers are within exposure limits for ionizing radiation.

Risk Summary: The risk is **medium** based upon radiation scatter surveys documented in the Defense Occupational and Environmental Health Readiness System (DOEHRS) and administrative procedures that are in place to maintain exposures as low as reasonable achievable.

Medical Implications: None.

Confidence in the Risk Assessment: Confidence in this risk is **medium**.

5.4 Non-Ionizing Radiation

Specific hazard sources were documented in DOEHRS or the MESL from in 2015.

5.4.1 Short and long-term health risks:

Risk Summary: The risk is **low** due to procedures that are in place to maintain exposures below the permissible exposure limits

Medical Implications: None

Confidence in the Risk Assessment: Confidence in this risk assessment is medium.

6 Endemic Diseases

6.1 Sample data/notes:

The assessed risk for endemic diseases addressed below represents the residual risk that exists in the presence of preventive measures.

Department of Defense Directive 6490.02 series, Comprehensive Health Surveillance, establishes policy for routine health surveillance of all DoD personnel throughout their military service.

The Armed Forces Health Surveillance Branch (AFHSB) maintains archives of medical event reports for all Services.

Medical event reports identified related to deployment in Kuwait did not identify specific locations within the country, nor did they describe the probable site of the exposure; therefore, epidemiological analysis of medical event data was limited to the country level.

Endemic diseases present in Kuwait were assessed by referring to the Defense Intelligence Agency's Infectious Disease Risk Assessment Database for CENTCOM: Kuwait at https://www.ncmi.detrick.army.mil/product/idra_db.php?co=KWT and the "Destinations" section of the Centers for Disease Control and Prevention (CDC) Travelers' Health website, http://wwwnc.cdc.gov/travel/destinations/traveler/none/kuwait.

Where effective vaccines, such as those for Hepatitis A and B, are in place, risk to individuals is effectively reduced to none and these endemic diseases were excluded from further assessment.

Reporting of medical events from deployed environments is inconsistent. Identified reports of endemic disease associated with deployment to Kuwait are assumed not to represent all cases of reportable endemic disease events among service personnel deployed to Kuwait. Where available; additional relevant reports were used to supplement reportable medical event data for this assessment.

6.2 Gastrointestinal Diseases

U.S. Service members have little or no immunity to the food and waterborne diseases present in Kuwait. To prevent food and waterborne diseases among individuals deployed to Kuwait, food and water are purchased from approved sources. Food is prepared in facilities where there is public health oversight (certificate of sanitation, health screening of food service workers, periodic inspections, etc.). Due to the potential presence of disease causing organisms, as well as the high prevalence of improper food handling and preparation, local food and water were not approved for consumption. Viral gastroenteritis that is spread through contact or fomites (any inanimate object or substance capable of carrying infectious organisms) presents a recurrent risk due to a high rate of personnel turnover, and shared dining, berthing, bathroom facilities, and working spaces.

Approach: The health risk for fomite-borne gastrointestinal infections and endemic food and waterborne diseases to individuals deployed to Kuwait during the period of this assessment was epidemiologically assessed based on the combination of identified endemic diseases, knowledge of preventive measures in place, review of medical event reports associated with deployment to Kuwait, and review of military public health reports.

6.2.1 Short -term health risks*:*

Risk assessment: The overall short-term risk associated with food borne and waterborne diseases in Kuwait was **high** (bacterial or viral gastroenteritis, protozoal diarrhea, cholera, brucellosis, hepatitis E, typhoid/paratyphoid fever).

The short-term risk for viral gastroenteritis was **moderate.** Risk due to a high rate of personnel turnover, shared dining, berthing, bathroom facilities, and working spaces is not substantially different than that expected in similar settings within the United States.

Medical implications: Gastroenteritis, particularly from viral agents, can cause periodic outbreaks in spite of preventive measures. An operationally significant attack rate (potentially 11-50% per month) could occur among personnel consuming local food, water, or ice. 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 number of infections may require greater than 72 hours convalescence and/or hospitalization.

Confidence in the risk assessment: Confidence in the risk assessment is **medium**. Food and water borne diseases, especially those with short convalescence and lack of long-term health effects are often underreported for deployed military populations.

6.2.2 Long-term (chronic) health risks:

Risk assessment: The long-term risk associated with food and waterborne diseases was **low** for protozoal diarrhea and brucellosis.

Medical implications: Long-term health effects resulting from infection with food and waterborne diseases are rare.

Confidence in the risk assessment: Confidence in the risk assessment was **high** Incidence of protozoal diarrhea and brucellosis in the post deployment military population is known to be extremely low.

