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***ENVIRONMENTAL HEALTH
PROGRAM MANAGEMENT***

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This manual implements requirements of the Department of the Air Force Instruction (DAFI) 48-145, *Occupational and Environmental Health Program* and is consistent with Department of the Air Force Policy Directive (DAFPD) 48-1, *Aerospace and Operational Medicine Enterprise* and describes procedures essential for successful management and execution of installation environmental health (EH) programs. This publication applies to the entire Department of Air Force (DAF), the United States Space Force, Air Force Reserve (AFR), and Air National Guard (ANG) and those with a contractual obligation to abide by the terms of DAF issuances, except where noted otherwise. Ensure all records generated as a result of processes prescribed in this publication adhere to Air Force Instruction 33-322, Records Management and Information Governance Program, and are disposed in accordance with the Air Force Records Disposition Schedule, which is located in the Air Force Records Information Management System. Refer recommended changes and questions about this publication to the office of primary responsibility (OPR) using the DAF Form 847, *Recommendation for Change of Product*; route DAF Forms 847 from the field through the appropriate functional chain of command. This publication may be supplemented at any level, but all supplements must be routed to the OPR of this publication for coordination prior to certification and approval. The authorities to waive wing, unit, or delta level requirements in this publication are identified with a tier (“T-0, T-1, T-2, T-3”) number following the compliance statement. Submit requests for waivers through the chain of command to the appropriate tier waiver approval authority, or alternately, to the requestor’s commander for non-tiered compliance items. See DAF Manual (DAFMAN) 90-161, *Publishing Processes and Procedures*, for a description of the authorities associated with the Tier numbers.

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Chapter 1

INTRODUCTION

1.1. Overview.

1.1.1. The purpose of this DAFMAN is to provide policy and guidance on managing and executing the requirements of the DAF EH program in garrison, and to the greatest extent possible, during contingencies and while deployed. It outlines EH program roles and responsibilities and should be read in conjunction with DAFI 48-145, *Occupational and Environmental Health Program* and the Air Force Tactics Techniques and Procedures (AFTTP) 3-2.82, *Occupational and Environmental Health Site Surveillance at Deployment Locations*.

1.1.1.1. This DAFMAN focuses on EH program management as a subset of the larger Occupational and Environmental Health (OEH) program. DAFI 48-145 defines basic concepts of the OEH management system: the Plan, Do, Check, Act cycle. While most of DAFI 48-145 describes the DAF OEH program from a policy (the “plan” portion of the management system cycle) and programmatic level (the “check” and “act” portions of the management system cycle), this DAFMAN’s primary purpose is to define the EH program at the installation level (the “do” portion of the management system cycle). The OEH risk management cycle in [Figure 1.1. Environmental Health Risk Management Cycle](#), depicts how installations execute the “do” portion of the plan, do, check, act management system cycle.

1.1.1.2. This DAFMAN aligns with the standardized Joint Service Force Health Protection (FHP) process defined in AFTTP 3-2.82, hereafter referred to as the Joint Service Occupational and Environmental Health Site Surveillance (OEHS). This process, executed in garrison during normal operations and contingencies, will ensure a consistent, effective DAF process deployed.

1.1.1.3. This DAFMAN provides implementation guidance for the use of the Defense Occupational and Environmental Health Readiness System-Industrial Hygiene (DOEHRS-IH), hereafter referred to as DOEHRS, in support of the EH program.

1.1.2. The DAF EH program focuses on health risk assessment, management, documentation, and communication of exposures originating from hazardous military operations as well as environmental conditions in air, water, and soil from natural or civilian operations. The DAF EH program provides environmental health risk assessments (HRAs), supports data-driven risk management decisions, identifies an effective risk communication framework, and drives documentation of EH data and environmental HRAs in DOEHRS, which in turn support the individual longitudinal exposure record (ILER). An effective EH program promotes and preserves health and prevents disease and injury. It does so by identifying and mitigating EH hazards, supporting clinical evaluation and treatment, and informing leadership and decision-making forums of community health risks as dictated by DAF and Department of Defense (DoD) policies.

1.2. Applicability. This manual applies to DAF-led installations (including deltas) globally, hereafter referred to as installations, during garrison peacetime operations, response to garrison natural disasters and contingencies, and at contingency and enduring deployment locations. The

requirements of this manual apply at DAF installations located outside the United States (i.e., overseas) so long as requirements do not conflict with standards or criteria in applicable international agreements, country-specific DoD Final Governing Standards (FGS), DoDM 4715.05, *Overseas Environmental Baseline Guidance Document (OEBGD)*, Vols. 1-5, if no FGS exists, DoDI 4715.22, *Environmental Policy for Contingency Locations*, DoD Lead Environmental Component (LEC) environmental policy and guidance, geographic combatant command policy, and annexes to operational orders, operational plans or other operational directives. The FHP capability defined by this manual is applicable to service members, federal civilian personnel, and DoD beneficiaries working and/or living on DAF installations and deployed.

1.3. Requirements Outlined. The roles, responsibilities, and supporting details in this DAFMAN focus on the medical unit's execution and management of the DAF EH program. It also defines the supporting roles and responsibilities of non-medical mission partners. Broader OEH roles and responsibilities of non-medical mission partners are covered in DAFI 48-145.

1.4. Goals of the Department of the Air Force Environmental Health Program.

- 1.4.1. Deliver effective risk management options to DAF leaders through EH risk assessment processes, optimal medical care support and accurate ILERs.
- 1.4.2. Enable DAF personnel and relevant communities to appropriately understand EH risks and risk management opportunities through effective risk communication.
- 1.4.3. Equip DAF leaders at all levels with information and options for controlling EH risks while sustaining and improving operational effectiveness.

1.5. The Objective of Environmental Health Risk Management. OEH surveillance activities are designed to support commanders' risk management decisions. EH risk management enhances this decision-making process by helping commanders, stakeholders, program managers and other decision makers effectively apply the principles of risk management outlined in DoDI 6055.05, *Occupational and Environmental Health*, and DAFI 90-802, *Risk Management*.

1.6. Comparison of Environmental Health and Occupational Health Programs.

- 1.6.1. As stated in DAFI 48-145, personnel assess and communicate EH risks through the OEH Risk Management process to inform installation leadership of EH hazards and mitigation options and prioritize resources. The DAF EH program aligns with the OEH Risk Management process as well as the DAF Occupational Health (OH) program defined in DAFMAN 48-146, *Occupational Health Program Management*, and is summarized in [Table 1.1](#). *OEH Risk Management Comparison*, and further defined in [chapter 3](#).

Figure 1.1. Environmental Health Risk Management Cycle.

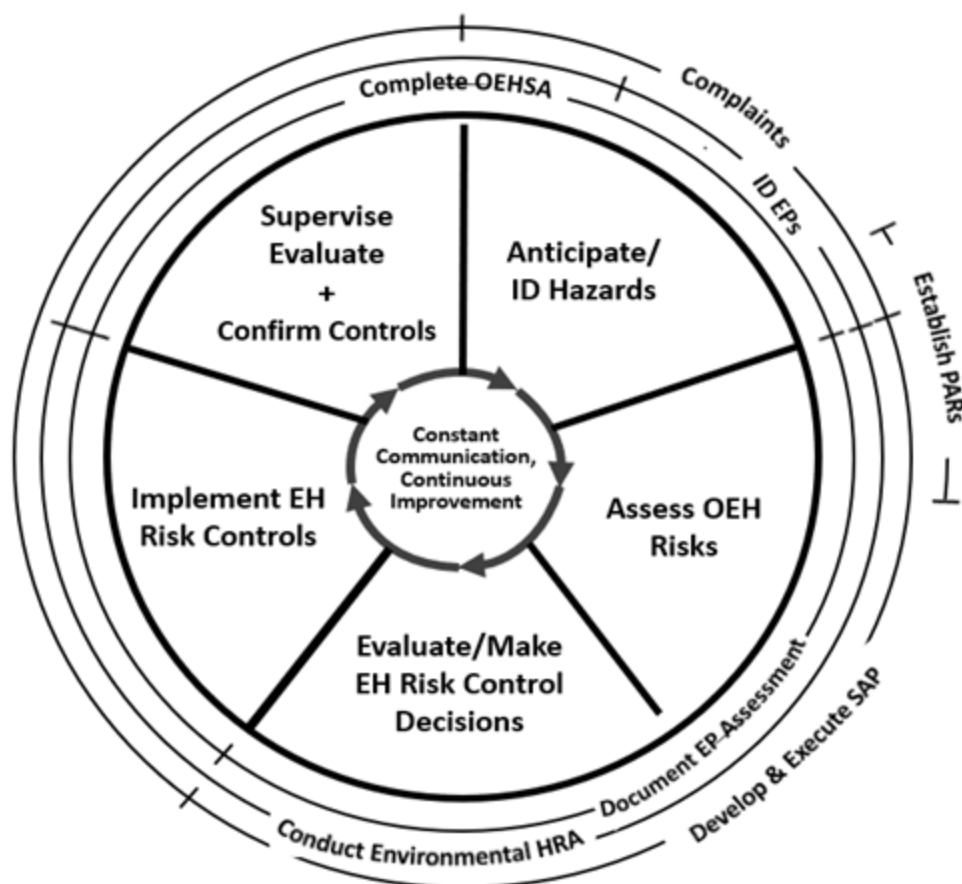


Table 1.1. OEH Risk Management Comparison.

OEH Risk Management Steps	DAF EH Program	DAF OH Program
Anticipate and Identify Hazards	Occupational and Environmental Health Site Assessment (OEHSA), Community Concerns, Public Interests, Installation Mission Changes, etc.	Routine Assessments, Workplace Supervisors, Process Changes, Installation Mission Changes, etc.
	Population at Risk (PAR), Potentially Exposed Populations (PEP)	Similar Exposure Groups (SEG)
	Exposure Pathways (EP)	Workplace Processes
	EP Priorities	Exposure Assessment Priority
Assess OEH Risks	EP Assessment	Exposure Assessment
	Sampling and Analysis Plans	Workplace Monitoring Plan
Evaluate/Make OEH Risk Control Decisions	Recommend Mitigation Measures or Management Plans	Recommend Control Options
Implement OEH Risk Controls	Subfloor Ventilation, Prevention Programs, Management Plans, Heating Ventilation and Air Conditioning (HVAC) Changes	Process Change, Ventilation System, Certified Personal Protective Equipment, Risk Assessment Codes
Supervise and Evaluate, Confirm Controls in	Medical Surveillance, Illness Trend Analysis, Community Complaints,	Medical Surveillance, Work Related Illness/Injury, Trend Analysis, Next

Place	Next Iteration of OEHSA	Iteration of Routine Assessment
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1.6.2. Environmental HRAs are an FHP capability that estimates risk to all service members, federal civilian personnel, and DoD beneficiaries. Environmental HRA synthesizes available information to identify and characterize EH hazards; the probability or likelihood of exposure; the magnitude and timing of exposure; the population exposed; the health effects caused by exposure; the severity of the health effects; and the probability or likelihood that exposure will result in predicted effects. EH risks are assessed within the context of the operational environment and level of resources available. For example, a routine HRA for drinking water at the home station will look quite different than it would during a natural disaster recovery and will look vastly different than that at a far-forward contingency location. EH risk mitigation or management measures must be determined using a team approach with appropriate stakeholders and mission partners, including but not limited to Aerospace and Operational Medicine Enterprise (AOME), Occupational Safety, facility managers, Civil Engineers (CE), and Military Housing Office (MHO).

1.6.3. The DAF EH program encompasses EH exposure pathways (EP), populations at risk (PARs), sampling and analysis plans (SAP), EP assessments, and DOEHRS documentation. EPs define and link the EH risk and the PAR. SAPs drive data gathering efforts in support of EP assessments. EP assessments are the environmental HRA and address both acute (short-term) and chronic (long-term) risks. All components of the EH program will be documented in DOEHRS in accordance with this DAFMAN. In the Joint Service OEHSS doctrine (AFTTP 3-2.82), the term OEH Site Surveillance (OEHSS) is used in place of EH Program Management. These terms are synonymous.

Chapter 2

ROLES AND RESPONSIBILITIES

2.1. Air Force Surgeon General, Policy and Resources Directorate (SGMED).

- 2.1.1. Develops policy for the DAF EH program.
- 2.1.2. Supports DAF EH program initiatives by validating requirements.
- 2.1.3. Plans, programs, and budgets for resources and provides oversight for execution of the DAF EH Program through the Force Structure & Resources Division (AF/SG8) and Defense Health Agency (DHA).

2.2. Air Force Medical Command (AFMEDCOM). In addition to the roles and responsibilities defined in DAFI 48-145.

- 2.2.1. Provides subject matter expertise to SGMED in support of developing policy to execute the DAF EH Program.
- 2.2.2. Coordinates with the Secretary of the Air Force for Energy, Installation, and Environment (SAF/IE), AF/A4, AF Materiel Command (AFMC) on all DAF EH program aspects addressed in this DAFMAN to ensure clear and synchronized guidance and execution in support of DAF FHP.
- 2.2.3. Coordinates with the other services on EH program policy execution and procedures to align similar and shared EH responsibilities. Provides guidance and acquisition support and services, in collaboration with the other services to address Joint Service EH issues.
- 2.2.4. In coordination with AFMC and SAF/IE, consults with DoD LEC to ensure overseas and in-theater consistency of Substantial Impact to Human Health and Safety (SIHHS) assessments per DoDI 4715.08, *Remediation of Environmental Contamination Outside the United States*, and establishes a reasonable likelihood of an SIHHS and the potential need to remediate.

2.3. Major Command Surgeon (MAJCOM/SG). Refer to roles and responsibilities as defined in DAFI 48-145.

2.4. United States Air Force School of Aerospace Medicine (USAFSAM). In addition to the roles and responsibilities defined in DAFI 48-145.

- 2.4.1. Develops tools to support execution of the DAF EH program and tools that assess and report program quality.
- 2.4.2. Develops, manages and resources DOEHRS visualization and audit tools in support of the DoD EH program.
- 2.4.3. Provides consultative guidance and metrics concerning proper alignment of DAF EH program documentation and DOEHRS utilization, supporting accurate ILERs.
- 2.4.4. With AFMEDCOM, serves as the DAF subject matter expert (SME) and consultant to all joint EH program development, working groups, and guidance documents.

2.4.5. Provides consultative guidance and support in developing common data quality objectives for EH sampling and data collection for in-garrison, contingency, and deployed site surveillance and assessment activities.

2.4.6. Supports Medical Treatment Facility (MTF)-level Childhood Blood Lead Screening programs in accordance with DAFMAN 48-105, *Public Health Surveillance*.

2.4.7. Provides consultative services and risk communication guidance to installations on identification and anticipation of EH risks and possible mitigation measures based on locality.

2.4.8. Serves as the primary technical resource for health impact assessment (HIA) for outside the United States (i.e., overseas) SIHHS determinations. Provides consultative services in support of SIHHS (e.g., needs determination, site investigation plan development, etc.). Coordinates with AFMC and AFMEDCOM on potential SIHHS.

2.5. Air Force Materiel Command (AFMC). AFMC, through the Air Force Installation and Mission Support Center (AFIMSC) and the Air Force Civil Engineer Center (AFCEC).

2.5.1. Allocates resources and oversees execution of environmental quality, restoration and installation division programs throughout the DAF. Engineers solutions and programs for installation level construction, renovation, or other mitigation measures to abate or control installation EH risks.

2.5.2. Provides technical advice and assistance to the DoD medical authority regarding SIHHS determinations pursuant to DoDI 4715.08. Technical support includes, when requested or authorized, data and information supporting the site investigation plan, site investigation, and the preparation of HIA.

2.5.3. Through AFIMSC and regional support offices, coordinates with AFMEDCOM on environmental quality and environmental compliance issues with EH impacts.

2.5.4. Through AFIMSC and AFCEC, provides collaboration, coordination and communications support for community engagement responsibilities. Supports Restoration Advisory Boards and maintains primary responsibility for community health risk communication related to toxicological data (i.e., theoretical health risks based on scientific research and studies) and mitigation actions.

2.5.5. Through AFCEC, offers technical expertise and consultation services in environmental chemistry, hydrogeology, toxicology, remedial engineering, air and water program compliance, and regulatory criteria.

2.5.6. Through AFCEC, maintains primary responsibility for vapor intrusion (VI) investigations as part of the Environmental Restoration Program (ERP). Identifies Defense Environmental Restoration Program (DERP) sites (e.g., Installation Restoration Program sites) with the potential for VI into occupied buildings.

2.5.6.1. Manages overall compliance of ERP activities with applicable local, state, and federal laws/regulations; serves as the primary interface with regulators and stakeholders for evaluation and remediation of subsurface contamination.

2.5.6.2. Coordinates VI-related technical support, to include evaluating need for an expedited screening-level building assessment, identifying appropriate screening levels, identifying potentially affected buildings, communicating with regulatory agencies,

developing risk communication materials, and evaluating work plans for definitive VI investigations.

2.5.6.3. Conducts the appropriate investigations to determine if VI EPs are complete to DAF facility occupants, shares applicable investigation and site management data with AOME community, and supports health risk communication and risk management.

2.5.7. Through AFCEC, provides technical assistance on environmental regulatory requirements and design and maintenance requirements related to DAF facilities, mission training pools and recreational waters. Ensures that DAF pools are designed and built in accordance with the current Model Aquatic Health Code (MAHC).

2.5.8. **Geospatial Engineering Office (AFCEC/CBFG).** When resourced, supports AFMEDCOM and USAFSAM in developing analysis and visualization tools for corporate EH hazards and surveillance programs supporting installation AOME. (Reference [Attachment 3](#), *Geospatial Capabilities*, for additional guidance.)

2.6. Installation Commander.

2.6.1. Assigns appropriate stakeholder(s) for the ownership and oversight of installation hazard management or mitigation plans for extremely high-, high- and medium-risk EH exposures to service members, federal civilian personnel, and DoD beneficiaries supporting FHP.

2.6.2. Permits AOME personnel clearance and access to areas of concern (AOCs) with the potential for EH exposure.

2.6.3. Provides funding for comprehensive assessment of unforeseen EH risks (beyond initial health risk determination and characterization) to service members, federal civilian personnel, and DoD beneficiaries on the installation or in their areas of responsibility (AOR).

2.6.4. Prioritizes risk mitigation and documents risk acceptance where mitigation is not feasible and/or where mission priorities/operational risks override health risks.

2.6.5. Approves locations of all training areas, recreational areas, natural bathing areas, etc. with input from the medical unit commander or director.

2.6.6. Determines need for installation EH working group(s) at the recommendation of AOME and CE (e.g., Radon Working Group, Mold Prevention Working Group, etc.), and designates working group chairs.

2.7. Base Civil Engineer (BCE).

2.7.1. Ensures installation facilities are constructed and maintained in accordance with applicable DAF recognized facility or construction codes, and federal standards (e.g., Unified Facilities Guide Specifications (UFGS) 31-21-13, *Radon Mitigation*) to mitigate or minimize EH exposures to all service members, federal civilian personnel, installation visitors, and DoD beneficiaries in support of FHP.

2.7.2. Designs, constructs and maintains swimming pools, mission training pools, hot tubs and spas, therapeutic pools, and splash pads as outlined in this DAFMAN, DAFI 34-112, *Services Nonappropriated Fund Facility Projects*; DAFMAN 32-1084, *Standard Facility Requirements*; Unified Facilities Criteria (UFC) 3-230-02 *Operation & Maintenance: Water Supply Systems*; United Facilities Guide Specifications 22-00-00, *Plumbing, General Purpose*;

CDC MAHC; Public Law 110-140, *Energy Independence and Security Act of 2007*; and Title 15 United States Code (USC) Sections 8001-8008, *Virginia Graeme Baker Pool and Spa Safety Act*.

2.7.2.1. Designates a pool treatment plant manager and maintains and operates the pool equipment and keeps records as outlined in CDC MAHC. Pool treatment plant manager will be responsible for treatment chemical purchases and operating the pump room to maintain water quality.

2.7.2.2. In coordination with the Force Support Squadron (FSS) and AOME, addresses access to and suitability of natural bathing areas for swimming and other outdoor recreation activities.

2.7.3. Supports development and activities of installation hazard mitigation or management plans for extremely high-, high- and medium-risk EH exposures to service members, federal civilian personnel, and DoD beneficiaries, and supporting working groups (e.g., Radon Working Group, Mold Prevention Working Group, etc.).

2.7.4. Through the Facility Managers' Program, identifies, corrects, and manages DAF facility deficiencies creating or capable of creating EH risks.

2.7.4.1. Manages facility in-place EH risk mitigation processes/controls; confirms process adherence and proper operation of controls (e.g., radon subfloor exhaust fans, VI foundation crack management, proper function of HVAC systems for mold prevention, etc.).

2.7.4.2. Serves as facility occupants' liaison and communication avenue to AOME and mission partners.

2.7.5. Provides Bioenvironmental Engineering (BE) and Public Health (PH) access to environmental compliance and restoration programs, information, and data in support of AOME roles and responsibilities defined in this DAFMAN.

2.7.6. Considers BE and PH EH risk expertise and control recommendations in future infrastructure plans, programs, development, and operations (e.g., radon mitigation, mold prevention, etc.).

2.7.7. Serves as a key mission partner in installation EH risk communication and public engagement activities when environmental compliance programs are a factor and when installation infrastructure are part of the EH hazard control, mitigation, or management plans.

2.7.8. Civil Engineer Installation Geospatial Integration Office (GIO and/or CENME). When resourced, supports BE and PH with developing data integration, analysis and visualization tools for EH hazards and surveillance programs. (Reference [Attachment 3](#), *Geospatial Capabilities* for additional guidance.)

2.7.9. Civil Engineer Military Family Housing Office (MHO).

2.7.9.1. Serves as functional lead to identify, record, investigate, coordinate, track, mitigate and resolve any DoD housing (Military Family Housing (MFH) or Unaccompanied Housing (UH)) conditions and related health hazards reported by residents, and ensures project owner (PO) establishes equivalent processes for Military Housing Privatization Initiative (MHPI) (i.e., privatized housing). Manages concerns and

documents actions taken to resolve resident concerns in the Enterprise Military Housing (eMH) database.

