United States Air Force

Environmental Health Site Assessment

Guide

Version 1.3

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1.0 Purpose

In accordance with Presidential Directive 5 (PRD-5), the United States Air Force has developed the Environmental Health Site Assessment (EHSA) guide as a tool to enable military personnel to evaluate environmental conditions and assess risk of acquiring diseases and non-battle injuries (DNBI) to military personnel at forward deployed bed-down locations. In addition, the Air Force developed the Environmental Health Site Assessment (EHSA) software to be used to document the occupational and environmental conditions at an Air Force bed-down location, whether it is during wartime or peacetime.

After the Gulf War many of the veterans reported a variety of symptoms, illnesses, disorders, and diseases that were attributed to their time served during Desert Shield/Desert Storm. Scientists struggled to determine what contributed to their illnesses but there was little environmental data collected in the field to make any scientific determinations. The EHSA is a document that focuses on collecting pertinent site information necessary to complete a comprehensive environmental health assessment, reduce/eliminate environmental health risks, and identify, quantify, and prioritize abatements of health hazards that pose a threat to deployed military personnel that may impact the effectiveness of military operations.

The focus of the Air Force EHSA is on the occupational and environmental hazard assessments at deployed locations. The EHSA is designed as the initial steps in executing the deployed health surveillance requirements outlined in Presidential Review Directive 5 (PRD-5); DoD 6490.2, "Joint Medical Surveillance; DoDI 6490.3, "Implementation And Application Of Joint Medical Surveillance For Deployments", ASD-HA memo, "Policy for Pre- And Post Deployment Health Assessments And Blood Samples"; Joint Staff memo MCM-251-98, "Deployment Health Surveillance And Deployment Health Surveillance Readiness"; and Joint Staff memo "Updated Procedures for Deployment and Health Surveillance And Readiness." The preventive nature of the EHSA will serve as a force multiplier and mission enabler.

The Air Force EHSA protocol is to be executed by Team Aerospace (Flight Medicine, Bioenvironmental Engineering, Public Health and/or an Independent Duty Medical Technician) medical experts typically from several different Unit Type Codes (UTCs). In most cases, the AMC Medical Global Reach Laydown (MGRL) (UTC – FFGRL) teams will initiate the EHSA process. They will perform the "initial screening assessments". The Preventive and Aerospace Medicine (PAM – FFGL2, FFGL3, & FFGL4) teams will accomplish the "core assessments". Since the PAM teams will have the bulk of the occupational & environmental health site assessment data, they will be the overall EHSA owners and coordinators. Advanced hazard-specific assessments that are beyond the capabilities of the MGRL & PAM teams may require reachback assistance from specialized CONUS laboratories at Air Force Institute of Operational Health (AFIOH) and other locales.

This guide has been prepared to provide instruction to preventive medicine personnel deployed at forward bed-down locations to conduct the EHSA. Specific deployment teams to be addressed in this guide include the MGRL, and the PAM. Although the mission of these teams may be different in some respects, each can play a significant role with the EHSA to meet PRD-5 and to prevent or reduce DNBI.

Field Commanders deploying troops to forward locations must decide whether or not to bed-down in specific areas. Environmental contamination or the absence of contamination can be critical information for a Commander to have prior to making a decision. As a result, the goal of the EHSA is to provide a road map to gather environmental information quickly and as accurately as necessary. Data collected will be used to conduct health risk assessments and to communicate health risk assessments to the Commander. In addition, it is the goal of the EHSA to continue to collect information and data that may allow military personnel to determine whether conditions exist or are created that can lead to DNBI as well as relationships from potential long-term effects from environmental and occupational exposures.

The MGRL may be the first to arrive at the bed-down location and shall have the capability to quickly assess the environmental conditions of potential bed-down locations. The role of the MGRL is to gather environmental conditions data and to assess health risks to provide field Commanders with information to enable them to decide whether or not to use the area as a bed-down location. The MGRL will conduct an initial site assessment to enable them to make the best possible decisions with regard to environmental conditions of bed-down locations. Once on the ground, the MGRL must be capable of accomplishing a screening assessment of environmental conditions for up to 30 days. To carry out this mission, the MGRL will utilize direct reading instrumentation. Direct reading instrumentation is inherently less accurate than bench top laboratory equipment. As a result, the analyses will provide order of magnitude results or Yes / No information which can be used to assess acute and sub-chronic risks to military personnel. The MGRL supports the TALCE – Tanker Airlift Control Element. Operational control of the MGRL remains with US Transportation Command and may be delegated to the Air Mobility Command.

The PAM team will deploy and be capable of interpreting the data produced by the MGRL and to continue to gather data from the time of arrival forward. In some cases the PAM team may arrive at a location without an MGRL in which case the PAM team is responsible for initiating the EHSA. The PAM team will use much of the same instrumentation as the MGRL but will also deploy with a gas chromatograph with mass spectroscopy detector (GC/MS) to more accurately identify and quantify lower concentrations of environmental constituents. In addition, the PAM team may rely more heavily upon reach back laboratories i.e. AFIOH, as they will be concerned with chronic exposures to lower levels of chemicals.

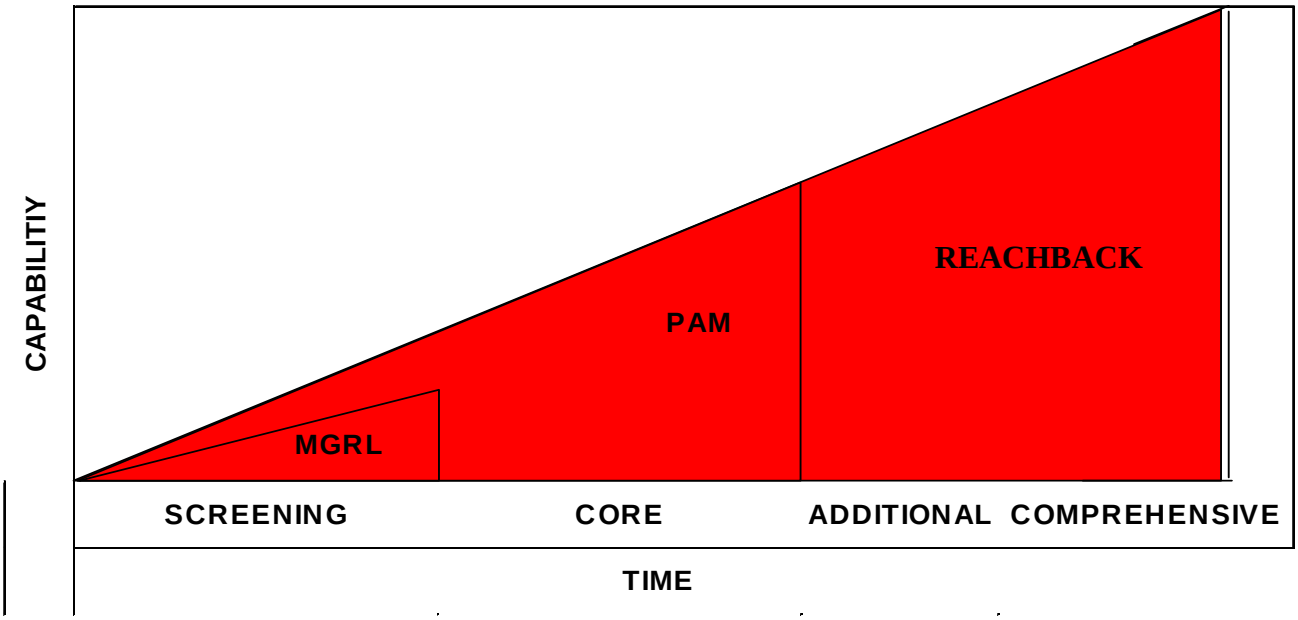
All MGRL and PAM team members will familiarize themselves with this EHSA Guide, the EHSA Protocol and systems prior to deployment.

The EHSA data will form a broad-based health risk assessment snapshot for that bed-down location. This data will provide a focused launch point for tailored “individual airman” health assessments. These airman health assessments will be executed as part of the routine occupational and environmental health surveillance provided by the MGRL and PAM teams. The data from both the “site” assessments and “individual” assessments will be integrated into automated systems such as Global Expeditionary Medical System (GEMS) Theater Occupational Module (TOM).

1.1 Use of This Guide

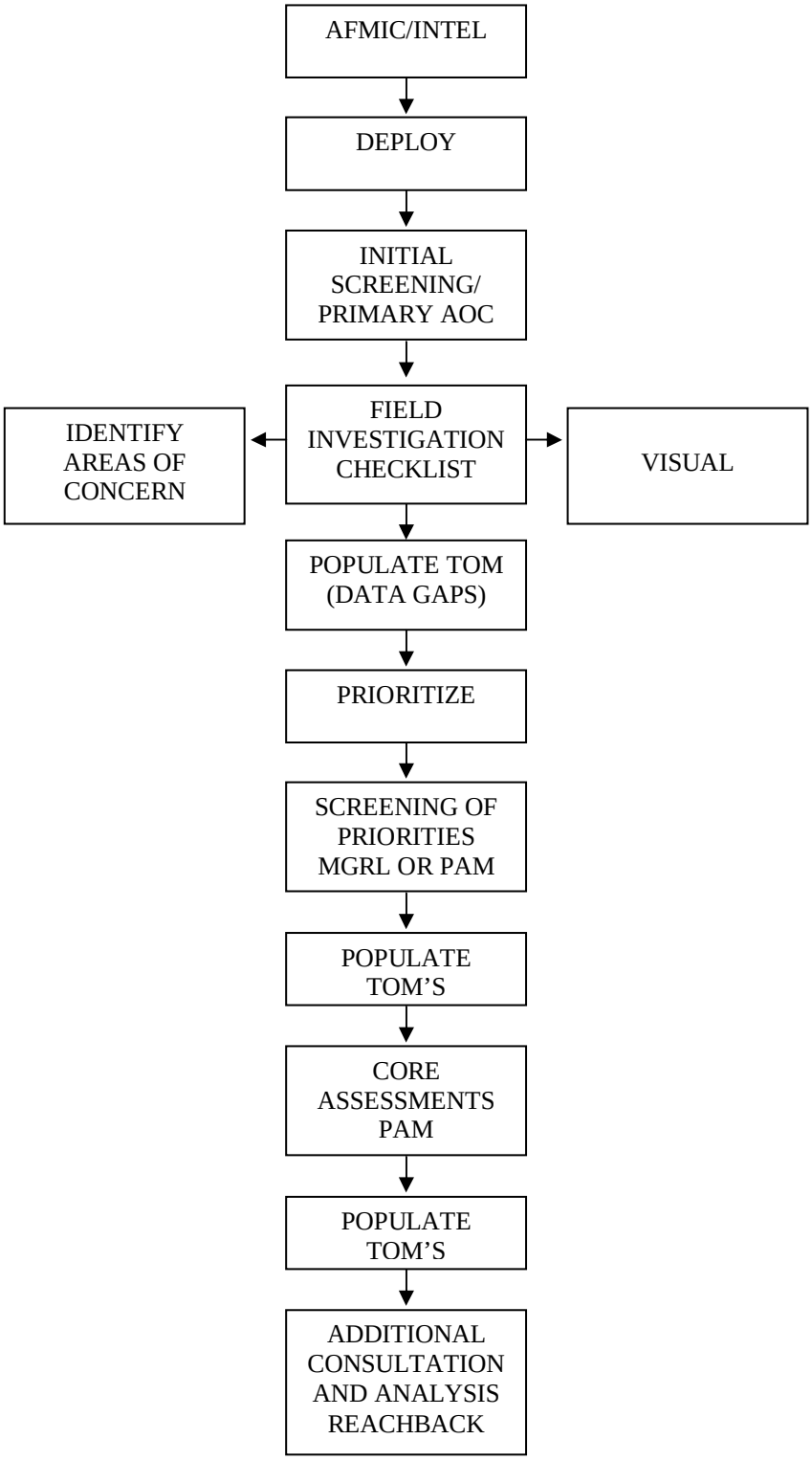
The implementation of the EHSA will be based on the type and quality of the environmental data that must be developed; the speed at which the environmental data must be collected, evaluated and reported; the deployed team: MGRL, PAM, IDMT and their capabilities; and the equipment and infrastructure available to the team.

In general, the deployment timeline will begin with the MGRL team and/or the PAM team arriving on-site. The MGRL team may remain deployed for up to 30 days. The PAM team may remain indefinitely. The initial team will conduct screening focusing first on the immediate bed-down location followed by the identification and evaluation of other Areas of Concern (AOC). The PAM team will conduct the core assessments. As the build-up occurs, greater reachback capabilities will also be available due to more available cargo space on aircraft, additional or improved infrastructure, greater local resources etc. The following diagram depicts the timeline and expectations:

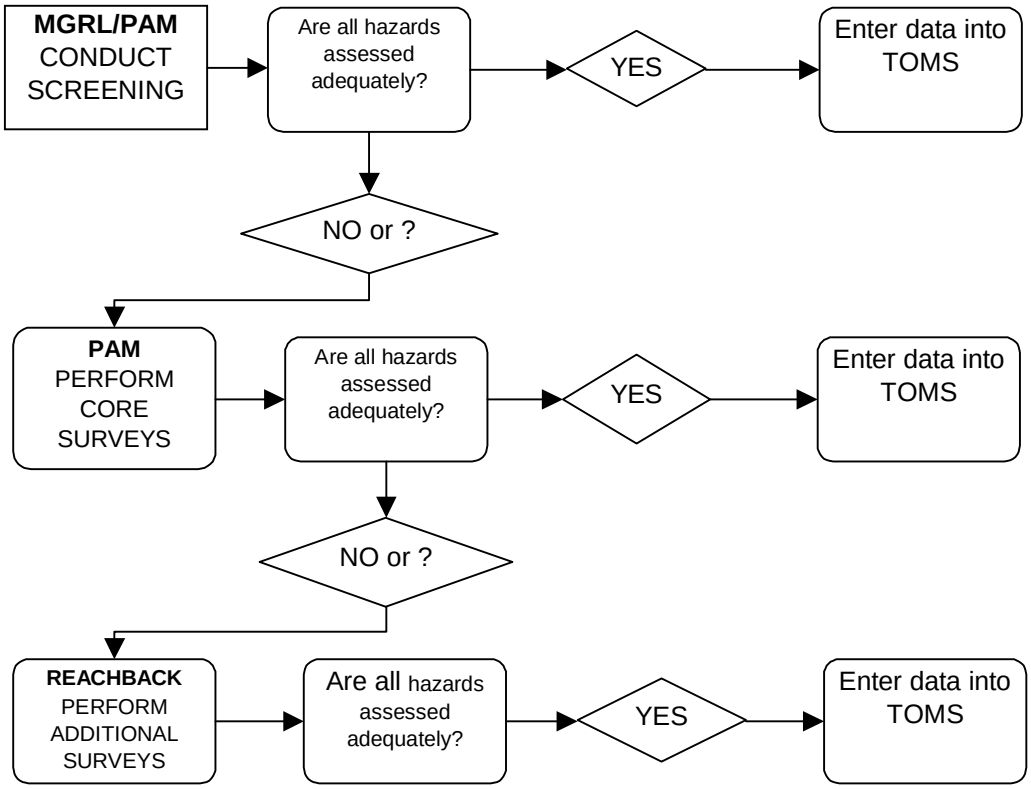


A team initially deploying to the location should obtain environmental data from the Armed Forces Medical Intelligence Center(AFMIC), the Medic CD, Air Field Surveys, previous After Action Reports, Department of State (DOS), and/or the Embassy. Medical Intelligence may also be obtained once at the deployed location. Once deployed, an initial screening shall be conducted of the bed down location to determine whether environmental factors have impacted or could potentially impact the mission. This information will be provided to the Commander. The Field Investigation Checklist provided in this guide can then be used to assess adjacent areas where environmental contamination would either be suspected or if undetected would be of significant consequence to personnel. Initially, screening with basic equipment can be conducted.