6.3 Arthropod Vector-Borne Diseases

The climate and ecological habitat found in Kuwait support populations of arthropod vectors, including mosquitoes, ticks, and sand flies. Risk for arthropod-borne disease is higher during warmer months (typically from April through November); with variable rates of disease transmission (vector-borne diseases occur at low or unknown levels throughout the country). Personnel may have been exposed to mosquitoes, ticks, sand flies, or other biting vectors both during the day or night. Risk is higher in urban and other densely populated areas, or near where animals were kept. Removing vector harborages, spraying for vectors within base camps, avoiding animals or areas where they were kept, proper wearing of insecticide-treated (permethrin) uniforms, use of bed nets in field conditions, avoiding peak vector feeding times if possible, and the application of insect repellent to the skin (DEET) were the main protective measures against vector-borne diseases.

Approach: The health risk for endemic vector-borne diseases to individuals deployed to Kuwait during the period of this assessment was epidemiologically assessed based on the combination of identified endemic diseases, knowledge of preventive measures in place, review of medical event reports associated with deployment, and review of military public health reports.

6.3.1 Short-term (acute) health risks:

Risk assessment: The short-term risk for cutaneous leishmaniasis was **moderate**. The short-term risk for the vector-borne diseases Sandfly fever, Sindbis, West Nile Fever, and visceral leishmaniasis was **low**. Individuals who deploy from Ahmed Al Jaber Air Base, Kuwait or rural outlying areas may experience increased short-term risk.

Medical implications:

Sandfly fever, Sindbis, and West Nile Fever present in Kuwait have fairly short incubation periods ranging from days to weeks. Any of these diseases would initially present as acute fever and malaise, some accompanied by rash, and would lead to acute, sometimes severe illness.

Cutaneous leishmaniasis typically presents as skin lesions, single or multiple, that start as a papule and enlarge into an ulcer. Rare cases (less than 0.1% per month attack rate) could occur among personnel exposed to sandfly bites in areas with infected people, rodents, dogs, or other reservoir animals. Both cutaneous and visceral leishmaniasis can have an incubation period range from 7 to 180 days.

Confidence in the risk assessment: Confidence in the risk assessment is **moderate**.

6.3.2 Long-term (chronic) health risks:

Risk assessment:

The long-term risk for leishmaniasis, cutaneous and visceral, was **low**.

Medical implications:

Both visceral and cutaneous leishmaniasis may have extended incubation periods, ranging from a months to years. Although rare, it is possible to be infected during deployment, but not to have clinically evident disease until redeployed. Leishmaniasis should be considered in the differential diagnosis for any unusual skin lesions, or chronic, systemic disease.

Confidence in the risk assessment: Confidence in risk assessment is **moderate**. Incidence of visceral leishmaniasis in the post deployment military population is known to be low. Cases of cutaneous leishmaniasis have been detected and treated post deployment. The military medical community was/is aware of the presence of leishmaniasis in Kuwait, and skin lesions in individuals with a history of time spent in Kuwait were/are evaluated with that in mind.

6.4 Water Contact Diseases

Operations or activities that involve extensive fresh water contact may result in individuals being exposed to leptospirosis. The occurrence of flooding after heavy rainfall facilitates the spread of leptospirosis because, as water saturates the environment, leptospirosis present in the soil pass directly into surface waters. Activities such as wading or swimming in fresh water sources may result in exposures to enteric diseases such as diarrhea and hepatitis via incidental ingestion of water. Prolonged water contact also may lead to the development of a variety of skin conditions, such as bacterial or fungal dermatitis. Elimination of standing, and/or open, bodies of fresh water protects against the spread of water contact diseases.

Approach: The health risk for endemic water contact diseases to individuals deployed to Kuwait during the period of this assessment was epidemiologically assessed based on the combination of identified endemic diseases, knowledge of preventive measures in place, review of medical event reports associated with deployment to Kuwait, and review of military public health reports.

6.4.1 Short-term (acute) health risks:

Risk assessment: The short-term risk for leptospirosis was **moderate**, peaking between April and October.

Medical implications: Leptospirosis, which has an incubation period of 5-14 days, presents as acute fever with nonspecific symptoms that last for 1 week to several months.

Confidence in the risk assessment: Confidence in the risk assessment is **high**. No reported cases of water contact diseases were identified from Kuwait during the assessment period.

6.4.2 Long-term (chronic) health risks:

No long-term health risk was identified.

6.5 Respiratory Diseases

U.S. military populations living and working in close-quarter conditions were at risk for substantial person-to-person spread of respiratory virus infections such as the common cold and influenza. Primary exposure pathways for tuberculosis include prolonged close contact (generally several hours per day for greater than three days per week in a closed space) with the local population or third country national contractors. U.S. personnel who remained on base had limited to no contact with the local population, and local and third country national workers/contractors were required to complete health screening prior to employment.