2.7.9.2. Establishes processes for resident complaints and concerns related to EH (i.e., mold, indoor air quality (IAQ), drinking water, lead-based paint, asbestos, radon, etc.) in DoD housing, and ensures PO establish equivalent processes for MHPI. Documents all housing data related to environmental HRAs and remediation requirements and actions in the eMH database in accordance with ASD Guidance Memorandum, *Standards and Guidance for Managing Environmental Health Hazards in Department of Defense Housing*, February 2022.

2.7.9.3. Requests SME support from BE and PH in interpreting and applying EH standards and guidance, reviewing housing condition information concerning EH risks, identifying facility management issues and design considerations which may contribute to EH risks, and recommending mitigation actions.

2.7.9.4. Addresses, in consultation with BE and PH as needed, questions regarding the applicability of DAF EH standards to MHPI housing.

2.7.9.5. Provides housing information (e.g., current and historical housing conditions and potential hazards identified, maintenance information associated with actions to address potential hazards, other occupants affected by the hazard, etc.) to AOME personnel to help in patient clinical evaluations. Upon request, the MHO will obtain housing information for patients residing in MHPI housing or request project owners' assistance in obtaining housing information.

2.7.9.6. Consults with BE and PH (and primary care managers (PCM), if applicable) on EH concerns raised by residents of MHPI housing. MHO will address the following issues with the PO directly: MHPI resident concerns regarding EH hazards and housing conditions, health deficiencies, maintenance and design factors which may contribute to EH issues and questions regarding the applicability of EH standards to MHPI housing.

2.7.9.7. Requests and obtains assistance from BE and PH in development of work statements for contracted HRAs and/or sampling in MHPI housing. Provides copies of any contracted environmental HRAs and sampling results accomplished in MFH, UH, or MHPI to BE and PH (and PCM, if applicable) when EH risks to service members and DoD beneficiaries exist.

2.7.9.8. Supports development and activities of installation hazard mitigation or management plans for extremely high-, high- and medium-risk EH exposures to service members, federal civilian personnel, and DoD beneficiaries, and applicable working groups (e.g., Radon Working Group, Mold Prevention Working Group, etc.).

2.7.9.9. Manages in-place EH risk mitigation processes and/or controls (e.g., operational radon exhaust fans, proactive mold prevention or management plans, etc.); informs residents of (and encourages adherence to) processes and proper operation of EH risk controls. Refer to [Attachment 5](#), *Mold*, and [Attachment 6](#), *Radon*, for additional guidance.

2.8. Public Affairs (PA). Serves as a key mission partner in EH risk communication strategies and public engagement activities of the installation EH program.

2.9. Servicing Legal Office (JA).

2.9.1. Serves as a key mission partner in advising the installation leadership, stakeholders, AOME, and mission partners on legal aspects, risks, and applicability of the DAF EH program.

2.9.2. Coordinates with Office of The Judge Advocate General, Operations and International Law Directorate, Environmental Law and Litigation Division on EH regulatory requirements applicable to the DAF. For overseas installations, privatized housing or other privatized areas, and non-DAF-owned AOCs, provides legal advice and support regarding DAF's EH responsibilities.

2.10. Force Support Squadron/Unit (FSS) Commander.

2.10.1. Consults with BE and PH on potential EH risk to all service members, federal civilian personnel, installation visitors, and DoD beneficiaries for base-wide community events. Informs BE and PH of any potential EH hazards reported by on-base community personnel.

2.10.2. Oversees the day-to-day operations of recreational areas, recreational waters and mission training pools to provide patrons with safe and healthy conditions. (Reference [Attachment 9 Recreational Waters and Mission Training Pools](#) for additional guidance.)

2.10.3. For swimming and mission training pools, implements CDC's MAHC and Healthy Swimming standard (<https://www.cdc.gov/model-aquatic-health-code/php/our-work/index.html>) and (<https://www.cdc.gov/healthy-swimming/index.html>).

2.10.3.1. Creates and implements a safety plan in accordance with CDC's MAHC and DAFI 34-101, *Department of the Air Force Morale, Welfare and Recreation (MWR) Programs and Use Eligibility*.

2.10.3.2. Appoints certified (where applicable) bathing facility personnel (i.e., lifeguards or other outdoor recreation personnel) and ensures adequate training is accomplished in accordance with CDC MAHC.

2.11. Medical Unit Commander. For Regular DAF medical units, this is the Medical Group Commander, who is dual-hatted and, in that capacity, executes the duties, authorities, and responsibilities of both the MTF Director and the Medical Group Commander. Guard medical unit commanders and reserve medical unit commanders (or local equivalent) ensure the duties and responsibilities as defined in this DAFMAN are executed to the extent possible within the scope of training, manpower and equipment available when organic capabilities are limited.

2.11.1. Directs the installation EH program and provides personnel and expertise to evaluate EH risks based on the requirements defined in this DAFMAN.

2.11.2. Advocates for installation resources and support for a team approach in addressing and mitigating or managing EH hazards.

2.11.3. Works with installation PA, JA, BCE and other installation partners to synchronize risk communication messaging and uses a team-approach to address community concerns related to current or past environmental exposures, short- and long-term healthcare considerations, and successful mitigation or management of existing EH hazards.

2.12. Chief of Aerospace Medicine (SGP).

2.12.1. Leads AOME execution, direction, and oversight of the installation EH program.

2.12.2. When requested, supports BE and PH with any EH hazard investigations, and advocates to medical and installation leadership for additional resource support. Solicits medical support from MTF staff as needed.

2.12.3. Ensures MTF medical providers are aware of and familiar with the spectrum of potential illnesses based on local risks associated with EH hazards and existing EPs.

2.12.4. Provides health risk communication for short- and long-term EH risks in accordance with this DAFMAN. SGP risk communication, in coordination with AOME, will focus on health risk to service members, federal civilian personnel, and DoD beneficiaries when impacted by EH hazards.

2.12.5. Gain situational awareness on potential EH hazards such as air emissions, drinking water, mold, radon, soil contamination and restoration programs, and military and industrial operations. Key stakeholders may include CE, Occupational Safety, PA, and JA.

2.12.6. Ensures accurate documentation of medical care due to possible EH exposures in support of patients' ILER for service members and provides pertinent information to PARs or PEPs in accordance with applicable privacy laws and regulations.

2.13. Bioenvironmental Engineering (BE) (or local equivalent).

2.13.1. In coordination with AOME, plans, manages and executes the installation EH program. Coordinates and teams with stakeholders and mission partners, as applicable.

2.13.2. Uses the most current OEHSAs to support the installation EH program and recovery operations following a garrison natural disaster or a contingency impacting the installation mission.

2.13.2.1. Considers new or compressed OEHSAs immediately following a garrison natural disaster or a contingency impacting the installation mission to expedite identification of newly created EH hazards and risks, capture contingency-related exposures, and guide risk reduction activities during installation recovery.

2.13.2.2. For joint installations where DAF does not have Base Operating Support – Integrator (BOS-I), identifies and assesses EPs for EH hazards impacting DAF personnel. OEHSAs or similar types of requirements are the responsibility of BOS-I.

2.13.3. Develops EPs and conducts EP assessments in accordance with [chapter 3](#).

2.13.4. Manages EPs and EP assessments in DOEHS. Reports newly identified EPs to the Occupational and Environmental Health Working Group (OEHWG).

2.13.5. Supports key stakeholders and mission partners in their development of risk mitigation measures and management plans for extremely high-, high- and medium-risk EH exposure to service members, federal civilian personnel, and DoD beneficiaries. (e.g., Radon Management, Mold Prevention, etc.). EH risk mitigation or management plans will be owned and managed by the key stakeholder(s).

2.13.6. Conducts health risk assessments and provides health risk communication for short- and long-term EH risks or concerns to include IAQ, VI, mold, radon, and other EH hazards in air, water, and soil. Risk communication, in coordination with AOME, will focus on the health risk to service members, federal civilian personnel, and DoD beneficiaries when impacted by the EH hazard.

2.13.7. Provides risk-based oversight of water quality monitoring and health risk management practices in accordance with the CDC's MAHC for recreational waters and mission training pools and provides HRA of (and risk communication for) recreational water illness (RWI).

2.13.8. At the request of MHO, serves as the EH SME for MFH and UH. Coordinates with MHO, CE, and other mission partners in the event of a reported potential EH hazard exposure involving service members and/or DoD beneficiaries residing in MFH and UH. (Reference [Attachment 8](#) *Environmental Health Hazards in Department of Defense Housing* for details on BE support to MHO and MHPI.)

2.14. Public Health (PH) (or local equivalent).

2.14.1. In coordination with AOME and non-medical mission partners, plans, programs, manages and executes the components of the installation EH program related to PH EH hazards (infectious disease, communicable disease, vectors, or other PH EH concerns).

2.14.2. Coordinates and consults with USAFSAM to effectively execute the installation EH program.

2.14.3. Develops, in coordination with key stakeholders and mission partners, installation risk mitigation and management plans for extremely high, high and medium PH EH risks to Service members, federal civilian personnel, installation visitors, and DoD beneficiaries.

2.14.4. Provides HRA, health risk communication, and public education for PH EH risks. PH risk communication, in coordination with AOME, will focus on the health risk to service members, federal civilian personnel, and DoD beneficiaries when impacted by PH EH hazards.

2.14.5. Investigates potential environmental illnesses and reports risks and trends to the appropriate leaders, stakeholders, and Aerospace Medicine Council in a timely manner IAW DAFMAN 48-105.

2.14.6. At the request of MHO, serves as the PH SME for MFH and UH. Coordinates with MHO, CE, and other mission partners in the event of a reported potential PH EH risk involving service members and/or DoD beneficiaries residing in MFH and UH. (Reference [Attachment 8](#) *Environmental Health Hazards in Department of Defense Housing* for details on PH support to MHO and MHPI.)

2.14.7. Provides risk-based oversight of sanitation practices for recreational and mission associated water areas (pools, ponds, lakes, etc.) and provides HRA of (and risk communication for) RWI or disease outbreaks.

2.14.8. Implements EH- and PH-related activities in accordance with DoDI 6490.03, *Deployment Health*, and Defense Health Agency Procedural Instruction (DHAPI) 6490.03, *Deployment Health Procedures*. Gains access to the DOEHRS DoD Deployment Surveillance Program Office and the site-specific DAF Program Office.

2.14.9. Utilizes DOEHRS to document PH EH risks to service members, federal civilian personnel, and DoD beneficiaries. Determines need for EPs and EP assessments.

2.14.10. Utilizes DOEHRS to document elevated Childhood Blood Level investigations.

2.15. Installation Occupational and Environmental Medicine Consultant (IOEMC).

2.15.1. When requested, supports BE and PH with any EH hazard investigations, and advocates to medical and installation leadership for additional resource support, as necessary.

2.15.2. Reviews and consults on EH surveillance reports, exposure data, risk estimates and mitigation measures for an exposed person or population (i.e., PAR, PEP). Population includes, but not limited to, service members, federal civilian personnel, and DoD beneficiaries.

2.15.3. Determines the need for a clinical examination due to a plausible environmental exposure (past or present) contributing to adverse health effects or concerns.

2.15.4. Recommends appropriate preventive, diagnostic, or treatment and surveillance medical support requirements for PARs or PEPs.

2.15.5. Ensures documentation of EH related medical conditions in patients' records for service members and DoD civilians.

2.15.6. In collaboration with the AOME and OEHWG, supports EH risk communication activities and public engagements where service members, federal civilian personnel, and DoD beneficiaries are potentially exposed to EH hazards.

2.15.7. Invites other representatives such as Injury Compensation Specialist, CE Environmental, PA, JA, etc. to the OEHWG, when warranted.

2.15.8. Periodically briefs ,or schedules another qualified flight surgeon to brief, the professional staff on local EH risks, related efforts (e.g., identification, mitigation, risk communication), and standard of care annually or more frequently based on local needs or staff turnover.

2.15.9. In coordination with BE and PH, provides a supportive role to the MHO when requested, to provide consultative assistance with identifying, investigating and determining an appropriate mitigation plan to abate any unsafe conditions related to EH hazards in MFH or UH.

2.15.10. Coordinates with BE and PH on a PCM's request for environmental HRA of MFH, UH, or other installation facility in support of patient care.

2.15.11. Liaises with healthcare providers on potential EH related medical conditions requiring environmental HRAs and AOME support.

2.16. Occupational and Environmental Health Working Group (OEHWG).

2.16.1. Acts as a cross-functional forum to discuss EH hazards, risks, mitigation measures, and medical support to protect service members, federal civilian personnel, and DoD beneficiaries.

2.16.2. Establishes EH surveillance requirements and considers medical support needs for all EPs prioritized as moderate to urgent, and/or EP assessments greater than low risk (short-and/or long-term).

2.16.3. In coordination with installation mission partners to include, but not limited to CE, Occupational Safety, PA, JA, etc., develops health risk communication strategies in support of

community activities and public engagements when service members, federal civilian personnel, and DoD beneficiaries are potentially impacted by EH hazards.

Chapter 3

ENVIRONMENTAL HEALTH (EH) RISK MANAGEMENT

3.1. EH Risk Management Overview. The EH program promotes and preserves health by driving down EH risks and documents exposures to service members, federal civilian personnel, and DoD beneficiaries on DAF installations and other AORs in garrison, during contingencies, and deployed. EH risk management occurs within an operational context. Accordingly, EH risks are managed at an installation during routine operations very differently than at a far-forward contingency location with limited preventive medicine capabilities. The EH program identifies, evaluates, assesses, and documents EH risks in the surrounding environment and determines if health risk mitigation measures are needed and if existing measures are adequately implemented. As discussed in [chapter 1](#), EH Risk Management is part of the larger OEH Risk Management Cycle and is broken down into five steps: 1) anticipate and identify health risks, 2) assess EH hazards and determine risk estimate, 3) develop mitigation measures and make risk decisions, 4) implement mitigation measures or risk acceptance, and 5) supervise, evaluate, and confirm mitigation effectiveness.

3.2. Step 1. Anticipate and Identify Environmental Health (EH) Risks.

3.2.1. Utilize multiple resources to anticipate EH risks at an installation or in the AOR: previous OEHSAs, the installation hazard abatement plan, vulnerability assessments, geospatial tools (e.g., EPA's AIRNow, GeoBase), environmental compliance and restoration programs, past environmental releases or incidents, other installations or AORs with similar DAF missions, etc. For overseas locations, deployed enduring locations and deployments to contingency locations contact the National Center for Medical Intelligence (NCMI) and MAJCOM BE for additional, site-specific information.

3.2.1.1. Area of Responsibility (AOR). AOR is defined by the physical locations under the DAF control. AOR is typically the installation, but other less defined locations may be considered AORs if the DAF or DoD has authoritative control and responsibility. Installation leadership may have multiple AORs under their command. BE and PH will coordinate with leadership and mission partners to determine all AORs. (T-3)

3.2.1.2. Areas of Concern (AOC). An AOC is a common description of a sub-location within an AOR to define and communicate the EP and PAR or PEP. AOC is defined by the reach of the EH hazards originating from either inside or outside of the AOR with a pathway to service members, federal civilian personnel, DoD beneficiaries, and other personnel working or living (e.g. contractors, transient personnel, visitors, etc.) on or in the AOR. AOCs are typically sub-locations within an AOR; however, an AOC could encompass an entire AOR.

3.2.2. Occupational and Environmental Health Site Assessment (OEHSA).

3.2.2.1. During routine operations, the OEHSA survey is the primary process to anticipate and identify EH hazards. BE and PH will document background demographics, reassess existing EPs, and investigate new potential EPs through site surveillance, interviews with local SMEs and program managers, and review site assessments, engineering reports, engineers' environmental baseline assessment, etc. (Reference USAFSAM technical guide

Occupational and Environmental Health Site Assessment (OEHSA) for additional guidance.)

3.2.2.2. An OEHSA reassessment will be completed within 12 months of the assignment of a new BE flight commander (or equivalent). (T-1) ANG units will complete an OEHSA reassessment every 10 years; the OEHSA will be completed by the highest qualified BE technician, if there is no BE flight commander. (T-2) For deployments, the OEHSA timeline will be established by the command Bioenvironmental Engineer, in accordance with Combatant Command policies. (T-0)

3.2.2.3. When operating in a crisis or resource constrained situation (e.g., natural disaster, contingency, deployment, etc.), the resources and time available for surveillance may prevent assessment of all but the most acute threats to mission and health (i.e., condensed or compressed OEHSA). These assessments should be expanded as resources and time permit.

3.2.3. Other means to anticipate and identify potential EH hazards include, but are not limited to, complaints, illnesses or illness trends, patients, commander interests, off-base entity interests, higher headquarters and congressional interests, community interests, remote sensing, airfield assessments, or an EH crisis or emergency. Installation mission and operational tempo changes, and OH hazards identified by the OH program are additional sources of EH hazard information that may create complete EPs to service members, non-industrial federal civilian personnel, and DoD beneficiaries.

3.2.4. Identify Exposure Pathways (EP) and Define Population at Risk (PAR) or Potentially Exposed Population (PEP).

3.2.4.1. **Identify EP.** BE and PH will identify EPs in a particular AOR. (Deployed: T-0; In-garrison: T-1) An EP is defined as a description of how exposure occurs from a EH hazard released from a source into the environment in one or more of the environmental media (i.e., air, water, soil, biota, etc.) the routes of exposure (e.g., inhalation, ingestion, skin contact, etc.), and where and when personnel come into contact with the hazard. There are six components of an EP: (1) source, (2) health hazard, (3) exposure point, (4) exposure media, (5) route of exposure, and (6) co-occurrence in time with a PAR or PEP. All six criteria must be present for an EP to be considered complete. The U.S. Army Public Health Command, Technical Guide 392, *Conceptual Site Model Best Practices and Exposure Pathway Guidance*, provides additional guidance on EPs.

3.2.4.2. **Define PAR or PEP.** BE and PH will define the PAR or PEP via each EP. (Deployed: T-0; In-garrison: T-1) A PAR or PEP establishes an association between a particular cohort of individuals (limited to service members, federal civilian personnel, and DoD beneficiaries), a unique EH exposure via a common location (i.e., AOC), and specific timeframe. Well defined PARs or PEPs are critical for accurate ILERs, Periodic Occupational and Environmental Monitoring Summaries (POEMS), and any other EH risk reporting actions. BE and PH must clearly define the risk, the AOC, and the threat to allow DoD to be able to associate individuals with a specific EH exposure. BE and PH are not required to track individuals of a PAR through space and time.

3.2.4.2.1. **PAR.** PAR is defined as a group of individuals who are or may be exposed to an EH hazard via one or more routes of exposure. PAR is a key element of the EP

and associates the hazard to individuals in DOEHRS. PAR is limited to service members, federal civilian personnel, and DoD beneficiaries. Contractors and installation visitors are not included in PARs. PARs for one or more EPs may be the entire AOR.

3.2.4.2.2. **PEP.** PEP is defined as a group of individuals who were or may have been exposed to an EH hazard via one or more routes of exposures due to a short-term incident or accident. Contractors and installation visitors are not included in PEPs. (Reference [paragraph 3.6](#) for more guidance on PEPs and EH risk management for incidents or accidents.)

3.2.4.3. Document complete EPs in DOEHRS as defined in [Table 3.1](#). *DOEHRS Exposure Pathway Documentation Guidance*. (Deployed: **T-0**; In-garrison: **T-1**) All DOEHRS' fields must be populated.

Table 3.1. DOEHRS Exposure Pathway Documentation Guidance.

DOEHRS EP Section	DOEHRS EP Data Entry Guidance
Name	Reference standard naming conventions in Technical Guide 392, Section 7. Examples provided below. Basic format: “ <i>Media (AOC)</i> ” Example: “ <i>Municipal Water System (Base X Drinking Water System)</i> ” Example: “ <i>Ambient Air (Jun 2021 Wildfire)</i> ” Example: “ <i>Workplace Air (Bldg 4302 Vapor Intrusion)</i> ” Example: “ <i>Soil (North Housing)</i> ” Example: “ <i>Ambient Noise (Flightline)</i> ”
Applicable OEHS Section	Pick list; select from options. Determine appropriate sections of the OEHS. (Note: Within the OEHS survey, each EP may be associated to multiple sections of the OEHS. For example, an EP for ambient air quality may also be associated with waste management if an incinerator or burn pit is a source.)
Threat Source	Where is the EH hazard source coming from? First, choose most appropriate option from pick list, then provide more detailed description of source using building or facility numbers or environmental site descriptors. Examples below. Example: “Smokestack On Base Sources” Example: “ <i>Installation Restoration Program Site 4</i> ” If no site identifier is available, use geo-coordinates with a short description. Work with local GIO office to identify location.
Environmental Media	Pick list (air, water, soil, other); select an option.
Health Hazard	Enter the EH hazard (i.e., environmental contaminants of concern). Inputs may be a chemical or class of chemicals. There is an option to use pick list or add a more descriptive choice.
Route of Exposure	Pick list (inhalation, physical, skin absorption, skin contact, other); select from the options. Choose all that apply.
Description of Affected Population	Short description of PAR.
Number of Affected Personnel	Determine number of affected personnel.

DOEHRS EP Section	DOEHRS EP Data Entry Guidance
Existing Controls and Protective Measures	Identify key stakeholder(s), describe mitigation measures, and add any additional information on how EP is being controlled or managed (i.e., monitoring frequency, replacement or changeout, management plans, etc.) Example: “8 CES/CEO: GAC filters for drinking water. Changeout schedule is annual and currently in operation.” Example: “MHO: Active radon mitigation in North Housing. Operation checks semi-annually. Reports annually to Installation Radon Working Group.” Example: “Bldg 800 Facility Manager: quarterly assessment in accordance with facility IAQ prevention plan.”
Supporting Background Information.	Provide detailed background information, and reference applicable attachments, samples, and surveys as needed.
Duration	Provide estimate of duration.
Frequency	Provide estimate of frequency.
Priority	Select from dropdown: Urgent, High, Moderate, Low. EP priority is not the same as the risk estimate in the EP assessment.
Comments	Comments must include all the information supporting the priority determination. Include priority rationale, available environmental data and indicators, and direct reading instrument measurements, if available.