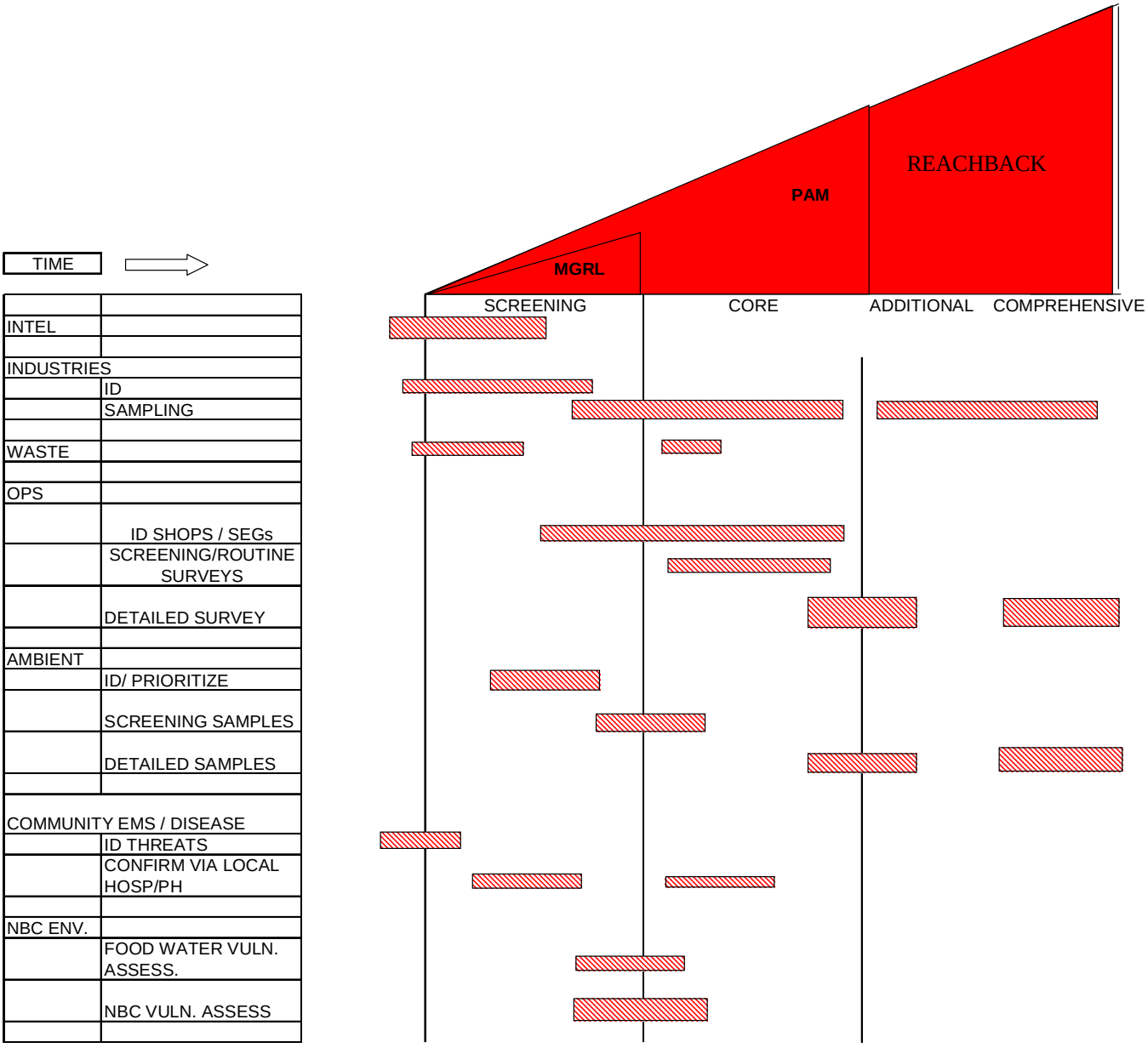
Then if concerns are identified, further assessments can be conducted. The assessment sequence is provided as follows:



Core Assessments and Additional Analysis do not need to be conducted for every location. Only where information is insufficient or incomplete and where the data can reveal a risk to personnel should further assessments be conducted. The following diagram depicts this decision logic:



A comprehensive depiction of the build-up and implementation is as follows:



2.0 Exposure Pathways and Risk Assessment

The health risk assessment process drives the EHSA. This section discusses that process in detail as it pertains to the EHSA. The ORM process is the model used by the AF to perform a risk assessment. This is an iterative and continual process.

2.1 Identify the Hazards

In order to identify the hazards at a forward operating location, the BEE must identify the Areas of Concern (AOC) or hazard sources. The primary AOC is the tent city and work area for those deployed. A more detailed investigation of this AOC is required early on because of the frequency of exposure to potential hazards. This will be discussed further in the next sections. Additional AOCs include on-base AOCs, not in the immediate living/working area, and off-base AOCs, such as industrial complexes. Finally, occupational hazards should be identified. This includes chemical, physical, and biological hazards inherent to our operations.

These sources, referred to as AOCs, present various hazards to personnel. In order to complete this step of the ORM process, the BEE must use intelligence data, screening samples, core assessment sampling, and first-hand knowledge of operations. These are explained in more detail in sections 3-6. Because this will take much time to fully implement, it will be essential to prioritize each AOC, hazard within each AOC, and sampling strategy for each hazard. A comprehensive assessment of the site will be complete with time, but low priority AOCs, hazards, or sampling should not hinder progress to the next step. Ultimately, this process is continual, iterative, and several issues should be worked in parallel.

2.2 Assess the Risks

Once the AOCs and hazards associated with these AOCs are identified, the BEE must perform a risk assessment. There are several components to a risk assessment. First, determine the hazard severity. This can be derived by comparing the sampling results with toxicological data for the hazard. For example, a concentration of 5 mg/m3 of Arsenic is greater than the TWA of 0.01 mg/m3. Second, determine the frequency and duration of the hazard exposure. Assuming that the exposure takes place over 10 minutes, the ACGIH toxicological data is useful in determining adverse effects. Using ACGIH TLVs, this is 10 times the 8-hr TWA TLV. Third, determine the population exposed. Although this is an extreme example, there may be no risk if this hazard is not located near our population. Finally, the ORM matrix should be used to determine the overall risk to the population for each hazard.

This process should be repeated for each hazard, and each hazard should be prioritized.

2.3 Analyze Risk Control Measures

Using the prioritized risk ratings, the BEE should employ their engineering skills to determine risk controls or mitigation efforts for each hazard. Further analysis of step two is warranted considering current controls to evaluate the effectiveness. We should consider other risk factors or mitigating factors that would impact our assessment (i.e., MOPP reducing our exposure level, MOPP increasing our risk to heat stress, etc.). The goal of this step is to abate high-risk hazards through engineering,

administrative, or protection controls. Finally, the BEE should reprioritize the risks considering control measures.

2.4 Make Control Decisions

The BEE is responsible for communicating risks to the commander. Initially, the primary AOC (living and working area) will be assessed through this process and results of the risk process will be conveyed to commanders to make operational decisions. For instance, if the BEE finds that the tent city is going to be built on sand contaminated with Cadmium, the BEE would communicate the risks with the current plan as well as some alternatives with their associated risks to the commander for an operational decision. Each step prior to this is critical to the process. By following this logical process and presenting well-thought-out alternatives and their risks to the commander, the BEE enables the commander to make an informed, fact-based decision. Bed-down location is obviously a significant decision, but the same process is valid for drinking water source selection, waste management, and occupational exposure.

2.5 Implement Risk Controls

After the commander makes the decision, the BEE must follow-up with the effected elements to ensure proper execution of the decision. Often, communication can break down toward the end of the process. As the expert, the BEE can consult those implementing the commander's decision to facilitate the risk controls.

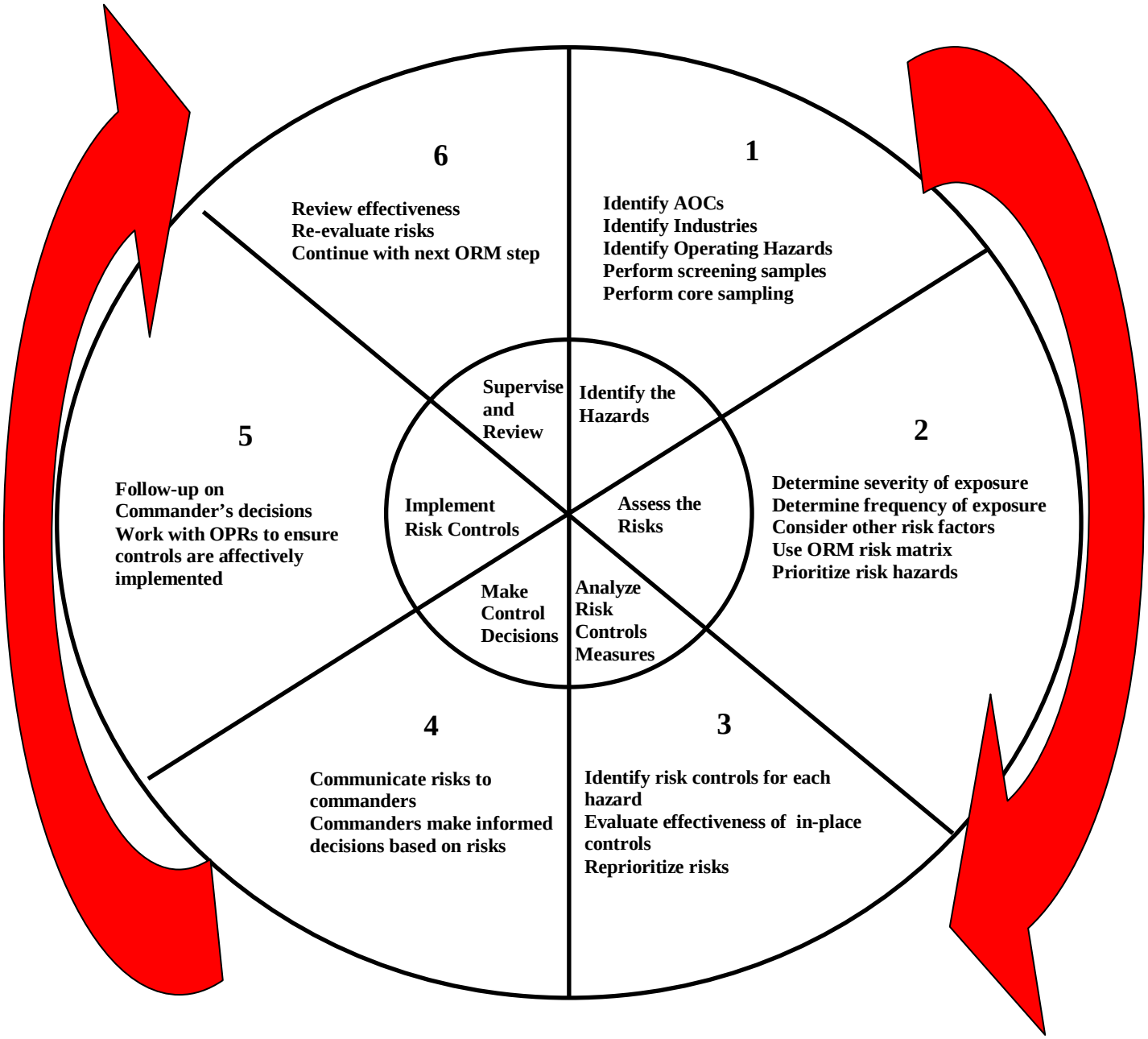
2.6 Supervise and Review

Finally, the BEE will review the effectiveness of the new risk controls. This step validates the decision made in step 4 through the evaluation process. It is important to be proactive in this step to identify problems or discrepancies between the decided course of action and implementation.

2.7 Summary

This process continues again with step one. As previously mentioned, the BEE may complete all 6 steps with one hazard while only part of step one with other hazards. Prioritization of risks after each step will set a clear agenda for risk management. The next sections detail the building blocks of the EHSA sampling strategy.

EHSA ORM PROCESS



3.0 Review of Available Information

3.1 Environmental Health Site Reconnaissance

Site Information: The collection and documentation of pertinent site information is necessary to complete a comprehensive environmental health site assessment, and reduce/eliminate environmental health risks, which impact on the effectiveness of military operations. In the EHSA protocol Site Information is broken down into five areas. Medical Intelligence, General Data, Major Industrial Activities, Waste Storage and Disposal Areas, and Hazardous Material Storage. In each area the objective is to capture present and past external factors that can/could have adverse health effects on Air Force personnel. Site information captured in each of the five sections must be evaluated to determine the type and degree of environmental sampling required to accomplish the environmental health site assessment. The assessment must identify industrial, commercial and institutional facilities, operations, and/or commodities that currently pose health risks or, if destroyed, damaged, released, or held hostage by the enemy, could result in a health threat to friendly, combat, and civilian personnel. Data sources and data types include:

- Armed Forces Medical Intelligence Center (AFMIC)
- Human Intelligence
- Medical Environmental Disease Intelligence and Countermeasure (MEDIC) CD
- Air Field Surveys
- Previous After Action Reports
- Department of State (DOS)
- Information provided by the Embassy

3.1.1 Medical Intelligence (AFMIC)

The Defense Intelligence Agency's Armed Forces Medical Intelligence Center (AFMIC) produces finished, all-source, medical intelligence in support of the Department of Defense and its components, national policy officials, and other federal agencies. AFMIC assesses health risks and medical capabilities of foreign countries. Assessments, forecasts, and databases are prepared on and are broken down into four areas of responsibility: 1) environmental health, 2) epidemiology, 3) medical capabilities and 4) foreign life science technology, and should be the point of inquiry for these areas. The environmental health provides current medical intelligence focusing on environmental risks that can degrade force health or effectiveness including: industrial toxic chemical/radiation accidents, environmental warfare/terrorism, and hazardous waste. The goal is to identify any potential hazardous sources, describe the health implications of specific agents of concern, and characterize the risks to potential exposed personnel. AFMIC's Epidemiology section provides current medical intelligence focusing on those infectious diseases that could degrade mission effectiveness of deployed forces. AFMIC's Epidemiology also assesses: 1) the impact of worldwide infectious diseases/trends on national security and policy formulation and 2) endemic disease baselines to support arms control. Request for information/requirements can be obtained from AFMIC by contacting AFMIC Operations: Commercial: (301) 619-7574 DSN: 343-7574. Address: Defense Intelligence Agency, Bldg 6000, Washington DC 20340-5100, Attn: AFMIC Operations, MA-OP.

The AF Medical Intelligence officer should obtain this information and provide it to the Preventive Medicine team to populate the EHSA prior to deployment. This information should include:

- Historical and current property use of the site such as the type of agricultural, industrial, institutional, commercial and/or residential uses.
- Known hazardous waste sites.
- Known contamination and pollution in air, water and soil media.
- Typical climate conditions including normal and extreme temperatures, seasonal precipitation, and seasonal prevalent wind directions and velocities.
- Known property use including type of infrastructure such as existing buildings, transportation networks, water treatment and distribution systems, wastewater collection and treatment systems, and known power generation and transmission systems.
- Maps, topographic and geological information relevant to the deployment area.

3.1.2 Human Intelligence

Human intelligence from the field can provide immense data on the historical operations at the site to include chemical use, handling procedures etc. Natural topography can be identified as well as general practices employed. Additionally, contact with AF personnel, contractors, or the host nation can provide the deploying unit with specific information, address concerns, and help focus the priorities of the deploying team.

3.1.3 Medic CD

The MEDIC CD is an essential intelligence product that forms the cornerstone of the deploying unit's intelligence assessment. The MEDIC is an AFMIC product, which provides worldwide disease and environmental health risks hyperlinked to the Joint Service-approved countermeasures recommendations. Additionally, the MEDIC furnishes: 1) Military and civilian health care delivery capabilities; 2) Operational Information; and 3) Disease vector ecology information.

3.1.4 Air Field Surveys

Airfield survey reports can orient the deploying team to the bed-down location. This report can help identify areas of concern, geographic features, hazards, and other pertinent information. Airfield surveys can provide a deploying unit's perspective on a bed-down location. Information on Airfield surveys can be found at the following two web sites https://xop-web.scott.af.mil; http://www.amc.scott.af.smil.mil

3.1.5 Previous After Action Reports

Previous After Action Reports can provide information regarding industry types and problems identified with those circumstances. Previous after-action reports can identify intrinsic issues with a location and lessons learned during past deployments. In a sustainment operation, it gives the deploying unit some continuity on past practices, issues, and problems. The deploying unit may be able to contact previously deployed units concerning the contents of the after-action report before the deployment. Ultimately, they provide the history of a site.

3.1.6 Department Of State

The Department of State (DOS) is responsible for US diplomats abroad. Additionally, the DOS provides advisories to US travelers abroad. This may be useful information, in particular, contact

information for embassies and consulates in the deployment location. The DOS website can provide most of this information. http://www.state.com

3.1.7 Information provided by the Embassy

Embassy/Consulates can provide local information that may be useful to the deploying unit, such as: exchange rate policies, medical capabilities, foreign intelligence threats, local threats, etc. Since each embassy has a military attaché, it is important to establish contact and derive current intelligence from this source. Additionally, the embassy may be the conduit by which the deploying unit expedites requests to the host nation.

3.1.8 USEPA industry specific information

The USEPA has compiled information regarding major industries and the typical chemicals used, materials produced as waste and most common emissions. This information can be very helpful if the industries are known prior to deployment so the USEPA information can be easily accessed and evaluated. http://www.epa.gov/enviro/html/sic_lkup.html

4.0 Initial Screen of the Primary AOC – The Bed-Down Location

Once the team is at the deployed site, data should be obtained with intelligence gathering to verify the information obtained from AFMIC and also to develop information to supplement information supplied by AFMIC. The initial step should be the completion of the **Field Investigation Checklist.** The Field Investigation Checklist shall be completed by the Team (MGRL or PAM) as soon as possible for each Area of Concern (AOC), prioritizing the bed-down location first.

An AOC is defined as an area where there is a potential hazard source, which may result in exposure to personnel. Such supposition may be due to industries identified in the area, visible soil staining, debris piles, lagoons, pits, ponds, unnatural topography, stressed vegetation, sick animals, drums, known contents in industrial facilities, local resident information etc. AOCs may be an area to be entered by military personnel or may be a location that through weather, continued operations, terrorist activities or military operations may affect military personnel. The EHSA software program in TOM lists industries and some potential contaminants associated with them. As a result, Team members will have to identify AOCs and exercise diligence in evaluating conditions related to them.