Approach: The health risk for respiratory diseases to individuals deployed to Kuwait during the period of this assessment was epidemiologically assessed based on the combination of identified endemic diseases, knowledge of preventive measures in place, review of medical event reports associated with deployment to Kuwait, and review of military public health reports.

6.5.1 Short-term (acute) health risks:

Risk assessment: The short-term risk for upper respiratory infections was **low.** Risk due to a high rate of personnel turnover, shared dining, berthing, recreational facilities, and working spaces is not substantially different than that expected in similar settings within the United States.

The short-term risk for tuberculosis was **moderate**. Rates of latent TB infection (LTBI) may be elevated for personnel with prolonged indoor exposure to local populations.

The short-term risk for meningococcal meningitis is **low**. The risk is comparable to the U.S. among unvaccinated personnel who have close contact with the local population.

Medical implications: Upper respiratory infections, particularly from viral agents, can cause periodic outbreaks in spite of preventive measures. A small proportion of infections may require greater than 72 hours convalescence and/or hospitalization.

Symptoms of tuberculosis, including fever, weight loss, night sweats and cough, typically start within 1-6 months of infection. The lifetime risk for tuberculosis after becoming infected is 5-10%; half of this risk occurs in the first two years following infection.

Meningococcal meningitis is a potentially very severe disease typically requiring intensive care; fatalities may occur in 5-15% of cases. Risk is elevated under crowded living conditions and for personnel having close contact with local nationals. Group A usually predominates; group W-135 case reporting increased in the late 1980s.

Confidence in the risk assessment: Confidence in risk assessment is **medium**. Upper respiratory infections, especially those with short convalescence and lack of long-term health effects are not reportable for deployed military populations. Tuberculosis prevalence in the local population is widespread, but no reports of tuberculosis were identified for individuals deployed to Kuwait during the assessment period. Regionally for meningococcal meningitis, outbreaks were reported in Saudi Arabia in March and April 1992. Group A outbreaks were reported after the 1987 Hajj; group W-135 outbreaks occurred after the 2000 and 2001 Hajjs.

6.5.2 Long-term (chronic) health risks:

Risk assessment: The long-term risk for tuberculosis and meningococcal meningitis were **low**.

Medical implications: Symptoms of tuberculosis can be delayed by two or more years following infection. Tuberculosis should be considered in assessing symptoms of fever accompanied by night sweats and cough.

Confidence in the risk assessment: Confidence in risk assessment is **high**. Prevalence of tuberculosis in the local population is widespread, but prevalence of tuberculosis in the post deployment military population is known to be extremely low.

6.6 Animal-Contact Diseases

Animals in Kuwait were not routinely vaccinated against vaccine preventable diseases such as rabies or anthrax. Q-fever, anthrax, and rabies are known to be present in Kuwait. Exposure to animals, and/or locations where animals were kept (stray dogs/cats, barnyards, slaughterhouses), were the primary infection sources for all these diseases, and avoidance of companion and farm animal contacts was the primary prevention strategy. Preventive measures in place include anthrax vaccination, which is effective in preventing both cutaneous and inhalation anthrax, and rabies post exposure prophylaxis, which is effective for preventing onset of rabies in exposed individuals.

Approach: The health risk for endemic animal contact diseases to individuals deployed to Kuwait during the period of this assessment was epidemiologically assessed based on the combination of identified endemic diseases, knowledge of preventive measures in place, review of medical event reports associated with deployment to Kuwait, and review of military public health reports.

6.6.1 Short-term (acute) health risks:

Risk assessment: The short-term risk for Q-fever was **moderate**. The short-term risk for anthrax (naturally acquired), rabies and H5N1 avian influenza was **low**.

Medical implications: Naturally occurring anthrax (non-weaponized) is an acute disease that usually affects the skin, while inhalation anthrax has mild and non-specific initial symptoms among unimmunized individuals.

Symptoms of acute Q-fever, which may present one week to greater than one month after exposure, include fever, chills, and weakness and sometimes present as pneumonia-like symptoms.

Rabies presents as an acute, viral encephalomyelitis and is almost invariably fatal.

Confidence in the risk assessment: Confidence in risk assessment is **high**.

6.6.2 Long-term (chronic) health risks:

Risk assessment: The long-term risk for Q-fever and rabies was **low**. However, Q-fever has been diagnosed in a small number of personnel after they returned to the U.S.

Medical implications: Q-fever is generally an acute febrile disease. However, considerable variation in severity and duration may be seen; infections may be unapparent or present as a nonspecific undifferentiated febrile syndrome or as pneumonia. Q-fever should be considered in the differential diagnosis of an undifferentiated febrile syndrome when personnel mention a history of being near or in areas where animals were kept or had been kept. Unpasteurized milk may also transmit infection.