3.2.4.4. EP Priority . All EPs require an initial priority. (Deployed: **T-0**; In-garrison: **T-1**) The four priority levels are urgent, high, moderate, and low. EP priority is based on readily available environmental indicators, observation, and PAR complaints. Reference [Table 3.2. Exposure Pathway Prioritization Criteria Consideration](#) for determining prioritization. The priority is not an HRA (e.g., EP assessment). The EP priority is a guide for prioritizing OEH resources, communicating an EP’s importance relative to other EPs to installation leadership, key stakeholders, and mission partners. The EP priority determines the follow-on assessment timeline. Reference [Table 3.3. Exposure Pathway Prioritization and Timeframe for Assessment](#) for guidance on completing rapid and enhanced EP assessments. Rapid and enhanced EP assessments are defined in [paragraph 3.3](#).

Table 3.2. Exposure Pathway Prioritization Criteria Consideration.

Priority	Priority Criteria Consideration
Urgent	Potential health risk indicates immediate action as soon as possible and assessment with sampling when appropriate and feasible.
High	Potential health risk indicates rapid action and assessment with sampling when appropriate and feasible.
Moderate	Potential health risk indicates routine assessment with sampling when appropriate and feasible.
Low	Potential health risk indicates routine assessment without sampling.

3.2.4.5. Bundled Exposure Pathways. In some circumstances, bundled EPs may be used to capture multiple EH hazards affecting the same PAR through the same environmental media (i.e., air, water, soil). Limit bundling to cases where pathways’ characteristics (e.g.,

start and stop dates, duration, frequency, priority, etc.) are similar, cases in which the short- and long-term risk levels in the EP assessments are expected to be similar, and cases in which these similarities are not expected to change significantly in the future. Municipal Water and Ambient Air are typical examples of appropriate bundled exposure pathways. Consult with ESOH Service Center (<https://hpws.afrl.af.mil/dhp/OE/ESOHSC/>; email: esoh.service.center@us.af.mil; toll free 1-888-232-ESOH (3764)) for guidance on best practices.

3.2.4.5.1. The *Bundled Municipal Water (Base X Drinking Water System)* EP captures the sampling and surveillance of the drinking water system for the PAR served by the water system. If an installation or AOR has multiple water systems serving different PARs, separate EPs will be established for each PAR. BE will create bundled municipal water EP(s) for the installation and AORs. (T-1)

3.2.4.5.2. The *Bundled Ambient Air Quality* EP captures the health hazards from exposure to the ambient air quality such as, but not limited to the installation military industrial operations (or AOR operations), surrounding industrial operations (i.e., civilian industry), and natural incidents (i.e., wildfires, etc.). Geospatial tools are available to identify these EH hazards. (Reference **Attachment 3 Geospatial Capabilities** for additional guidance.) AOME may determine if a bundled ambient air quality EP for the installation and AORs is appropriate and necessary.

3.2.5. **Identify Environmental Exposure Limits and Criteria.** Agency for Toxic Substances and Disease Registry (ATSDR) Minimal Risk Levels (MRLs) are the best guides for community exposures. Environmental Protection Agency's Maximum Contaminant Levels (MCLs), Existing Chemical Exposure Limits (ECELs), Integrated Risk Information System (IRIS), Risk Assessment Guidance for Superfunds (RAGS), Regional Screening Levels (RSLs), Acute Exposure Guideline Levels (AEGs), and the Department of Housing and Urban Development (HUD) resources may be useful. Consult ESOH Service Center for guidance on appropriate or additional environmental exposure criteria. Military Exposure Guidelines (MEGs) outlined in US Army Public Health Command Technical Guide 230, *Environmental Health Risk Assessments and Chemical Exposure Guidelines for Deployed Military Personnel*, are exposure level guidance for deployments.

Table 3.3. Exposure Pathway Prioritization and Timeframe for Assessments.

If EP Priority	Then Complete Rapid EP Assessment	If Rapid EP Risk Estimate	Then Complete Enhanced EP Assessment
Urgent	Immediately	Extremely High, or High with low confidence	As soon as possible
High	Within 3 months	High with high confidence, or Medium with low confidence	Within 6 months
Moderate	Within 6 months	Medium with high confidence	Within 12 months
Low	Within 6 months	Low	Within 24 months

3.3. Step 2. Assess Environmental Health (EH) Hazards and Determine Risk Estimate.

3.3.1. All EPs require an assessment. (T-1) The EP assessment is a “risk estimate” and considered the environmental HRA. The EP assessment is the primary EH data source used to populate the ILER. There are two types of EP assessments: rapid and enhanced. Note, bundled EPs will require individual assessments for each EH hazard. Once an EP assessment has been accomplished, reassess the EP priority and update, annually at a minimum.

3.3.1.1. Rapid EP assessments are the initial assessment of an EP and may either be qualitative in nature using observation and PAR feedback or semi-quantitative using readily available environmental data and/or direct reading (screening) instruments.

3.3.1.1.1. Annotate “Rapid HRA” at the beginning of the *Executive Summary* in the EP assessment DOEHRs data field, as depicted in [Table 3.4](#). *DOEHRs Exposure Pathway Assessment Data Fields* below.

3.3.1.1.2. All rapid EP assessments will be transitioned to enhanced assessments in accordance with the timelines defined in [Table 3.3](#) (T-3) A rapid EP assessment risk estimate will be updated to (replaced with) an enhanced EP assessment based on the results of the SAP.

3.3.1.2. Enhanced EP assessments are definitive environmental HRAs of a particular EP for a particular timeframe and PAR. Enhanced EP assessments are quantitative assessments accomplished in accordance with an SAP. Once the enhanced assessment is complete, transition the existing rapid EP assessment documentation to an enhanced EP assessment. Annotate “Enhanced HRA” at the beginning of the *Executive Summary* in the EP assessment DOEHRs data field, as depicted in [Table 3.4](#) below. Documentation of reassessed enhanced EP assessments will be updated via two methods: exposure timeframe extension or end dating existing assessment and creating a new, current assessment. The existing enhanced EP assessments may be extended if the risk estimate and exposures continue to be consistent. If the risk estimate has changed, the enhanced EP assessment will be end dated and a new enhanced EP assessment created.

3.3.1.2.1. Enhanced EP assessments timeframe may be extended. Enhanced EP assessment “end dates” may be updated (e.g., changed to the current date) if the risk estimate is still valid for the EP and PAR. The actual enhanced EP assessment risk estimates should not be changed without compelling data concluding an incorrect, historical risk estimate associated to the PAR (e.g., delayed receipt of data collected during the original assessment timeframe that changes the original risk estimate).

3.3.1.2.2. A new enhanced EP assessment record will be created when environmental conditions or circumstances change the EH risk estimate to the PAR. The previous enhanced EP assessment must be end dated as the new enhanced EP assessment is created to show the historical progression of the EH risk. The end date of the old, enhanced EP assessment will align with the start date of the new enhanced EP assessment (i.e., no gap in assessment timeline).

Table 3.4. DOEHRs Exposure Pathway Assessment Data Fields.

Exposure Pathway Assessment

Start Date	Date on which members of the PAR began to be exposed to the selected hazard(s). (This is not the date that BE or PH was notified about or began to investigate the exposure.)
End Date	The date that the exposure stopped. If the exposure is on-going enter today's date for now and upon reassessment update the end date to accurately capture the full exposure timeline. This process may continue until the EP assessment is no longer accurate. (Reference paragraph 3.3.1.2. for guidance on extending end dates versus creating new EP assessments.)
Health Hazard Assessed	Add the EH hazard (i.e., environmental contaminants of concern) consistent with the EP. Only one contaminant or category of contaminants is allowed per EP assessment.
Executive Summary	Begin summary with "Rapid" or "Enhanced" to annotate assessment status, then provide a summary of the purpose, methods, and findings of the assessment, confidence (high, medium, or low) in assessment, and risk rational. (4000 character limit.)
Acute/Short-Term Risks	Based on health risk estimate assessment criteria in paragraph 3.3.5., select from drop-down menu: Extremely High Risk, High Risk, Medium Risk, or Low Risk. Do not use the "not evaluated" option.
Long-Term Risks	Based on health risk estimate assessment criteria in paragraph 3.3.5., select from drop-down menu: Extremely High Risk, High Risk, Medium Risk, or Low Risk. Do not use the "not evaluated" option.
Force Health Protection Recommendations	Provide a summary of the risk management and risk mitigation recommendations. (4000 character limit.)
Attachments	Include relevant documents (SAP, applicable data, risk communication materials, memos, etc.) supporting the EP assessment and mitigation and management recommendations.

3.3.2. Characterize Exposure. EH exposures and the assessment of EPs does not follow the OH exposure assessment strategy with individual, 8-hour exposure monitoring leading to acceptable or unacceptable exposures; representative environmental media sampling and monitoring may be necessary to confidently identify and quantify EH hazards over longer time frames (e.g., >24 hrs, >30 days, >1 yr, etc.). Multiple samples and sampling events representative of larger areas and cyclical environmental conditions may be necessary to develop a more defensible risk estimate. The EP assessment can be informed by previous environmental assessments, quantitative measurement data (obtained locally or consolidated from similar operations from other locations) and estimates of exposure (modeling). Greater confidence in the exposure characterization is garnered by collection and analysis of more data in line with a well-designed SAP. SAP details are discussed below.

3.3.2.1. Models, surrogate data, and direct reading instruments are valuable tools for determining which exposures need further assessment and which exposures can be characterized quickly. Care should be taken in applying these tools, as their validity depends on the assumptions they are built upon.

3.3.2.2. National Environmental Exposure Studies conducted by the ATSDR or EPA may provide assessment techniques. Reference the following websites. <https://www.atsdr.cdc.gov/> and <https://www.epa.gov/report-environment/human-exposure-and-health>.

3.3.2.3. Record the environmental HRA rationale in the DOEHS EP assessment *Executive Summary* to establish a historical record of decisions. This is especially important when the decisions are based primarily on qualitative information.

3.3.2.4. When additional exposure data is required to complete an enhanced EP assessment, a SAP will be created. BE will execute the SAP, complete the enhanced EP assessment, update the EP assessment, and recommend mitigation measures with the goal of driving down EP health risks. Data collection is instrumental in providing high-confidence, quantitative environmental HRAs and data-driven risk mitigation recommendations to commanders, key stakeholders, mission partners, and PAR members.

3.3.3. **Develop a SAP.** A SAP is required to complete an enhanced EP assessment. (T-3) Reference 2019 *BE Field Manual* and references listed in [paragraph 3.3.2.2](#) for EP assessment strategies. Consult ESOH Service Center for guidance on appropriate or additional EH assessment strategies. [Table 3.5. Sampling and Analysis Plan Guidance](#) provides SAP guidance.

Table 3.5. Sampling and Analysis Plan Guidance (2019 BE Field Manual).

SAP Steps	SAP Input
1. State the Problem	• Problem: A completed EP was identified during the [OEHS, trend, illness, complaint, etc.] • Determine if additional resources are needed (e.g., outside support agency)
2. Identify the Decision	What decision needs to be made associated with the EP? Example: Does the EP pose an unacceptable acute risk and require immediate mitigation?
3. Identify Sampling Inputs to the Decision	• Define the six elements of the EP • Identify appropriate exposure guidelines for the associated EP • Define the EP AOC (i.e., brief description or geo-coordinates) • Determine where to take samples • Determine laboratory analysis and field screening analysis methods • Describe how to take samples and equipment needed for collection • Determine number of samples needed to support the decision for the EP • Identify when (and how long) samples will be taken (e.g., time of day, specific seasonal variations) • Identify the statistic that will be used to estimate exposure (e.g., the mean, the 90th percentile, etc.) and the desired level of certainty (e.g., 75% percent confidence interval) needed to make recommendations
4. Develop the Decision Matrix	Determine actions to be taken if exposure guidelines are exceeded (e.g., document results, no action, take more samples, risk mitigation, risk communication) or not exceeded (e.g., no action other than document results, risk communication)
5. Formulate the Detailed Sample Collection Plan	Gather and record all the information necessary for the EP sampling, peer-review the SAP, and approve SAP.
6. Conduct Peer Review of SAP	
7. Approve SAP	

3.3.4. **Execute the SAP.** BE (and PH, if applicable) will execute the EP SAP(s) to complete an enhanced EP assessment. (T-3)

3.3.4.1. Coordinate with USAFSAM consultants or laboratory for support in SAP execution, acquiring necessary sampling supplies and equipment, and guidance on local laboratory analysis support. USAFSAM and Defense Health Agency – Public Health may have environmental sampling supplies and equipment available, or guidance on how to acquire necessary resources. Local laboratories may also have resources available.

3.3.4.2. Coordinate with MTF Resource Managers on availability of OEH funds, and coordinate with installation leadership, stakeholders, or mission partners for availability of non-Defense Health Program funds, if necessary.

3.3.4.3. Attach documentation of environmental conditions and variables during SAP execution to the current OEHS in DOEHS. This documentation will also include any existing environmental mitigation measures.

3.3.5. Determine EH Risk Estimates. As previously stated, EH exposures are characterized as risk estimates. All EH risks for each EP are classified as extremely high, high, medium, or low in DOEHS EP assessments. BE and PH will determine the acute (short-term) and chronic (long-term) EH risk estimates. (Deployed: **T-0**; In-garrison: **T-1**) EH risk estimates are defined in **Table 3.6. Risk Estimates**.

3.3.5.1. By risk criteria, determine acute and chronic risk estimates to service members, federal civilian personnel, and DoD beneficiaries using **Table 3.6** and the equations below for both acute and chronic health effects.

3.3.5.1.1. The Risk Factor (RF) is used for non-cancer health effects (acute and chronic). It is the representative exposure concentration (C) divided by the exposure guideline (EG):

Figure 3.1. Risk Factor Equation.

$$RF = \frac{C}{EG}$$

3.3.5.1.2. The Cancer Risk (CR) is used for cancer health effects (chronic only). It is the representative exposure concentration (C) multiplied by the slope factor (SF):

Figure 3.2. Cancer Risk Equation.

$CR = C \times SF.$

3.3.5.1.3. Exposure guidelines and/or slope factors are found using the most applicable reference. Different references have guidelines for different timeframes, generally use shorter-term guidelines for acute risk estimates and longer-term guidelines for chronic risk estimates. Examples include federal regulations, ATSDR MRLs, EPA RSLs, Health Advisories or Provisional Peer Reviewed Toxicity Values, etc. Consult ESOH Service Center for guidance in determining appropriate exposure guidelines and slope factors. If the values found are toxicity values (e.g. reference doses (RfD) or reference concentrations (RfC)), consult ESOH Service Center for assistance with calculation of the guideline.

3.3.5.1.4. If no exposure guidelines or slope factors can be found, use **Table 3.7** to conduct a qualitative risk estimate. These cases are likely to be low or medium risk since more hazardous health effects are expected to have established guidelines/slope factors.

Table 3.6. Risk Estimates.

Risk Estimate	Non-Cancer Health Effects	Cancer Health Effects
Extremely High	$RF > 10$	$CR > 1 \times 10^{-3}$
High	$RF \leq 10$	$1 \times 10^{-3} > CR > 1 \times 10^{-4}$
Medium	$RF \leq 5$	$1 \times 10^{-4} > CR > 1 \times 10^{-5}$
Low	$RF \leq 1$	$1 \times 10^{-5} > CR > 1 \times 10^{-6}$
NOTE: There is uncertainty in correlating RF to level of risk, use as preliminary guidelines and adjust as determined by knowledge of ground truth.		

3.3.5.2. After determining the risk estimate, use [Table 3.7. Consequences to Military Operations and Force Health Protection](#), to describe what each risk level means and to check if the calculated risk estimate reasonably represents site-specific conditions. If necessary, adjust the risk estimate to better match the consequences in [Table 3.7](#). Document the justification in the EP assessment.

Table 3.7. Consequences to Military Operations and Force Health Protection.

Risk Estimate	Acute EH Risk		Chronic EH Risk
	Service Members and Federal Civilian Personnel	DoD Beneficiaries	Service Members, Federal Civilian Personnel and DoD Beneficiaries
Extremely High	Unable to accomplish the mission if hazards occur during mission.	Chances of irreversible adverse reactions or health issues are likely.	Significant future medical surveillance activities and medical provider resources anticipated. EH hazard recognized as a human carcinogen and confidence in complete EP is high.
High	Significant mission degradation if hazards occur during mission.	Chances of reversible adverse reactions or health issues are likely.	Notable future medical surveillance activities and related resources anticipated. EH hazard recognized as a possible human carcinogen and confidence in complete EP is high.
Medium	Expected mission degradation if hazards occur during mission.	Chances of reversible, minor adverse reactions or minor health issues are likely.	Limited future medical surveillance activities and related resources anticipated.
Low	Little or no impact on accomplishing the mission if hazards occur during mission.	Chances of reversible, minor adverse reactions or minor health issues are possible, but unlikely.	No specific medical action required.
From Technical Guide 230			

3.3.6. **Bundled EP Environmental HRA.** [Paragraph 3.2.4.5](#) describes the process of creating bundled EPs. Bundled EP will require a bundled environmental HRA (i.e., EP assessment). Conduct a bundled (media specific) environmental HRA by reviewing holistically all EP assessments by one media (air, water, and/or soil) to a PAR to determine an overall EH risk estimate to that PAR for that media (i.e., do the health risks from all ambient air EPs create an additive or synergic health risk?).

3.3.6.1. BE (and PH, if applicable) will document air, water, and soil bundled EP assessments in the OEHSAs under the *Air Quality*, *Water-Municipal Water Source*, and *Other Environmental Concerns*, as applicable. (T-3) BE (and PH, if applicable) will document all the bundled EPs and the bundled HRA in narrative form in the OEHSAs *Executive Summary*, and POEMS (if deployed). (T-3) ESOH Service Center can help with bundled HRAs.

3.3.6.2. **Paragraph 3.2.4.5.1** requires a bundled municipal water EP for each installation and AOR. BE will assess the bundled municipal water EP annually and associate all National Primary Drinking Water Standard and Secondary Standard sampling results with the assessment. (T-1) For routine bacteriological surveillance, only document and associate positive results with the assessment. Routine chlorine and pH monitoring are not required to be associated with the assessment. Utilize USAFSAM electronic data deliverable tool to expedite DOEHS data entry. (Reference DAFI 48-144, *Drinking Water Surveillance Program* for additional guidance.)

3.3.7. **Hazard-Specific Bundled HRA** . In rare instances where two or more media have similar EH hazards, complete a bundled (hazard specific) environmental HRA by reviewing holistically all EPs with the same health hazard to the same PAR to determine an overall EH risk estimate for that EH hazard. Document this bundled environmental HRA in narrative form in the OEHSAs *Executive Summary* and the POEMS (if deployed). Note, a bundled EP cannot be created for a single EH hazard from multiple media. ESOH Service Center can help with these bundled assessments.

3.4. Step 3. Develop Mitigation Measures and Make Risk Decisions.

3.4.1. **EH Risk Control Measures** . Risk mitigation or management measures are required for extremely high-, high- and medium-risk EH exposures. (T-1) Key stakeholders, AOME, and mission partners will develop recommended mitigation or management plan options and details. Coordination and communication with installation commanders and key stakeholders is necessary to effectively implement risk control measures and/or risk acceptance.

3.4.1.1. **EH Risk Mitigation Plans**. Mitigation plans are designed to eliminate an EH hazard or sever the EP. Key stakeholders, AOME, and mission partners will determine if a particular EH hazard is able to be eliminated or if the EP can be severed through other means. EPs will be end-dated once an EH hazard is no longer a risk to service members, federal civilian personnel, or DoD beneficiaries. EH mitigation plans will be assigned to the key stakeholder(s). (T-3)

3.4.1.2. **EH Risk Management Plans**. If an extremely high-, high- or medium-risk EH hazard cannot be eliminated or the EP severed, key stakeholders, AOME, and mission partners will develop and implement EH hazard management plans to reduce the EH risk. EH hazard management plans will be assigned to the primary key stakeholder(s). (T-3) EH management plans will include the following as a minimum:

3.4.1.2.1. Key stakeholder owner

3.4.1.2.2. EH hazard and source

3.4.1.2.3. Plan procedures or processes, and responsible parties

3.4.1.2.4. Process on how the EH risk estimate was determined

3.4.1.2.5. Reassessment plan and timelines

3.4.1.2.6. PAR risk communication and education strategy or plan

3.4.2. Key stakeholders, AOME, and mission partners will recommend, and with installation commander approval, stand up working group(s) to oversee execution of mitigation or management plans. (T-3) Working groups will convene as necessary to mitigate or manage the EH hazard(s) and will terminate at the discretion of the group members with installation commander approval. The installation commander will designate working group chairs. (T-3)

3.5. Step 4. Implement Mitigation Measures or Risk Acceptance.

3.5.1. Installation commanders will be informed of the EH risks, impacted PARs, and any mitigation or management measures in their AOR via the Environment, Safety, and Occupational Health Council (ESOHC). (Deployed: T-0; In-garrison: T-1) Reference [chapter 5](#) for additional guidance in ESOHC reporting. For deployments, reference Joint Service OEHS for additional requirements for a commander's risk acceptance.

3.5.2. EH risk mitigation or management measures will be approved by installation leadership and owned by key stakeholders. (T-3) EH risk mitigation or management measures will aim to reduce risk as low as possible, and prevent or minimize exposures to all service members, federal civilian personnel, and DoD beneficiaries. Maintenance and monitoring of mitigation or management measures or plans is the responsibility of the identified stakeholder (e.g., unit commander, environmental restoration manager, EH hazard source owner, impacted facility owner, etc.). Stakeholder management is necessary until the EP is severed or until the risk estimate is reduced to low.