The Field Investigation Checklist guides the evaluator to collect information on the following:

- Physical information regarding the site location, climate etc.
- Property use (industrial, rural etc.)
- Industrial use information
- Chemical/Material Storage
- Radiological Concerns
- Dumps/Landfills/Incinerators
- Stack Emissions
- Water Bodies
- Wastewater Discharges
- Monitoring Wells
- Asbestos
- Molds & Fungi
- Fill Material
- Surface Soils
- Existing Water Supply
- Vegetation
- Observed Animals/Insects

The Field Investigation Checklist can be accessed by clicking on the following link:

Field Investigation Checklist

The purpose of the ambient environment assessment is to identify any ambient environmental hazards that may pose potential risk to Air Force personnel at deployed bed-down locations. The ambient environment is divided into four major categories: air quality, soil quality, water quality and drinking water quality. Each category has minimal baseline requirements that should be completed as soon as possible after reaching a bed-down location. Detailed assessments may be required after

completion of the environmental threat assessment for each potential threat identified in the site information section. Drinking water quality is accomplished on source water and after treatment. Bottle water plants will need to be sampled and inspected if the plant is not currently approved for use by the VETCOM, http://vets.amedd.army.mil/vetcom/. Data collected during EHSA will be used to establish the long-term monitoring plan to maintain force health protection.

As part of the environmental field investigation, the team will need to perform rapid sampling and analysis for known and unknown constituents of concern using equipment that is portable and reliable for field screening at levels determined to be "short-term" safe for AF personnel. A level of baseline or "minimal sampling and analysis requirements" should be performed at every deployment site. The objective of the minimal sampling and analysis effort is to "screen" a site/AOC for the presence of constituents of concern (COCs). If COCs are identified, specific or more "detailed sampling requirements" can be performed based on medical intelligence and the results of the minimal sampling and analysis efforts. The goal of the field investigation is to be capable of the following:

- Chemical Sampling and Analysis
- Radiological Sampling and Analysis
- Biological Sampling and Analysis

Each team will have somewhat different capabilities with regard to field sampling, generally based on the amount of notice and preparation time prior to deployment and the anticipated duration spent in the field.

4.1 Screening of Bed-down Locations

The goal of the EHSA is to evaluate environmental conditions at bed-down locations and to identify and evaluate Areas of Concern (AOC) that may impact military personnel. Team members will have to identify AOCs and exercise diligence in evaluating conditions related to them.

The initial screen is conducted at the bed-down location due to the constant presence of military personnel. The severity of exposure is unknown –until the bed-down location has been properly characterized. Given these risk factors of unknown severity and high frequency, it is important to conduct a risk assessment of the bed-down location as soon as possible after arrival. This assessment when communicated to the commanders will help them determine the best course of action regarding tent city and work areas. Depending on size and location of the bed-down location, the highest priority for this phase of the assessment is the living/sleeping quarters/area (i.e., tent city, off-base quarters, etc.) and the work areas. Second to these assessments are other areas of concern that may impact these primary areas.

4.1.1 Air and Soil Sampling

4.1.1.1 Minimum Sampling Requirements

The MGRL or PAM team will be first to evaluate bed-down locations for environmental concerns. AOCs shall be identified in accordance with information from AFMIC, visible signs, odors etc. The EHSA Field Investigation Checklist shall be used for all AOCs. A bed-down location shall be treated as an AOC prior to bedding down and evaluated for environmental contamination. The

concern in the bed-down location is exposing military personnel via contact with contaminants, inhalation of contaminants or ingestion of contaminants via hand to mouth contact or contact with water or food impacted with environmental contaminants.

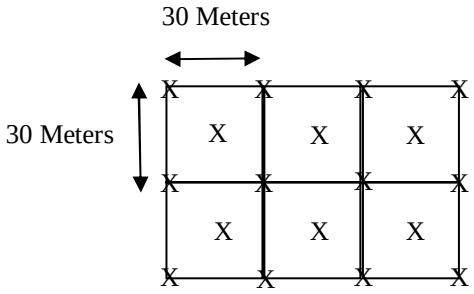
Soil contaminants shall be screened and evaluated immediately to report bed down conditions to the Commander as soon as possible. As a result, the analyses must be quick, accurate and provide suitable data for decision-making. The soil can be assessed for volatile organic compounds (VOCs), toxic metals, and radiation using much of the same equipment. The instrumentation shall be calibrated and zero air shall be used (for the PID/FID) to ensure the meters are functioning properly. The evaluators shall note the temperature and humidity and fully understand the potential impact of temperature and humidity on direct reading instrumentation. The following is a link to the soil ambient environment section of the EHSA for reference.

4.1.1.2 Soil Sampling and Analysis

The following equipment will be necessary to conduct the soil and soil gas sampling:

- PID/FID
- XRF
- ADM-300
- Hapsite (optional)

a. Grid the bed-down location into approximately 900 m^2 areas. Each grid should be a rough estimate of 30-meter by 30-meter square.



b. Perform soil gas sampling by collecting a soil sample from each corner of the grid and the center of each grid (five samples per grid). Collect the soil samples from the top six to twelve inches of soil using stainless steel tools, or disposable shovels if available. The soil is placed in a plastic bag, sealed and the bag is gently shaken to release soil vapors. Allow the soil to remain in the bag for approximately 30 seconds. Insert the PID/FID sample probe into the bag using caution not to draw soil or moisture into the probe. Record the results. If the PID/FID reading equals or exceeds 5.0 ppm a contaminant source shall be considered present. If a Hapsite is available, use it to identify the constituents and estimate the concentration. The Commander shall be notified and a soil sample shall be collected. Soil sampling should be performed in accordance with the procedures and equipment presented in Appendix 8-2 of the USA CHPPM TG-251. The soil sample shall be shipped to the theater lab or to AFIOH for further analysis. Samples should be analyzed for VOCs and semi-VOCs in accordance with EPA methods. Soil sampling equipment must be thoroughly decontaminated after each sample is taken, unless using disposable shovels.

c. Perform soil sampling for radiation at the center and corner of each grid (five samples per grid). Collect a sample in a plastic bag and place into the chamber of the radiation detector (gamma ray

spectrometer) and record the reading. If radiation is detected at grater than 0.1mrem/hr notify the Commander.

d. Perform soil sampling for toxic metals in the surface of the soil at the center and each corner of the grid using an XRF. Sampling shall be in accordance with manufacturer's instructions.
e. Enter the sampling locations and analytical results into the GEMS (Theater Occupational Module) database.

4.1.2 Perimeter Air Sampling

Perimeter air monitoring should be initiated as soon as the site perimeter is secured. Perimeter air sampling should be performed at all four compass directions when the bed-down location is downwind from an AOC to determine if airborne constituents of concern are entering the bed-down area from off-site sources. Samples should be collected using a PID/FID, radiation detector, an aerosol monitor and an ultra-fine particulate monitor. Sampling time, location and results shall be recorded for each sample taken. Enter this information into the GEMS (Theater Occupational Module) database.

4.1.3 Surface Water Sampling

Ambient surface water sampling shall be conducted after the site perimeter is secured. Initial ambient surface water sampling shall begin with sampling of any surface waters located within the perimeter of the bed-down location (excluding puddles or pooled water due to rainfall) and proceed to any surface waters, streams, ditches, etc. that personnel or equipment may come into to contact with as they are deployed. Initial sampling of surface waters in the bed-down area shall be completed as soon as possible. Surface water sampling should be conducted initially, and as environmental and weather conditions change or as the size of the area of operations changes. Surface water samples should be collected in accordance with the methods contained in the Ground or Surface Water Contaminates/Analytes Table located in Section 6 of this guide. The following is a complete list of surface water analytes which will be sampled for initially. Sampling time, location and results shall be recorded for each sample taken. Enter this information into the GEMS (Theater Occupational Module) database.

4.1.4 Drinking Water Sampling

Drinking water quality shall be evaluated on both source water and after treatment. Bottled water plants will need to be sampled and inspected if the plant is not currently approved for use by the VETCOM. Quality standards for potable water vary depending on force structure and duration of use. Identification of all drinking water sources should be documented and evaluated prior to use and at regular intervals throughout the operation to ensure the hazard profiles have not changed. All water sources should be assessed prior to their use regardless of the source to determine if the water is potable or can be made potable by purification. Data collected during initial assessment will be used to establish the long-term monitoring plan to maintain force health protection. Drinking water samples should be collected in accordance with the methods contained in the Drinking Water Contaminates/Analytes Table located in Appendix D of this guide. The following is a link to the complete list of drinking water analytes and detection limits. In addition to the sampling methods listed above, initial field sampling of raw water sources can be testing in the field. Field analysis of the source water will be conducted with the Preventive Medicine Equipment Sets to determine whether the source is treatable. Click on the following link for additional raw water field sampling

methods and equipment. Sampling time, location and results shall be recorded for each sample taken. Enter this information into the GEMS (Theater Occupational Module) database.

5.0 Identification, Prioritization and Evaluation of Secondary Areas of Concern

Once the initial bed-down location has been evaluated, other areas of concern can be identified, prioritized and evaluated. The identification of an area of concern follows from the data obtained from AFMIC, Human Intelligence, Air Field Surveys, information provided by the Embassy, previous After Action Reports, and information derived from USEPA for all areas where deployed personnel may become exposed to environmental contaminants. The Field Investigation Checklist should be used to aid with this identification. All industrial, manufacturing, waste reclamation and disposal, medical and processing facilities within a twenty-mile radius of the bed-down location should be considered areas of concern. A larger radius of 500 miles should be considered for nuclear power plants. The Field Investigation Checklist can be accessed by clicking on the following link:

Field Investigation Checklist

Once an AOC has been identified, it must be compared and prioritized relative to other AOCs. Consideration must be given to the severity of the hazard, duration of exposures (probability), quantity of personnel exposed, contaminants of concern, effects on readiness, controls in place, etc. The hazard probability and hazard severity matrix can be used as a guide to prioritize AOCs. Each AOC should be rank rated by the aforementioned characteristics, and ultimately a risk rating should be determined by using the ORM matrix. The additional factors that are not direct inputs to the ORM matrix can be used as "tie-breakers"

. **Hazard Probability**

Hazard Severity	**Frequent**	**Likely**	**Occasional**	**Seldom**	**Unlikely**
Catastrophic	Extremely High	Extremely High	High	High	Moderate
Critical	Extremely High	High	High	Moderate	Low
Marginal	High	Moderate	Moderate	Low	Low
Negligible	Moderate	Low	Low	Low	Low

Once the AOCs are prioritized the pathways for the hazards must be identified and sampled. Although multi-media sampling is the ultimate goal, those media-pathways that pose the highest risk should be sampled first. Use the Hazard Severity and Hazard Probability matrix methodology to determine the priority of samples. Once the AOCs have been prioritized, an initial screening should be conducted in accordance with the following:

5.1 Initial Sampling Methods

5.1.1 Initial Air Sampling:

- For each AOC perform air sampling using the PID/FID, radiation detector and aerosol monitor. Collect air samples as follows:
  - Collect two air samples per instrument from each homogenous area under 900 square meters. A homogenous area is defined as an area where there is no significant deviation in area use, ground surface type, or building areas. Examples of homogenous areas are a pile of the same material, a warehouse area, a grassy field, or a manufacturing area inside a building where the processes are the same.
  - Collect two air samples per 900 square meters for homogenous areas greater than 900 square meters.
  - Collect an air sample in any area where an odor is present.
  - Collect an air sample in areas where building or ground surfaces are discolored.
  - Collect an air sample where flora or fauna is visibly stressed.

5.1.2 Initial Soil Sampling:

- For each AOC perform soil gas sampling using the PID/FID and soil sampling using the radiation detector and XRF. Perform soil gas sampling, radiation sampling and XRF sampling in accordance with Paragraph 5.1.1.2. Collect soil samples as follows:
- Collect two soil samples per instrument from each homogenous area under 900 square meters.
- Collect two soil samples per 900 square meters for homogenous areas greater than 900 square meters.

5.1.3 Initial Surface Water Sampling:

- Identify all potential sources of surface water contamination that may pose a risk to personnel and equipment.
- Collect one set of surface water samples from each identified stream, pit, lagoon, ditch, etc. identified.
- Collect each surface water sample in accordance with methods identified in Ground or Surface Water Contaminates/Analytes table located in Section 6 of this guide.
- The following is a complete list of target surface water analytes.
- Screening samples can be analyzed with the HACH water test kit.

5.1.4 Initial Drinking Water Sampling:

- Identify all potential drinking water sources
- Collect one set of drinking water samples from each potential drinking water source identified.
- Collect each drinking water sample in accordance with the methods identified in Drinking Water Contaminants/Analytes Table located in Appendix D of this guide.
- The following is a complete list of target drinking water analytes.
- In addition to the sampling methods listed above, initial field sampling of raw water sources can be testing in the field. Field analysis of the source water will be conducted with the Preventive Medicine Equipment Sets to determine whether the source is

treatable. Click on the following link for additional raw water field sampling methods and equipment.

- Screening samples can be analyzed with the HACH water test kit.

5.2 Description of Field Sampling Equipment

Direct reading instruments can be used to assess airborne hazards. Specific meters should be chosen based on the physical characteristics of the COC.

The hand held photoionization detector (PID) instrument is a very useful field-screening tool used to measure airborne volatile organic compounds (VOCs). The PID uses an ultra-violet lamp to ionize airborne VOC molecules taken into the instrument via an internal air pump. The lamp has an energy measured in electron volts. This energy level (which is generally 9.5, 10.2, 10.6 or 11.7 eV) would be compared to the ionization potential in Table 1 to determine whether or not the PID can ionize and thus measure the concentration of the VOC. The ionization energy must be less than or equal to the lamp energy. The performance of the instrument can be affected by high humidity, extreme temperatures, and the presence of methane. Click on the following link for a detailed description of the (PID) meter.

The hand held flame-ionization detector (FID) instrument is also a very useful field-screening tool also used to measure airborne volatile organic compounds (VOCs). The FID uses an internal hydrogen flame, which is supplied oxygen from the air via the internal air pump. The hydrogen is supplied via an internal compressed gas cylinder and the hydrogen must be very pure. The usefulness of the instrument can be affected by the concentration of oxygen in the air entering the instrument (air from a confined space may be oxygen deficient), extreme temperatures and chlorinated compounds can degrade the detector.

Useful information presented in the EHSA using both PID and FID results is as follows:

	FID<PID	FID=PID	FID>PID
PID 10.6 eV	Halogenated Aromatics	Aliphatic and Aromatic	Flammable Organics (Aromatic, Aliphatic)
PID 11.7 eV	Halogenated Aromatics and Alkanes	Aliphatic, Aromatic and Alkanes	Flammable Organics
PID 10.6ev<PID 11.7 eV	Halogenated Alkanes	Aliphatic and Alkanes	Flammable Alkanes
PID 10.6 > PID 11.7	Halogenated Aromatic	Aliphatic and Aromatic	Flammable Aromatic (Methane)

Colorimetric detector tubes can be very useful in the field to measure concentrations of VOCs, acid gases, toxic compounds etc. Once an airborne contaminant is identified, air can be drawn through a glass detector tube where a chemical reaction occurs and color staining indicates the concentration of the material. Limitations of colorimetric detector tubes include the ability of each tube being used only once, they are chemical specific and thus many tubes may be required, they have specific ranges which they are designed to measure and they can be adversely affected by heat (they may

need to be refrigerated). Additional limitations include interfering compounds, humidity, and false positives.

The X-ray fluorescence instrument uses a radioactive source to excite metals in solid media and can measure concentrations of select metals. Metals measured effectively with the XRF include Lead and Chromium. Air samples can be drawn through a filter and the filters can be effectively scanned with the XRF. Soil can be spread on a media such as a board and the soil can then be scanned as well. The instrument has very limited usefulness scanning soil in-situ.

Low flow air sampling pumps can be used to draw air through sorbent media which can be subsequently analyzed to determine time weighted average concentrations of various materials. Sorbent media are shown in Table 1. In addition, thermal desorption tubes can be used and they can be thermally desorbed in a forward deployed environment and a field GC/MS can be used to determine the concentrations and to identify unknown compounds. Click on the following link for a detailed description of the (GC/MS).

A field gas chromatograph (GC) can be used such as a capillary column unit which can effectively separate compounds, water, methane etc where they can then be measured with a detector (PID, FID, ECD, MS etc.).

Click on the following link to view detailed information regarding each piece of field sampling equipment listed above. Additionally, page two of the worksheet describes the contaminates each piece of equipment should be used to detect. Should further evaluation be necessary, procedures outlined in Section *6.0 Conducting Core Assessments* are provided. As environmental information is gathered in the field, it shall be entered into the GEMS (Theater Occupational module) database daily. This information shall include all medical, environmental, and disease threats.

6.0 Conducting Core Assessments – PAM Team

Core Assessments are conducted if data including visual evidence, human intelligence, Air Force intelligence information etc. has identified an environmental problem or concern that cannot be properly evaluated via the field screening procedures or where field screening procedures provide incomplete data. A core assessment may also be conducted when health effects are suspected and an environmental cause is suspected.

Core Assessments will be conducted by the PAM Team because of their analytical capabilities including a field GC/MS. If contaminant concentrations cannot be identified or ascertained by the GC/MS or other forward deployed laboratory means, samples must be collected and shipped to AFIOH for further analysis. All sample locations, and analysis data shall be recorded in the GEMS (Theater Occupational Module) database.

The Core Assessments are conducted as compound specific evaluations. These evaluations should only be conducted when screening and core assessments are incomplete. This level of the assessment can be accomplished by the PAM or a combination of the deployed unit utilizing a reach-back laboratory. Detailed sampling methods are contained via links in the following tables. The links can be clicked on and the full analytical methods can be accessed. Specific collection methods are also included and are also linked in the table. Simply clicking on the sampling methods will allow immediate access to the EPA collection procedures.