The incubation period for rabies is typically 1–3 months, but may be more than one year in rare instances.

Confidence in the risk assessment: Confidence in risk assessment is **high**.

7 Venomous Animals/Insects

The bite or sting from a spider, scorpion, or snake should be considered a medical emergency, and personnel should seek immediate medical attention. Antivenin, if available for the specific species, may be indicated depending on the treating provider's professional judgement. No anti-venom is available at Ahmed Al Jaber and cannot be implemented until a critical care treatment capability is established in order to adequately treat side-effects of the anti-venom/venin. Antivenin is available at U.S. Army Camp Arifjan, Kuwait.

The species listed below have home ranges that overlap the country of Kuwait, and may present a health risk if encountered. Information was taken from U.S. Army Public Health Command, Armed Forces Pest Management Board Living Hazards Database, and personal communication from previously deployed preventive medicine personnel. Little to no regional (within the country of Kuwait) animal range information was available. The below list should not be considered all inclusive; other venomous scorpions and snakes may be present in the region. See Section 10 for more information about pesticides and pest control measures.

7.1 Short-term (acute) health risk:

7.1.1 Spiders: Numerous species of spiders are found in Kuwait. The Black Widow Spider (*Latrodectus lugubris*), camel spiders (*Solifugae*), and brown recluse (*Loxosceles reclusa*) are known species whose bite presents a threat. Widow spider bites are mostly minor and even significant envenomation is unlikely to be lethal. Bite is usually felt as a "sting", with delayed (10+min) local pain, and sweating. More severe envenomation may produce regional pain, tender draining lymph nodes, nausea, hypertension, and malaise. Camel spider bites are very painful and may cause a localized reaction but global reaction is rare. Brown recluse spider bites often go unnoticed initially because they are usually painless bites. Occasionally, some minor burning that feels like a bee is noticed at the time of the bite. Symptoms usually develop 2-8 hours after a bite. Keep in mind that most bites cause little tissue destruction. Initially the bite site is mildly red and upon close inspection may reveal fang marks. Within a few hours, the redness gives way to pallor with a red ring surrounding the area, or a "bull's-eye" appearance. The lesion will often appear to flow downhill over the course of many hours. The center area will then often blister, which over 12-48 hours can sink, turning bluish then black as this area of tissue dies. Health risk was **low**.

7.1.2 Scorpions: Numerous species of scorpion are found in Kuwait. The majority of scorpions found in the region have stings that cause only short lived local effects, such as pain, without systemic effects. Serious envenomations may result in numbness, frothing at mouth, difficulty breathing, and convulsions. Various factors influence the severity of the envenomation to include health and age of patient, sting site, and size and age of scorpion. Most scorpion venom is neurotoxic with a mixture of

other substances. If the patient is allergic to bee and wasp stings, extreme caution and care must be taken to prevent excessive morbidity and even possibly death. The following three scorpions are listed as present in Kuwait and have known detrimental health effects:

- *Androctonus amoreuxi* (Fat-tailed scorpion).
- *Androctonus crassicauda (Arabian fat-tailed scorpion)*
- *Leiurus quinquestriatus (Death Stalker)*
- *Hemiscorpius lepturus* (highly cytotoxic venom which can cause serious wounds, inflammation, blisters, and necrosis. No antivenom is currently available).
- *Hottentotta alticola* (Black scorpion)

Overall health risk associated with a scorpion sting was **high**. Scorpion sightings and reports of scorpions around the living areas were common.

7.1.3 Snakes: Numerous species of snakes are found in Kuwait. A number of poisonous snakes, whose range incorporates Kuwait, could have been encountered to include cobras, pit vipers, and vipers. The following list is not an all-inclusive list of vipers and cobras in the area, but rather those deemed most significant or potentially encountered.

- *Cerastes cerastes gasperetti* (Desert Horned Viper): Cause the majority of the bites. envenomation causes deep local tissue damage accompanied by stomach pain, sweating, nausea, possible fever in conjunction with gangrene
- *Echis carinatus* (Saw-scaled Viper): Bites are typically moderate to severe, with potentially lethal envenoming, requiring urgent assessment and treatment, including IV fluids, IV antivenom and good wound care. Antivenom is key for the treatment of systemic envenoming.
- *Echis sochureki (Sochurek's Saw-scal*ed Viper): Bites are typically moderate to severe, with potentially lethal envenoming, requiring urgent assessment and treatment, including IV fluids, IV antivenom and good wound care. Antivenom is key for the treatment of systemic envenoming.
- *Macrovipera lebetina* (Levantine Viper): Bites may cause mild to severe local effects, including shock and coagulopathy.
- *Daboia russeli* (Russell's Viper): Venom is highly hemotoxic, and this snake has been known to cause severe envenomation and fatalities.
- *Pseudocerastes persicus fieldi (Field's Sand* Viper): venom characterized as neurotoxic; little pain at bite site general weakness followed by paralysis
- *Pseudocerastes persicus persicus* (Persian Sand Viper): venom characterized as hemorrhagic; immediate and severe pain at bite site
- *Walterinnesia aegyptia* (Desert Black Snake/Desert Cobra): venom strongly neurotoxic with lesser anticoagulant activity.