3.6. Step 5. Supervise, evaluate, and confirm mitigation effectiveness. The OEHS will be updated/reassessed according to [paragraph 3.2.2.2](#) to identify environmental changes that may impact EH hazards, identify new EH hazards and EPs, and evaluate existing EH hazard control measures and prevention programs. The EPs will be reassessed to maintain confidence and currency of EH exposure documentation and improve assessments for "low confidence" health risk decisions that need additional exposure information or data. During OEHS or individual EP reassessments, BE and PH will work with key stakeholders and mission partners to determine the effectiveness of existing control measures and/or prevention programs. (T-1)

3.6.1. OEHS Reassessment.

3.6.1.1. An OEHS reassessment will be accomplished in accordance with [paragraph 3.2.2.2](#).

3.6.1.2. Additional triggers for an OEHS reassessment may include low confidence in EP identification, installation mission changes, regulatory changes, substantial new construction, new environmental exposure limits, new national environmental health studies, population complaints, community interests, significant weather event (flood, hurricane, etc.), or an incomplete/inaccurate OEHS.

3.6.1.3. A reassessment or a compressed OEHS may be necessary immediately following a garrison natural disaster or a contingency impacting installation mission to expedite identification of newly created EP risks, capture contingency-related exposures, and guide risk reduction activities during installation recovery.

3.6.2. EP Reassessment. Current EP assessments are critical for accurate ILERs. EPs must always have a current EP assessment. BE and PH will reassess EPs annually. (T-1) Reference [paragraph 3.3](#) for extensive details on assessment transition or update processes for rapid and enhanced EP assessments. Any update or change to an EP assessment that also drives an update to the assessment “end date” meets the annual reassessment requirement.

3.7. Applying EH Risk Management to Emergency Response Scenarios. During an incident response and in accordance with DAFI 10-2501, *Emergency Management Program*, BE and PH will evaluate EH risks to non-emergency responders as PEPs. Health risks to emergency responders are captured in the OH Risk Management process as defined in DAFMAN 48-146. The basic steps of EH Risk Management are the same in a response scenario but often executed in a compressed timeframe with limited and/or evolving data. Applicability of emergency response to PH is limited to PH emergencies only.

3.7.1. Environmental Exposure Limits. The environmental exposure and health risk criteria for PEPs do not change for emergency and disaster scenarios; however, mission accomplishment and first responder protection are priority. Use the same standards and/or guidance criteria defined in [paragraph 3.3.2](#).

3.7.2. Emergency response scenarios are typically shorter in duration but have higher exposure potential. BE will monitor environmental conditions as soon as practical during the emergency to determine AOC, PEPs, and exposure levels, and recommend mitigation measures immediately, if necessary. (T-1) After the initial response, BE will continue environmental monitoring and assessing control measures in the AOC until recovery operations are complete and EH hazards return to background levels. (T-1)

3.7.3. Incidents do not use EP or EP assessments. Individuals exposed due to an incident will be directly linked to the PEP via name and social security number. AOME will determine if an incident resulted in an exposure requiring DOEHRs documentation. Reference [paragraph 3.7.4](#) below for guidelines on determining if an exposure occurred. Multiple PEPs (with varying exposures and risks) are likely in a single incident. PEPs are limited to service members, federal civilian personnel, and DoD beneficiaries. Contractors and installation visitors are not included in PEPs.

3.7.4. Additional criteria to determine if exposures occurred during an incident.

3.7.4.1. Visual/sensory cues are, or were, present indicating potential presence of an EH hazard (e.g., smoke/cloud, odors, strange liquid/powders, etc.).

3.7.4.2. Elevated levels of an acute EH hazard is indicated through positive detection using direct reading instruments.

3.7.4.3. The presence of a EH hazard is plausibly associated with actual observed (acute) clinical health outcomes that are reported and/or treated (e.g., complaints of headaches, dizziness, skin or eye irritation/burning, coughing, nausea, etc.).

3.7.4.4. Concern over a perceived or potential adverse health exposure leads to involvement of AOME for investigation, assessment, determination and response. Document these actions as an incident report even when the determination is that no adverse exposures or impacts to human health are expected.

3.7.5. BE and PH will document environmental HRAs conducted in support of emergency response operations or PH emergencies using the DOEHRS Incident Response module. (T-1)

Chapter 4

RISK COMMUNICATION

4.1. Risk Communication Team. Health risk communication is an integral part of a successful EH management program and requires a team approach. Every opportunity to communicate risk early, consistently, and often must be taken to inform commanders, stakeholders, mission partners, PARs, and PEPs about EH hazards and risks, control measures, and risk management decisions. The installation risk communication team will include, but is not limited to PA, stakeholders, mission partners, and AOME. The risk communication team will be tailored based on the scope of the EH hazard as determined by AOME.

4.1.1. Strong working relationships between the installation risk communication team are critical for successful risk communication. These relationships will be established early, before an EH issue or crisis. Understanding the installation's and AOR's EH hazards and risks and community perceptions will help prepare the risk communication team for future EH issues.

4.1.2. The risk communication team will coordinate on all materials, messaging and talking points. (T-3) Risk communication procedures and products may be necessary for multiple leadership levels (e.g., commanders, stakeholders, mission partners, supervisors, medical providers, PARs, etc.).

4.2. Risk Communication Team Roles. The risk communication team will provide risk communication support in various forums to include, but not limited to, town halls, public meetings, Restoration Advisory Boards, etc. (T-3) Risk communication team members' primary focus areas are listed below.

4.2.1. PA will be the primary for the overall installation risk communication strategy when requested to support the risk communication team. PA will support the risk communication team if the EH risk requires installation leadership awareness or action, media engagement is anticipated, or off-base community activities are anticipated. (T-1)

4.2.2. AOME will focus on communicating EH risks based on actual measured exposure levels to service members, federal civilian personnel, and DoD beneficiaries impacted by the EH hazard. (T-1)

4.2.3. BCE, through the restoration program manager, will focus on clean-up and restoration program details and timelines. BCE will communicate health-related toxicological data (theoretical health risks based on scientific research and studies) supporting clean-up or restoration level goals. BCE, as a stakeholder, will also comply with [paragraph 4.2.4](#) (T-1)

4.2.4. Key stakeholders and mission partners with responsibility for control, management, or mitigation of a particular EH hazard or risk will provide details and timelines of controls, management, or mitigation plans supporting risk communication activities. (T-3)

4.2.5. JA may support the risk communication team as necessary and will be included if EH hazards exceed published U.S. or DoD exposure standards. (T-1)

4.3. Use of publicly available materials. Installation risk communication team will utilize publicly available health hazard and health risk communication materials, if appropriate, based on

the scope or level of community concern. AOME will determine if/when publicly available materials are appropriate.

4.4. Additional Risk Communication Support. Upon request, USAFSAM will provide additional risk communication support to AOME, and AFIMSC will provide additional risk communication to support BCE. ANG units may request additional risk communication and functional support from the Air National Guard Bureau Readiness Center.

4.5. ATSDR assessments. DoD and ATSDR have an EH exposure assessment study cooperative agreement. If ATSDR is actively assessing an installation EH risk, stakeholders, mission partners, and AOME will support information gathering efforts (except additional sampling), coordinate surveillance activities, and participate in community outreach and risk communication actions.

4.5.1. BE and PH will create EPs and EP assessments for any ATSDR assessments in the AOR, and capture EH data and reports in DOEHRS. (T-1)

4.5.2. AFMC and USAFSAM will support installation risk communication teams and ATSDR with respect to community outreach and risk communication. (T-2)

4.6. Risk communication documentation. All risk communication support provided to PARs will be included in the documentation of EPs in DOEHRS. (T-3)

Chapter 5

REPORTING AND RECORD KEEPING

5.1. DOEHRS. EH-related activities, such as samples, surveys, reports, risk assessments, risk management decisions, and risk communication products will be documented in DOEHRS in accordance with this DAFMAN and the business practices established in USAFSAM guidance documents for both garrison and deployed settings. **(T-1)**

5.1.1. Associate samples, surveys, and other assessments unique to an EP to that EP. Save samples, surveys, and other assessments generic to the installation (i.e., no specific EP) in the DOEHRS Document Library.

5.1.2. Associate all EPs, surveys, and samples to the applicable OEHSAs.

5.1.3. Associate any completed IRs to the applicable OEHSAs.

5.1.4. A qualified reviewer will verify the accuracy and completeness of all EH data and environmental HRA activities entered in DOEHRS according to local quality assurance procedures. A qualified reviewer is a fully qualified BE Officer (43E3X/43E4X), BE Craftsman (4B071), or civilian equivalent. If a qualified reviewer is not available, the most senior BE officer or technician will perform the reviews

5.2. ILER. Individual service members' EH exposure records managed in DOEHRS are accessible by DoD and Department of Veterans Affairs (VA) medical providers through the ILER web-based application. The ILER is a complete record of a service member's EH exposures over the course of a career; it associates individuals to known exposure events and incidents. The ILER is intended to provide DoD and VA clinicians, claims adjudicators, and benefit advisors the data required to improve the care provided to service members and veterans. EPs and EP assessments are the primary EH exposure and risk estimate documentation pulled from DOEHRS to create an ILER; AOME supports accurate ILER development through complete, accurate OEHSAs, EPs, and EP assessments.

5.3. OEHWG. Pertinent EP and EP assessment information will be annotated in the OEHWG minutes when discussed at the OEHWG (e.g., Occupational and Environmental Health Exposure Data, Medical Surveillance Exam approval, trend analysis, need to brief MTF medical providers of risks, etc.). **(T-2)** All other EH documentation will be maintained in the appropriate electronic database/format. Protected health information will be maintained according to the *Health Insurance Portability and Accountability Act*. Additional documentation maintained by PH will be up to local discretion.

5.4. ESOHC.

5.4.1. AOME will brief the current list of all extremely high-, high- and medium-risk EPs (including assessed risk) that do not have an assigned key stakeholder every 24 months, and request stakeholder assignment. **(T-3)**

5.4.2. Key stakeholders will brief the status and progress of assigned extremely high-, high- and medium-risk EPs at least every 24 months. **(T-3)**

JOHN J. DEGOES
Lieutenant General, USAF, MC, FS
Surgeon General

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

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Abbreviations and Acronyms

AEGL—Acute Exposure Guideline Level—

AFCEC—Air Force Civil Engineer Center
AFI—Air Force Instruction
AFIMSC—Air Force Installations and Mission Support Center
AFMC—Air Force Materiel Command
AFMEDCOM—Air Force Medical Command
AFR—Air Force Reserve
AICUZ—Air Installation Compatible Use Zone
ANG—Air National Guard
AOC—Area of Concern
AOME—Aerospace and Operational Medicine Enterprise
AOR—Area of Responsibility
ASD—Assistant Secretary of Defense
ASHRAE—American Society of Heating, Refrigerating and Air-Conditioning Engineers
ATSDR—Agency for Toxic Substances and Disease Registry
BCE—Base Civil Engineer
BE—Bioenvironmental Engineering
BEACH—Beaches Environmental Assessment and Coastal Health Act
Bldg—Building
BOS-I—Base Operating Support-Integrator
C—Concentration—CDC—Centers for Disease Control and Prevention
CE—Civil Engineer
CFR—Code of Federal Regulations
CO₂—Carbon Dioxide
CONUS—Continental United States
CR—Cancer Risk
DAF—Department of the Air Force
DAFI—Department of the Air Force Instruction
DAFMAN—Department of the Air Force Manual
DERG—Data Entry and Report Guide
DERP—Defense Environmental Restoration Program
DoD—Department of Defense
DoDI—Department of Defense Instruction

DOEHRS—Defense Occupational & Environmental Health Readiness System

DOEHRS-IH—Defense Occupational & Environmental Health Readiness System – Industrial Hygiene

ECEL—Existing Chemical Exposure Limit

EG—Exposure Guideline

EH—Environmental Health

EP—Exposure Pathway

EPA—Environmental Protection Agency

eMH—Enterprise Military Housing

ERP—Environmental Restoration Program

ESOH—Environment, Safety, and Occupational Health

ESOHC—Environmental, Safety, and Occupational Health Council

FAC—Free Available Chlorine

FGS—Final Governing Standard

FHP—Force Health Protection

FSS—Force Support Squadron

GEOMAP—Geospatial Engineering Operations Mapping & Analysis Portal

GIO—Geospatial Integration Office

GPS—Global Positioning System

GSU—Geographically Separated Unit

HAZCOM—Hazard Communication

HIA—Health Impact Assessment

HRA—Health Risk Assessment

HUD—Housing and Urban Development

HVAC—Heating Ventilation and Air Conditioning

IAQ—Indoor Air Quality

ILER—Individual Longitudinal Exposure Record

IOEMC—Installation Occupational and Environmental Medicine Consultant

IR—Incident Report

IRIS—Integrated Risk Information System

JA—Judge Advocate (Legal)

LEC—Lead Environmental Component

MAJCOM—Major Command

MAHC—Model Aquatic Health Code (CDC)
NCMI—National Center for Medical Intelligence
MEG—Military Exposure Guideline
MFH—Military Family Housing
MHO—Military Housing Office
MHPI—Military Housing Privatization Initiative
MTF—Medical Treatment Facility
mV—millivolts
MWR—Morale, Welfare and Recreation
NOAA—National Oceanic and Atmospheric Administration
NORM—Naturally Occurring Radioactive Material
NWS—National Weather Service
OCONUS—Outside the Continental United States
OEBGD—Overseas Environmental Baseline Guidance Document
OEH—Occupational and Environmental Health
OEHSA—Occupational and Environmental Health Site Assessment
OEHSS—Occupational and Environmental Health Site Surveillance
OEHWG—Occupational and Environmental Health Working Group
OH—Occupational Health
OPR—Office of Primary Responsibility
OSD—Office of the Secretary of Defense
PA—Public Affairs
PAR—Population at Risk
PCB—Polychlorinated biphenyls
pCi/L—Picocuries per Liter
PCM—Primary Care Manager
PEP—Potentially Exposed Population
PH—Public Health
PMAS—Program Maturity Audit System
PMR—Program Management Review
PO—Project Owner (Privatization)
POEMS—Periodic Occupational and Environmental Monitoring Summaries

ppm—Parts Per Million

RAGS—Risk Assessment Guidance for Superfund Sites

RF—Risk Factor

Rf(C)—Reference Concentration

Rf(D)—Reference Dose

RH—Relative Humidity

RPM—Restoration Program Managers

RWI—Recreational Water Illness

SAP—Sampling and Analysis Plan

SEG—Similar Exposure Group

SF—Slope Factor

SGP—Chief of Aerospace Medicine

SIHHS—Substantial Impact to Human Health and Safety

SME—Subject Matter Expert

SOFA—Status of Forces Agreements

T—Temperature—Temp—Temperature

UFGS—Unified Facilities Guide Specifications

UH—Unaccompanied Housing

U.S.—United States

USAFSAM—United States Air Force School of Aerospace Medicine

USC—United States Code

USGS—United States Geological Survey

VA—Veterans Affairs

VI—Vapor Intrusion

MWR—Morale, Welfare, and Recreation

yr—Year

Office Symbols

AFCEC/CBFG—Air Force Civil Engineer Center, Geospatial Engineering Branch

AFMEDCOM—Air Force Medical Command

MAJCOM/SG—Major Command, Command Surgeon

SAF/IE—Secretary of the Air Force for Energy, Installation, and Environment

WGS84—World Geodetic System 1984

Terms

Acute Exposure Guideline Level (AEGL)—Used by emergency planners and responders worldwide as guidance in dealing with rare, usually accidental, releases of chemicals into the air. AEGLs are expressed as specific concentrations of airborne chemicals at which health effects may occur. They are designed to protect the elderly and children, and other individuals who may be susceptible.

Aerospace and Operational Medicine Enterprise (AOME)—All health capabilities and activities that directly support execution of the DAF missions for Air and Space Forces, including aviation and space medicine; occupational, environmental, and operational medicine; industrial hygiene; public health; force health readiness and protection; medical support to the nuclear enterprise; human performance sustainment, optimization, and enhancement; medical response to aviation and operational mishaps and to chemical, biological, radiological, or nuclear (CBRN) events. (Reference: DAFPD 48-1, *Aerospace and Operational Medicine Enterprise (AOME)*, 26 December 2024)

Contingency location (CL)—A non-enduring location outside of the United States that supports and sustains operations during named and unnamed contingencies or other operations as directed by appropriate authority and is categorized by mission life-cycle requirements as initial, temporary, or semi-permanent. (Reference: DoDD 3000.10, *Contingency Basing Outside the United States*)

DoD Beneficiary—Individuals who have been determined to be entitled to or eligible for medical benefits and therefore authorized treatment in a MTF or under DoD auspices.

Enduring Location (EL)—A location is enduring when DoD intends to maintain access and use of that location for the foreseeable future. The following types of sites are considered enduring for U.S. Government purposes: main operating base, forward operating site, and cooperative security location. All three types of locations may be composed of more than one distinct site. Enduring locations are published in the Office of the Secretary of Defense-approved Enduring Location Master List.

Enhanced Health Risk Assessment—A comprehensive, data driven assessment of a DOEHRs EP conducted by an experienced health risk assessor driven by a detailed sampling and analysis plan.

Environmental Health (EH)—The programs, activities, and subsequent risk determination associated with the anticipation, recognition, evaluation, and potential control of hazards identified within the media of the environment. Environmental health focuses on the reduction or mitigation of the health hazards identified in the operational or garrison environment. (DODD 6420.02)

Environmental Health (EH) Hazard—EH hazards are factors or conditions in the environment that can negatively impact human health and well-being. EH hazards include chemical and radiological substances, organisms or toxins that can cause disease, and physical conditions (e.g., heat, noise). EH hazards may also be classified as Public Health threats which include an event or condition that poses a significant risk to the health and well-being of a population (e.g., infectious disease outbreaks, natural disasters, accidents involving hazardous chemicals, etc.).

Exposure Estimate—Measurements or predictions of the level of exposure to a given health hazard. These estimates can be qualitative, but are traditionally considered to be numerical, quantitative estimates.

Exposure Pathway (EP)—A description of how exposure occurs from health hazard release from a source into the environment, transport through environment and within one or more environmental media (air, water, soil, surfaces, etc.), the routes of human exposure (e.g., inhalation, ingestion, skin contact, etc.), and where and when specific personnel come into contact with the hazard (e.g. a specific cohort exposed at the same time or in a similar way as compared). There are six components of an exposure pathway that each must be present in order for an actual exposure to occur: (1) source, (2) health hazard, (3) exposure point, (4) exposure media, (5) route of exposure, and (6) co-occurrence in time with a population-at-risk.

Existing Chemical Exposure Limit (ECEL)—A regulatory occupational exposure limit set by EPA to limit inhalation risks to workers exposed to certain chemicals in a workplace.

Health Impact Assessment (HIA)—A scientific assessment that evaluates the levels of environmental contamination present at a location and whether there is a pathway of exposure that results in a substantial impact to human health and safety.

Integrated Risk Information System (IRIS)—EPA program or dataset used to identify and characterize the health hazards of chemicals found in the environment—IRIS assessments can cover a chemical, a group of chemicals, or a complex mixture.

Lead Environmental Component—The Secretary of a Military Department, Combatant Commander, or Subunified Commander specifically designated to execute the responsibilities prescribed in DoDI 4715.05 *Environmental Compliance at Installations Outside the United States*, Enclosure 2, and DoDI 4715.08, *Remediation of Environmental Contamination Outside the United States*, for environmental matters associated with DoD installations in specific foreign countries.

Military Exposure Guideline (MEG)—The MEGs are intended to be used as a preventive medicine tool to identify and assess chemical OEH hazards faced by deployed military personnel. It is essential that the impact of exposures be translated in this fashion so that commanders can compare risks from chemical hazards against a myriad of other mission- and personnel-related risks and make appropriate risk management decisions. MEGs are defined in Technical Guide 230.

Mission Partners—Organizations with the responsibly and skill set to support EH risks. Typical mission partners are CE, Occupational Safety, facility managers, AOME, MHO, etc.

Overseas—A geographic area located outside the jurisdiction of the United States, which includes land and associated territorial seas, contiguous zones, and exclusive economic zones of the United States; an area outside the United States (e.g., a foreign nation).

Periodic Occupational and Environmental Monitoring Summary (POEMS)—Unclassified and publicly releasable OEH monitoring summaries (e.g., noise, thermal stress, airborne pollutants, soil and water contaminants, incidents, and infectious diseases) that identify location specific OEH hazards and population-based health risks. POEMS provide estimated exposures, assessment of whether estimated exposures were acceptable or unacceptable, and the criteria used for the estimate (i.e., above or below Military Exposure Guidelines) along with anticipated acute, chronic, or latent health effects.

Population at Risk (PAR)—As an element of an exposure pathway, this is a group of individuals who are or may be exposed to a health hazard via one or more routes of exposure.

Potentially Exposed Population (PEP)—This is a group of individuals similarly exposed to an EH hazard originating from an unusual event (emergency, incident, or natural disaster).

Sampling and Analysis Plan (SAP)—A plan that defines the EH problem requiring sampling data that addresses data quality objectives, sampling strategies, sample management, laboratory analyses, and associated quality assurance.

Source—As an element of an exposure pathway, a source is the origin of a health hazard that is released into the environment. Often referred to as a threat source. Example sources include a field of buried drums, burn pit, bulk chemical storage, incinerator, radio-frequency emitters, fugitive emission from off-site industries, on-site sanding/painting operations, and a transportation route.

Stakeholders—Key organizations or leaders owning or having decision authority over a particular EH hazard or risk.

Substantial Impact—A level of exposure that is occurring or is about to occur within the next 3 to 5 years, and exceeds a generally established, published, and applied federal standard in the United States. (DoDI 4715.08)

Rapid Health Risk Assessment—A basic, screening-level assessment of a DOEHS EP that relies on on-site observations, professional judgments, and data generated by field expedient methods.

Risk Assessment Guidance for Superfund (RAGS)—EPA developed manuals to be used in the remedial investigation/feasibility study process at Superfund sites. The RAGS Human Health Evaluation Manual provides a basic framework for health risk assessment.