Soil Contaminants / Analytes

Analytical Category	Analytes	Sampling Methods
ICP Metals	EPA 6010	SW 846 Chapter 3
Hexavalent Chromium	EPA 7196	SW 846 Chapter 3
Mercury	EPA 7470/7471	SW 846 Chapter 3
Organic Lead	EPA 6010	SW 846 Chapter 3
Lead	EPA 6010	SW 846 Chapter 3
Priority Pollutant Metals	EPA 6010/7400	SW 846 Chapter 3
RCRA Metals (8)	EPA 6010/7400	SW 846 Chapter 3
Tributyl Tin	EPA 3520/3550	SW 846 Chapter 4
TPH/Diesel	EPA 8015	SW 846 Chapter 4
Creosote, Coal Tar	EPA 8270	SW 846 Chapter 4
PCB's	EPA 8082	SW 846 Chapter 4
Pentachlorophenol	EPA 8270	SW 846 Chapter 4
Phenols	EPA 8270	SW 846 Chapter 4
Phthalates	EPA 8270	SW 846 Chapter 4
Organochlorine Pesticides	EPA 8081/8082	SW 846 Chapter 4
Poly Aromatic Hydrocarbons	EPA 8270	SW 846 Chapter 4
Organophosphorus Pesticides	EPA 8270	SW 846 Chapter 4
Organoclorine Herbicides	EPA 8151	SW 846 Chapter 4
TPH/Gasoline	EPA 8015	SW 846 Chapter 4
BTEX	EPA 8020	SW 846 Chapter 4
MTBE	EPA 8020	SW 846 Chapter 4
Volatile Halogens	EPA 8260	SW 846 Chapter 4
Volatile Aromatics	EPA 8260	SW 846 Chapter 4
Volatile Organics	EPA 8260	SW 846 Chapter 4
Volatile Organics Extended List	EPA 8260	SW 846 Chapter 4

Ground or Surface Water Contaminants / Analytes

Analytical Category	Analytes	Sampling Methods
ICP Metals	EPA 6010	SW 846 Chapter 3
Hexavalent Chromium	EPA 7196	SW 846 Chapter 3
Mercury	EPA 7470/7471	SW 846 Chapter 3
Organic Lead	EPA 6010	SW 846 Chapter 3
Lead	EPA 6010	SW 846 Chapter 3
Priority Pollutant Metals	EPA 6010/7400	SW 846 Chapter 3
RCRA Metals (8)	EPA 6010/7400	SW 846 Chapter 3
Tributyl Tin	EPA 3520/3550	SW 846 Chapter 4
TPH/Diesel	EPA 8015	SW 846 Chapter 4
Creosote, Coal Tar	EPA 8270	SW 846 Chapter 4
PCB's	EPA 8082	SW 846 Chapter 4
Pentachlorophenol	EPA 8270	SW 846 Chapter 4
Phenols	EPA 8270	SW 846 Chapter 4
Phthalates	EPA 8270	SW 846 Chapter 4
Organochlorine Pesticides	EPA 8081/8082	SW 846 Chapter 4
Poly Aromatic Hydrocarbons	EPA 8270	SW 846 Chapter 4
Organophosphorus Pesticides	EPA 8270	SW 846 Chapter 4
Organoclorine Herbicides	EPA 8151	SW 846 Chapter 4
Semivolatile Organics	EPA 8270	SW 846 Chapter 4
TPH/Gasoline	EPA 8015	SW 846 Chapter 4
BTEX	EPA 8020	SW 846 Chapter 4
MTBE	EPA 8020	SW 846 Chapter 4
Volatile Halogens	EPA 8260	SW 846 Chapter 4
Volatile Aromatics	EPA 8260	SW 846 Chapter 4
Volatile Organics	EPA 8260	SW 846 Chapter 4
Volatile Organics Extended List	EPA 8260	SW 846 Chapter 4

In addition to the sampling methods listed above, initial field sampling of raw water sources can be testing in the field. Field analysis of the source water will be conducted with the Preventive Medicine Equipment Sets to determine whether the source is treatable. Click on the following link for additional raw water field sampling methods and equipment.

Air Contaminants / Analytes

CHEMICAL NAME	EPA SAMPLING METHOD	NIOSH SAMPLING METHOD
Acetaldehyde		XAD – 2 GC/FID
Acidamide		
Acetonitrile		Charcoal GC/FID
Acetophenone		
2-Acetylaminofluorene		None
Acrolein	TO-5	XAD – 2 GC/NPD
Acrylamide		Filter/silica gel GC/NPD
Acrylic acid		XAD – 2 HPLC/UVD
Acrylonitrile		Charcoal GC/FID
Allyl chloride		
4-Aminobiphenyl		Filter/silica gel GC/FID
Aniline	TO-17	Filter/silica gel GC/FID
o-Anisidine		XAD – 2 HPLC/UVD
Antimony compounds		Filter FAAS
Arsenic compounds		Filter HGAAS
Asbestos	56015-85-024	Filter/PCM
Benzene		Charcoal GC/FID
Benzidine		Filter/HPLC/UVD
Benzotrichloride		
Benzylchloride	IP-1B, TO-1 & TO-17	Charcoal GC/FID
Beryllium compounds		Filter GFAAS
Biphenyl		
Bis(2-ethylhexl)phthalate		
Bis(chloromethyl)ether		Impinger GC/ECD
Bromoform	TO-1	Charcoal tubes GC/FID
1,3-Butadiene	TO-17	Charcoal tubes GC/FID
Cadmium Compounds		Filter FAAS
Calcium Cyanamide		Filter/Gravimetric
Captan	TO-10	OSHA sampler HPLC/UVD
Carbaryl		OSHA sampler HPLC/UVD
Carbon Disulfide	EPA-0030, EPA-0031	Charcoal tubes GC/FPD
Carbon tetrachloride	TO-2	Charcoal tubes GC\FID
Carbonyl Sulfide		
Catechol		N/A
Chlordane	TO-4, TO-10	Filter/Chromosorb GC/Electrochemical Detector
Chlorine		Filter, Ion chromotography
Chloroacetic acid		
2-Chloroacetophenone		Tenax thermal desorp GC/FID
Chlorobenzene		Charcoal tubes GC/FID
Chlorobenzilate		
Chloroform	EPA-0030, EPA-0031, EPA-0040	Charcoal tubes GC/FID

CHEMICAL NAME	EPA SAMPLING METHOD	NIOSH SAMPLING METHOD
Chloromethyl methyl ether		Impinger GC/Electrochemical Detector
Chloroprene	EPA-0030, EPA-0031	Charcoal tube GC/FID
Chromium Compounds		
Cr		Filter FAAS
Cr II		Filter FAAS
Cr III		Filter FAAS
Cr VI		Filter VS
Cobalt Compound		Filter FAAS
Coke Oven Emissions		Filter OSHA Gravimetric
Cresols/Cresylic acid		XAD-7 GC/FID
o, m, p-cresols		XAD-7 GC/FID
Cumene		Charcoal tubes GC/FID
Cyanide Compounds		
2,4-D, salt and esters		
DDE		
Diazomethane		XAD-2 GC/FID
Dibenzofurans		
1,2-Dibromo-3-chloropropane		None
Dibutylphthalate		Filter GC/FID
1,4-Dichlorobenzene(p)	TO-1	Charcoal tube GC/FID
3,3- Dichlorobenzidene		Filter HPLC/UV
Dichloroethyl ether		Charcoal tube GC/FID
1,3-Dichloropropene	TO-17	None
Dichlorvos	IP-8, TO-10	XAD-2 GC/FPD
Diethanolamine		Impinger Ion chromatography
N,N-Diethyl aniline		
Diethyl sulfate		
3,3-Dimethoxybenzidine		Filter HPLC/UV
Dimethyl aminoazobenzene		G-Chromosorb tube GC/FID
3,3-Dimethyl benzidine		Filter HPLC/UV
Dimethyl carbamoyl chloride		N/A
Dimethyl formamide		Silica gel GC/FID
1,1-Dimethyl hydrazine		Bubbler, Visible spectrophotemetry
Dimethyl Phthalate		OSHA sampler HPLC/FID
Dimethyl sulfate		Porapak tube, GC/ECD
4,6-Dinitro-o-cresol		Filter/Bubbler HPLC/UV
2,4-Dinitrophenol		
2,4-Dinitrotoluene		
1,4-Dioxane	IP-1B	Charcoal tube GC/FID
1,2-Diphenylhydrazine		
Epichlorohydrin		Charcoal tube GC/FID
1,2-Ethoxybutane		
Ethyl acrylate	TO-17	Charcoal tube GC/FID
Ethyl benzene	IP-1B, TO-1, TO-17	Charcoal tube GC/FID
Ethyl carbamate		

CHEMICAL NAME	EPA SAMPLING METHOD	NIOSH SAMPLING METHOD
Ethyl chloride	TO-17	Charcoal tubes GC/FID
Ethylene dibromide	TO-1	Charcoal tube GC/ECD
Ethylene dichloride	EPA-0030, IP-1B	Charcoal tube GC/FID
Ethylene glycol		OSHA sampler GC/FID
Ethylene imine		Bubbler, HPLC/UV
Ethylene oxide		Charcoal tube GC/ECD
Ethylene thiourea		Filter Visible Spectrophotometry
Ethylene dichloride (1,1-Dichloroethane)		Charcoal tube GC/FID
Formaldehyde	TO-5, TO-11	Silica gel HPLC/UV
Glycol ethers		
Heptachlor	IP-8, TO-10	Chromosorb tube 102 GC/ED
Hexachlorobenzene		
Hexachlorobutadiene		XAD-2 GC/ED
Hexachlorocyclopentadiene		Porapak tube GC/ED
Hexachloroethane		Charcoal tube GC/FID
Hexamethylene-1,6-diisocyanate		Impinger HPLC/FD/ED
Hexamethyl phosphoramide		None available
Hexane	EPA-0030, EPA-0040, TO-17	Charcoal tube GC/FID
Hydrazine		Bubbler VS
Hydrochloric acid		Silica gel IC
Hydrogen fluoride		Silica gel IC
Hydroquinone		Filter HPLC/UVD
Isophorone		Charcoal tube GC/FID
Lead		Filter FAAS
Lindane	IP-8, TO-10	Filter GC/ECD
Maleic anhydride	TO-17	Bubbler HPLC/UVD
Manganese compounds		Filter ICP
Mercury compounds		Hopcalite AA cold
Methanol	TO-17	Silica gel GC/FID
Methoxychlor	TO-10	Filter GC/ECD
Methyl bromide		Charcoal tube GC/FID
Methyl Chloride		Charcoal tube GC/FID
Methyl chloroform	EPA-0030, TO-1, TO-2	Charcoal tube GC/FID
MEK		Carbon beads GC/FID
Methyl hydrazine		Bubbler VS
Methyl iodide	EPA-0030	Charcoal tube GC/FID
MIBK	TO-17	Charcoal tube GC/FID
Methyl isocyanate		XAD-7 tube HPLC/UVD/FD
Methyl methacrylate	TO-17	XAD-2 Tube GC/FID
Methyl tert butyl ether		
4,4 Methylenebis(2-chloraniline)		Filters GC/ECD
Methylene chloride		Charcoal tube GC/FID

CHEMICAL NAME	EPA SAMPLING METHOD	NIOSH SAMPLING METHOD
Methylene bisphenyl isocyanate		Impinger HPLC/FD/ED
4,4 Methylenedianiline		Filter HPLC/UVD/ECD
Mineral fibers		
Naphthalene	IP-7, TO-13	Charcoal tube GC/FID
Nickel compounds		Filter ICP
Nitrobenzene	TO-1	Filter GC/FID
4-Nitrophenyl		Filter Silica gel GC/FID
4-Nitrophenol		
2-Niropropane		Chromosorb tube 106 GC/FID
N-Nitroso-N-methylurea		
N-Nitrosodimethylamine		T-Sorb GC/FID
N-Nitrosomorpholine		
Parathion		OSHA sampler GC/FID
Pentachloronitrobenzene		
Pentachlorophenol	IP-8, TO-10	Filter/Bubbler HPLC/UVD
Phenol	TO-8, TO-17	XAD-7 Tube GC/FID
p-Phenylenediamine		Filter HPLC/UVD
Phosgene	TO-6	
Phosphine		Beaded carbon IC
Phosphorus		Tenax GC GC/FPD
Phthalic anhydride		Filter HPLC/UVD
Polychlorinated biphenyls		
Polychlic Organic Matter		
Propane sultone		None available
beta-Propiolactone		None available
Propionaldehyde		
Propoxur		OSHA sampler HPLC/UVD
Propylene dichloride		
Propylene Oxide		Charcoal tube GC/FID
Propyleneimine		None available
Quinoline		
Quinone		XAD-2 tube HPLC/UVD
Radionuclides		
Selenium compounds		Filter ICP
Styrene	TO-17	Charcoal tube GC/FID
Styrene oxide		
2,3,7,8-Tetrachloro-dibenso-p-dioxin	TO-9	None available
1,1,2,2-Tetrachloroethane	IP-1B	Charcoal tube GC/FID
Tetrachloroethylene	TO-17	Charcoal tube GC/FID
Titanium tetrachloride		
Toluene	EPA-0040, TO-1, TO-17	Charcoal tube GC/FID
2,4-Toluene diamine		
2,4-Toluene diisocyanate		Impinger HPLC/FD/ED
o-Toluidine		Filter Silica gel/GC/FID
Toxaphene		Filter GC/ED
1,2,4-Trichlorobenzene	TO-17	Filter/XAD-2 tube GC/ED

CHEMICAL NAME	EPA SAMPLING METHOD	NIOSH SAMPLING METHOD
1,1,2-Trichloroethane	IP-1B	Charcoal tube GC/FID
Trichloroethylene	EPA-0030, TO-1, TO-17	Charcoal tube GC/FID
2,4,5-Trichlorophenol		
2,4,6-Trichlorophenol		
Triethylamine		Bubbler GC/FID
Trifluralin		
2,2,4-Trimethylpentane		
Vinyl acetate		Carbon mol sieve GC/FID
Vinyl bromide	EPA-0040	Charcoal tube GC/FID
Vinyl chloride	TO-17, EPA-0040, TO-2	Charcoal tube GC/FID
Vinylidene chloride	EPA-0030, TO-17	Charcoal tube GC/FID
o-Xylene	TO-17	Charcoal tube GC/FID
m-Xylene	IP-1B	Charcoal tube GC/FID
p-Xylene	TO-1	Charcoal tube GC/FID

7.0 Minimum Skill Requirements

All Team Aerospace members must be fully trained to fully implement the EHSA. Specific training requirements are as follows:

7.1 Medical Global Reach Laydown Team and the Preventive Aerospace Medicine Team

The MGRL Team and PAM team will have to be trained to implement the following:

a. Requesting information from AFMIC concerning industries and industrial practices within a 20 mile radius, chemicals of concern, known industrial wastes, sources of radiation, common diseases and modes of transmission, condition of water and soil in the area, topography, general climate conditions, availability of electricity, availability of resources to procure locally.
b. Using and populating the EHSA,
c. Identifying and evaluating environmental anomalies and completing the EHSA Field Assessment Checklist,
d. Applications and Use of all monitoring equipment,
e. Limited repair and maintenance of field equipment (i.e. changing filters, effects of temperature and humidity etc),
f. Collecting environmental samples of all types of media (soil, water and air),
g. Decontaminating collection devices, equipment etc.,
h. Identify and assess Areas of Concern,
i. Interpreting environmental data, and
j. Establishing risk of environmental concerns to military personnel and accurately conveying that risk to the field Commander.

8.0 Team Responsibilities

This section outlines the operational responsibilities of the Team Aerospace (Flight Medicine, Bioenvironmental Engineering, & Public Health) medical experts typically from several different UTCs that will be initiating and implementing the environmental health site assessment. These will typically be from several different Unit Type Codes (UTCs).

In most cases, the AMC Medical Global Reach Laydown (MGRL) (UTC – FFGRL) teams will initiate the EHSA process. They will perform the "screening assessments". The Preventive Aerospace Medicine (PAM – FFGL2, FFGL3, & FFGL4) teams will accomplish the "core assessments." Since the PAM teams will have the bulk of the occupational & environmental baseline assessment data, they will be the overall EHSA owners and coordinators.

8.1 Medical Global Reach Laydown Team

The MGRL Team will typically be the first Team Aerospace medical experts arriving at a deployed location. The MGRL Team will initiate, implement and maintain the environmental health site assessment during its deployment.

