KINGDOM OF BAHRAIN
FINAL GOVERNING STANDARDS

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Prepared by
U.S. Navy Central Command
United States Central Command

On behalf of
United States Central Command (USCENTCOM)

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FORWARD

This Department of Defense (DoD) Publication is issued under the authority and requirements of DoD Instruction (DoDI) 4715.5, "Management of Environmental Compliance at Overseas Installations," April 22, 1996. This Final Governing Standard (FGS) provides criteria, standards, and management practices for environmental compliance at DoD installations in the Kingdom of Bahrain. The FGS is derived from DoD 4715.05-G, "Overseas Environmental Baseline Guidance Document," dated May 2007.

To produce the FGS for the Kingdom of Bahrain, a comprehensive review of the host nation's environmental regulations was conducted. A review was also conducted of Gulf Cooperation Council (GCC) environmental requirements of which the Kingdom of Bahrain is a party. Furthermore, any treaty, convention, protocols, etc., of which the Kingdom of Bahrain may be a party to, were also reviewed. The regulatory analysis consisted of reviewing each regulation that included an environmental requirement, per the scope of the OEBGD. Thus, the Kingdom of Bahrain's occupational or industrial health and safety regulations were not addressed as they are not part of the 16 OEBGD chapters. Local regulations were not included as part of the regulatory review.

This FGS applies to the Office of the Secretary of Defense, the Military Departments, the Chairman of the Joint Chiefs of Staff, the Combatant Command, the Inspector General of the Department of Defense, the Defense Agencies, the DoD Field Activities, and all other organizational entities within the Department of Defense (hereafter referred to collectively as the "DoD Components") operating in the Kingdom of Bahrain.

This FGS is effective immediately and its use is mandatory by the DoD Components, pursuant to DoDI 4715.5. The Heads of the DoD Components may only issue supplementary instructions when deemed necessary to provide for unique requirements within their organizations.

FOR THE COMMANDER:

KARL R. HORST
Major General, U.S. Army
Chief of Staff

METHODOLOGY

Chapters 2-19 of the FGS include scope, definitions and criteria. Appendices and tables are also presented. The applicable Kingdom of Bahrain environmental regulations were compared to the May 2007 Overseas Environmental Baseline Guidance Document (OEBGD), and determinations were made as to whether an environmental regulation of the Kingdom of Bahrain was more or less stringent, equivalent to, or in addition to, the OEBGD standard. The more restrictive and additional standards were adopted in this FGS.

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REFERENCES

Department of Defense

(a) DoD Instruction 4715.5, "Management of Environmental Compliance at Overseas Installations," April 22, 1996
(b) Executive Order 12344, "Naval Nuclear Propulsion Program," February 1, 1982
(c) Section 7158 of title 42, United States Code
(d) Executive Order 12114, "Environmental Effects Abroad of Major Federal Actions," January 4, 1979
(e) DoD Instruction 4715.4, "Pollution Prevention," June 18, 1996
(f) DoD 8910.1-M, "DoD Procedures for Management of Information Requirements," June 30, 1998
(g) DoD Instruction 6050.05, "DoD Hazard Communication (HAZCOM) Program," August 15, 2006
(h) Defense Logistics Agency Instruction 4145.11, Army Technical Manual 38-410, Naval Supply Publication 573, Air Force Joint Manual 23-209, and Marine Corps Order 4450.12A, "Storage and Handling of Hazardous Materials," January 13, 1999
(i) Air Force Interservice Manual 24-204(I), Army Technical Order 3 8-250, Naval Supply Publication 505, Marine Corps Order P4030.19I, and Defense Logistics Agency Instruction 4145.3, Defense Contract Management Agency D1, Ch3.4 (HM24), "Preparing Hazardous Materials for Military Air Shipments," 15 April 2007, Incorporating Change 1, 4 May 2007.
(j) DoD 4160.21 -M, "Defense Materiel Disposition Manual," August 18, 1997, authorized by DoD 4140.1-R, "Department of Defense Materiel Management Regulation," January 25, 1993
(k) DoD Directive 4001.1, "Installation Management," September 4, 1986
(l) Naval Facility Manual of Operation-213, Air Force Regulation 9 1-8, and Army Technical Manual 5-634, "Solid Waste Management," May 1990
(m) DoD 4150.7-M, "DoD Pest Management Training and Certification," April 24, 1997
(n) Military Handbook 1 028/8A, "Design of Pest Management Facilities," November 1, 1991
(o) DoD Instruction 6055.1, "DoD Safety and Occupational Health (SOH) Program," August 19, 1998
(p) DoD Instruction 6055.5, "Industrial Hygiene and Occupational Health," January 10, 1989
(q) Section 2643 of title 15, United States Code
(r) Title 40, Code of Federal Regulations, Part 763, Subpart E, "Asbestos-Containing Materials in Schools," current edition
(s) DoD Instruction 4715.8, "Environmental Remediation for DoD Activities Overseas," February 2, 1998

CHAPTER 1

OVERVIEW

1.1 PURPOSE.

The primary purpose of these Final Governing Standards (FGS) is to provide-environmental compliance criteria at United States (U.S.) Department of Defense (DOD) installations in Bahrain. This document implements DOD Instruction 4715.5, "Management of Environmental Compliance at Overseas Installations," dated 22 April 1996, and is based upon DOD 4715.05-G, "Overseas Environmental Baseline Guidance Document" (OEBGD), dated 1 May 2007.