Regional Screening Levels (RSLs)—EPA developed screening level tables of chemical contaminants at Superfund Sites that provide comparison values for residential and commercial/industrial exposures to soil, air, and drinking water.

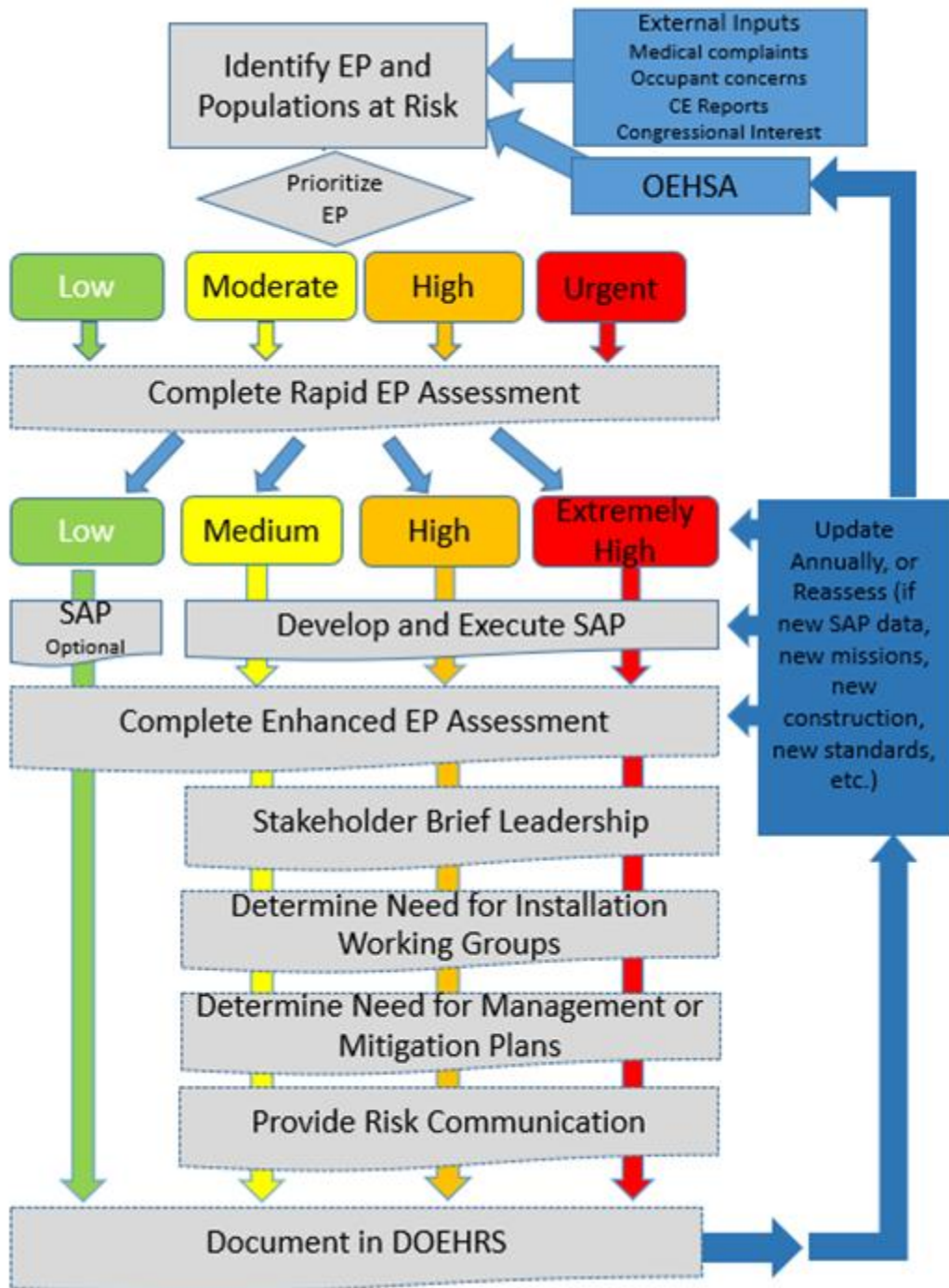
United States—The several States, District of Columbia, Commonwealths of Puerto Rico and Northern Mariana Islands, American Samoa, Guam, Midway and Wake Islands, United States Virgin Islands, any other territory, or possession of the United States, and associated navigable waters, contiguous zones, and ocean waters of which the natural resources are under the exclusive management authority of the United States. See DoDI 4715.05, DoDI 4715.08, and DoDD 3000.10.

Attachment 2

ENVIRONMENTAL HEALTH RISK ASSESSMENT FLOW CHART

A2.1. Environmental Health Risk Assessment Flow Chart.

Figure A2.1. Environmental Health Risk Assessment Flow Chart.



Attachment 3

GEOSPATIAL CAPABILITIES

A3.1. Background. Geographic information systems and geospatial capabilities are abundant and continually evolving to provide decision-ready information. This attachment provides information and guidance on the availability of DoD and non-DoD geospatial resources to support and speed execution of the EH program, guidance on geo-coordinate collection and documentation, and additional resources available to manage, display, and communicate EH risk. Collecting geo-coordinates and recording in DOEHRS in accordance with sections A3.4. and A3.5. is required. The use of the geospatial tools and resources defined in the rest of this attachment is optional and is not a requirement.

A3.2. Non-DoD Geospatial Resources. **Table A3.1.** *Non-DoD Geospatial Resources* highlights several applicable non-DoD resources that provide medical surveillance, environmental conditions, and infrastructure data that can be used to prepare, identify, and respond to health-related incidents.

Table A3.1. Non-DoD Geospatial Resources.

Platform	Agency	Capability	Website
AirNow	EPA, NOAA, National Aeronautics and Space Administration, States	AirNow reports air quality using the official U.S. Air Quality Index (AQI)	AirNow Interactive Map (epa.gov)
Air Quality Index	N/A	Real-time air quality for more than 10,000 sites worldwide	https://aqicn.org/map/world
Climate Mapper	NOAA	Library of various climate and climate impacts mapper (snow, hurricanes, temperatures, etc.)	Maps & Data NOAA Climate.gov
Cyanobacteria Assessment Network	EPA, USGS	This experimental web application provides provisional satellite derived measures of cyanobacteria,	EPA CyAN Web App
Drought Mapper	NOAA, National Integrated Drought Information System	US and Global information on drought for different sectors	International Drought.gov

		including public health, agriculture, ecosystems, etc. Drought early warning systems.	
Energy Infrastructure and Resources	American Geosciences Institute	Energy infrastructure mapping	Interactive map of United States energy infrastructure and resources American Geosciences Institute
EnviroMapper	EPA	A single point of access to select EPA environmental data about environmental activities that may affect air, water, and land.	EnviroMapper Envirofacts US EPA
EnviroAtlas	EPA, United States Geological Survey (USGS)	Air quality, Algal Blooms, Discharge Pollutants, and many other mappers	EnviroAtlas (epa.gov)
Fire and Smoke Map 4.0	EPA and U.S. Forest Service	This map shows observed air quality conditions based on fine scale particulate (PM2.5) concentrations, as well as fire locations from incidents and satellite detections, and smoke plumes detected by satellites	https://fire.airnow.gov/#6/43.039/-119.72
Fire related mapping tools	National Interagency Fire Center	An assortment of tools for wildland fire risk and response	NIFC Maps
Geospatial Health Systems	Administration for Strategic Preparedness and Response, Department of Health	The Geospatial Health Systems is the premier secured geospatial portal, integrating	https://gis.hhs.gov/

	& Human Services	cutting-edge mapping tools and geospatial analysis to help navigate complexities of public health emergencies	
HealthMap (Disease Daily)	Various	Global infectious disease alerts	Flu & Ebola Map Virus & Contagious Disease Surveillance (healthmap.org)
Health Surveillance Explorer	Armed Forces Health Surveillance Division	The Armed Forces Health Surveillance Division is the central epidemiologic health resource for the U.S. military. They conduct medical surveillance to protect those who serve our nation in uniform and allies who are critical to our national security interests	https://www.health.mil/Military-Health-Topics/Health-Readiness/AFHSD/Integrated-Biosurveillance/DHA-Health-Surveillance-Explorer
Homeland Infrastructure Found-Level Data	Geospatial Management Office US Department of Homeland Security	Data on U.S. critical infrastructure	https://hifld-geoplatform.hub.arcgis.com/
National Hurricane Mapper	NOAA (NWS)	Maps of Atlantic and Pacific Ocean Hurricanes	National Hurricane Center (noaa.gov)
National Risk Index	Federal Emergency Management Agency	Identifies the risk and resiliency for a US county from natural disasters.	Map National Risk Index (fema.gov)
Toxic Chemical Release Inventory	EPA	Identifies toxic chemical releases	Where You Live US EPA
Water Quality Portal	National Water Quality Monitoring Council	Water Quality Portal is the premiere source of	Water Quality Data Home

		discrete water-quality data in the US and beyond.	
Weather, Snow, River	National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS)	Outlook and forecasting mapper for NOAA (NWS)	https://www.weather.gov/

A3.3. DAF Geospatial Resources. GeoBase is the DAF geospatial engineering program of record that is part of the Air Force Geospatial Enterprise (AFGE); the program provides the framework for all DAF installations and contingency locations built and natural infrastructure geospatial data, resources and tools. GEOMAP is the data information and integration management system. GEOMAP contains geographic information on all installations and approximately 1,700 deployment locations. CE and its mission partners utilize GEOMAP data to enhance operational and business missions with spatial, tabular, relational, and temporal information integration, and enable the management of DAF installations' natural and built infrastructure to support military readiness concerning facility construction, contingency planning, force protection, sustainment, and modernization.

A3.3.1. DAF unique geospatial tools (i.e., GeoBase) can be used to speed data gathering and data sharing to AOME from mission partners, review large geospatial datasets for accuracy and completeness, analyze BE and PH surveillance areas, sampling points, and sampling results for increased confidence in risk assessments, identify trends or future risks, and visually communicate risks to stakeholders. AOME may coordinate directly with local GIO to develop installation specific EH support and visualization tools that support the AOME mission.

A3.3.2. **Table A3.2. GEOMAP Layers and AOME Relevance** highlights several of the relevant CE data sets, as well as the established BE GeoBase web applications and visualizations. The Bioenvironmental GeoBase Homepage (<https://maps.afmc.af.mil/portal/apps/sites/#/bee-geo-base-homepage>) hosts all BE GeoBase cross-functional GIS data and applications.

Table A3.2. GEOMAP Layers and AOME Relevance.

GEOMAP or GeoBase Layers	AOME Relevance
OEHS Web Application	Consolidates useful CE GEOMAP layers to support completion of local OEHSAs
Toxic Release Inventory	Provides location of surrounding civilian industry with air emission release inventories and quantities
Airfield Operations	Noise contours, radar equipment
Utilities	Location of communication, electrical, fuel, stormwater, and water lines, determine manhole locations

Utilities Water	Installation drinking water lines and assets visualization
Utilities Water Lead Service Line	Location of lead service lines and galvanized requiring replacement, and replacement updates
Environmental Restoration	Installation restoration program sites visualization
Environmental Compliance	Visualization of all installation air emission sources, hazardous material and waste sites, and storage tanks
Environmental Natural Resources	Visualization of coastal zone management, wetlands, species and habitat management, outdoor recreation
Environmental Toxics	Location of asbestos, lead-based paint, and polychlorinated biphenyls (PCB) sampling and results

A3.4. Collecting Geospatial Data (Geo-Coordinates). BE and PH will capture and record in DOEHRs geo-coordinates for locations and facilities to which EH surveys, EH sampling points or individual samples are associated. (Drinking water sample points: **T-1**; all other EH samples and sampling points: **T-3**) Geo-coordinates will be collected in accordance with the below guidance.

A3.4.1. Geo-Coordinate Collection Hierarchy. Use the below priority when collecting geo-coordinates.

A3.4.1.1. Priority 1. Collect geo-coordinates at the source of the EH risk, hazard, or sample location, or the centroid of the AOC.

A3.4.1.2. Priority 2. If accurate geo-coordinates cannot be collected in the field due to Global Positioning Systems (GPS) interference (e.g., inside buildings) or due to insufficient resources to complete field recordings, use GeoBase to estimate the geo-coordinates.

A3.4.1.3. Priority 3. If geo-coordinates cannot be collected in the field or an accurate estimation cannot be determined using GeoBase, use geo-coordinates of the centroid of the building or area that the data is located within to represent the EH hazard, survey, or sample.

A3.4.2. Geo-Coordinate Format. Record geo-coordinates in the formats listed below.

A3.4.2.1. Priority 1. Decimal Degrees. This format will be recorded to the sixth decimal place (e.g., latitude 39.787604N, longitude 84.082356W).

A3.4.2.2. Priority 2. Degrees, Minutes, Seconds. This format will be recorded to two decimal places in the seconds section (e.g., latitude 39° 47' 15.64"N, longitude -84° 04' 56.31"W).

A3.4.2.3. Geo-coordinate Datums. Collection of geospatial coordinates requires the use of a GPS receiver that uses a specific datum as a reference. There are two types of datums; horizontal and vertical datums. Horizontal datums measure positions (latitude and longitude) on the surface of the Earth, while vertical datums measure land elevations and water depths. The most popular datum in use is the WGS84 datum (World Geodetic System 1984) and is a standard setting on current GPS handheld receivers and smart phones. It is

recommended that the appropriate datums are set within the GPS receivers consistent with GEOMAP and state/federal database requirements. The installation GIO should be consulted prior to data collection. Improper use of vertical and horizontal datums, especially OCONUS, may result in substantial errors.

A3.5. Entering Geo-coordinates into DOEHRS. BE and PH are not required to collect and enter geo-coordinates for EH surveys and samples already associated to higher level locations, facilities, industrial shops, equipment, or drinking water sampling points. Reference the below guidance for more specifics on DOEHRS geo-coordinate data entry.

A3.5.1. Locations. All locations identified in DOEHRS require geo-coordinates.

A3.5.2. Facilities. All facilities identified in DOEHRS require geo-coordinates. Facility geo-coordinates are maintained by CE and available in GEOMAP under the *Utilities* layer. BE and PH can access this layer directly from GEOMAP or from the BE GeoBase dashboard if specific geo-coordinates are needed for a particular facility.

A3.5.3. Occupational and Environmental Health Site Assessment (OEHSA) Surveys. OEHSA surveys are linked to a location and therefore additional geo-coordinates are not required.

A3.5.4. Entomology Surveys. Entomology surveys are associated to a location and therefore additional geo-coordinates are not required.

A3.5.5. General Sanitation and Food Sanitation Surveys. General Sanitation and Food Sanitation surveys are associated to a facility or industrial shop and therefore additional geo-coordinates are not required.

A3.5.6. Exposure Pathways (EP). EP and EP assessments are associated to the location via the OEHSA therefore additional geo-coordinates are not required. Surveys and samples supporting the EP assessment will be associated to the EP.

A3.5.7. Water Systems and Sampling Points.

A3.5.7.1. All water systems are associated to locations in DOEHRS therefore additional geo-coordinates are not required. Water systems' geo-coordinates are also maintained by CE and available in GEOMAP under the *Utilities* layer. BE can access this layer directly from GEOMAP or from the BE GeoBase dashboard if specific geo-coordinates are needed for any portion of the water system.

A3.5.7.2. BE will document geo-coordinates for all water sampling points in DOEHRS under *Water Systems, Sampling Points, Location Information*. Water samples are associated to sampling points in DOEHRS and therefore do not require collection of additional geo-coordinates during water sampling events.

A3.5.8. Radiation Surveys and Samples.

A3.5.8.1. Radon. Radon sampling points require geo-coordinates in DOEHRS and will be associated to an EP. (Reference [Attachment 7 Radon](#) for additional guidance on radon.)

A3.5.8.2. Other Ionizing and Non-ionizing Surveys and Samples. Other ionizing and non-ionizing surveys and samples are associated with either a facility, industrial shop, or piece of equipment and are tracked and managed in the occupational health or radiation safety programs and therefore additional geo-coordinates are not required.

A3.5.9. Other Environmental Surveys. Environmental surveys will be associated in DOEHS with the most appropriate location, facility, industrial shop, EP, or other description based on the purpose for the survey and therefore additional geo-coordinates are not required.

A3.5.10. Other Environmental Sampling. Capture and document geo-coordinates for all environmental samples in the designated *Location Information* field of the samples section. Environmental samples must be associated in DOEHS based on the purpose of the sample.

A3.5.11. Incident Report (IR). Incidents are associated with either a location, facility or an industrial shop and therefore additional geo-coordinates are not required. Samples collected in support of the incident require geo-coordinates and will be associated to the IR. Surveys accomplished in support of the incident will be associated to the IR.

A3.6. Additional Geospatial Resources. GEOMAP serves as a powerful data integration, visualization, and analysis tool for EH risk management, which can provide a decision advantage for AOME, commanders, stakeholders, and other decision makers. A geospatial representation of data enhances and speeds the translation process of intricate data. AOME may coordinate with local GIO or AFMEDCOM for support in developing any of the products or capabilities listed below.

A3.6.1. Attributes: An attribute is a singular data source. This source can be a point, line, or area on the map. It means that point, line, or area has the same data associated with it throughout its entirety. Attributes can be searched and filtered within the web map, or automatically by tools within dashboards and web applications.

A3.6.2. Web Maps: These tools are the most general but are the foundation of additional geospatial tools. A web map is a digital map that displays geospatially oriented data. The data is displayed as attributes which are organized into layers.

A3.6.3. Layers: A layer is a collection of similar attributes (i.e., the workplaces on an installation, the vents on an installation, background radiation samples, etc.). Layers can be turned on and off so that the map does or does not display them. Different layers and the data associated with them can be viewed and/or cross-analyzed by using other tools such as dashboards and web applications.

A3.6.4. Dashboards: These tools are used to take data that is within a web map and analyze or report on what the data is saying. A great resource for managing a data set, dashboards can tell the user almost anything about the data by putting the information into graphs, tables, and charts that the user can then filter additionally if needed.

A3.6.5. Web Applications: These tools are the jack of all trades. They are web maps but with the ability to add applications and automatic tools that allow the user to quickly distinguish unknown relationships between two or more different data sets or layers within the web application. A simple example would be to tell the web application to identify every building within 0.5 miles of the flightline. Once complete, the user could make that data its own layer with the web application and alter its display as needed.

A3.6.6. Story Maps: These tools are the primary means of providing organized communication to the widest audience possible. The story map creator can implement text, pictures, and maps (or subsections of maps) that display data and layers that augment the text and pictures to tell a story. For example, the creator can make a ten-slide story that explains

the hazards of lead in drinking water to the residents of base housing, or a three-slide story that explains last year's OEHSA and the most urgent EPs associated with it for installation leadership.

Attachment 4

INDOOR AIR QUALITY (IAQ)

A4.1. Background.

A4.1.1. Poor IAQ can lead to the development of serious illness and PH issues. This attachment provides guidance, roles, and responsibilities for the assessment of IAQ issues presenting health risks. (This attachment does not address all issues in housing; reference [attachment 8](#) *Environmental Health Hazards in DoD Housing* for additional guidance.) As defined by the Occupational Safety and Health Administration, IAQ is a term that “describes how indoor air can affect a person’s health, comfort, and ability to work.” Poor or inadequate IAQ are terms used to describe nonindustrial, indoor spaces where occupants complain of health issues that may be associated with building occupancy (i.e., occupant complaints appear while inside the facility and lessen upon leaving). Sick Building Syndrome and Building-Related Illness are two common terms associated with IAQ issues.

A4.1.2. IAQ assessments require collaboration among a team of stakeholders and mission partners to include, but not limited to FSS, CE, PH, BE, and the facility managers. A number of federal agencies and private organizations such as Occupational Safety and Health Administration, Department of Energy, EPA, National Institute for Occupational Safety and Health, and American Society of Heating Refrigerating and Air-Conditioning Engineers (ASHRAE) are actively involved in IAQ research and guidance development, but no one agency has a clear regulatory role (i.e., no enforceable standards). BE and PH must be familiar with the guidance set forth from these organizations to apply the most practical guidance to a particular scenario. As a starting point, ESOH Service Center maintains the most current consultation and technical guidance on IAQ surveys and assessments.

A4.1.3. Reference the USAFSAM *Bioenvironmental Engineer’s Guide to Indoor Air Quality Surveys* for step-by-step procedures in conducting IAQ surveys.

A4.1.4. Facility managers are critical to avoiding IAQ issues. To minimize IAQ concerns, facility managers will: **(T-3)**

A4.1.4.1. Maintain a clean and dry indoor environment.

A4.1.4.2. Ensure facility HVAC systems are functioning properly and providing adequate fresh air make-up.

A4.1.4.3. Routinely survey the facility (inside and outside) to identify and correct issues or remove nearby sources of EH hazards before an IAQ issue develops.

A4.1.4.4. Execute and manage designated EH risk prevention programs or control measures for the facility, if applicable. Contact CE if control measures are not operating properly.

A4.1.4.5. Promptly clean and correct any small (less than 10 square feet) visible mold or water damage within their capability (e.g., replacing ceiling tiles with minor water damage). If mold or water damage abatement exceeds the facility manager’s capabilities, the manager will contact CE to request an expedited work order. Facility managers abating mold will contact BE for health risk guidance and proper personal protective equipment recommendations.

A4.1.4.6. Coordinate with AOME and CE (and obtain health risk assessments) prior to using excessive quantities of (or industrial strength) indoor cleaning chemicals or any non-typical indoor cleaning chemicals. If unsure, reach out to BE.

A4.1.4.7. Provide risk communication to facility occupants on any historical and current IAQ issues/complaints, and provide educational materials to facility occupants, to include the occupants' role, [paragraph A4.1.5](#), in reducing the risk of reemergence of past issues, or creation of new issues. EPA IAQ education materials are available at <https://www.epa.gov/indoor-air-quality-iaq>.

A4.1.5. Facility occupants are critical to avoiding IAQ issues. To minimize IAQ concerns, facility occupants will:

A4.1.5.1. Report immediately any delinquencies in housekeeping practices to the facility manager.