- The MGRL Team will research information from AFMIC web site and contact them for additional information if time permits.
- The MGRL Team's EHSA equipment package will be identified, equipment calibrated, and stored along with MGRL Team UTCs equipment at the corresponding CONUS base.
- MGRL Team personnel will familiarize themselves with the EHSA guide.
- MGRL Team personnel will familiarize themselves with equipment and sampling techniques required for the EHSA.
- MGRL Team personnel will populate the GEMS (Theater Occupational Module) database with information obtained from AFMIC.
- MGRL Team personnel will review the EHSA Field Inspection Checklist.
- The MGRL Team will implement the EHSA protocol included in Section 5 of this document. Bed-down locations should have priority and the initial site health assessment information should be provided to the Commander As soon as possible after arriving on-site.
- The MGRL Team will typically remain at a deployed location until it is relieved by the PAM team (estimated time 30 days). Post deployment activities include:
- MGRL personnel shall decontaminate equipment and clothing to designated level (see AFI 48-148, Attachments 4 and 7 or host nation agreements)
- MGRL personnel shall confirm that the GEMS (Theater Occupational Module) database has been updated to include information obtained during deployment.
- MGRL personnel shall brief the PAM team on Areas of Concern and the level of investigation completed for each area. As part of this task the MGRL Team shall:
    - Prioritize investigation activities that remain to be completed;

- Identify and document data requests that have been made and their response status; and
- Identify any samples that have been sent off-site for which analytical results are pending.
- Provide the PAM team with an updated GEMS (Theater Occupational Module) database (which will have been sent back to the Command Bioenvironmental Engineer to facilitate planning and decision making).

8.2 Preventive Aerospace Medicine Team

The PAM team will typically be the team that relieves the MGRL Team. The PAM team will coordinate the transition, implement, maintain and finalize the EHSA for a deployment.

- The PAM Team's senior medical officer will request information form the MGRL Team. The Pam Team will research information from the AFMIC web site and contact them for additional information if time permits
- The PAM Team EHSA equipment package will be identified, equipment calibrated, and stored along with PAM Team UTCs equipment at the corresponding CONUS base. The PAM Team equipment package will be independent of the MGRL Team equipment package.
- The PAM Team personnel will familiarize themselves with the EHSA guide.
- The PAM Team personnel will familiarize themselves with equipment and sampling techniques required for the EHSA.
- The PAM team shall review existing GEMS (Theater Occupational Module) database and any additional information obtained from AFMIC.
- The PAM team shall review the EHSA Field Inspection Checklist.
- The PAM team shall coordinate the transition of the implementation of the EHSA protocol included in Section 5 of this document.
- The PAM team shall implement the EHSA protocol included in Section 5 of this document. Priority should be given to those Areas of Concern identified during the transition with MGRL Team that have the potential for greatest risk to deployed personnel.
- The PAM team shall consider, measure and evaluate both acute and chronic environmental stressors to reduce potential DNBI to military personnel.
- The PAM team will typically remain at a deployed location until evacuation from the deployed location is completed. Post deployment activities include:
- The PAM team shall confirm that the GEMS (Theater Occupational Module) database has been updated to include information obtained during deployment.
- The PAM team shall have completed the "core assessments".
- The PAM team shall coordinate any incomplete "detailed assessments" with the Command Bioenvironmental Engineer and enter the data into the EHSA database.

Appendix A

The following table provides physical data such as Vapor Pressures and Ionization Potential and the OELs, and target organs to aid the evaluator in choosing the correct sample collection or analysis method.

Chemical Name	OEL	IDLH	IP	VP	Measurement	Target Organs
Acetaldehyde	200ppm Ca	2000ppm	10.22	740 mm Hg	XAD – 2 GC/FID	Eyes, skin, respiratory system, kidneys, central nervous system, reproductive system
Acidamide						
Acetonitrile	20ppm	500 ppm	12.20	73 mm Hg	Charcoal GC/FID	Respiratory system, cardiovascular system, central nervous system, liver, kidneys
Acetophenone						
2-Acetylaminofluorene	- Ca	Ca	N/A	N/A	None	Liver, bladder, kidneys, pancreas, skin
Acrolein	0.1 ppm	2 ppm	10.13	210 mm Hg	XAD – 2 GC/NPD	Eyes, skin, respiratory system, heart
Acrylamide	0.3 mg/m3 skin	Ca - 60mg/m3	9.50	0.007 mm Hg	Filter/silica gel GC/NPD	Eyes, skin, central nervous system, peripheral nervous system, reproductive system
Acrylic acid	2ppm		N/A	3 mm Hg	XAD - 2 HPLC/UVD	Eyes, skin, respiratory system
Acrylonitrile	1 ppm	Ca - 85 ppm	10.91	83 mm Hg	Charcoal GC/FID	Eyes, skin, cardiovasular system, liver, kidneys, central nervous system
Allyl chloride						
4-Aminobiphenyl	Ca	Ca	N/A	1mm Hg (227F)	Filter/silica gel GC/FID	Bladder, skin
Aniline	5 ppm - Ca	Ca - 100ppm	7.70	0.6 mm Hg	Filter/silica gel GC/FID	Blood, cardiovascular system, eyes, liver, kidneys, respiratory system
o-Anisidine	0.5 mg/m3 - Ca	Ca - 50 mg/m3	7.44	<0.1 mm Hg	XAD - 2 HPLC/UVD	Blood, kidneys, liver, cardiovascular system, central nervous system
Antimony compounds	0.5 mg/m3	50 mg/m3	NA	N/A	Filter FAAS	Eyes, skin, respiratory system, cardiovascular system
Arsenic compounds	0.002 mg/m3 - Ca	Ca - 5 mg/m3	N/A	N/A	Filter HGAAS	Liver, kidneys, skin, lungs, lymphatic system
Asbestos	0.1 f/cc	Ca	N/A	N/A	Filter/PCM	respiratory system, eyes
Benzene	0.1 Ca	Ca - 500 ppm	9.24 ppm	75 mm Hg	Charcoal GC/FID	Eyes, skin, respiratory system, blood, central nervous system, bone marrow
Benzidine	Ca	Ca	N/A	Low	Filter/HPLC/UVD	Bladder, skin, kidneys, liver, blood
Benzotrichloride						
Benzylchloride	1 ppm	10 ppm	N/A	1 mm Hg	Charcoal GC/FID	Eyes, skin, respiratory system, central nervous system
Beryllium compounds	0.0005 mg/m3 - Ca	Ca - 4 mg/m3	N/A	N/A	Filter GFAAS	Eyes, skin, respiratory system
Biphenyl						
Bis(2-ethylhexl)phthalate						

Chemical Name	OEL	IDLH	IP	VP	Measurement	Target Organs
Bis(chloromethyl)ether	Ca	Ca	N/A	30 mm Hg (72F)	Impinger GC/ECD	Eyes, skin, respiratory system
Bromoform	0.5 ppm	850 ppm	10.48	5 mm Hg	Charcoal tubes GC/FID	Eyes, skin, respiratory system, central nervous system, liver, kidneys
1,3-Butadiene	1 ppm - Ca	Ca - 2000 ppm	9.07	2.4 atm	Charcoal tubes GC/FID	Eyes, respiratory system, central nervous system, reproductive system
Cadmium Compounds	0.005 mg/m3 - Ca	Ca - 9 mg/m3	N/A	N/A	Filter FAAS	Respiratory system, kidneys, blood
Calcium Cyanamide	0.5 ppm	N/D	N/A	N/A	Filter/Gravimetric	Eyes, skin, respiratory system, vasomotor system
Captan	5 mg/m3	Ca	N/A	N/A	OSHA sampler HPLC/UVD	Eyes, skin, respiratory system, gastrointestinal tract, liver, kidneys
Carbaryl	5 mg/m3	100 mg/m3	N/A	0.00004 mm Hg	OSHA sampler HPLC/UVD	Respiratory system, central nervous system, cardiovascular system, skin, blood cholinesterase, reproductive system
Carbon Disulfide	1 ppm	500 ppm	10.08	297 mm Hg	Charcoal tubes GC/FPD	Central nervous system, peripheral nervous system, cardiovascular system, eyes, kidneys, liver, skin, reproductive system
Carbon tetrachloride	2 ppm - Ca	Ca - 200 ppm	11.47	91 mm Hg	Charcoal tubes GC\FID	Central nervous system, eyes, lungs, liver, kidneys, skin
Carbonyl Sulfide						
Catechol	5 ppm	N/D	N/A	10 mm Hg (244F)	N/A	Eyes, skin, respiratory system, central nervous system, kidneys
Chlordane	0.5 mg/m3 - Ca	Ca - 100 mg/m3	?	0.00001 mm Hg	Filter/Chromosorb GC/Electrochemical Detector	Central nervous system, eyes, lungs, liver, kidneys
Chlorine	0.5 C	10 ppm	11.48	6.8 atm	Filter, Ion chromotography	Eyes, skin, respiratory system
Chloroacetic acid						
2-Chloroacetophenone	0.3 mg/m3	15 mg/m3	9.44	0.005 mm Hg	Tenax thermal desorp GC/FID	Eyes, skin, respiratory system
Chlorobenzene	75 ppm	1000 ppm	9.07	9 mm Hg	Charcoal tubes GC/FID	Eyes, skin, respiratory system, central nervous system, liver
Chlorobenzilate						
Chloroform	2 ppm	500 ppm - Ca	11.42	160 mm Hg	Charcoal tubes GC/FID	Liver, kidneys, heart, eyes, skin, central nervous system
Chloromethyl methyl ether	Ca	Ca	10.25	192 mm Hg (70F)	Impinger GC/Electrochemical Detector	Eyes, skin, respiratory system
Chloroprene	25 ppm skin (NIOSH Ca)	300 ppm	8.79	188 mm Hg	Charcoal tube GC/FID	Eyes, skin, respiratory system, reproductive system
Chromium Compounds						
Cr	0.5 mg/m3	250 mg/m3	N/A	N/A	Filter FAAS	Eyes, skin, respiratory system
Cr II	0.5 mg/m3	25 mg/m3	N/A	N/A	Filter FAAS	Eyes, skin

Chemical Name	OEL	IDLH	IP	VP	Measurement	Target Organs
Cr III	0.5 mg/m3	25 mg/m3	N/A	N/A	Filter FAAS	Eyes, skin
Cr VI	0.001 mg/m3 - Ca	Ca - 15 mg/m3	N/A	Very low	Filter VS	Blood, respiratory system, liver, kidneys, eyes, skin
Cobalt Compound	0.05 mg/m3	20 mg/m3	N/A	N/A	Filter FAAS	Skin, respiratory system
Coke Oven Emissions	0.5-0.7 mg/m3 - Ca	Ca - N.D.	N/A	N/A	Filter OSHA Gravimetric	Skin, respiratory system, urinary system
Cresols/Cresylic acid	2.3 ppm	250 ppm	8.93	0.29 mm Hg (77F)	XAD-7 GC/FID	Eyes, skin, respiratory system, central nervous system, liver, kidneys, pancreas, cardiovascular system
o, m, p-cresols	2.3 ppm	250 ppm	8.93 - 8.98	0.11 - 0.29	XAD-7 GC/FID	Eyes, skin, respiratory system, central nervous system, liver, kidneys, pancreas, cardiovascular system
Cumene	50 ppm skin	900 ppm (10% LEL)	8.75	8 mm Hg	Charcoal tubes GC/FID	Eyes, skin, respiratory system, central nervous system
Cyanide Compounds						
2,4-D, salt and esters						
DDE						
Diazomethane	0.2 ppm	2 ppm	9.00	>1 atm	XAD-2 GC/FID	Eyes, respiratory system
Dibenzofurans						
1,2-Dibromo-3-chloropropane	0.001 - Ca	Ca	?	0.8 mm Hg	None	Eyes, skin, respiratory system, central nervous system, liver, kidneys, spleen, reproductive system, digestive system
Dibutylphthalate	5 mg/m3	4000 mg/m3	?	0.00007 mm Hg	Filter GC/FID	Eyes, respiratory system, gastrointestinal tract
1,4-Dichlorobenzene(p)	75 ppm - Ca	150 ppm - Ca	8.98 ppm	1.3 mm Hg	Charcoal tube GC/FID	Liver, respiratory system, eyes, kidneys, skin
3,3- Dichlorobenzidene	Ca	Ca	?	?	Filter HPLC/UV	Bladder, liver, lung, skin, gastrointestinal tract
Dichloroethyl ether	5 ppm - Ca	100 ppm - Ca	?	0.7 mm Hg	Charcoal tube GC/FID	Eyes, respiratory system, liver
1,3-Dichloropropene	1 ppm - Ca	Ca	?	28 mm Hg	None	Eyes, skin, respiratory system, central nervous system, liver, kidneys
Dichlorvos	1 mg/m3 skin	100 mg/m3	?	0.01 mm Hg	XAD-2 GC/FPD	Eyes, skin, respiratory system, cariovascular system, central nervous system, blood cholinesterase
Diethanolamine	3 ppm	ND	?	<0.01 mm Hg	Impinger Ion chromatography	Eyes, skin, respiratory system
N,N-Diethyl aniline						
Diethyl sulfate						
3,3-Dimethoxybenzidine	Ca	Ca	?	?	Filter HPLC/UV	Skin, kidneys, liver, thyroid
Dimethyl aminoazobenzene	Ca	Ca	?	0.0000003 mm Hg	G-Chromosorb tube GC/FID	Skin, kidneys, liver, respiratory system, bladder
3,3-Dimethyl benzidine	Ca	Ca	?	?	Filter HPLC/UV	Eyes, respiratory system, liver, kidneys
Dimethyl carbamoyl chloride	Ca	Ca	?	?	N/A	Eyes, skin, respiratory system, liver
Dimethyl formamide	10 ppm skin	500 ppm	9.12	3 mm Hg	Silica gel GC/FID	Eyes, skin, respiratory system, liver, kidneys, cardiovascular system

Chemical Name	OEL	IDLH	IP	VP	Measurement	Target Organs
1,1-Dimethyl hydrazine	0.06 ppm skin	15 ppm - Ca	8.05	103 mm Hg	Bubbler, Visible spectrophotemetry	central nervous system, liver, gastrointestinal tract, blood, respiratory system, eyes, skin
Dimethyl Phthalate	5 mg/m3	2000 mg/m3	9.64	0.01 mm Hg	OSHA sampler HPLC/FID	Eyes, respiratory system, gastrointestinal tract
Dimethyl sulfate	0.1 ppm skin	7ppm - Ca	?	0.1 mm Hg	Porapak tube, GC/ECD	Eyes, skin, respiratory system, liver, kidneys, central nervous system
4,6-Dinitro-o-cresol	0.2 mg/m3 skin	5 mg/m3	?	0.00005 mm Hg	Filter/Bubbler HPLC/UV	Cardiovascular system, endocrine system
2,4-Dinitrophenol						
2,4-Dinitrotoluene						
1,4-Dioxane	1 ppm - Ca	500 ppm - Ca	9.13	29 mm Hg	Charcoal tube GC/FID	Eyes, skin, respiratory system, liver, kidneys
1,2-Diphenylhydrazine						
Epichlorohydrin	5 ppm - Ca	75 ppm - Ca	10.60	13 mm Hg	Charcoal tube GC/FID	Eyes, skin, respiratory system, kidneys, liver, reproductive system
1,2-Ethoxybutane						
Ethyl acrylate	25 ppm skin - Ca	300 ppm - Ca	10.30	29 mm Hg	Charcoal tube GC/FID	Eyes, skin, respiratory system
Ethyl benzene	100 ppm	800 ppm (10% LEL)	8.76	7 mm Hg	Charcoal tube GC/FID	Eyes, skin, respiratory system, central nervous system
Ethyl carbamate						
Ethyl chloride	1000 ppm	3800 ppm (10% LEL)	10.97	1000 mm Hg	Charcoal tubes GC/FID	Liver, kidneys, respiratory system, cardiovascular system, central nervous system
Ethylene dibromide	20 ppm	100 ppm - Ca	9.45	12 mm Hg	Charcoal tube GC/ECD	Eyes, skin, respiratory system, liver, kidneys, reproductive system
Ethylene dichloride	1 ppm - Ca	50 ppm - Ca	11.05	64 mm Hg	Charcoal tube GC/FID	Eyes, skin, kidneys, liver, central nervous system, cardiovascular system
Ethylene glycol		N/D	?	0.06	OSHA sampler GC/FID	Eyes, skin, respiratory system, central nervous system
Ethylene imine	Ca	100 ppm - Ca	9.20	160 mm Hg	Bubbler, HPLC/UV	Eyes, skin, respiratory system, liver, kidneys
Ethylene oxide	1 ppm	800 ppm - Ca	10.56	1.46 atm	Charcoal tube GC/ECD	Eyes, skin, respiratory system, liver, central nervous system, blood, kidneys, reproductive system
Ethylene thiourea	Ca	Ca	8.15	16 mm Hg	Filter Visible Spectrophotometry	Eyes, skin, thyroid, reproductive system
Ethylene dichloride (1,1-Dichloroethane)	100 ppm	3000 ppm	11.06	182 mm Hg	Charcoal tube GC/FID	Skin, liver, kidneys, lungs, central nervous system
Formaldehyde	0.75 ppm	20 ppm - Ca	10.88	>1 atm	Silica gel HPLC/UV	Eyes, respiratory system
Glycol ethers						
Heptachlor	0.5 mg/m3 Ca	35 mg/m3	-	0.0003 mmHg	Chromosorb tube 102 GC/ED	Central nervous system, liver
Hexachlorobenzene						
Hexachlorobutadiene	0.02 Ca	N.D.	-	0.2 mmHg	XAD-2 GC/ED	Eyes, skin, respiratory system, kidneys
Hexachlorocyclopentadiene	0.01 ppm	N.D.	-	0.08 mmHg	Porapak tube GC/ED	Eyes, skin, respiratory system, liver, kidneys