1.2 APPLICABILITY.

1.2.1. These FGS provide environmental compliance criteria applicable to actions for DOD Components at installations located in the Kingdom of Bahrain.

1.2.2. These FGS represent minimum criteria; DOD Components may impose additional criteria provided those policies and directives do not directly conflict with these FGS.

1.2.3. Activities and installations shall notify the Environmental Executive Agent (EEA), United States Central Command (US

1.2.4. CENTCOM), via the Lead Environmental Component (LEC), Commander Navy Region Europe Africa Southwest Asia (CNREURAFSWA), of any directly conflicting DOD Component policies or directives they discover prior to imposing criteria more protective than provided in these FGS.

1.2.5. DOD Components shall not enter into agreements with Bahrain authorities at any level that establishes a criterion for environmental compliance that contradicts those provided in these FGS without the prior written approval of the LEC.

1.3. EXEMPTIONS.

These FGS do not apply to:

1.3.1. DOD installations that do not have more than *de minimis* potential to affect the natural environment (e.g., offices whose operations are primarily administrative, including defense attaché offices, security assistance offices, foreign buying offices, and other similar organizations), or for which the DOD Components exercise control only on a temporary or intermittent basis.

1.3.2. Leased, joint use, and similar facilities to the extent that the DOD does not control the instrumentality or operation that a criterion seeks to regulate.

1.3.3. Operations of U.S. military vessels or the operations of U.S. military aircraft, or off installation operational and training deployments. Off-installation operational deployments include cases of hostilities, contingency operations in hazardous areas, and when U.S. forces are

operating as part of a multi-national force not under full control of the United States. Such excepted operations and deployments shall be conducted in accordance with applicable international agreements, other DOD Directives (DODDs) and DOD Instructions (DODIs), and environmental annexes incorporated into operation plans or operation orders. However, these FGS do apply to support functions for U.S. military vessels and U.S. military aircraft provided by the DOD Components, including management or disposal of off-loaded waste or material.

1.3.4. Facilities and activities associated with the Naval Nuclear Propulsion Program, which are covered under Executive Order (E.O.) 12344 "Naval Nuclear Propulsion Program," and conducted pursuant to 42 United States Code (U.S.C.) 7158.

1.3.5. The determination or conduct of remediation to correct environmental problems caused by the Department of Defense's past activities, conducted in accordance with DOD Instruction (DODI) 4715.8, "Environmental Remediation for DOD Activities Overseas.

1.3.6. Environmental analyses conducted under E.O. 12114, "Environmental Effects Abroad of Major Federal Actions."

1.4. DEFINITIONS.

For purposes of these FGS, unless otherwise indicated, the following definitions apply:

1.4.1. Criteria and Management Practices. Particular substantive provisions of the OEBGD that are used by the EEA to develop these FGS.

1.4.2. Existing Facility. Any facility and/or building, source, or project in use or under construction before 1 October 1994, unless it is subsequently substantially modified.

1.4.3. Final Governing Standards. A comprehensive set of country-specific substantive provisions, typically technical limitations on effluent, discharges, etc., or a specific management practice.

1.4.4. New Facility. Any facility and/or building, source, or projects with a construction start date on or after 1 October 1994, or a pre-existing facility that has been substantially modified since 1 October 1994.

1.4.5. Substantial Modification. Any modification to a facility and/or building the cost of which exceeds $1 million, regardless of funding source.

1.5. ADDITIONAL INFORMATION.

1.5.1. The DOD Components shall establish and implement an environmental audit program to ensure that overseas installations assess compliance with these FGS at least once every 3 years at all major installations.

1.5.2. DODI 4715.4, "Pollution Prevention," implements policy, assigns responsibility, and prescribes procedures for implementation of pollution prevention programs throughout the

DOD. As a matter of DOD policy, DODI 4715.4 should be consulted for particular requirements that apply to activities outside the United States. Pollution prevention should be considered in developing the criteria and management practices for these FGS. Where economically advantageous and consistent with mission requirements, pollution prevention shall be the preferred means for attaining compliance with these FGS.

1.5.3. Laboratory analyses necessary to implement these FGS would normally be conducted in a laboratory that has been certified by a U.S. or Bahrain regulatory authority for the applicable test method. In the absence of a certified laboratory, analyses may also be conducted at a laboratory that has an established reliable record of QA compliance with standards for the applicable test method that are generally recognized by appropriate industry or scientific organizations, such as ISO 17025.