A4.1.5.2. Practice sound housekeeping practices including vacuuming floors, removing trash frequently, and preventing excessive dust accumulation.

A4.1.5.3. Quickly clean-up water leaks or spills or immediately report any visible water leaks and spills or evidence of water damage to the facility manager.

A4.1.5.4. Make an appointment with their PCM if experiencing abnormal symptoms or illness due to IAQ and inform the facility manager.

A4.2. Procedures. Successful IAQ investigations, environmental HRA, and EH hazard mitigation requires all mission partners' and stakeholders' support. IAQ investigations begin with identification of an EH concern, preliminary investigation, full investigation, mitigation or control, and risk communication.

A4.2.1. EH Concern Notification.

A4.2.1.1. Primary notification of an IAQ concern or complaint is initiated via the facility managers. When facility managers deem IAQ concerns are more than just comfort issues and affecting multiple employees, and, with the support of CE, have exhausted all efforts to mitigate the problem, the facility managers will contact BE or PH. **(T-3)**

A4.2.1.2. If building occupants contact BE or PH directly via phone or e-mail with concerns or complaints about the IAQ in their building, BE and PH will immediately notify the facility manager of the concern/complaint and discuss the possible need for an IAQ investigation. **(T-3)**

A4.2.1.3. An IAQ concern notification may come in response to a PCM-identified illness related to a place of employment. BE and PH will work with AOME members to determine the need for an environmental HRA. BE and PH will contact and inform the facility manager as needed. **(T-3)** BE and PH will keep patient name(s) anonymous, if applicable or requested.

A4.2.1.4. PH trending may identify an IAQ concern. PH will report trends immediately to AOME members and discuss need for an IAQ investigation. **(T-3)**

A4.3. Preliminary Investigation. Once notification is received, BE and PH will plan, organize, and execute an IAQ investigation with assistance from the appropriate mission partners. **(T-3)** This

action begins with a preliminary investigation (interviews, initial data gathering, and building walkthrough).

A4.3.1. BE and PH will interview and collect information from the facility occupant(s) concerned with the IAQ.

A4.3.2. BE and PH will review historical information and assessments of the facility. If warranted based on the interviews, BE may find useful EH hazards data and information concerning CE operations, flightline activities (e.g., noise, exhaust, electromagnetic frequency emitters, etc.), or environmental compliance programs (e.g., DoD and non-DoD air emissions, Installation Restoration Program sites, etc.) in GeoBase.

A4.3.3. BE and PH will conduct a facility walkthrough (inside and outside) and look for improper HVAC system function and cleanliness, adequate fresh air supply, evidence of water leaks, damage, and mold growth, or individual employees' sources of poor air quality. BE and PH will also review recent renovation or area-wide activities involving chemicals. If the walkthrough identifies any concerning issues, the issues must be corrected as soon as possible.

A4.4. Full Investigation. If the preliminary investigation fails to uncover any potential sources of IAQ concerns, BE, PH, and mission partners will accomplish a full investigation. **(T-3)** The full investigation may include one or all of the following activities (air quality indicator monitoring, full SAP, occupant questionnaires).

A4.4.1. Air quality indicators may help pinpoint problem areas. The most essential air quality indicators are carbon dioxide (CO₂), relative humidity (RH), and temperature (T). The indicators will be monitored over multiple days to determine air quality patterns and external influences (e.g., building occupancy, outdoor environmental factors, etc.).

A4.4.2. Questionnaires may provide additional information if an EH hazard is not easily identifiable. These results can further pinpoint symptom clusters and AOCs within the building. PH will distribute the questionnaires. An example of a questionnaire is in the USAFSAM *Technical Guide for Indoor Air Quality Surveys*.

A4.4.3. Review EH hazards generated from outside the facility and possibly entering the facility. Review nearby OH program workplaces that might be impacting the facility. Review GeoBase for surrounding civilian industry effluents, restoration program plumes, and other environmental programs in the vicinity of the facility.

A4.4.4. If BE and PH determine other EH hazards pose a potential EH risk to facility occupants, an SAP will be developed and executed, in consultation with ESOH Service Center.

A4.5. EH Hazard Control: Mitigation, Management, and Prevention Plans.

A4.5.1. Once EH hazard(s) are identified and EP confirmed complete, mission partners and stakeholders will determine best mitigation and/or control techniques. **(T-3)** For persistent EH hazards, a facility specific prevention program or management plan may be warranted.

A4.5.1.1. CE, in coordination with the facility manager, will investigate, evaluate, and remediate on-going facility problems resulting in IAQ issues (e.g., repetitive water infiltration after heavy rains, excess moisture issues due to poor ventilation control), until the problems are corrected.

A4.5.1.2. BE will recommend appropriate health risk control measures to facility managers required to abate sources of poor IAQ. BE will recommend proper occupational health personal protective equipment to facility managers if EH hazards require cleaning (e.g., mold removal).

A4.5.2. All mission partners will conduct a 30–60-day follow-up visit to validate control measures are abating or managing the EH risks to acceptable levels. **(T-3)**

A4.6. Risk Communication. During initial indications of an IAQ concern, stakeholders and mission partners will conduct initial risk communication efforts with a focus on facility inspection findings and fixes when conveying EH risks to facility occupants, facility managers, and commanders. **(T-3)** If an IAQ investigation is accomplished, AOME, CE, and the stakeholder or mission partner (i.e., facility manager) will coordinate a single risk communication message to include, but not limited to, investigation findings, mitigation actions already accomplished, planned mitigation actions, management plans, health risks, and options for individuals concerned about personal health. **(T-3)** AOME and mission partners are encouraged to utilize standardized or publicly available tools, resources, and health risk language to support risk communication actions. Risk communication resources are available through the ESOH Service Center.

A4.7. Reporting/Recordkeeping.

A4.7.1. BE will attach the survey and assessment report to the DOEHRS document library in accordance with USAFSAM's most recent technical guidance. **(T-1)**

A4.7.2. For IAQ issues in MFH or UH, BE will provide a copy of the survey and assessment report to MHO. **(T-1)** MHO will upload the survey and assessment reports into eMH. **(T-1)** (Refer to [attachment 8](#) *Environmental Health Hazards in DoD Housing* for additional guidance.)

A4.7.3. AOME will determine if an EP and EP assessment (or IR) is warranted. If the IAQ investigation reveals a complete EP of an EH hazard with long term health risk to a small population (less than 25 facility occupants), consider an IR and PEP, and link all affected personnel. AOME will determine locally the best documentation option based on the scenario or incident. Any EP or IR will be associated to the OEHS IAQ section. Standard EP naming for IAQ is "Indoor Air (*address or building number* – IAQ)."

A4.7.4. AOME will redact any personal identification information prior to submitting environmental HRA results to non-medical stakeholders.

Attachment 5

MOLD

A5.1. Background.

A5.1.1. This attachment addresses mold hazards that can be encountered across an installation. It specifically incorporates portions of the ASD memorandum *Standards and Guidance for Managing Environmental Health Hazards in Department of Defense Housing*, 1 February 2022, and Secretary of the AF memorandum *Standards and Guidance for Managing EH Hazards in DoD Housing*, 4 March 2022, that are related to mold. This attachment supersedes all previous DAF Surgeon General mold policies, and together with the other attachments of this DAFMAN supersedes DAF Surgeon General memorandum *Implementation Guidance for Bioenvironmental Engineering's Environmental Health Support of Military Housing*, 22 July 2022.

A5.1.2. CE, MHO, facility managers, building occupants and housing residents are responsible for the prevention or remediation of mold- or water-damaged facilities or homes. AOME serves as the health care providers and health risk assessors for mold and other bacteriological health risks, however, AOME may provide consultation in prevention techniques and mitigation processes.

A5.1.3. Molds are part of the natural environment and can be found everywhere, indoors and outdoors. Mold is not usually a problem unless there is excessive growth indoors. The best way to control mold growth is to control moisture. When excessive moisture (through a water leak or high humidity in the air) is present in housing, facilities or on building materials, mold or microbial growth can occur, particularly if excessive moisture is not addressed within 48 hours. In sensitive populations, molds can trigger allergic reactions or irritant disorders, such as asthma, allergic rhinitis, and rhinosinusitis. In rare cases, seriously immunocompromised individuals may be at risk for mold infections. Molds can also cause structural damage to facilities. These are important reasons to prevent excessive moisture and mold growth, and to remediate and/or clean up water intrusion, water leaks, damage, and existing visible mold in a timely manner.

A5.1.4. Moisture sources resulting in mold growth can have many causes, such as high or uncontrolled indoor air temperature and humidity; roof, window, and plumbing leaks; landscaping or drainage that directs water into or under buildings; unvented appliances, bathrooms, or areas where condensation occurs; inadequate design and operation of HVAC systems; compromises or degradation of the building envelope; poor housekeeping and sanitation practices; and neglected facility maintenance.

A5.1.5. Refer to BE *Technical Guide for Indoor Air Quality Surveys* for additional guidance on indoor mold health risks. Refer to the EPA's pamphlet for background mold information: *A Brief Guide to Mold, Moisture and Your Home*, <https://www.epa.gov/mold/brief-guide-mold-moisture-and-your-home>.

A5.2. Prevention.

A5.2.1. Mold growth is prevented by controlling temperature, humidity, proper ventilation design and performance, preventing water leaks and moisture intrusion, proactive maintenance, good housekeeping and sanitation practices, and the prompt removal of mold

contaminated materials. Prevention and remediation of excessive moisture and mold growth within facilities, MFH, and UH require rapid reporting, inspection, and response procedures and the education and collaboration of housing residents and management, facilities occupants and management, and CE.

A5.2.2. BE and PH will assign mold risk by installation or facility. **(T-3)** [Table A5.1](#), *Installation or Facility/Resident Mold Risk Criteria and Routine Assessment Recommendations*, can be used to inform mold risk determinations. Installations or individual facilities/residences with higher risk of excessive indoor mold growth will have a mold prevention program. **(T-3)** Effective mold prevention programs include routine assessments, proactive maintenance, and good sanitation practices. Installation mold risk is primarily dependent on location and climate factors (i.e., hot, humid conditions in Southeastern portions of the U.S. generally have a higher risk for mold), and facility/residence mold risks are dependent on indoor environmental controls. Therefore, an installation mold risk is based on environmental conditions (hot, humid) and facility/residence mold risk is based on the number of local indoor mold complaints. [Table A5.1](#) provides routine assessment timelines based on installation and facility/residence mold risks.

A5.2.2.1. For high- and medium-risk installations, the MHO and MHPI will develop mold prevention programs (i.e., routine assessment, proactive maintenance, and sanitation practices). **(T-3)** The MHO and MHPI will also distribute a current version of the EPA *A Brief Guide to Mold, Moisture and Your Home* to all incoming residents. **(T-1)**

A5.2.2.2. For high- and medium-risk installations and/or facilities, CE will incorporate mold prevention program (i.e., routine assessment, proactive maintenance, and sanitation practices) into the facility managers' handbook and management program. **(T-3)**

Table A5.1. Installation or Facility/Resident Mold Risk Criteria and Routine Assessment Recommendations.

Health Risk	Risk Level Criteria		Routine Assessment
	Installation	Facility	
High	Environmental conditions exist supporting mold growth (hot, humid), or >10 facility mold complaints per year.	>3 facility/residence mold complaints in a 2-year period.	Quarterly
Medium	Environmental conditions exist supporting mold growth, or >3 facility mold complaints per year.	Up to 3 facility/residence mold complaints in a 2-year period.	Semi-annually
Low	Environmental conditions typically do not exist supporting mold growth, <3 facility mold complaints per year.	Up to 1 facility/residence mold complaint in a 2-year period.	Annually

A5.2.3. Facility managers will perform routine assessments in accordance with [Table A5.1](#) to aid in identifying moisture control problems and early signs of mold growth while also helping

to prevent other infrastructure issues. **(T-3)** Below are typical assessment questions to assist in determining whether a mold problem exists, or conditions exist that may create excessive mold growth. Assessments must be documented in facility manager files for minimum of 5 years. **(T-3)** Residents will also be aware of these questions and self-assess.

A5.2.3.1. Is there visible moisture damage on building materials or furnishings?

A5.2.3.2. Have building materials been wet for more than 48 hours?

A5.2.3.3. Are there existing moisture problems in the building?

A5.2.3.4. Are building occupants reporting musty or moldy odors?

A5.2.3.5. Are building occupants reporting health problems that they think are related to mold in the indoor environment?

A5.2.3.6. Has the building been recently remodeled or has the building-use changed?

A5.2.3.7. Has routine maintenance been delayed, or the maintenance plan been altered?

A5.2.4. Proactive maintenance and sanitation. Preventive maintenance of HVAC systems, regular inspections and assessments of building operating systems (e.g., water treatment, HVAC, mitigation systems), and regular inspections/assessments, and maintenance of building infrastructure (e.g., roofing, plumbing, windows) are key elements of proactive MFH, UH, or facility maintenance programs. Proactive maintenance and sanitation programs pre-empt moisture and humidity issues in buildings and excessive mold growth. Facility managers with CE (and in coordination when appropriate with facility occupants) will follow the [Table A5.2. Proactive Maintenance and Sanitation Guidance](#). **(T-3)** MHO or MHPI maintenance personnel (and in coordination when appropriate with MFH or UH residents) will follow [Table A5.2](#). **(T-1)** DAFI 32-6000, *Housing Management*, provides additional, comprehensive moisture management and mold prevention tips, operations, maintenance, and removal procedures that will be applied to all DAF-owned and DAF-controlled MFH and UH.

Table A5.2. Proactive Maintenance and Sanitation Guidance.

Prevention Guidance
Repair plumbing leaks and leaks in the building structure as soon as possible.
Look for condensation and wet spots. Fix source(s) of moisture incursion problem(s) as soon as possible.
Prevent moisture from condensing by increasing surface temperature or reducing the moisture level in the air (humidity). To increase surface temperature, insulate or increase air circulation. To reduce the moisture level in the air, repair leaks, increase ventilation (if outside air is cold and dry), or dehumidify (if outdoor air is warm and humid).
Keep HVAC drip pans clean, flowing properly, and unobstructed.
Perform regularly scheduled building/ HVAC inspections and maintenance, including filter changes.
Maintain indoor relative humidity below 70% (40- 60%, if possible).
Vent moisture-generating appliances, such as dryers, to the outside where possible.
Vent kitchens (cooking areas) and bathrooms according to local code requirements.

Clean and drying wet or damp spots as soon as possible, but no more than 48 hours after discovery.
Provide adequate drainage around buildings and sloping the ground away from building foundations. Follow all local building codes.
Pinpoint areas where leaks have occurred, identifying the causes, and taking preventive action to ensure that they do not reoccur.

A5.2.5. MHO or MHPI PO will advise residents and dormitory occupants of their responsibility to perform necessary housekeeping (i.e., sanitation) to prevent conditions conducive to mold growth, and to immediately report any water leaks, intrusion, or appearance or odor of mold in their housing unit. **(T-1)**

A5.2.6. Service members, federal civilian personnel, and DoD beneficiary housing residents and facility occupants seeking a mold inspection and remediation will contact their facility manager, MHO, or MHPI PO.

A5.2.6.1. For facilities, the facility managers and CE will initially investigate occupant concerns, and if associated with minor visible mold and intrusive water problems due to poor housekeeping (i.e., sanitation) or lack of maintenance, they will address immediately. **(T-3)**

A5.2.6.2. For MFH and UH, the MHO will initially investigate occupant concerns, and if associated with minor visible mold and intrusive water problems due to poor housekeeping or lack of maintenance, they will address immediately. **(T-1)**

A5.2.6.3. For MHPI, PO's maintenance managers and the MHO initially investigate occupant concerns, and if associated with minor visible mold and intrusive water problems due to poor housekeeping or lack of maintenance, they will address immediately. **(T-1)**

A5.3. Assessment.

A5.3.1. The 2020 National Defense Authorization Act, Section 2891a(2) states "In response to a request by the head of the housing management office of an installation, the installation commander shall use the assigned bio-environmental personnel or contractor equivalent at the installation to test housing units for mold, unsafe water conditions, and other health conditions." This term is a generic term for environmental health specialists (i.e., Navy and Army do not have bio-environmental [engineers]). This term does not mean bioenvironmental engineering, but implies environmental health specialist, and "test housing unit for mold..." equates to on-site inspection for the presence of visible mold growth.

A5.3.2. Per the CDC, "If you can see or smell mold, a health risk may be present. You do not need to know the type of mold growing in your home, and CDC does not recommend or perform routine sampling for molds. No matter what type of mold is present, you should remove it. Since the effect of mold on people can vary greatly, either because of the amount or type of mold, you cannot rely on sampling and culturing to know your health risk." Therefore, mold sampling is **NOT** recommended or required as part of routine housing or facility assessments. Sampling is usually unnecessary because the risk of excessive mold growth is obvious due to water stains, visible mold growth, odor (occasionally), and decayed substrates. These areas will be cleaned up or removed as soon as possible.

A5.3.3. Regardless of the type of mold present, the recommendation is the same: visible mold or other indications of excessive mold growth always requires remediation.

A5.3.4. Patients presenting with symptoms of asthma, hypersensitivity pneumonitis, rhinitis, or rhinosinusitis due to mold exposure will be evaluated clinically for these conditions. At the discretion of the PCM, mold sensitivity testing may be performed in conjunction with an allergy or pulmonology consult. If after appropriate evaluation a patient has evidence of a mold-related illness and reports ongoing exposure to unremediated mold at any facility, UH, or MFH, to include privatized housing, the PCM will contact the IOEMC to initiate a site assessment of that facility or residence. **(T-1)** The IOEMC will work with the BE, PH, and the MHO or MPHPI PO to determine appropriate follow-up actions.

A5.4. Control and Mitigation.

A5.4.1. Successful control or mitigation is dependent on immediate clean-up of any visible mold, and the correction of the situation causing excessive mold growth. Any number of facility or residence factors could contribute to excessive indoor mold growth, but all the factors typically link to uncontrolled water intrusion, excess indoor moisture, uncontrolled temperature and humidity, etc. Facility managers, MHO or MPHPI PO maintenance managers will investigate the cause of these out-of-control issues and correct them immediately. (MHO and MPHPI: **T-1**; facility managers: **T-3**)

A5.4.2. All workorders related to mold concerns in DAF facilities, UH, or MFH will be classified as a Health Safety issue. **(T-1)** If mold concerns are reported with visible water intrusion, the workorder will be classified as a Health and Life Safety “Emergency” **to facilitate a coordinated installation safety and civil engineering assessment.** This is due to an increased likelihood of a potential of electrical shock risk or the deterioration of building materials beyond normal safety conditions. **(T-1)** Water intrusion, regardless of mold, needs to be reported to the host installation safety office for an assessment of any potential safety issues such as electrical, falling debris, foundation deterioration etc. Occupational Safety will work with subject matter experts to determine severity and safety risk to these types of hazards. **(T-1)**

A5.4.3. In all cases, repair of the underlying source of water intrusion is critical to correct and prevent further moisture and mold concerns. Corrective actions or mitigation measures for moisture intrusion should occur within 48 hours to prevent the development of large-scale mold problems. If corrective actions exceed 48 hours, consider relocating occupants to eliminate potential exposure. (MHO and MPHPI: **T-1**; Facility managers: **T-3**) Unless the underlying source of water intrusion is identified and corrected, the facility, UH unit, or MFH residence will continue to experience moisture and mold issues.

A5.4.4. When mold in facilities, MFH, and UH has been identified by facilities personnel or reported by residents and is unable to be controlled through a routine assessment, proactive maintenance, and a good sanitation program, CE and BE will assist MHOs and facility managers to identify and correct the root cause of moisture and mold. **(T-1)**

A5.4.4.1. Small mold problems and water damage (i.e., less than 10 square feet) will be cleaned by residents or facility management personnel.

A5.4.4.2. Larger mold removal and remediation projects will be completed in accordance with industry-approved standards and guidance, such as the American National Standards

Institute/Institute of Inspection Cleaning and Restoration Certification S520 and DoD guidance in the UFGS 02-85-00, *Mold Remediation*. Per DAFI 32-6000, immediately relocate occupants until assessment and remediation are complete if mold is visible in multiple areas or is so extensive (more than 10 square feet) that remediation or repair cannot be accomplished within 24 hours.

A5.4.4.3. All affected materials will be adequately cleaned or removed. If nonporous surfaces are covered with mold, these surfaces can likely be cleaned to remove mold in lieu of material replacement. Porous materials including drywall and carpeting will be removed to prevent additional growth.

A5.4.4.4. If mold-related contamination or water damage exceeds the MHO's, PO's maintenance manager, facility manager's or CE's abilities to control or mitigate, the installation or PO will contract with mold remediation experts.

A5.4.5. BE will advise MHOs engineers/maintenance staff on the OEH concerns and protective measures for large-scale mold cleaning projects and mold removal and remediation actions.

A5.5. Risk Communication. AOME, CE, stakeholder, and either the facility manager, MHO, MHPI (as applicable) will coordinate a single risk communication message to include, but not limited to, investigation findings, mitigation actions already accomplished, planned mitigation actions, management plans, generic health risks of mold, and options for individuals concerned about personal health. **(T-1)** AOME and mission partners are encouraged to utilize standardized or publicly available tools, resources, and mold health risk language to support risk communication actions.

A5.5.1. Key points to consider for mold health risk communication.

A5.5.1.1. Mold is everywhere in the environment. It will be indoors as well.

A5.5.1.2. Best way to reduce mold EH risk is through well controlled indoor environmental conditions and good sanitation practices. Routine assessment and proactive maintenance processes are key to prevention and control.

A5.5.2. PCMs are available if you have a persistent health issue (related to mold or some other EH hazard).

A5.5.3. A Commander's *Guide to Mold in Privatized Housing* is available through the ESOH Service Center to support leadership understanding of the mold, health risks, mission partner roles, and stakeholder communication.

A5.6. Reporting/Recordkeeping.