Overall, the health risk associated with a snake bite was **high**. Snake sightings and reports of snakes around the living areas were common.

7.2 Long-term (chronic) health risk:

No long-term health risks were identified based on available data.

Risk assessment: The long-term risk associated with snakes was low based on disease incident reporting from Kuwait.

Medical implications: Long-term health effects resulting from interaction with snakes is **low.** Based on efficacy of control measure as evidenced by lack of disease(s) reported in various medical surveillance data bases e.g, TMDS, MERS, DRSi as per incident reporting from Kuwait.

Confidence in the risk assessment: Confidence in risk assessment is **high** based on disease incident reporting from Kuwait.

8 Heat/Cold Stress

8.1 Site-Specific Conditions

Kuwait's climate is subtropical desert climate with two distinct seasons. Summer is May through October, and winter is November through April. During the summer months frequent sand storms are caused by arid shamal winds which blow across the Persian Gulf. Average daily wind speed is 9.4 mph. Winter brings all of Kuwait's annual precipitation (0.2-1 inch), which is sometimes heavy enough to produce minor local flooding.

8.2 Heat

8.2.1 Heat Exposure Guidelines

The risk of heat injury is based on the Wet Bulb Globe Temperature Index as follows:
Low (80-84.9 °F)
Moderate (85-87.9°F)
High (88-89.9°F)
Extremely High (≥ 90°F)

8.2.2 Short (acute) and long-term (chronic) health risk:

Approach: No heat casualty, medical event reports involving heat injuries or heat stress monitoring data were available in the Defense Occupational and Environmental Health Readiness System or the Military Exposure Surveillance Library for any of the camps covered in this assessment. Accordingly, risk estimates are based strictly on existing climatologic data.

Risk Summary:

Short-term (acute) health risk: **Unmitigated Variable,** high health risk of heat injury in unacclimatized personnel from April to October, and Low from November to March. 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 (TG230, Table 3-6).

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.

Medical implications: Severity of heat injury can range from mild clinical signs such as clamminess, nausea, disorientation or headache to life threatening symptoms requiring hospitalization. Long-term medical implications from heat injuries are rare but can occur, especially from more serious injuries such as heat stroke. Individuals with a history of heat injury, even when medical attention was not sought, are at increased risk for future heat injury; repeat heat injury may have increased severity.

Confidence in the risk assessment: Based on generally available information on climatic conditions and the absence of reported heat injuries, confidence in risk assessment is medium. Individuals who experienced mild symptoms of heat injury may not have sought medical attention; this may lead to an underestimation of the risk.

8.3 Cold

8.3.1 Short (acute) and long-term (chronic) health risks*:*

Approach: No cold injury data were available in the Defense Occupational and Environmental Health Readiness System or the Military Exposure Surveillance Library for any of the camps covered in this assessment. Accordingly, risk estimates are based strictly on existing climatologic data.

Risk Summary: The risk for cold stress/injuries is largely dependent on clothing/equipment worn, operational work intensity and individual factors rather than environmental factors alone. The acute and chronic risk for non-freezing cold injuries, such as chilblain, trench foot, and hypothermia was **low.**

Medical implications: The cooling of body parts may result in various cold injuries - nonfreezing injuries, freezing injuries and hypothermia which is the most serious. Toes, fingers, ears and nose are at greatest risk because these areas do not have major muscles to produce heat. In addition, the body will preserve heat by favoring the internal organs and thus reducing the flow of blood to the extremities under cold conditions. The most severe cold injury is hypothermia which occurs from excessive loss of body heat and the consequent lowering of the body's core temperature.

Confidence in the risk assessment: Based on generally available information on climatic conditions and the absence of reported cold injuries, confidence in risk assessment is high. Individuals who experienced mild symptoms of cold injury may not have sought medical attention; this may lead to an underestimation of the risk.

9 Noise

9.1 Continuous

9.1.1 Exposure Guidelines:

The Services have established occupational exposure limits (OEL) for continuous or intermittent noise at 85 decibels on the A-weighted scale (dbA), 84 dbA for the Navy, as an eight hour time-weighted average (TWA). The A-weighted scale of noise measurement is used because it mimics the human ear's response to sound. All Services require that individuals routinely exposed to noise levels greater than the OEL be enrolled in the hearing conservation program. Generally, routinely exposed is defined as when the TWA exceeds 84 dB(A) on average more than 2 days in any month.