Chemical Name	OEL	IDLH	IP	VP	Measurement	Target Organs
Hexachloroethane	1 ppm Ca	300 ppm	11.22	0.2 mmHg	Charcoal tube GC/FID	Eyes, skin, respiratory system, kidneys
Hexamethylene-1,6-diisocyanate	0.005 ppm	N.D.	-	0.5 mmHg	Impinger HPLC/FD/ED	Eyes, skin, respiratory system
Hexamethyl phosphoramide	Ca	N.D.	-	0.03 mmHg	None available	Eyes, skin, respiratory system, central nervous system, gastrointestinal tract
Hexane	50 ppm	1100 ppm	10.18	124 mmHg	Charcoal tube GC/FID	Eyes, skin, respiratroy system, central nervous system, peripheral nervous system
Hydrazine	0.03 Ca	50 ppm	8.93	10 mmHg	Bubbler VS	Eyes, skin, respiratory system, central nervous system, liver, kidneys
Hydrochloric acid	5 ppm	50 ppm	12.74	40.5 atm	Silica gel IC	Eyes, skin respiratory system
Hydrogen fluoride	3 ppm	30 ppm	15.98	783 mmHg	Silica gel IC	Eyes, skin, respiratory system, bones
Hydroquinone	2 mg/m3	50 mg/m3	7.95	0.00001 mmHg	Filter HPLC/UVD	Eyes, skin, respiratory system, central nervous system
Isophorone	4 ppm	200 ppm	9.07 eV	0.3 mmHg	Charcoal tube GC/FID	Eyes, skin, respiratory system, central nervous system, liver, kidneys
Lead	0.050 mg/m3	100 mg/m3	NA	NA	Filter FAAS	Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue
Lindane	0.5 mg/m3	50 mg/m3	-	0.00001 mmHg	Filter GC/ECD	Eyes, skin, respiratory system, central nervous system, blood, liver, kidneys
Maleic anhydride	.25 ppm	10 mg/m3	9.90	0.2 mmHg	Bubbler HPLC/UVD	Eyes, skin, respiratory system
Manganese compounds	1 mg/m3	500 mg/m3	NA	NA	Filter ICP	Respiratory system, central nervous system, blood, kidneys
Mercury compounds	0.05 mg/m3	10 mg/m3	NA	0.0012 mmHg	Hopcalite AA cold	Eyes, skin, respiratory system, central nervous system, kidneys
Methanol	200 ppm	6000 ppm	10.84	96 mmHg	Silica gel GC/FID	Eyes, skin, respiratory system, central nervous system, gastrointestinal tract
Methoxychlor	15 mg/m3	5000 mg/m3	-	Very low	Filter GC/ECD	Central nervous system, liver, kidneys
Methyl bromide	20 ppm Ca	250 pm	10.54	1.9 atm	Charcoal tube GC/FID	Eyes, skin, respiratory system, central nervous system
Methyl Chloride	100 ppm Ca	2000 ppm	11.28	5.0 atm	Charcoal tube GC/FID	Central nervous system, liver, kidneys, reproductive system
Methyl chloroform	350 ppm	700 ppm	11.00	100 mmHg	Charcoal tube GC/FID	Eyes, skin, central nervous system, cardiovascular system, liver
MEK	200 ppm	3000 ppm	9.54	78 mmHg	Carbon beads GC/FID	Eyes, skin, respiratory system, central nervous system
Methyl hydrazine	0.04 ppm Ca	20 ppm	8.00	38 mmHg	Bubbler VS	Eyes, skin, respiratory system, central nervous system, liver, blood, cardiovascular system
Methyl iodide	2 ppm Ca	100 ppm	9.54	400 mHg	Charcoal tube GC/FID	Eyes, skin, respiratory system, central nervous system
MIBK	50 ppm	500 ppm	9.30	16 mmHg	Charcoal tube GC/FID	Eyes, skin, respiratory system, central nervous system, liver, kidneys
Methyl isocyanate	0.02 ppm	3 ppm	10.67	348 mmHg	XAD-7 tube HPLC/UVD/FD	Eyes, skin respiratory system

Chemical Name	OEL	IDLH	IP	VP	Measurement	Target Organs
Methyl methacrylate	100 ppm Ca	1000 ppm	9.70	29 mmHg	XAD-2 Tube GC/FID	Eyes, skin, respiratory system
Methyl tert butyl ether						
4,4 Methylenebis(2-chloraniline)	0.003 mg/m3 Ca	N.D.	-	0.00001 mmHg	Filters GC/ECD	Liver, blood, kidneys
Methylene chloride	25 ppm	2300 ppm	11.32	350 mmHg	Charcoal tube GC/FID	Eyes, skin, cardiovascular system, central nervous system
Methylene bisphenyl isocyanate	0.05 mg/m3	75 mg/m3	-	0.000005 mmHg	Impinger HPLC/FD/ED	Eyes, respiratroy system
4,4 Methylenedianiline	0.01 ppm Ca	N.D.	10.70	0.0000002 mmHg	Filter HPLC/UVD/ECD	Eyes, liver, cardiovascular system, spleen
Mineral fibers						
Naphthalene	10 ppm	250 ppm	8.12	0.08 mmHg	Charcoal tube GC/FID	Eyes, skin, blood, liver, kidneys, central nervous system
Nickel compounds	0.015 mg/m3	10 mg/m3	NA	NA	Filter ICP	Nasal cavities, lungs, skin
Nitrobenzene	1 ppm	200 ppm	9.92	0.3 mmHg	Filter GC/FID	Eyes, skin, blood, liver, kidneys, cardiovascular system, reproductive system
4-Nitrophenyl	Ca	N.D.	-	N/A	Filter Silica gel GC/FID	Bladder, blood
4-Nitrophenol						
2-Niropropane	25 ppm Ca	100 ppm	10.71	13 mmHg	Chromosorb tube 106 GC/FID	Eyes, skin, respiratory system, central nervous system, kidneys, liver
N-Nitroso-N-methylurea						
N-Nitrosodimethylamine	Ca	N.D.	8.69	3 mmHg	T-Sorb GC/FID	Liver, kidneys, lungs
N-Nitrosomorpholine						
Parathion	0.05 ppm	10 mg/m3	-	0.00004 mmHg	OSHA sampler GC/FID	Eyes, skin respiratory system, central nervous system, cardiovascular system, blood cholinesterase
Pentachloronitrobenzene						
Pentachlorophenol	0.5 ppm	2.5 mg/m3	N.A.	0.0001 mmHg	Filter/Bubbler HPLC/UVD	Eyes, skin, respiratory system, cardiovascular system, liver, kidneys, central nervous system
Phenol	5 ppm	250 ppm	8.50	0.4 mmHg	XAD-7 Tube GC/FID	Eyes, skin, respiratory system, liver, kidneys
p-Phenylenediamine	0.1 ppm	25 mg/m3	6.89	<1 mmHg	Filter HPLC/UVD	Respiratory system, skin
Phosgene	0.1 ppm	2 ppm	11.55	1.6 atm	XAD-2 tube GC/ND/PD	Eyes, skin, respiratory system
Phosphine	0.3 ppm	50 ppm	9.96	41.3 atm	Beaded carbon IC	Respiratory system
Phosphorus	0.1 mg/m3	5 mg/m3	-	0.03 mmHg	Tenax GC GC/FPD	Eyes, skin, respiratory system, liver, kidneys, jaw, teeth, blood
Phthalic anhydride	6 mg/m3	60 mg/m3	10.00	0.0015 mmHg	Filter HPLC/UVD	Eyes, skin, respiratory system, liver, kidneys
Polychlorinated biphenyls						
Polychlic Organic Matter						
Propane sultone	Ca	N.D.	-	-	None available	Eyes, skin respiratory system
beta-Propiolactone	Ca	N.D.	-	3 mmHg	None available	Kidneys, skin, lungs, eyes
Propionaldehyde						

Chemical Name	OEL	IDLH	IP	VP	Measurement	Target Organs
Propoxur	0.5 ppm	N.D.	-	0.000007 mmHg	OSHA sampler HPLC/UVD	Central nervous system, liver, kidneys, gastrointestinal tract, blood cholinesterase
Propylene dichloride						
Propylene Oxide	100 ppm Ca	400 ppm	9.81	445 mmHg	Charcoal tube GC/FID	Eyes, skin, respiratory system
Propyleneimine	2 ppm Ca	100 ppm	9.00	112 mmHg	None available	Eyes, skin
Quinoline						
Quinone	0.4 mg/m3	100 mg/m3	9.68	0.1 mmHg	XAD-2 tube HPLC/UVD	Eyes, skin
Radionuclides						
Selenium compounds	0.2 mg/m3	1 mg/m3	NA	0 mmHg	Filter ICP	Eyes, skin, respiratory system, liver, kidneys, blood, spleen
Styrene	50 ppm	700 ppm	8.40	5 mmHg	Charcoal tube GC/FID	Eyes, skin, respiratory system, central nervous system, liver, reproductive system
Styrene oxide						
2,3,7,8-Tetrachloro-dibenso-p-dioxin	Ca	N.D.	-	0.000002 mmHg	None available	Eyes, skin, liver, kidneys, reproductive system
1,1,2,2-Tetrachloroethane	1 ppm Ca	100 ppm	11.10	5 mmHg	Charcoal tube GC/FID	Skin, liver, kidneys, central nervous system, gastrointestinal tract
Tetrachloroethylene	100 ppm Ca	150 ppm	9.32	14 mmHg	Charcoal tube GC/FID	Eyes, skin, respiratory system, central nervous system, liver, kindeys
Titanium tetrachloride						
Toluene	100 ppm	500 ppm	8.82	21 mmHg	Charcoal tube GC/FID	Eyes, skin, respiratory system, central nervous system, liver, kindeys
2,4-Toluene diamine						
2,4-Toluene diisocyanate	0.02 ppm Ca	2.5 ppm	-	0.01 mmHg	Impinger HPLC/FD/ED	Eyes, skin, respiratory system
o-Toluidine	5 ppm Ca	50 ppm	7.44	0.3 mmHg	Filter Silica gel/GC/FID	Eyes, skin, blood, kidneys, liver, cardiovascular system
Toxaphene	0.5 mg/m3	200 mg/m3	-	0.4 mmHg	Filter GC/ED	Central nervous system. Skin
1,2,4-Trichlorobenzene	5 ppm Ca	N.D.	-	1 mmHg	Filter/XAD-2 tube GC/ED	Eyes, skin, respiratory system, liver, reproductive system
1,1,2-Trichloroethane	10 ppm Ca	100 ppm	11.00	19 mmHg	Charcoal tube GC/FID	Eyes, respiratory system, central nervous system, liver, kidneys
Trichloroethylene	Ca	1000 ppm	9.45	58 mmHg	Charcoal tube GC/FID	Eyes, skin, repiratory system, heart, liver, kidneys, central nervous system
2,4,5-Trichlorophenol						
2,4,6-Trichlorophenol						
Triethylamine	25 ppm	200 ppm	7.50	54 mmHg	Bubbler GC/FID	Eyes, skin, respiratory system, cardiovascular system, liver, kidneys
Trifluralin						
2,2,4-Trimethylpentane						

Chemical Name	OEL	IDLH	IP	VP	Measurement	Target Organs
Vinyl acetate	4 ppm	N.D.	9.19	83 mmHg	Carbon mol sieve GC/FID	Eyes, skin, respiratory system
Vinyl bromide	Ca	N.D.	9.80	1.4 atm	Charcoal tube GC/FID	Eyes, skin, central nervous system, liver
Vinyl chloride	1 ppm Ca	N.D.	9.99	3.3 atm	Charcoal tube GC/FID	Liver, central nervous system, blood, respiratory system, lymphatic system
Vinylidene chloride	Ca	N.D.	10.00	500 mmHg	Charcoal tube GC/FID	Eyes, skin, respiratory system, central nervous system, liver, kidneys
o-Xylene	100 ppm	900 ppm	8.56	7 mmHg	Charcoal tube GC/FID	Eyes, skin, respiratory system, central nervous system, liver, kidneys, blood, gastrointestinal tract
m-Xylene	100 ppm	900 ppm	8.56	9 mmHg	Charcoal tube GC/FID	Eyes, skin, respiratory system, central nervous system, liver, kidneys, blood, gastrointestinal tract
p-Xylene	100 ppm	900 ppm	8.56	9 mmHg	Charcoal tube GC/FID	Eyes, skin, respiratory system, central nervous system, liver, kidneys, blood, gastrointestinal tract

Appendix B

Drinking Water Contaminants / Analytes

Contaminant	Drinking Water Analytical Method	MCL or TT1(mg/L)2	Potential Health effects from exposure above the MCL	Common sources of contaminant in drinking water	Sample Collection Method
Microorganisms					
Cryptosporidium		TT 3	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and fecal animal waste	
	9221 A	Multiple-Tube Fermentation Technique for Members of the Coliform Group	Standard Methods for the Examination of Water and Wastewater, 18th & 19th Editions		
	9221 B	Standard Total Coliform Fermentation Technique	Standard Methods for the Examination of Water and Wastewater, 18th & 19th Editions		
	9221 C	Estimation of Bacterial Density	Standard Methods for the Examination of Water and Wastewater, 18th & 19th Editions		
Giardia lamblia		TT3	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	
	9221 A	Multiple-Tube Fermentation Technique for Members of the Coliform Group	Standard Methods for the Examination of Water and Wastewater, 18th & 19th Editions		
	9221 B	Standard Total Coliform Fermentation Technique	Standard Methods for the Examination of Water and Wastewater, 18th & 19th Editions		
	9221 C	Estimation of Bacterial Density	Standard Methods for the Examination of Water and Wastewater, 18th & 19th Editions		

Contaminant	Drinking Water Analytical Method	MCL or TT1(mg/L)2	Potential Health effects from exposure above the MCL	Common sources of contaminant in drinking water	Sample Collection Method
Heterotrophic plate count		TT3	HPC has no health effects; it is an analytic method used to measure the variety of bacteria that are common in water. The lower the concentration of bacteria in drinking water, the better maintained the water system is.	HPC measures a range of bacteria that are naturally present in the environment	
	9215 B	Heterotropic Plate Count by Pour Plate Method	Standard Methods for the Examination of Water and Wastewater, 18th & 19th Editions		
Legionella		TT3	Legionnaire's Disease, a type of pneumonia	Found naturally in water; multiplies in heating systems	
Total Coliforms (including fecal coliform and E. Coli)		5.0%4	Not a health threat in itself; it is used to indicate whether other potentially harmful bacteria may be present5	Coliforms are naturally present in the environment; as well as feces; fecal coliforms and E. coli only come from human and animal fecal waste.	
	9221 A	Multiple-Tube Fermentation Technique for Members of the Coliform Group	Standard Methods for the Examination of Water and Wastewater, 18th & 19th Editions		
	9221 B	Standard Total Coliform Fermentation Technique	Standard Methods for the Examination of Water and Wastewater, 18th & 19th Editions		
	9221 C	Estimation of Bacterial Density	Standard Methods for the Examination of Water and Wastewater, 18th & 19th Editions		
	9222 A	Membrane Filtration Technique for Members of the Coliform Group	Standard Methods for the Examination of Water and Wastewater, 18th & 19th Editions		
	9222 B	Standard Total Coliform Membrane Filter Procedure	Standard Methods for the Examination of Water and Wastewater, 18th & 19th Editions		
	9222 C	Delayed Incubation Total Coliform Procedure	Standard Methods for the Examination of Water and Wastewater, 18th & 19th Editions		

Contaminant	Drinking Water Analytical Method	MCL or TT1(mg/L)2	Potential Health effects from exposure above the MCL	Common sources of contaminant in drinking water	Sample Collection Method
Turbidity		TT3	Turbidity is a measure of the cloudiness of water. It is used to indicate water quality and filtration effectiveness (e.g., whether disease-causing organisms are present). Higher turbidity levels are often associated with higher levels of disease-causing microorganisms such as viruses, parasites and some bacteria. These organisms can cause symptoms such as nausea, cramps, diarrhea, and associated headaches.	Soil runoff	
	180.1	Turbidity, Nephelometric	Methods for the Determination of Inorganic Substances in Environmental Samples (EPA/600/R-93/100)		
	Method 2	Turbidity, Nephelometric.	Turbidity		
	2130 B	Turbidity, Nephelometric	Standard Methods for the Examination of Water and Wastewater, 18th & 19th Editions		
Viruses (enteric)		TT3	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	
	9222 A	Membrane Filtration Technique for Members of the Coliform Group	Standard Methods for the Examination of Water and Wastewater, 18th & 19th Editions		
	9222 B	Standard Total Coliform Membrane Filter Procedure	Standard Methods for the Examination of Water and Wastewater, 18th & 19th Editions		
	9222 C	Delayed Incubation Total Coliform Procedure	Standard Methods for the Examination of Water and Wastewater, 18th & 19th Editions		
Disinfection Byproducts					
Bromate		0.01	Increased risk of cancer	Byproduct of drinking water disinfection	
	317				317 rev 2
Chlorite		1	Anemia; infants & young children: nervous system effects	Byproduct of drinking water disinfection	