A5.6.1. AOME will determine if an EP and EP assessment (or IR) for a mold HRA in DAF facilities, UH, or MFH residence is warranted. Document mitigation actions and risk communication actions/products in EP *Comments Field* and EP assessment *Force Health Protection Recommendations* field. Attach facility or resident HRA reports to the EP or IR. Standard EP naming for indoor mold is "Indoor Air (*address or building number* – Mold)."

A5.6.2. Any medical concerns, to include concerns related to potential mold exposure, will be worked through the PCM. Clinical medical assessments accomplished by PCM will be recorded in patient medical records at the discretion of the PCM and coded accordingly. **(T-1)**

A5.6.3. The MHO will record all housing data related to mold assessments and remediation requirements in the eMH database in accordance with DoD housing policy. **(T-1)**

A5.6.4. Where unresolved issues persist, residents may contact the DAF Housing Hotline at 1-800-482-6431.

Attachment 6

VAPOR INTRUSION (VI)

A6.1. Background.

A6.1.1. **Disclaimer:** VI is not a common occurrence at DAF installations or AORs in garrison or deployed. AOME will immediately coordinate with USAFSAM for guidance.

A6.1.2. Subsurface contamination at Defense Environmental Restoration Program (DERP) sites requires evaluation for possible VI of volatile compounds from the subsurface to indoor air. VI has the potential to occur at sites where a subsurface source (e.g., soil, soil gas, or groundwater) of volatile compounds is present at sufficient concentrations under or near an occupied facility. VI events will be documented as EPs in DOEHS with EP assessments and associated with the OEHS. AFCEC, together with AFIMSC and local Environmental flights, make up the DAF Environmental Restoration Program (ERP) community.

A6.1.3. This attachment clarifies the roles and responsibilities of the ERP and AOME communities and is limited to actions supporting the determination of health risk to occupants inside DAF facilities. VI investigations and HRAs require complete coordination between ERP and AOME. In general, the ERP community is primarily responsible for investigating and mitigating EPs resulting from VI, and the AOME community is primarily responsible for determining and communicating health risks and documenting exposures to facility occupants.

A6.1.4. ERP community manages environmental contamination, including the potential for VI, to protect human health and the environment in accordance with DAFI 32-7020, *The Environmental Restoration Program*, DoDI 4715.07, *Defense Environmental Restoration Program (DERP)*, and DoDM 4715.20, *Defense Environmental Restoration Program (DERP) Management*. Where there is a risk of VI to an occupied DAF facility from a DERP site, the ERP community will conduct the appropriate investigations to determine if the VI EP is complete. **(T-1)** Per DAFI 32-7020, Restoration Program Manager (RPM) begins assessing VI potential once a plume containing volatile compounds migrates to within 100 feet of a facility (30 feet for volatile petroleum hydrocarbons).

A6.1.5. RPM will notify the AOME community of any potential VI issues. **(T-1)** BE may also identify potential VI issues during an OEHS survey or an occupant IAQ complaint. When responding to a VI issue, AOME will coordinate with the ERP community to ensure a shared understanding of the issue, agreement on the conclusions, facts, and response actions. AOME will determine, document, and communicate health risk to occupants in accordance with DAFI 48-145 and this DAFMAN.

A6.1.6. DERP is not applicable at deployed or overseas locations, however, BE will coordinate with the ERP community on subsurface contamination, determine if any VI risks exist, and be prepared to investigate, assess, and document potential VI events and determine need for SIHHS investigation. **(T-1)** NCMI may provide data on potential subsurface contamination at deployed or overseas locations.

A6.1.7. For reference, additional VI assessment, mitigation, and management guidance are available in DoD *Vapor Intrusion Handbook* (Jan 2009), EPA's *Vapor Intrusion Pathway: A Practical Guideline* by Interstate Technology and Regulatory Council Vapor Intrusion Team, and EPA's Office of Solid Waste and Emergency Response Publication 9200.2-154 *Technical*

Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air (Jun 2015).

A6.2. Procedures. When DERP sites create an IAQ and/or VI issue and the pathway is considered complete, an EP and an EP assessment will be created in accordance with this DAFMAN. **(T-1)** AOME will focus on the health aspects and ERP will focus on EPA compliance and restoration aspects; however, both will coordinate on exposure guidelines, risk management and risk communication.

A6.2.1. RPM will identify DERP sites with the potential for VI into occupied facilities, determine if the EP is potentially complete **(T-1)**, and provide detailed information for these sites (e.g., potentially affected facilities, chemicals of concern, environmental sampling data, criteria used to assess sampling results, risk communication products) to AOME. **(T-3)** RPM will coordinate with AFCEC for VI-related technical support, to include evaluating need for expedited screening-level facility assessment, identifying appropriate screening levels, identifying potentially affected facilities, communicating with regulatory agencies, developing risk communication materials, and evaluating work plans for definitive VI investigations.

A6.2.2. Upon identification or notification of a potential VI event with a complete EP, BE will initiate a pre-survey data gathering effort. **(T-1)** BE will coordinate with ERP and confirm impacted facilities, identify chemicals of concern and design an IAQ assessment strategy. GeoBase (Environmental Restoration layer) may contain much of this information. AOME will coordinate with ESOH Service Center for VI-related technical support, to include chemicals of concern, SAP guidance, appropriate health risk exposure criteria and limits, building occupancy recommendations, and risk communication materials and strategies. Building occupants are encouraged to seek medical care from their PCM for any symptoms or health-related concerns.

A6.2.3. To document the EH risks to facility occupants, BE will create an EP in DOEHRS and conduct an EP assessment. **(T-1)** BE will utilize ERP investigation details and conclusions, and indoor facility sample results to complete the EP assessment; however, additional sampling (personal and/or work area) may be required to complete the EP assessment.

A6.2.3.1. If additional sampling is necessary to complete the EP assessment, sampling will only be conducted to determine health risk to building occupants and not to verify intrusion of vapors into the facility.

A6.2.3.2. Sampling will be conducted in accordance with an SAP.

A6.2.3.3. Document geo-coordinates for the facility impacted by VI. **(T-3)** Geo-coordinates of the restoration program plume will be recorded in OEHS survey, *Section 6, Waste Management, Landfill* tab. **(T-3)**

A6.2.4. In consultation with ERP, AOME will select and apply appropriate EPA or state indoor air screening levels or appropriate exposure limits to assess risk (acceptable or unacceptable risk) to facility occupants. **(T-3)** Use of worker 8-hour occupational exposure limits are not appropriate for VI issues. Both ERP and AOME must leverage reach-back support from AFCEC and ESOH Service Center to determine appropriate exposure and health risk criteria.

A6.2.5. If unacceptable risk to human health is identified, ERP and AOME will develop and implement mitigation actions in accordance with the procedures in DoDM 4715.20 to address the VI issue. **(T-1)** Examples of mitigation actions could include building modifications (e.g., sealing floor cracks or adjusting HVAC systems), engineering controls and/or administrative controls, such as occupancy limitations or optional relocation. Occupant personal protective equipment is not an acceptable control for VI issues.

A6.3. Risk Communication. AOME and ERP will provide health risk communication to all affected facility occupants and provide health risk communication guidance to commanders. **(T-1)** AOME and ERP will leverage all facilities, engineering, and health expertise to coordinate risk communication messaging for facility occupants. (Reference [chapter 4](#) for additional guidance on other risk communication team members.)

A6.3.1. ERP provides risk communication support to include products and tools to help convey toxicological data (theoretical health risks based on scientific research and studies) and mitigation actions to the affected building occupants. Risk communication includes informing facility occupants about the potential presence of VI, target indoor screening levels, and planned mitigation strategies or management activities.

A6.3.2. AOME provides risk communication support to include potential acute and long-term health risks to facility occupants and sensitive populations (e.g., pregnant workers, women of child-bearing age), and conducts follow-up risk communication as new information becomes available (e.g., results of exposure assessment, environmental sampling, and mitigation activities, etc.). AOME focuses on health risk communication of actual EH exposures to service members, federal civilian personnel, and DoD beneficiaries.

A6.4. Reporting/Recordkeeping.

A6.4.1. DERP sites near DoD beneficiary communities or DAF facilities will be documented in the OEHSA Section 6, *Waste Management, Landfills* section. **(T-1)**

A6.4.2. Create an EP and an EP assessment, if the EP to facility occupants is determined to be complete. **(T-1)** Accurately describe the affected population. Update the EP with new EP assessments periodically, if necessary, until the VI issue is abated. Associate the EP to the current OEHSA.

A6.4.3. Attach the SAP **(T-3)** and associate samples **(T-1)** to the EP. Attach any DERP site investigation data useful in characterization of the health risk and EP assessment to the EP. **(T-3)**

A6.4.4. Document mitigation actions in EP *comments field* and EP assessment *Force Health Protection Recommendations* field. **(T-3)**

A6.4.5. Attach all HRA reports, sampling, and risk communication products to the EP and the OEHSA Section 6, *Waste Management, Landfills* section. **(T-3)**

Attachment 7

RADON

A7.1. Background.

A7.1.1. This attachment covers naturally occurring radon at installations and AORs and incorporates EPA-recommended action level of 4 picocuries per liter (pCi/L) for all installation and AOR priority facilities (MFH and UH, schools, youth centers, and CDCs). AFMAN 48-148, *Ionizing Radiation Protection*, established policy for occupational exposures to radon in workplace facilities. DoD UFGS 31-21-13 *Radon Mitigation* provides requirements for constructing radon mitigation systems in new and existing buildings and facilities. ASD memorandum *Standards and Guidance for Managing Environmental Health Hazards in Department of Defense Housing* extends the UFGS 31-21-13 requirements for radon mitigation for DoD housing exceeding 4 pCi/L. The 4 pCi/L criterium will be applicable in overseas locations unless specifically defined in a country-specific DoD FGS or OEBGD if no FGS exists. *BE Guidebook for Radon Management* and *DOEHRS Radon Quick Start Guide* provide additional program guidance; DAF will follow this DAFMAN where the guidebooks conflict.

A7.1.2. Radon is naturally occurring ionizing radiation that is found in air, water, natural gas, soil, and building materials. The primary health concern from radon exposure is an increased risk of lung cancer. Radon can migrate into homes and buildings primarily from soil or groundwater through air spaces around pipes, cracks in concrete slabs and building foundations. Exposure occurs when these gases accumulate indoors creating an inhalation hazard.

A7.1.3. The DAF 1987 *Radon Assessment and Mitigation Program* initiated the assessment and mitigation of the potential health risks from radon exposure to service members, federal civilian personnel, and DoD beneficiaries working and living in DAF facilities. In 1993, the EPA developed the Map of Radon Zones to identify areas of the U.S. with the greatest potential for elevated radon levels based on indoor radon measurement data, geology, aerial radioactivity, soil parameters, and foundation types to guide national, state, and local organizations in the implementation of radon-resistant building codes. Radon zones are classified as red, orange, or yellow based on the average indoor radon level potential (reference [Table A7.1. EPA Map of Radon Zone Classification](#)).

Table A7.1. EPA Map of Radon Zone Classification.

Zone	Indoor Radon Level Potential
Zone 1 (Red)	Highest potential. Average indoor radon levels may be >4 pCi/L
Zone 2 (Orange)	Moderate potential. Average indoor radon levels may be between 2-4 pCi/L
Zone 3 (Yellow)	Low potential. Average indoor radon levels may be < 2pCi/L

A7.1.4. USAFSAM plays a key role in the DAF radon program. USAFSAM provides oversight for all DAF radon sampling, to include reviewing past sampling data, recommending sampling strategies, prioritizing and scheduling sampling events, providing equipment necessary to execute sampling events, and providing consultative advice to help installations resolve issues and concerns.

A7.1.5. For non-DoD-owned MFH, per DoD policy, the PO is directed to have radon testing and monitoring procedures and a mitigation plan in place that meets applicable federal, state and local radon standards of practice; BE is not required to review or validate results or these requirements. BE will provide consultative support to the MHO for the MHPI, as needed, to help interpret radon sampling results. BE may recommend additional sampling or mitigation and may state long-term risks of detected levels above 4 pCi/L, upon request.

A7.2. Procedures.

A7.2.1. Installation Radon Risk Level Determination.

A7.2.1.1. Installations will determine radon risk level (red, orange, or yellow) based on the EPA, state, and county radon zones. **(T-1)** EPA radon zone interactive map is available at <https://www.epa.gov/radon/epa-map-radon-zones-and-supplemental-information>. Links to OCONUS radon maps can be found in the *BE Guide to Radon Management*.

A7.2.1.2. If resources are unavailable to determine installation or AOR radon risk level, BE will consult with ESOH Service Center on adequacy of existing historical radon data and options to determine risk. This attachment does not cover processes and procedures to baseline radon risk at installations.

A7.2.2. Management and Mitigation.

A7.2.2.1. For installations in red radon zones, CE will incorporate passive or active radon mitigation systems and techniques into new construction building designs and existing facilities. (Reference Unified Facilities Guide Specifications 31-21-13, *Radon Mitigation*.) **(T-1)** Construction or building contracts or renovations (to install mitigation measures or techniques) at installations in red radon zones will include post construction or renovation radon sampling in contract requirements. **(T-1)**

A7.2.2.2. For schools, CDCs, and youth centers, the facility managers and CE will track, manage, check/confirm proper operation, perform preventive maintenance, and repair in-place radon mitigation processes and controls on a routine basis. **(T-3)**

A7.2.2.3. For DoD housing, MHO and CE will work together to ensure proper management and/or mitigation of radon is accomplished in accordance with this DAFMAN. **(T-3)** MHO will work with housing residents to track, manage, and check/confirm operation of in-place radon mitigation processes and controls on a routine basis. **(T-3)**

A7.2.2.4. If installation commander decides to establish a Radon Working Group, the group will include at a minimum BE, CE, MHO, JA, and PA. **(T-3)** The working group's objectives will be to mitigate and maintain all radon levels in priority facilities (MFH and UH, schools, youth centers, and CDCs) to below 4 pCi/L.

A7.2.2.5. Stakeholders in red radon zones will develop a Radon Management Plan for the EP in their AOC (i.e., MHO for housing, school director for schools). **(T-3)** The plan will address, at a minimum, the following:

A7.2.2.5.1. List of priority facilities/homes (MFH and UH, schools, youth centers, and CDCs).

A7.2.2.5.2. Status of mitigation (i.e., mitigation systems are in-place and operational), and prioritization of new mitigation measures.

A7.2.2.5.3. New construction or major renovations of priority facilities and radon risk.

A7.2.2.5.4. Review of measured radon data in priority facilities, gaps in radon data, and priority of future sample sites.

A7.2.2.5.5. Community risk communication and public notification and education plans.

A7.2.2.5.6. Facility managers and residents use of commercial off-the-shelf testing tools.

A7.2.3. Assessment.

A7.2.3.1. BE will assess radon at priority facilities during the OEHSA. **(T-1)** This assessment will verify:

A7.2.3.1.1. Radon sampling has been accomplished (and results are available) for all priority facilities.

A7.2.3.1.2. Mitigation is in place for all priority facilities with radon levels >4 pCi/L. Sampling has been accomplished to validate mitigation is controlling radon to <4 pCi/L.

A7.2.3.1.3. Priority facilities with significant building renovations (e.g., new windows, foundation repairs, new HVAC systems) or other events potentially alter the building envelope have been assessed.

A7.2.3.2. Sampling.

A7.2.3.2.1. If BE determines a need for additional radon sampling during the radon assessment (i.e., gap in radon data, new mitigation installed), BE will coordinate with ESOH Service Center to plan and schedule sampling.

A7.2.3.2.2. Commercial off-the-shelf continuous radon monitoring tools are acceptable alternatives to passive long-term samplers and can be utilized to the maximum extent possible; coordinate with the ESOH Service Center on approved tools and coordinate with MHO and school facility managers on execution. MHO facility managers and home residents may use commercial off-the-shelf radon monitoring or sampling tools to determine individual MFH or UH radon levels outside of the installation radon program.

A7.2.3.2.3. BE is encouraged to utilize MHO facility manager or home resident personal sampling events and results for EP assessment, if available and reliable. Strict sampling guidance and training for MHO facility managers and residents increases reliability.

A7.2.3.2.4. BE will utilize MHPI PO sampling results in the EP assessment.

A7.2.3.3. EP and EP Assessment.

A7.2.3.3.1. At a minimum, BE will create an EP and complete an EP assessment for installations or AOCs with service members and DoD beneficiary in red radon zones. **(T-1)** Multiple EPs may be necessary to delineate differing AOCs.

A7.2.3.3.2. Update the EP with new EP assessments annually, incorporate any new radon sampling results. **(T-1)**

A7.2.3.3.3. Installation radon risk levels, as shown in **Table A7.2. Installation Risk, EP Priority, and EP Assessment Comparison**, determine the EP priority and EP assessment risk estimate. EP assessment risk estimates are based on the installation risk, not on radon sampling results.

Table A7.2. Installation Risk, EP Priority, and EP Assessment Comparison.

Installation Risk Level	EP Priority	EP Assessment Risk Estimate	
		Without Installation Program	With Installation Program
Red	Urgent or High	Extremely High and High	Medium
Orange	Medium	Medium	Low
Yellow	Low	Low	Low

A7.3. Risk Communication.

A7.3.1. For red radon zone installations, MHO will ensure residents are informed of the results of any radon sampling in their residence and provided risk communication and/or public education information. **(T-3)** MHO, per DAFI 32-6000, will provide EPA's *A Citizen's Guide to Radon: The Guide to Protecting Yourself and Your Family from Radon*. **(T-1)**

A7.3.2. School, youth center, and CDC directors will be informed of the results of any radon sampling in their facilities. **(T-3)** Directors will inform families and provide risk communication and/or public education information.

A7.3.3. Installation will consult ESOH Service Center for additional guidance on radon health risk communication, as needed.

A7.4. Geospatial Capability. In addition to documenting radon EP assessments and results in DOEHRS, BE may consider working with the installation GIO to load installation radon results into GEOMAP to create useful visualization tools for installation leadership and personnel and simplify future installation radon assessments. (This is an optional capability.)

A7.5. Reporting/Recordkeeping.

A7.5.1. BE may reference DOEHRS *Radon Quick Start Guide* for detailed guidance on documenting radon in DOEHRS.

A7.5.2. BE will document installation or AOR radon risk level and sampling results summary (range, average, and 90% level) in the DOEHRS OEHS Section 8, *Physical Hazards, Ionizing Radiation* section. **(T-1)**

A7.5.3. BE will document radon sample results in DOEHRS under the installation's *Location* with unique sampling points and *Air Direct Reading* in accordance with *Radon Quick Start*

Guide. Add geo-coordinates to each sampling point. Utilize the following format for naming radon sampling points “Bldg XXXX – *Generic Building Name*” or Bldg XXXX – *housing street address*” (e.g., Bldg 3904 – Medical Center, Bldg 9201 – 123 Curtis Drive). **(T-3)**

A7.5.4. EPs and EP assessments will follow the naming convention defined in Technical Guide 392, Chapter 7 for naturally occurring radioactive material (NORM) (example “*NORM Radiation (South Housing)*”).”

A7.5.4.1. Attach any installation level HRA summary reports and any risk communication products to the EP(s). **(T-3)**

A7.5.4.2. Attach any radon SAPs to the EP(s). **(T-3)**

A7.5.4.3. Associate radon sampling results to EP assessments. **(T-1)** Document the range, average, and 90% radon level in the *Executive Summary* and the *Long-Term Risks* in the EP assessment. Radon does not present a short-term health risk.

A7.5.4.4. Document mitigation actions and other control techniques in EP *Existing Controls and Protective Measures*, risk communication actions in EP *Comments Field* and EP assessment *Force Health Protection Recommendations* field. **(T-3)**

Attachment 8

ENVIRONMENTAL HEALTH HAZARDS IN DOD HOUSING

A8.1. Background.

A8.1.1. Addressing health and safety concerns of DoD housing and non-DoD-owned housing residents requires a team approach between stakeholders and mission partners such as the MHO, CE, Occupational Safety, and AOME. This DAFMAN supports DAFI 32-6000 roles and responsibilities for installation stakeholders concerning EH issues in DoD housing. This attachment incorporates ASD memorandum *Standards and Guidance for Managing Environmental Health Hazards in Department of Defense Housing*, 1 February 2022, and Secretary of the AF memorandum *Standards and Guidance for Managing EH Hazards in DoD Housing*, 4 March 2022, and supersedes DAF Surgeon General memorandum *Implementation Guidance for Bioenvironmental Engineering's Environmental Health Support of Military Housing*, 22 July 2022.

A8.1.2. DoD housing includes DoD-owned and DoD-controlled (i.e. leased) MFH and unaccompanied housing (i.e., dorms) and temporary living quarters.

A8.1.3. Non-DoD-owned housing refers to housing owned and managed by a MHPI PO (i.e. privatized). The PO has primary responsibility to address and resolve MHPI resident concerns, and the MHPI property manager is the lead for addressing resident's EH concerns in MHPI housing.

A8.1.3.1. Per AFI 1-2 *Commander's Responsibilities*, paragraph 2.1, commanders have the "lawful authority and responsibility to promote and safeguard the morale, physical well-being, and the general welfare of persons under their command." Therefore, commanders, on the advice of the JA, have authority to allow DAF personnel to assess the living conditions of MHPI in order to make decisions on DAF actions, such as relocating service members and DoD beneficiaries to protect their health.

A8.1.3.2. Health exposures originating from DoD privatized environments are still a health exposure to service members, federal civilian personnel, and DoD beneficiaries and will be entered into DOEHS. (T-1)

A8.2. Procedures. This section outlines the process for AOME support to DoD housing. EH risks to DoD housing are no different than any other facility on an DAF installation; BE and PH will approach the environmental HRA and other PH concerns in DoD housing in the same manner as any other facility with the coordination and approval of MHO.

A8.2.1. MHO is the residents' first point of contact concerning EH concerns in DoD housing. MHO will refer residents reporting mold-related health concerns to their health care provider for an evaluation. MHO will prioritize maintenance and renovation measures related to immediate EH concerns, such as drinking water, mold, radon, asbestos, and lead-based paint. (T-1) MHO will record concerns and actions taken to resolve resident concerns in the eMH database. (T-0)

A8.2.1.1. If DoD housing residents reach out directly to BE, PH, IOEMC or other members of AOME, the resident will be redirected to the MHO.