9.1.2 Site Specific Conditions:

Sources of potential noise include flight line operations, associated with both fixed and rotary wing aircraft, tactical generators and various hand tools in maintenance shops. Due to the inherent noise hazard in flight line operations, personnel were required to wear dual hearing protection.

9.1.3 Short (acute) and long-term (chronic) health risk:

Approach: Knowledge of the Service hearing conservation programs and typical sound pressure level measurements associated with the various potential noise generating sources were used to complete the health risk assessment.

Risk Summary:

Short-term health risk: The short-term risk of noise-induced hearing loss with the use of appropriate hearing protection use was **low**. Few exposed individuals were expected to have experienced noticeable short-term health effects such as annoyance, speech interference, fatigue and temporary hearing threshold shifts during deployment.

Long-term health risk: The long-term risk of noise induced hearing loss with appropriate hearing protection use is **low**.

Confidence in the Risk Assessment: Confidence in the health risk assessment is **medium**. There is a well-established hearing conservation program; hearing protection is readily available and generally worn by individuals with known occupational exposures across the Services. However, the limited availability of information about specific noise sources and enforcement of the use of personal protective equipment diminishes confidence.

9.2 Impulse

No information about potential sources of impulse noise (140 dbA) or greater) was available.

9.2.1 Short-term (acute) and Long-term (chronic) health risks:

Not evaluated: Insufficient data exist upon which to base a health risk assessment.

10 Unique Concerns

10.1 Special Incidents or Spills:

10.1.1 Site Specific Conditions:

There are two dirt mounds along munitions road, one on each side of the road. The mounds are known to have the potential for containing UXOs left over from the Gulf War in the 1990s era. The areas were appropriately marked with UXO warning signage. Numerous UXOs have been discovered across the installation, particularly outside of the LSA area from October 2014-December 2015. EOD has disarmed many of these UXOs but warns that there may still be many more. Personnel should not stray off the paved road when outside of the LSA at Ahmed Al Jaber Air Base, Kuwait. Sometime between February and April 2015, EOD responded within a few miles outside of the installation after a local camel herder who had reportedly been handling a UXO when it detonated and killed him. Also, EOD found a location that still contained DU Projectiles that were still in the ground. They removed them and added them to the rest of the items on munitions road.

Medical implications: Not evaluated: No health risk assessment conducted.

Risk Summary: Medium based on limited access to the area and specific procedures in place forbidding personnel from entering the area without authorization.

Confidence in the Risk Assessment: **High** based upon information specific to Ahmed Al Jaber Air Base, Kuwait.

10.1.2 Site Specific Conditions:

November 2014: 80 gal of JP-8 leaked on the flightline. Fire Dept was able to contain spill area and clean up. On 12 May 2015 a marine unit spilled a 55 gal drum of 15W-40. The spill was contained across the loose surface sand while the hard packed layer approximately 6 inches below the surface sand was unaffected. The area of contaminated sand was shoveled into palletized box crates and

removed for disposal. CE maintained oversight of the cleanup and then URS provided removal and oversight of the palletized dirt-filled crates.

It is uncertain if any spills or fire incidents may have occurred that have health risks as a result of the Iraqi invasion and occupation of Kuwait during the first Gulf War.

Medical implications: Not evaluated: Insufficient data exist upon which to base a risk assessment

Risk Summary: **Low** based on available information specific to Ahmed Al Jaber Air Base, Kuwait.

Confidence in the Risk Assessment: **Low** based upon information specific to Ahmed Al Jaber Air Base, Kuwait.

10.2 Waste Sites/Waste Disposal

Approach: Knowledge of the U.S. Central Command and Service specific policies and procedures served as the basis of this risk assessment.

10.2.1 Site specific sources identified:

Four sources of waste exist on base, medical, non-hazardous solid waste, hazardous industrial waste, and sanitary sewer/latrine waste. Base personnel have minimal contact with this waste and risk to any exposure is high.

Hazardous medical waste (red-bagged or sharps containers) generated by the medical group is staged in an outdoor locked connex that is controlled by medical staff. The medical waste is delivered by medical technicians as needed to camp Arifjan for incineration. During transportation the medical waste is double bagged sealed within boxed crates.

Non-hazardous solid waste generated by base residents is disposed of in various trash bins throughout the base. The trash bins are emptied through a host nation contractor.

Currently, proper handling, storage, and disposal of industrial waste generated on base are coordinated at the unit level. Waste is turned in to the central short term storage hazardous material/waste satellite storage site which is managed by the base environmental coordinator (URS contract personnel: Alando Ownes). The waste is removed by host nation contract personnel.