Contaminant	Drinking Water Analytical Method	MCL or TT1(mg/L)2	Potential Health effects from exposure above the MCL	Common sources of contaminant in drinking water	Sample Collection Method
	317				317 rev 2
Haloacetic acids (HAA5)		0.06	Increased risk of cancer	Byproduct of drinking water disinfection	
Total Trihalomethanes (TTHMs)		0.1	Liver, kidney or central nervous system problems; increased risk of cancer	Byproduct of drinking water disinfection	
Disinfectants					
Chloramines (as Cl2)		MRDL=4.01	Eye/nose irritation; stomach discomfort, anemia	Water additive used to control microbes	
Chlorine (as Cl2)		MRDL=4.01	Eye/nose irritation; stomach discomfort	Water additive used to control microbes	
Chlorine dioxide (as ClO2)		MRDL=0.81	Anemia; infants & young children: nervous system effects	Water additive used to control microbes	
Inorganic Chemicals					
Antimony		0.006	Increase in blood cholesterol; decrease in blood sugar	Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder	
	200.8	Trace Elements by ICP/Mass Spectrometry	Methods for the Determination of Metals in Environmental Samples Supplement 1 (EPA/600/R-94/111)		
	200.9	Trace Elements by Stabilized Temperature Graphite Furnace AA Spectrometry	Methods for the Determination of Metals in Environmental Samples Supplement 1 (EPA/600/R-94/111)		
Arsenic		0.01	Skin damage or problems with circulatory systems, and may have increased risk of getting cancer	Erosion of natural deposits; runoff from orchards, runoff from glass & electronicsproduction wastes	
	200.7	Metals and Trace Elements by ICP/Atomic Emission Spectrometry	Methods for the Determination of Metals in Environmental Samples Supplement 1 (EPA/600/R-94/111)		
	200.8	Trace Elements by ICP/Mass Spectrometry	Methods for the Determination of Metals in Environmental Samples Supplement 1 (EPA/600/R-94/111)		

Contaminant	Drinking Water Analytical Method	MCL or TT1(mg/L)2	Potential Health effects from exposure above the MCL	Common sources of contaminant in drinking water	Sample Collection Method
	200.9	Trace Elements by Stabilized Temperature Graphite Furnace AA Spectrometry	Methods for the Determination of Metals in Environmental Samples Supplement 1 (EPA/600/R-94/111)		
Asbestos		7 MFL	Increased risk of developing benign intestinal polyps	Decay of asbestos cement in water mains; erosion of natural deposits	
	100.1	Asbestos by Transmision Electron Microscopy	Analytical Method for the Determination of Asbestos Fibers in Water (EPA/600/4-83-043)		
	100.2	Asbestos by Transmision Electron Microscopy	Determination of Asbestos Structures Over 10 µm in Length in Drinking Water (EPA/600R-94/134)		
Barium		2	Increase in blood pressure	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits	
	200.7	Metals and Trace Elements by ICP/Atomic Emission Spectrometry	Methods for the Determination of Metals in Environmental Samples Supplement 1 (EPA/600/R-94/111)		
	200.8	Trace Elements by ICP/Mass Spectrometry	Methods for the Determination of Metals in Environmental Samples Supplement 1 (EPA/600/R-94/111)		
Beryllium		0.004	Intestinal lesions	Discharge from metal refineries and coal-burning factories; discharge from electrical, aerospace, and defense industries	
	200.7	Metals and Trace Elements by ICP/Atomic Emission Spectrometry	Methods for the Determination of Metals in Environmental Samples Supplement 1 (EPA/600/R-94/111)		
	200.8	Trace Elements by ICP/Mass Spectrometry	Methods for the Determination of Metals in Environmental Samples Supplement 1 (EPA/600/R-94/111)		

Contaminant	Drinking Water Analytical Method	MCL or TT1(mg/L)2	Potential Health effects from exposure above the MCL	Common sources of contaminant in drinking water	Sample Collection Method
	200.9	Trace Elements by Stabilized Temperature Graphite Furnace AA Spectrometry	Methods for the Determination of Metals in Environmental Samples Supplement 1 (EPA/600/R-94/111)		
Cadmium		0.005	Kidney damage	Corrosion of galvanized pipes; erosion of natural deposits; discharge from metal refineries; runoff from waste batteries and paints	
	200.7	Metals and Trace Elements by ICP/Atomic Emission Spectrometry	Methods for the Determination of Metals in Environmental Samples Supplement 1 (EPA/600/R-94/111)		
	200.8	Trace Elements by ICP/Mass Spectrometry	Methods for the Determination of Metals in Environmental Samples Supplement 1 (EPA/600/R-94/111)		
	200.9	Trace Elements by Stabilized Temperature Graphite Furnace AA Spectrometry	Methods for the Determination of Metals in Environmental Samples Supplement 1 (EPA/600/R-94/111)		
Chromium (total)		0.1	Allergic dermatitis	Discharge from steel and pulp mills; erosion of natural deposits	
	200.7	Metals and Trace Elements by ICP/Atomic Emission Spectrometry	Methods for the Determination of Metals in Environmental Samples Supplement 1 (EPA/600/R-94/111)		
	200.8	Trace Elements by ICP/Mass Spectrometry	Methods for the Determination of Metals in Environmental Samples Supplement 1 (EPA/600/R-94/111)		
	200.9	Trace Elements by Stabilized Temperature Graphite Furnace AA Spectrometry	Methods for the Determination of Metals in Environmental Samples Supplement 1 (EPA/600/R-94/111)		

Contaminant	Drinking Water Analytical Method	MCL or TT1(mg/L)2	Potential Health effects from exposure above the MCL	Common sources of contaminant in drinking water	Sample Collection Method
Copper		TT8;Action Level=1.3	Short term exposure: Gastrointestinal distress Long term exposure: Liver or kidney damage. People with Wilson's Disease should consult their personal doctor if the amount of copper in their water exceeds the action level	Corrosion of household plumbing systems; erosion of natural deposits	
	200.7	Metals and Trace Elements by ICP/Atomic Emission Spectrometry	Methods for the Determination of Metals in Environmental Samples Supplement 1 (EPA/600/R-94/111)		
	200.8	Trace Elements by ICP/Mass Spectrometry	Methods for the Determination of Metals in Environmental Samples Supplement 1 (EPA/600/R-94/111)		
	200.9	Trace Elements by Stabilized Temperature Graphite Furnace AA Spectrometry	Methods for the Determination of Metals in Environmental Samples Supplement 1 (EPA/600/R-94/111)		
Cyanide (as free cyanide)		0.2	Nerve damage or thyroid problems	Discharge from steel/metal factories; discharge from plastic and fertilizer factories	
	335.4	Total Cyanide by Semi-Automated Colorimetry	Methods for the Determination of Inorganic Substances in Environmental Samples (EPA/600/R-93/100)		
Fluoride		4	Bone disease (pain and tenderness of the bones); Children may get mottled teeth	Water additive which promotes strong teeth; erosion of natural deposits; discharge from fertilizer and aluminum factories	
	300	Inorganic Anions by Ion Chromatography	Methods for the Determination of Inorganic Substances in Environmental Samples (EPA/600/R-93/100)		300
Lead		TT8; Action Level=0.015	Infants and children: Delays in physical or mental development; children could show slight deficits in attention span and learning abilities. Adults: Kidney problems; high blood pressure	Corrosion of household plumbing systems; erosion of natural deposits	

Contaminant	Drinking Water Analytical Method	MCL or TT1(mg/L)2	Potential Health effects from exposure above the MCL	Common sources of contaminant in drinking water	Sample Collection Method
	200.8	Trace Elements by ICP/Mass Spectrometry	Methods for the Determination of Metals in Environmental Samples Supplement 1 (EPA/600/R-94/111)		
	200.9	Trace Elements by Stabilized Temperature Graphite Furnace AA Spectrometry	Methods for the Determination of Metals in Environmental Samples Supplement 1 (EPA/600/R-94/111)		
Mercury (inorganic)		0.002	Kidney damage	Erosion of natural deposits; discharge from refineries and factories; runoff from landfills and croplands	
	245.1	Mercury by Cold Vapor AA Spectrometry - Manual	Methods for the Determination of Metals in Environmental Samples Supplement 1 (EPA/600/R-94/111)		
	245.2	Mercury by Cold Vapor AA Spectrometry - Automated	Methods for Chemical Analysis of Water and Wastes (EPA/600/4-79/020)		
	200.8	Trace Elements by ICP/Mass Spectrometry	Methods for the Determination of Metals in Environmental Samples Supplement 1 (EPA/600/R-94/111)		
Nitrate (measured as Nitrogen)		10	Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits	
	300	Inorganic Anions by Ion Chromatography	Methods for the Determination of Inorganic Substances in Environmental Samples (EPA/600/R-93/100)		300
Nitrite (measured as Nitrogen)		1	Infants below the age of six months who drink water-containing nitrite in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits	

Contaminant	Drinking Water Analytical Method	MCL or TT1(mg/L)2	Potential Health effects from exposure above the MCL	Common sources of contaminant in drinking water	Sample Collection Method
	300	Inorganic Anions by Ion Chromatography	Methods for the Determination of Inorganic Substances in Environmental Samples (EPA/600/R-93/100)		300
Selenium		0.05	Hair or fingernail loss; numbness in fingers or toes; circulatory problems	Discharge from petroleum refineries; erosion of natural deposits; discharge from mines	
	200.8	Trace Elements by ICP/Mass Spectrometry	Methods for the Determination of Metals in Environmental Samples Supplement 1 (EPA/600/R-94/111)		
	200.9	Trace Elements by Stabilized Temperature Graphite Furnace AA Spectrometry	Methods for the Determination of Metals in Environmental Samples Supplement 1 (EPA/600/R-94/111)		
Thallium		0.002	Hair loss; changes in blood; kidney, intestine, or liver problems	Leaching from ore-processing sites; discharge from electronics, glass, and drug factories	
	200.8	Trace Elements by ICP/Mass Spectrometry	Methods for the Determination of Metals in Environmental Samples Supplement 1 (EPA/600/R-94/111)		
	200.9	Trace Elements by Stabilized Temperature Graphite Furnace AA Spectrometry	Methods for the Determination of Metals in Environmental Samples Supplement 1 (EPA/600/R-94/111)		
Organic Chemicals					
Acrylamide		TT9	Nervous system or blood problems; increased risk of cancer	Added to water during sewage/wastewater treatment	
Alachlor		0.002	Eye, liver, kidney or spleen problems; anemia; increased risk of cancer	Runoff from herbicide used on row crops	
	505	Organohalide Pesticides and PCBs by microextraction and GC	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		

Contaminant	Drinking Water Analytical Method	MCL or TT1(mg/L)2	Potential Health effects from exposure above the MCL	Common sources of contaminant in drinking water	Sample Collection Method
	507	Nitrogen- and Phosphorus-Containing Pesticides by GC with a Nitrogen Phosphorus Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	508.1	Chlorinated Pesticides, Herbicides and Organohalides by Liquid-Solid Extraction and GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	525.2	Organic Compounds by Liquid- Solid Extraction and Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
Atrazine		0.003	Cardiovascular system or reproductive problems	Runoff from herbicide used on row crops	
	505	Organohalide Pesticides and PCBs by microextraction and GC	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	507	Nitrogen- and Phosphorus-Containing Pesticides by GC with a Nitrogen Phosphorus Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	508.1	Chlorinated Pesticides, Herbicides and Organohalides by Liquid-Solid Extraction and GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	525.2	Organic Compounds by Liquid- Solid Extraction and Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		

Contaminant	Drinking Water Analytical Method	MCL or TT1(mg/L)2	Potential Health effects from exposure above the MCL	Common sources of contaminant in drinking water	Sample Collection Method
Benzene		0.005	Anemia; decrease in blood platelets; increased risk of cancer	Discharge from factories; leaching from gas storage tanks and landfills	
	502.2	VOCs by Purge and Trap Capillary GC with Photoionization and Electrolytic Conductivity Detectors in Series	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	524.2	Purgeable Organic Compounds by Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
Benzo(a)pyrene (PAHs)		0.0002	Reproductive difficulties; increased risk of cancer	Leaching from linings of water storage tanks and distribution lines	
	525.2	Organic Compounds by Liquid- Solid Extraction and Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	550	Polycyclic Aromatic Hydrocarbons (PAHs) by Liquid-Liquid Extraction and HPLC with Coupled UV and Fluorescence Detection	Methods for the Determination of Organic Compounds in Drinking Water Supplement I (EPA/600/4-90/020)		
	550.1	Polycyclic Aromatic Hydrocarbons (PAHs) by Liquid-Solid Extraction and HPLC with Coupled UV and Fluorescence Detection	Methods for the Determination of Organic Compounds in Drinking Water Supplement I (EPA/600/4-90/020)		
Carbofuran		0.04	Problems with blood, nervous system, or reproductive system	Leaching of soil fumigant used on rice and alfalfa	
	531.1				

Contaminant	Drinking Water Analytical Method	MCL or TT1(mg/L)2	Potential Health effects from exposure above the MCL	Common sources of contaminant in drinking water	Sample Collection Method
Carbon tetrachloride		0.005	Liver problems; increased risk of cancer	Discharge from chemical plants and other industrial activities	
	502.2	VOCs by Purge and Trap Capillary GC with Photoionization and Electrolytic Conductivity Detectors in Series	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	524.2	Purgeable Organic Compounds by Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	551.1	Chlorinated Disinfection By-Products and Chlorinated Solvents by Liquid-Liquid Extraction and GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
Chlordane		0.002	Liver or nervous system problems; increased risk of cancer	Residue of banned termiticide	
	505	Organohalide Pesticides and PCBs by microextraction and GC	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	508	Chlorinated Pesticides by GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	525.2	Organic Compounds by Liquid- Solid Extraction and Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	508.1	Chlorinated Pesticides, Herbicides and Organohalides by Liquid-Solid Extraction and GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		

Contaminant	Drinking Water Analytical Method	MCL or TT1(mg/L)2	Potential Health effects from exposure above the MCL	Common sources of contaminant in drinking water	Sample Collection Method
Chlorobenzene		0.1	Liver or kidney problems	Discharge from chemical and agricultural chemical factories	
	502.2	VOCs by Purge and Trap Capillary GC with Photoionization and Electrolytic Conductivity Detectors in Series	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	524.2	Purgeable Organic Compounds by Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
2,4-D		0.07	Kidney, liver, or adrenal gland problems	Runoff from herbicide used on row crops	
	515.1	Chlorinated Acids by GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water (EPA/600/4-88-039)		
Dalapon		0.2	Minor kidney changes	Runoff from herbicide used on rights of way	
	515.1	Chlorinated Acids by GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water (EPA/600/4-88-039)		
1,2-Dibromo-3-chloropropane (DBCP)		0.0002	Reproductive difficulties; increased risk of cancer	Runoff/leaching from soil fumigant used on soybeans, cotton, pineapples, and orchards	
	504.1	EDB, DBCP, and 1,2,3-Trichloropropane by microextraction and GC	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	551.1	Chlorinated Disinfection By-Products and Chlorinated Solvents by Liquid-Liquid Extraction and GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		

Contaminant	Drinking Water Analytical Method	MCL or TT1(mg/L)2	Potential Health effects from exposure above the MCL	Common sources of contaminant in drinking water	Sample Collection Method
o-Dichlorobenzene		0.6	Liver, kidney, or circulatory system problems	Discharge from industrial chemical factories	
	502.2	VOCs by Purge and Trap Capillary GC with Photoionization and Electrolytic Conductivity Detectors in Series	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	524.2	Purgeable Organic Compounds by Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
p-Dichlorobenzene		0.075	Anemia; liver, kidney or spleen damage; changes in blood	Discharge from industrial chemical factories	
	502.2	VOCs by Purge and Trap Capillary GC with Photoionization and Electrolytic Conductivity Detectors in Series	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	524.2	Purgeable Organic Compounds by Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
1,2-Dichloroethane		0.005	Increased risk of cancer	Discharge from industrial chemical factories	
	502.2	VOCs by Purge and Trap Capillary GC with Photoionization and Electrolytic Conductivity Detectors in Series	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	524.2	Purgeable Organic Compounds by Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
1,1-Dichloroethylene		0.007	Liver problems	Discharge from industrial chemical factories	

Contaminant	Drinking Water Analytical Method	MCL or TT1(mg/L)2	Potential Health effects from exposure above the MCL	Common sources of contaminant in drinking water	Sample Collection Method
	502.2	VOCs by Purge and Trap Capillary GC with Photoionization and Electrolytic Conductivity Detectors in Series	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	524.2	Purgeable Organic Compounds by Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
cis-1,2-Dichloroethylene		0.07	Liver problems	Discharge from industrial chemical factories	
	502.2	VOCs by Purge and Trap Capillary GC with Photoionization and Electrolytic Conductivity Detectors in Series	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	524.2	Purgeable Organic Compounds by Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
trans-1,2-Dichloroethylene		0.1	Liver problems	Discharge from industrial chemical factories	
	502.2	VOCs by Purge and Trap Capillary GC with Photoionization and Electrolytic Conductivity Detectors in Series	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	524.2	Purgeable Organic Compounds by Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
Dichloromethane		0.005	Liver problems; increased risk of cancer	Discharge from drug and chemical factories	

Contaminant	Drinking Water Analytical Method	MCL or TT1(mg/L)2	Potential Health effects from exposure above the MCL	Common sources of contaminant in drinking water	Sample Collection Method
	502.2	VOCs by Purge and Trap Capillary GC with Photoionization and Electrolytic Conductivity Detectors in Series	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	524.2	Purgeable Organic Compounds by Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
1,2-Dichloropropane		0.005	Increased risk of cancer	Discharge from industrial chemical factories	
	502.2	VOCs by Purge and Trap Capillary GC with Photoionization and Electrolytic Conductivity Detectors in Series	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	524.2	Purgeable Organic Compounds by Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
Di(2-ethylhexyl) adipate		0.4	General toxic effects or reproductive difficulties	Discharge from chemical factories	
	506	Phthalate and Adipate Esters by Liquid-Liquid or Liquid-Solid Extraction by GC with a Photoionization Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	525.2	Organic Compounds by Liquid- Solid Extraction and Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
Di(2-ethylhexyl) phthalate		0.006	Reproductive difficulties; liver problems; increased risk of cancer	Discharge from rubber and chemical factories	