A8.2.1.2. If DoD housing residents report to PCM with medical concerns related to housing, following appropriate medical care, the resident will be requested to inform MHO. **(T-3)**

A8.2.1.2.1. The MHO will provide housing information (e.g., housing condition and potential hazards identified, maintenance information associated with actions to address potential hazards, other occupants affected by the hazard) to AOME to help in a patient's clinical evaluation. **(T-1)**

A8.2.1.2.2. The MHO can assist in obtaining similar housing information upon request for patients residing in MHPI housing to help in a patient's clinical evaluation. **(T-1)**

A8.2.1.3. If DoD housing residents' EH concerns are not addressed to the resident's satisfaction, the resident may request AOME support through their chain of command.

A8.2.1.3.1. MHO will coordinate with PO on EH concerns raised by residents of MHPI housing to AOME. **(T-1)**

A8.2.1.3.2. MHO will address the following issues with the PO directly: MHPI resident concerns regarding EH hazards and inadequate housing conditions, maintenance and design factors which may contribute to EH issues, and questions regarding the applicability of EH standards to MHPI housing. **(T-1)**

A8.2.1.3.3. BE will advise on OEH risk controls and personal protective equipment recommendations to protect the residents and the MHO maintenance personnel performing routine maintenance activities, abatement and cleanup activities, or other mitigation measures. **(T-1)** BE does not provide this support to contract personnel or MPH PO.

A8.2.2. Upon MHO request, BE and PH will serve as SME support in interpreting and applying EH standards and guidance, reviewing housing condition information to assess EH risks, identifying facility management deficiencies and design considerations which may contribute to housing EH issues, and recommending mitigation actions. **(T-1)**

A8.2.2.1. SME support may include technical support to MHO (and to MHPI through MHO) on contracted services to address EH issues (i.e., adequacy of EH hazard analysis and mitigation plans, and environmental HRA conclusions). The government has the right and responsibility to review all aspects of contracts or agreements it enters into, including those that contain health aspects. BE will acquire copies of contracted environmental HRA reports and sampling data for entry into DOEHS, if EP and EP assessments are deemed warranted by AOME.

A8.2.2.2. Provides technical support to MHO on housing disclosure documents related to EH hazards and risk communication.

A8.2.2.3. MHO may request consultation from BE and PH regarding the applicability of DAF EH standards to MHPI housing.

A8.2.3. BE and PH will complete environmental HRAs in accordance with this DAFMAN if MHO is unable to resolve EH-related concerns to the satisfaction of the residents or the commander, or at the request of PCM or IOEMC. **(T-1)**

A8.2.3.1. For MHPI-owned housing, in the event the PO is unable to resolve EH-related concerns to the satisfaction of the resident or the commander, at the request of the installation commander and on the advice of JA, BE and PH may conduct a separate EH assessment in accordance with this DAFMAN in MHPI housing. MHO will clearly delineate specific responsibilities between MHPI housing agreements and base contracting office.

A8.2.3.2. If MHO chooses to contract environmental HRAs, MHO will provide copies of the contracted assessments and sampling results accomplished in MFH with DoD beneficiaries to AOME. **(T-1)**

A8.3. Risk Communication. AOME, CE, stakeholder, MHO, and MHPI (as applicable) will coordinate a single risk communication message to include, but not limited to, investigation findings, mitigation actions already accomplished, planned mitigation actions, management plans, generic health risks of mold, and options for individuals concerned about personal health. **(T-3)** AOME, CE, stakeholder, MHO, and MHPI are encouraged to utilize standardized or publicly available tools, resources, and health risk language to support risk communication actions. The installation risk communication team is a resource for the installation commander in dealing with MHPI.

A8.4. Reporting/Recordkeeping.

A8.4.1. MHO will document all DoD housing data related to EH hazards (e.g., surveys, data, sampling and testing results, assessments, recommendations, remediation requirements, etc. related to mold, lead-based paint, radon, asbestos and other EH-related issues) in the eMH database in accordance with DoD housing policy. **(T-1)**

A8.4.2. PCM must document clinical results in patient records, as applicable, and code according. **(T-1)**

A8.4.3. AOME will determine when EPs and EP assessments are warranted. If EPs and EP assessments are created, any EH exposure data consistent with the environmental HRA will be documented in DOEHRs, including contracted environmental HRAs, surveys, and data affecting DoD beneficiaries. **(T-1)** Geo-coordinates for samples and sampling locations will be captured in accordance with [attachment 3 Geospatial Capabilities](#). **(T-3)**

A8.4.4. If significant exposures to residents (requiring medical treatment) occurred, all DoD and non-DoD data will be shared with AOME for entry into DOEHRs. **(T-1)** AOME will determine if EP or IR is more appropriate based on the situation. AOME will determine need for additional medical surveillance.

A8.4.5. BE will redact any personal identification information prior to submitting environmental HRA results to non-medical stakeholders or mission partners. **(T-0)** This includes contracted environmental HRAs affecting service members and DoD beneficiaries.

Attachment 9

RECREATIONAL WATERS AND MISSION TRAINING POOLS

A9.1. Background.

A9.1.1. This DAFMAN provides requirements and guidance to maintain safe and healthy aquatic venues such as recreational waters (e.g., swimming pools, hot tubs and spas, therapeutic pools, splash pads, and natural bathing areas), and mission training pools, and provides guidance for health risk responses. A safe and healthy recreational waters and mission training pools program requires collaboration among a team of mission partners to include, but not limited to FSS, CE, PH, BE, and Occupational Safety.

A9.1.2. This attachment replaces AFMAN 48-114, *Recreational Waters and Mission Training Pools*, 23 July 2019, and refocuses BE and PH roles from compliance oversight to health risk assessment and directs DAF use of the CDC MAHC (current edition), CDC Healthy Swimming (current guidance), the EPA criteria identified in Title 40, CFR Part 131, *Water Quality Standards*, and DAFI 34-101 for compliance requirements. FSS units and employees managing the recreational waters and training pools are responsible for adherence to CDC MAHC and Healthy Swimming and will reflect guidance in current FSS policy. (T-0) CDC MAHC is available at <https://www.cdc.gov/model-aquatic-health-code/php/our-work/index.html>. CDC Healthy Swimming is available at <https://www.cdc.gov/healthy-swimming/index.html>.

A9.1.3. Recreational waters and mission training pools can present multiple safety risks to patrons, such as drowning, slips and falls, and accidents with ladders, ropes, or drains. In addition, these venues present OEH risks to employees, facility support personnel, and patrons that include infectious disease and other biohazards, acute mishaps associated with uncontrolled release of oxidizing chemicals (typically chlorine gas), exposure to excess levels of chemicals (e.g., high levels of chlorine), and other contaminants which may expose or be transmitted to humans via the venue.

A9.1.4. It is critical that design and operation include basic precautions typically including chemical risk management with use of the least hazardous feasible chlorination process; protection from chemical mishaps such as efficient material handling and emergency eyewashes where appropriate. BE and PH will provide oversight of OEH hazard controls, PH risks preventive measures, and related employee training, to include emergency or accident response procedures. (T-1)

A9.1.5. Natural bathing areas can present multiple safety and health risks, such as drowning, high bacteria levels, and other biohazards. On October 10, 2000, the Beaches Environmental Assessment and Coastal Health Act (BEACH Act) was signed into law, amending the Clean Water Act. The BEACH Act required EPA to develop performance criteria for testing, monitoring, and notifying public users of possible coastal recreation water problems. The act required new or revised water quality standards by 2014. FSS, BE, and PH will be familiar with these requirements. (T-3)

A9.1.6. **Privatized Pools.** DAF mission partners do not have routine responsibility to manage or test pools, recreational waters, or splash pads in privatized or contracted housing. MPHI PO

are responsible to maintain and operate in accordance with MAHC standards. BE and PH may provide EH SME support at the request of MHO or contract core representative.

A9.2. Procedures.

A9.2.1. FSS unit and employees will oversee and manage the day-to-day operations of the recreational waters and mission training pools in accordance with CDC MAHC and CDC Healthy Swimming. **(T-0)**

A9.2.2. BE and PH will provide HRA support in response to potential OEH risks in accordance with this DAFMAN or DAFMAN 48-146, provide risk mitigation or control measures, and provide risk communication, as necessary. **(T-1)**

A9.2.2.1. Based on local health risk and historical trends, BE and PH will ensure recreational waters and mission training pools are properly surveyed and monitored to ensure a healthy working and recreational water environment, and anticipate, identify, assess, and recommend controls or mitigation measures for any OEH risks to employees and patrons. **(T-1)**

A9.2.2.2. BE and PH will provide HRA of (and risk communication for) RWI or disease outbreaks. **(T-1)**

A9.2.3. **Mission pools, swimming pools, hot tubs and spas, therapeutic pools, and splash pads.** All operations, maintenance, and management procedures for mission training pools, swimming pools, hot tubs and spas, therapeutic pools, and splash pads will be in accordance with the CDC MAHC. **(T-0)**

A9.2.3.1. Recreational Pool Manager (and Mission Training Pool Manager, as required) will oversee the day-to-day operation of recreational waters and mission pool facilities to provide patrons and service member trainees with safe and healthy conditions in accordance with CDC's MAHC and CDC Healthy Swimming, and employees with a safe and healthy workplace. **(T-0)**

A9.2.3.1.1. Creates and implements a safety plan in accordance with CDC's MAHC, CDC's Healthy Swimming, and DAFI 34-101. **(T-0)** Establishes safety, sanitation, water quality and health rules in coordination with CE, PH, BE, and Occupational Safety. **(T-0)** Posts safety and health rules clearly and visibly to patrons entering mission training pools or recreational waters. **(T-0)**

A9.2.3.1.2. Appoints certified (where applicable) bathing facility personnel (i.e., lifeguards or other outdoor recreation waters personnel) and ensures adequate training is accomplished in accordance with CDC MAHC. **(T-0)**

A9.2.3.1.3. Immediately upon employment and semi-annually, trains bathing facility personnel to perform required routine chemical testing in accordance with CDC MAHC's *Water Quality Testing Frequency*, and to document these measurements. **(T-1)** If results are outside the acceptable range as defined by the CDC MAHC, immediately contact the treatment plant manager for corrective action. **(T-1)** In-line, continuous monitoring with data logging is an acceptable alternative to manual, routine chemical testing and documentation.

A9.2.3.1.3.1. Trains and equips bathing facility personnel in cleaning up body fluid spills on pool surfaces and ensures adequate biohazard kits are available to clean

up blood or other potentially infectious material from pool decks or locker rooms, in accordance with DAFI 34-101. **(T-1)**

A9.2.3.1.3.2. If a water quality issue develops, such as water quality parameters consistently outside the acceptable range, or events related to fecal, vomit, or blood, the bathing facility personnel and pool managers will take immediate action in accordance with the safety plan and the CDC MAHC. **(T-0)** For fecal, vomit, or blood water quality issues, document response actions on the CDC Body Fluid Contamination Response Log or equivalent. **(T-0)** Contact PH and BE if there are any suspected RWI or outbreaks.

A9.2.3.2. A hazardous chemical list will be maintained on site to provide a list of the chemicals used in the swimming pool and surrounding deck, in accordance with AFI 90-821, *Hazard Communication (HAZCOM) Program*. **(T-1)** These records will include the expiration date for water quality chemical testing reagents.

A9.2.3.3. For mission training pools, pool managers will ensure trainee uniforms, boots, and equipment are cleaned of all visible debris prior to pool entry. **(T-0)** Equipment (such as basins and brushes) may be pre-positioned in shower room to clean uniforms, boots, and equipment.

A9.2.4. Natural Bathing Areas. Installation or AOR leadership (with the assessment and recommendation of stakeholders, mission partners, Occupational Safety, and AOME) will consider the following criteria for siting and approving natural bathing areas. **(T-1)**

A9.2.4.1. Site Location. Consider effects of point and nonpoint pollution sources. Sources of potentially dangerous contamination include (but are not limited to) waste discharges from communities, agriculture, industries, marine craft, local animal populations, and waterfowl.

A9.2.4.2. Type of Bottom. Areas should have floors which slope gently and uniformly toward deep water; have no holes or sudden step-offs; be free of hidden or submerged obstructions such as rocks, stumps, snags, and sunken logs; be composed of firm sand, small sized gravel, or shale; have no silt, quicksand, shell patches, sharp and broken rock, or debris in depths of 5 feet (1.5 meters) or less.

A9.2.4.3. Physical Water Quality. Consider the depth and turbidity of the water, presence of currents, rip tides, and dangerous aquatic flora and fauna.

A9.2.4.4. Common Diseases. Natural bodies of water located in areas where schistosomiasis (bilharziasis), leptospirosis, or primary amoebic meningoencephalitis are endemic will not be approved for recreational purposes without the concurrence of PH. PH will determine if there are threats from other microorganisms, including those endemic to the local area.

A9.2.4.5. Sensitive Natural Resources. Natural bathing areas must not be in areas indicated in the installation Integrated Natural Resources Management Plan as restricted for swimming due to the presence of sensitive natural resources or wildlife hazards.

A9.2.4.6. Risk-Based Sampling. BE will perform risk-based water quality sampling at natural bathing areas. **(T-1)** Risk factors to consider include, but are not limited to, proximity to suspected pollution sources, frequency of bathing area use, historical water

quality data, and occurrence of sewage spills or other pollution events. If local or state regulatory agencies have current data, those data may be used and BE can determine what, if any, additional parameters need to be evaluated. Consult with ESOH Service Center on guidance for an SAP.

A9.2.4.6.1. Additional sampling may be conducted when a bacterial concentration exceeds the applicable water quality standard identified in 40 CFR 131 of the Clean Water Act subpart 13.1.41 *Bacteriological Criteria For Those States Not Complying With Clean Water Act*, or anytime a storm, sewage spill, or pollution event occurs that could affect the natural bathing area.

A9.2.4.6.2. Sampling for HRA will be accomplished by BE. Sampling for EPA and state environmental compliance will be accomplished by CE.

A9.2.5. Mission Training Pools. Mission training operations require frequent and extensive training in aquatic environments. Special considerations are required due to the unique nature of activities occurring in the mission training pool. Trainees wear clothing or battle gear while in the pool, remain in the pool for extended periods of time, and practice a variety of vigorous movements in the pool. There are also times when high numbers of trainees are in the pool at one time. These factors can lead to an increased risk of unhealthy levels of water quality parameters in the pool, especially combined chlorine. Combined chlorine forms when organic material in the water (e.g., dirt, perspiration, urine) reacts with the free chlorine in the pool. Excess combined chlorine can lead to strong objectionable odors and respiratory problems, as well as eye, mucous membrane, and skin irritation.

A9.2.5.1. Maintenance. Mission training pool managers will ensure pool maintenance is accomplished as recommended by manufacturer to prevent algae buildup and increased turbidity, and to maintain optimal performance and safety for mission training. **(T-0)**

A9.2.5.2. Indoor mission training pool facilities will always be ventilated to remove excess combined chlorine vapors. **(T-0)** Design, construction, and installation of indoor mission training pool facilities' air handling systems must comply with the 2015 ASHRAE *Handbook – HVAC Applications* and ASHRAE Standard 62.1, *Ventilation for Acceptable Indoor Air Quality*.

A9.2.6. Investigations of Recreational Waters and Mission Training Pools.

A9.2.6.1. BE and PH will provide bacteriological monitoring in support of a HRA or investigation of RWI or disease outbreaks. **(T-1)**

A9.2.6.1.1. BE and PH will recommend closing the recreational water area or mission training pools if sampling is performed and bacteriological water quality indicates a health risk.

A9.2.6.1.2. Mission Partners, Occupational Safety, BE, and PH will conduct an immediate investigation to determine if any unusual conditions such as repairs to facilities, storms, spills, etc. might have caused a problem.

A9.2.6.1.3. For pools, hot tubs, and spas, CE personnel will determine if the filtration and disinfection systems are operating properly.

A9.2.6.2. PH may initiate surveillance or investigate the occurrence of illnesses associated with unhealthy water quality whenever conditions are encountered which may pose a health risk to employees or patrons. **(T-1)**

A9.2.7. **Table A9.1.** *Water Quality Requirements for Pools, Hot Tubs, Spas, Splash Pads* provides typical water quality parameters and monitoring frequencies for various recreational water and mission training pool venues. Responsible organizations will comply with **Table A9.1** where local or state requirements are less stringent or conservative. **(T-1)** Otherwise, pool managers will comply with local or state requirements. **(T-0)**

Table A9.1. Water Quality Requirements for Pools, Hot Tubs, Spas, Splash Pads.

Parameter	Acceptable Range	Applicability	Monitoring Frequency	Responsible Organization
Free available chlorine (FAC)*	1.0 – 4.0 ppm*	Pools and splash pads	Prior to opening & every 2 hours (manual disinfectant system); Prior to opening & every 4 hours (automated disinfectant system)	Pool manager, lifeguard, or other bathing facility personnel
	3.0 – 5.0 ppm	Hot tubs and spas		
Bromine	3.0 – 8.0 ppm	Pools and splash pads	Every 2 hours	Pool manager, lifeguard, or other bathing facility personnel
	4.0 – 8.0 ppm	Hot tubs and spas	Every hour	
pH	7.2 -7.8	Pools, splash pads, hot tubs and spas	Every 2 hours	Pool manager, lifeguard, or other bathing facility personnel
Total alkalinity	60 – 180 ppm	Pools and splash pads	Once per week	Pool manager, lifeguard, or other bathing facility personnel
		Hot tubs and spas	Weekly	
Calcium hardness	Not to exceed 2,500 ppm. (Ideal 200 – 400 ppm Pools and Splash pads; 100 – 200 ppm Hot tubs and spas)	Pools and splash pads	Monthly	Pool Treatment Plant Manager
		Hot tubs and spas		
Total Dissolved Solids (TDS)	Not to exceed 1500 ppm above the concentration in the fill water	Pools, splash pads, hot tubs and spas	Quarterly	Pool Treatment Plant Manager
Clarity	The bottom of the pool at its deepest point must be clearly visible and sharply defined from any point on the deck up to 30 ft. away in a direct line of sight. Perform this test when water is in a non-turbulent state.	Pools and splash pads	Daily	Pool manager, lifeguard, or other bathing facility personnel

Parameter	Acceptable Range	Applicability	Monitoring Frequency	Responsible Organization
	The bottom of the spa at its deepest point must be clearly visible. Perform this test when water is in a non-turbulent state and bubbles have dissipated.	Pools, splash pads, hot tubs and spas		Pool manager, lifeguard, or other bathing facility personnel
Cyanuric Acid	Ideal concentration is between 25-50 ppm, but must not exceed 90 ppm	Pools, splash pads, hot tubs and spas using Cyanuric Acid as a stabilizer	Monthly unless the pool utilizes stabilized chlorine as its primary disinfectant, then it must be tested every two weeks. It must be tested 24 hours after the addition of Cyanuric Acid to the pool; for saltwater pools - monitoring may be required more frequently - consult the manufacturers' instructions for appropriate frequency	CE personnel, if used
Oxidation Reduction Potential	Greater than 720 mV if using a silver or silver chloride electrode; Greater than 680 mV if using a calomel electrode	Not a required parameter; however, may supplement direct measurement of disinfectant residual as indicator of water quality	Not a required parameter; if used, recommend at least daily readings at same time FAC and pH readings are performed	CE personnel, if used
Salt		Pools, splash pads, hot tubs and spas using in-line electrolytic chlorinators	At least weekly, or per the manufacturer's instructions	CE personnel, if used
Temp	Maximum 104°F	Pools, splash pads, hot tubs and spas	Prior to opening and every two hours (manual disinfectant system) or every four hours (automated disinfectant system) at the same time the FAC and pH tests are performed	Pool manager, lifeguard, or other bathing facility personnel
Algae	No visible algae in water or on pool surfaces when open to swimmers	Pools, splash pads, hot tubs and spas	Continuous	Pool manager, lifeguard, or other bathing facility personnel
Combined chlorine	0 – 0.4 ppm (Ideal 0 ppm)	Pools, splash pads, hot tubs and spas	Every 2 hours	Pool manager, lifeguard, or other bathing facility personnel

Parameter	Acceptable Range	Applicability	Monitoring Frequency	Responsible Organization
Saturation Index	-0.3 to +0.3	Pools, splash pads, hot tubs and spas	Monthly	CE personnel
Copper or Silver	Per manufacturer's recommendations	Pools, splash pads, hot tubs and spas utilizing copper or silver systems	Daily	Pool manager, lifeguard, or other bathing facility personnel
* Pools using cyanuric acid must maintain a minimum FAC concentration of 2.0 ppm				

A9.3. Risk Communication. RWI outbreak requires prompt, frequent and accurate communication to impacted populations and all stakeholders. AOME will prepare risk communication statements or products and coordinate with PA, FSS, Occupational Safety, stakeholders, and other mission partners. **(T-1)** The CDC provides useful RWI outbreak response tools that can be accessed at https://www.cdc.gov/water-emergency/?CDC_AAref_Val=https://www.cdc.gov/healthywater/emergency/pdf/waterborne-disease-outbreak-toolkit-h.pdf. (Reference **chapter 4** for guidance on additional installation risk communication team members.)

A9.4. Reporting/Recordkeeping.

A9.4.1. Pool managers must document each incident by recording date and time of the event, whether it involved vomit, blood, formed stool or diarrhea, and the free available chlorine and pH levels at the time of the event. **(T-0)** The CDC Body Fluid Contamination Response Log can be downloaded from the CDC MAHC website under “MAHC *Tools and Training*” (MAHC Tools and Training | The Model Aquatic Health Code (MAHC) | CDC). Before reopening the pool, record the free available chlorine and pH levels and the procedures followed in response to the incident (including the process used to increase chlorine levels if necessary). These records will be kept for a minimum of three years. **(T-1)**

A9.4.2. AOME will determine if DOEHS documentation is warranted, and if EP or IR is more appropriate based on the situation. AOME will determine need for additional medical surveillance.