The sanitary sewer is a plumbed system from all hard structured buildings within the LSA. The sewage is pumped via 3 of 5 lift stations into the untreated raw sewage pond about 70 meters behind the dining facility. Numerous incidents have occurred where the lift station pump failed and the sewage overflowed onto the ground or across the road and personnel walked through the flooded areas. CE utilities personnel frequently work on the sewer lines, system, or may enter confined spaces where the sewer flows in order to conduct maintenance.

Portable latrines and shower/shave bladders are pumped out by contract personnel operating service tanker trucks and waste is disposed off-base by the same contract personnel.

10.2.2 Short-term (acute) and Long-term (chronic) health risks:

Risk Summary: Short and long-term risk is high based on available data.

Medical Implications: Not evaluated; no data exist upon which to base a risk assessment.

Confidence in the risk assessment: Confidence in the risk assessment is medium.

10.3 Potential Environmental Contamination Sources

In addition to environmental exposures already discussed, there may be specific occupational exposure pathways associated with aircraft, vehicle and site maintenance. Typical chemicals of concern associated with potential occupational exposures were petroleum, oils, and lubricants. No industrial hygiene data exist to document the significance of occupational exposures; however, there were typically procedures in place for storage, handling, use and disposal of hazardous materials which generally minimize health risk.

Approach: Knowledge of the U.S. Central Command and Service specific policies and procedures served as the basis of this risk assessment.

10.3.1 Short-term (acute) and Long-term (chronic) health risks: **Not Evaluated** - No data were available upon which to base a risk assessment specific to Ahmed Al Jaber Air Base, Kuwait

Risk Summary: None based on lack of available data upon which to base a risk assessment specific to Ahmed Al Jaber Air Base, Kuwait.

Medical Implications: None - No data were available upon which to base a risk assessment specific to Ahmed Al Jaber Air Base, Kuwait.

Confidence in the risk assessment: Confidence in the risk assessment is **low**. Typical chemicals of concern associated with potential occupational exposures are petroleum, oils, and lubricants. These were generally present in relatively low volumes. Procedures for storage, handling, use and disposal of hazardous materials were in place throughout the theater of operations to minimize health risk.

10.4 Pesticides/Pest Control:

Both contract and military vector control personnel mitigated pests and vectors in accordance with mandated integrated pest management practices. The overwhelming majority of those efforts at Ahmed Al Jaber Air Base, Kuwait were in the reduction of filth flies, rodents, and feral animals. Non-chemical measures such as exclusion measures and sanitation were first and primary efforts. Secondary measures included the use of targeted bait applications for flies and rodents, and various animal trapping methods. Tertiary measures included the application of pesticides which contained active ingredients that degraded rapidly in the Kuwait environment. On-site or regional oversight was provided as available to ensure compliance with Theater, Navy, and DoD practices and regulations.

10.4.1 Short and Long-term (chronic) health risk

Approach: The Integrated Pest Management Plan for Kuwait was reviewed for compliance with DoDI 4150.07 requirements. In addition, U. S. military entomologists who served at Ahmed Al Jaber Air Base, Kuwait and the Navy Entomology Center of Excellence were consulted about their knowledge of pest management activities at these camps.

Risk Summary: Low based on available data specific to Ahmed Al Jaber Air Base, Kuwait.

Short-term health risk: No short-term health risk was identified based on available data.

Long-term health risk: No long-term health risk was identified based on available data.

Confidence in the risk assessment: Confidence in the risk assessment is high. The integrated pest management plan emphasizes non-chemical control over the use of chemical pesticides. The potential for base residents to come in contact with improperly formulated insecticides is remote.

10.5 Asbestos and Lead-Based Paint

10.5.1 Site-Specific Conditions:

All structures occupied by U.S. personnel during the period were erected as new. Therefore, there was no exposure to potential sources of asbestos containing material (ACM) or peeling paint that could contain lead.

10.5.2 Short-term (acute) health risk:

Risk Summary: Short-term risk is **negligible** based on available data.

Medical Implications: None**.**

Confidence in the Risk Assessment: Confidence in assessment is **high** based on available data**.**

10.5.3 Long-term (chronic) health risk:

Risk Summary: Long-term risk is **negligible** based on available data**.**

Medical Implications: None.

Confidence in the Risk Assessment: Confidence in assessment is **high** based on available data**.**

10.6 Burn Pit

There are no burn pits at Ahmed Al Jaber Air Base, Kuwait. Historical information for burn pits in the AFCENT AOR can be found in Reference 7.

10.6.1 Site-Specific Conditions:

The only open-air burning authorize at Ahmed Al Jaber Air Base, Kuwait was a burn barrel as the lower half of a 55 gal drum located behind the Fire Department where only classified paper documents were allowed to be burned. No waste was permitted to be burned other than paper. The burning lasted from 0-2 hours as frequently as 0-4 times per week. Personnel from individual units who burned the classified material were responsible for oversight of the burning. Therefore, potential exposures were minimal for individual personnel.