Contaminant	Drinking Water Analytical Method	MCL or TT1(mg/L)2	Potential Health effects from exposure above the MCL	Common sources of contaminant in drinking water	Sample Collection Method
	506	Phthalate and Adipate Esters by Liquid-Liquid or Liquid-Solid Extraction by GC with a Photoionization Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	525.2	Organic Compounds by Liquid- Solid Extraction and Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
Dinoseb		0.007	Reproductive difficulties	Runoff from herbicide used on soybeans and vegetables	
	515.1	Chlorinated Acids by GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water (EPA/600/4-88-039)		
Dioxin (2,3,7,8-TCDD)		0.00000003	Reproductive difficulties; increased risk of cancer	Emissions from waste incineration and other combustion; discharge from chemical factories	
1613	1613				
Diquat		0.02	Cataracts	Runoff from herbicide use	
549.2	549.2	Diquat and Paraquat by Liquid- Solid Extraction and HPLC with a Photodiode Array UV Detector	Methods for the Determination of Organic and Inorganic Compounds in Drinking Water, Volume 1 (EPA 815-R-00-014)		
Endothall		0.1	Stomach and intestinal problems	Runoff from herbicide use	
548.1	548.1	Endothall by Ion Exchange Extraction, Acidic Methanol Methylation and GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water Supplement II (EPA/600/R-92/129)		
Endrin		0.002	Liver problems	Residue of banned insecticide	
	505	Organohalide Pesticides and PCBs by microextraction and GC	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		

Contaminant	Drinking Water Analytical Method	MCL or TT1(mg/L)2	Potential Health effects from exposure above the MCL	Common sources of contaminant in drinking water	Sample Collection Method
	508	Chlorinated Pesticides by GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	525.2	Organic Compounds by Liquid- Solid Extraction and Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
Epichlorohydrin		TT9	Increased cancer risk, and over a long period of time, stomach problems	Discharge from industrial chemical factories; an impurity of some water treatment chemicals	
	508.1	Chlorinated Pesticides, Herbicides and Organohalides by Liquid-Solid Extraction and GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	551.1	Chlorinated Disinfection By-Products and Chlorinated Solvents by Liquid-Liquid Extraction and GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
Ethylbenzene		0.7	Liver or kidneys problems	Discharge from petroleum refineries	
	502.2	VOCs by Purge and Trap Capillary GC with Photoionization and Electrolytic Conductivity Detectors in Series	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	524.2	Purgeable Organic Compounds by Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		

Contaminant	Drinking Water Analytical Method	MCL or TT1(mg/L)2	Potential Health effects from exposure above the MCL	Common sources of contaminant in drinking water	Sample Collection Method
Ethylene dibromide		0.00005	Problems with liver, stomach, reproductive system, or kidneys; increased risk of cancer	Discharge from petroleum refineries	
	504.1	EDB, DBCP, and 1,2,3-Trichloropropane by microextraction and GC	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	551.1	Chlorinated Disinfection By-Products and Chlorinated Solvents by Liquid-Liquid Extraction and GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
Glyphosate		0.7	Kidney problems; reproductive difficulties	Runoff from herbicide use	
	547	Glyphosphate by HPLC, Post Column Derivatization, and Fluorescence Detector	Methods for the Determination of Organic Compounds in Drinking Water Supplement I (EPA/600/4-90/020)		
Heptachlor		0.0004	Liver damage; increased risk of cancer	Residue of banned termiticide	
Heptachlor epoxide		0.0002	Liver damage; increased risk of cancer	Breakdown of heptachlor	
Hexachlorobenzene		0.001	Liver or kidney problems; reproductive difficulties; increased risk of cancer	Discharge from metal refineries and agricultural chemical factories	
	505	Organohalide Pesticides and PCBs by microextraction and GC	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	508	Chlorinated Pesticides by GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	508.1	Chlorinated Pesticides, Herbicides and Organohalides by Liquid-Solid Extraction and GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		

Contaminant	Drinking Water Analytical Method	MCL or TT1(mg/L)2	Potential Health effects from exposure above the MCL	Common sources of contaminant in drinking water	Sample Collection Method
	525.2	Organic Compounds by Liquid- Solid Extraction and Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	551.1	Chlorinated Disinfection By-Products and Chlorinated Solvents by Liquid-Liquid Extraction and GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
Hexachlorocyclopentadiene		0.05	Kidney or stomach problems	Discharge from chemical factories	
	505	Organohalide Pesticides and PCBs by microextraction and GC	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	508	Chlorinated Pesticides by GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	508.1	Chlorinated Pesticides, Herbicides and Organohalides by Liquid-Solid Extraction and GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	525.2	Organic Compounds by Liquid- Solid Extraction and Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	551.1	Chlorinated Disinfection By-Products and Chlorinated Solvents by Liquid-Liquid Extraction and GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		

Contaminant	Drinking Water Analytical Method	MCL or TT1(mg/L)2	Potential Health effects from exposure above the MCL	Common sources of contaminant in drinking water	Sample Collection Method
Lindane		0.0002	Liver or kidney problems	Runoff/leaching from insecticide used on cattle, lumber, gardens	
	505	Organohalide Pesticides and PCBs by microextraction and GC	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	508	Chlorinated Pesticides by GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	508.1	Chlorinated Pesticides, Herbicides and Organohalides by Liquid-Solid Extraction and GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	525.2	Organic Compounds by Liquid- Solid Extraction and Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	551.1	Chlorinated Disinfection By-Products and Chlorinated Solvents by Liquid-Liquid Extraction and GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
Methoxychlor		0.04	Reproductive difficulties	Runoff/leaching from insecticide used on fruits, vegetables, alfalfa, livestock	
	505	Organohalide Pesticides and PCBs by microextraction and GC	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	508	Chlorinated Pesticides by GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		

Contaminant	Drinking Water Analytical Method	MCL or TT1(mg/L)2	Potential Health effects from exposure above the MCL	Common sources of contaminant in drinking water	Sample Collection Method
	508.1	Chlorinated Pesticides, Herbicides and Organohalides by Liquid-Solid Extraction and GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	525.2	Organic Compounds by Liquid- Solid Extraction and Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	551.1	Chlorinated Disinfection By-Products and Chlorinated Solvents by Liquid-Liquid Extraction and GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
Oxamyl (Vydate)		0.2	Slight nervous system effects	Runoff/leaching from insecticide used on apples, potatoes, and tomatoes	
	531.1	N-Methylcarbamoyloximes and N-Methylcarbamates by HPLC with Post Column Derivatization	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
Polychlorinated biphenyls (PCBs)		0.0005	Skin changes; thymus gland problems; immune deficiencies; reproductive or nervous system difficulties; increased risk of cancer	Runoff from landfills; discharge of waste chemicals	
	508A	Screening for PCBs by Perchlorination and GC	Methods for the Determination of Organic Compounds in Drinking Water (EPA/600/4-88-039)		
Pentachlorophenol		0.001	Liver or kidney problems; increased cancer risk	Discharge from wood preserving factories	

Contaminant	Drinking Water Analytical Method	MCL or TT1(mg/L)2	Potential Health effects from exposure above the MCL	Common sources of contaminant in drinking water	Sample Collection Method
	515.1	Chlorinated Acids by GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water (EPA/600/4-88-039)		
Picloram		0.5	Liver problems	Herbicide runoff	
	515.1	Chlorinated Acids by GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water (EPA/600/4-88-039)		
Simazine		0.004	Problems with blood	Herbicide runoff	
	505	Organohalide Pesticides and PCBs by microextraction and GC	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	508	Chlorinated Pesticides by GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	508.1	Chlorinated Pesticides, Herbicides and Organohalides by Liquid-Solid Extraction and GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	525.2	Organic Compounds by Liquid- Solid Extraction and Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	551.1	Chlorinated Disinfection By-Products and Chlorinated Solvents by Liquid-Liquid Extraction and GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
Styrene		0.1	Liver, kidney, or circulatory system problems	Discharge from rubber and plastic factories; leaching from landfills	

Contaminant	Drinking Water Analytical Method	MCL or TT1(mg/L)2	Potential Health effects from exposure above the MCL	Common sources of contaminant in drinking water	Sample Collection Method
	502.2	VOCs by Purge and Trap Capillary GC with Photoionization and Electrolytic Conductivity Detectors in Series	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	524.2	Purgeable Organic Compounds by Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
Tetrachloroethylene		0.005	Liver problems; increased risk of cancer	Discharge from factories and dry cleaners	
	502.2	VOCs by Purge and Trap Capillary GC with Photoionization and Electrolytic Conductivity Detectors in Series	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	524.2	Purgeable Organic Compounds by Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
Toluene		1	Nervous system, kidney, or liver problems	Discharge from petroleum factories	
	502.2	VOCs by Purge and Trap Capillary GC with Photoionization and Electrolytic Conductivity Detectors in Series	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	524.2	Purgeable Organic Compounds by Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
Toxaphene		0.003	Kidney, liver, or thyroid problems; increased risk of cancer	Runoff/leaching from insecticide used on cotton and cattle	

Contaminant	Drinking Water Analytical Method	MCL or TT1(mg/L)2	Potential Health effects from exposure above the MCL	Common sources of contaminant in drinking water	Sample Collection Method
	505	Organohalide Pesticides and PCBs by microextraction and GC	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	508	Chlorinated Pesticides by GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	508.1	Chlorinated Pesticides, Herbicides and Organohalides by Liquid-Solid Extraction and GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	525.2	Organic Compounds by Liquid- Solid Extraction and Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
2,4,5-TP (Silvex)		0.05	Liver problems	Residue of banned herbicide	
	515.1	Chlorinated Acids by GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water (EPA/600/4-88-039)		
1,2,4-Trichlorobenzene		0.07	Changes in adrenal glands	Discharge from textile finishing factories	
502.4	502.4				
524.2	524.2	Purgeable Organic Compounds by Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
1,1,1-Trichloroethane		0.2	Liver, nervous system, or circulatory problems	Discharge from metal degreasing sites and other factories	
	502.2				
	524.2	Purgeable Organic Compounds by Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		

Contaminant	Drinking Water Analytical Method	MCL or TT1(mg/L)2	Potential Health effects from exposure above the MCL	Common sources of contaminant in drinking water	Sample Collection Method
	551.1	Chlorinated Disinfection By-Products and Chlorinated Solvents by Liquid-Liquid Extraction and GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
1,1,2-Trichloroethane		0.005	Liver, kidney, or immune system problems	Discharge from industrial chemical factories	
	502.2				
	524.2	Purgeable Organic Compounds by Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	551.1	Chlorinated Disinfection By-Products and Chlorinated Solvents by Liquid-Liquid Extraction and GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
Trichloroethylene		0.005	Liver problems; increased risk of cancer	Discharge from metal degreasing sites and other factories	
	502.2				
	524.2	Purgeable Organic Compounds by Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
	551.1	Chlorinated Disinfection By-Products and Chlorinated Solvents by Liquid-Liquid Extraction and GC with an Electron Capture Detector	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
Vinyl chloride		0.002	Increased risk of cancer	Leaching from PVC pipes; discharge from plastic factories	

Contaminant	Drinking Water Analytical Method	MCL or TT1(mg/L)2	Potential Health effects from exposure above the MCL	Common sources of contaminant in drinking water	Sample Collection Method
	502.4				
	524.2	Purgeable Organic Compounds by Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
Xylenes (total)		10	Nervous system damage	Discharge from petroleum factories; discharge from chemical factories	
	502.4				
	524.2	Purgeable Organic Compounds by Capillary Column GC/Mass Spectrometry	Methods for the Determination of Organic Compounds in Drinking Water-Supplement III (EPA/600/R-95-131)		
Radionuclides					
Alpha particles		15 picocuries per Liter (pCi/L)	Increased risk of cancer	Erosion of natural deposits of certain minerals that are radioactive and may emit a form of radiation known as alpha radiation	
Gross Alpha and Beta by Evaporation	EPA 900.0	Prescribed Procedures for Measurement of Radioactivity in Drinking Water (EPA/600/4-80-032) August 1980.			
Beta particles and photon emitters		4 millirems per year	Increased risk of cancer	Decay of natural and man-made deposits of certain minerals that are radioactive and may emit forms of radiation known as photons and beta radiation	
Gross Alpha and Beta by Evaporation	EPA 900.0	Prescribed Procedures for Measurement of Radioactivity in Drinking Water (EPA/600/4-80-032) August 1980.			

Contaminant	Drinking Water Analytical Method	MCL or TT1(mg/L)2	Potential Health effects from exposure above the MCL	Common sources of contaminant in drinking water	Sample Collection Method
Radium 226 and Radium 228 (combined)		5 pCi/L	Increased risk of cancer	Erosion of natural deposits	
Radium 226	EPA 903.1	Prescribed Procedures for Measurement of Radioactivity in Drinking Water (EPA/600/4-80-032)			
Radium 228	EPA 904.0	Prescribed Procedures for Measurement of Radioactivity in Drinking Water (EPA/600/4-80-032)			
Uranium		30 ug/L	Increased risk of cancer, kidney toxicity	Erosion of natural deposits	
Uranium	EPA 908.0	Prescribed Procedures for Measurement of Radioactivity in Drinking Water (EPA/600/4-80-032)			

Notes:
Maximum Contaminant Level (MCL) - The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology and taking cost into consideration. MCLs are enforceable standards.

Maximum Contaminant Level Goal (MCLG) - The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.
Maximum Residual Disinfectant Level (MRDL) - The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
Maximum Residual Disinfectant Level Goal (MRDLG) - The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.
Treatment Technique - A required process intended to reduce the level of a contaminant in drinking water.

[2] Units are in milligrams per liter (mg/L) unless otherwise noted. Milligrams per liter are equivalent to parts per million.

[3] EPA's surface water treatment rules require systems using surface water or ground water under the direct influence of surface water to (1) disinfect their water, and (2) filter their water or meet criteria for avoiding filtration so that the following contaminants are controlled at the following levels:

Cryptosporidium (as of1/1/02 for systems serving >10,000 and 1/14/05 for systems serving <10,000) 99% removal.
Giardia lamblia: 99.9% removal/inactivation
Viruses: 99.99% removal/inactivation

Legionella: No limit, but EPA believes that if *Giardia* and viruses are removed/inactivated, *Legionella* will also be controlled.

Turbidity: At no time can turbidity (cloudiness of water) go above 5 nephelolometric turbidity units (NTU); systems that filter must ensure that the turbidity go no higher than 1 NTU (0.5 NTU for conventional or direct filtration) in at least 95% of the daily samples in any month. As of January 1, 2002, turbidity may never exceed 1 NTU, and must not exceed 0.3 NTU in 95% of daily samples in any month.

HPC: No more than 500 bacterial colonies per milliliter.

Long Term 1 Enhanced Surface Water Treatment (Effective Date: January 14, 2005); Surface water systems or (GWUDI) systems serving fewer than 10,000 people must comply with the applicable Long Term 1 Enhanced Surface Water Treatment Rule provisions (e.g. turbidity standards, individual filter monitoring, Cryptosporidium removal requirements, updated watershed control requirements for unfiltered systems).

Filter Backwash Recycling; The Filter Backwash Recycling Rule requires systems that recycle to return specific recycle flows through all processes of the system's existing conventional or direct filtration system or at an alternate location approved by the state.

[4] more than 5.0% samples total coliform-positive in a month. (For water systems that collect fewer than 40 routine samples per month, no more than one sample can be total coliform-positive per month.) Every sample that has total coliform must be analyzed for either fecal coliforms or *E. coli* if two consecutive TC-positive samples, and one is also positive for *E.coli* fecal coliforms, system has an acute MCL violation.

[5] Fecal coliform and *E. coli* are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Disease-causing microbes (pathogens) in these wastes can cause diarrhea, cramps, nausea, headaches, or other symptoms. These pathogens may pose a special health risk for infants, young children, and people with severely compromised immune systems.

[6] Although there is no collective MCLG for this contaminant group, there are individual MCLGs for some of the individual contaminants:

Trihalomethanes: bromodichloromethane (zero); bromoform (zero); dibromochloromethane (0.06 mg/L). Chloroform is regulated with this group but has no MCLG.

Haloacetic acids: dichloroacetic acid (zero); trichloroacetic acid (0.3 mg/L). Monochloroacetic acid, bromoacetic acid, and dibromoacetic acid are regulated with this group but have no MCLGs.

[7] MCLGs were not established before the 1986 Amendments to the Safe Drinking Water Act. Therefore, there is no MCLG for this contaminant.

[8] Lead and copper are regulated by a Treatment Technique that requires systems to control the corrosiveness of their water. If more than 10% of tap water samples exceed the action level, water systems must take additional steps. For copper, the action level is 1.3 mg/L, and for lead is 0.015 mg/L.

[9] Each water system must certify, in writing, to the state (using third-party or manufacturer's certification) that when acrylamide and epichlorohydrin are used in drinking water systems, the combination (or product) of dose and monomer level does not exceed the levels specified, as follows:

Acrylamide = 0.05% dosed at 1 mg/L (or equivalent) Epichlorohydrin = 0.01% dosed at 20 mg/L (or equivalent)