10.6.2 Short-term health risks:

Risk Summary: Short-term risk is **low** based on available data and the associated health risk of burning limited quantities of paper.

Medical Implications: None.

Confidence in the Risk Assessment: Confidence in assessment is **high** based on available data**.**

10.6.3 Long-term (chronic) health risk:

Risk Summary: Long-term risk is **low** based on available data and the associated health risk of burning limited quantities of paper.

Medical Implications: None.

Confidence in the Risk Assessment: Confidence in assessment is **high** based on available data**.**

11 References

POEMS developed according to:

1. **DoDI 6490.03, *Deployment Health*, 2006.**
2. **JCSM (MCM) 0028-07, *Procedures for Deployment Health Surveillance,* 2007.**
3. **DoDI 6055.05, Occupational and Environmental Health, 2008.**
4. **Klaassen, C.D. *Casarett & Doull's Toxicology: the Basic Science of Exposures*, Chapter 2, Principles of Toxicology; Fifth Edition, McGraw Hill, New York.**

Site description and baseline information obtained from:

5. **Occupational and Environmental Health Site Assessment for Ahmed Al Jaber Air Base, Kuwait, Survey ID: 236822, November 26, 2014**

Sampling data were obtained from the:

6. **Defense Occupational and Environmental Health Readiness System (referred to as the DOEHRS-EH database) at https://doehrs-ih.csd.disa.mil/Doehrs/. Some of the data may be classified or otherwise have some restricted distribution. See discussion below.**
7. **Military Exposure Surveillance Library: https://mesl.apgea.army.mil/mesl/. Some of the data and reports used may be classified or otherwise have some restricted distribution.**

Additional environmental health reports/survey documents are from the:

8. **Integrated Pest Management Plan – Multi-National Coalition Kuwait – January 23, 2006 Restricted link only from Armed Forces Pest Management Board, http://www.afpmb.org/**
9. **Kuwait – Ahmed Al Jaber Profile – GlobalSecurity.Org http://www.globalsecurity.org/military/facility/ahmed-al-jaber.htm**

Chemical hazards (air, water, soil) evaluated based on military exposure guidelines (MEGs) and risk assessment methodology in:

10. **USACHPPM June 2010 Revision, Technical Guide (TG230), "Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel". For further information, contact USAPHC Environmental Health Risk Assessment Program at: commercial 410-436-2953 or DSN 584-2953.**
11. **Department of the Army Technical Bulletin Medical (TB MED) 577, Sanitary Control and Surveillance of Field Water Supplies, TB Med 577, NAVMED P-5010-10, AFMAN 48-138, 1 May 2010.**
12. **USACHPPM, Particulate Matter Factsheet No. 64-009-0708, 2008.**

Regional/country information on endemic/infectious disease and heat/cold from the:

13. **Centers for Disease Control and Prevention (CDC) Travelers' Health website (http://wwwnc.cdc.gov/travel/destinations/traveler/none/XXXcountry), "Destinations" section, Kuwait.**
14. **U.S. AFCENT Pre-Deployment Medical Screening Procedures, 30 Jun 2014**
15. **Defense Intelligence Agency Infectious Disease Risk Assessment Database, CENTCOM: Kuwait, 26 Sep 2011. (https://www.ncmi.detrick.army.mil/product/idra_db.php?co=KWT)**

The DOEHRS-EH database was queried to obtain the available sample data for air, soil, and drinking and nondrinking water sources at Ahmed Al Jaber Air Base, Kuwait. The data are currently assessed using the TG 230 June 2010 Revision as described above contains, the general method involves an

initial check of the data which eliminates all chemical substances not detected above 1-year negligible MEG. 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 and water (soil is only evaluated for long-term health risk). This is performed by deriving separate short-term and long-term population exposure level 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 subject matter experts, which includes comparison to any available marginal, critical, or catastrophic MEGs. For drinking water, 15 liters/day (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 2L/day (similar to the U.S. Environmental Protection Agency (USEPA)), which is derived by multiplying the 5-L/day MEG by a factor of 2.5. This value is used to conservatively assess nondrinking 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 for Health Readiness Policy and Oversight (HRP&O).
Army Public Health Center (Provisional) 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.aspx
U.S. Air Force School of Aerospace Medicine (USAFSAM) (formerly AFIOH) Phone: (888) 232-3764. http://www.wpafb.af.mil/afrl/711hpw/usafsam.asp
DoD Health Readiness Policy and Oversight (HRP&O) Phone: (800) 497-6261. http://fhpr.dhhq.health.mil/home.aspx