1.5.4. These FGS do not create any rights or obligations enforceable against the United States, the DOD, or any of its components, nor does it create any standard of care or practice for individuals. Although these FGS refers to other DODDs and DODIs, it is intended only to coordinate the requirements of those directives as required to implement the policies found in DODI 4715.5. These FGS do not change other DOD or service directives or instructions, or alter DOD or service policies.

1.6. WAIVERS.

1.6.1. If compliance with the FGS at particular installations or facilities would seriously impair operations, adversely affect relations with Bahrain authorities, or require substantial expenditure of funds at an installation that has been identified for closure or at an installation that has been identified for a realignment that would remove the requirement, a DOD Component may ask the EEA, via the LEC, to waive the particular standard. See DOD Instruction 4715.5, “Management of Environmental Compliance at Overseas Installations”, and USCENTCOM Regulation 200-1, “Protection and Enhancement of Environmental Assets,” for complete waiver procedures.

1.7. APPROVALS.

1.7.1. Approval may be required to engage in activities that have the potential to affect the environment in Bahrain. Generally, activities that occur within the confines of the installation and do not affect the environment outside of the installation do not require approval. DoD Components shall not apply for approval directly from Bahrain authorities. DoD Components shall contact the LEC to determine approval requirements and coordinate with Bahrain representatives regarding activities that may require approval as indicated in these FGS. If the installation has a Bahrain Installation Commander (BIC), the U.S. Installation Commander or designated representative shall inform the BIC of activities that may require approval, keeping the LEC informed. If the BIC declines to engage regarding an approval, DOD Components shall contact the LEC to determine approval requirements.

1.7.2. If Bahrain approval specifies a more protective standard than prescribed in the FGS, the standard in the approval shall be the compliance standard. However, if an approval allows a less protective standard, then the FGS will be the compliance standard unless a waiver is obtained (see section 1.6).

1.7.3. Contractors performing work for DOD on DOD installations must comply with all Bahrain laws and regulations including obtaining all necessary licenses and approvals. Contracting services does not absolve DOD Components from compliance with these FGS unless exempted under section 1.3, Exemptions.

1.7.4. Certificates obtained from appropriate Bahrain authorities (e.g., tank tightness testing) do not fall within the definition of an approval process requiring the LEC. Request for services (e.g., inspections) shall be forwarded directly to the appropriate organizations without involving the LEC.

1.8. WORKING WITH THE LEC.

1.8.1. DOD Components shall consult with the LEC when specified in these FGS and when:

1.8.1.1. Significant exceedances of FGS or approval criteria occur

1.8.1.2. Bahrain enforcement action is initiated

1.8.1.3. An issue is raised that has the potential to affect multiple installations or military services

1.8.2. DOD Components shall notify the LEC when specified in these FGS and when:

1.8.2.1. Information is provided to BIC for activities requiring approval governed by these FGS.

1.8.2.2. BIC or other Bahrain official requests information.

1.8.2.3. Any Bahrain official requests access to an installation in order to conduct an environmental inspection.

1.8.3. The LEC, working with the notifying DOD Component, may determine that notification specified in these FGS is no longer required on a case-by-case basis.

1.9. ACCESS TO INSTALLATIONS BY BAHRAIN AUTHORITIES. Inspections and non-routine requests for information by Bahrain authorities shall be coordinated with the BIC (if designated for a facility) or the LEC and reported to the EEA via the Component chain-of-command. To the maximum extent possible, U.S. military personnel, rather than civilian personnel, shall lead the review of DOD Component activities by Bahrain authorities during the inspection.

1.10. LEAD ENVIRONMENTAL COMPONENT.

The LEC for these FGS is the Commander, Navy Region Europe Africa Southwest Asia. Any questions or comments pertaining to these FGS shall be sent to:

Commander, Navy Region Europe Africa Southwest Asia
PSC 817 Box 108
FPO AE 09622
DSN Voice (314) 626-2886
DSN FAX (314) 626-4341
Commercial +39 081-568-2886

Or to the Environmental LEC representative in Bahrain at:

Commander Navy Region Europe Africa Southwest Asia
Detachment Bahrain
Environmental Program
PSC 451 BOX 850
FPO AE 09834-2800
DSN Voice (318) 439-4603
DSN FAX (318) 439-3028
Commercial +973-1-785-4603

CHAPTER 2

AIR EMISSIONS

2.1. SCOPE

This Chapter contains standards for air emissions sources. Criteria addressing open burning of solid waste are contained in Chapter 7, "Solid Waste." Criteria addressing asbestos are contained in Chapter 15, "Asbestos."

2.2. DEFINITIONS

2.2.1. Coal Refuse. Waste products from coal mining, cleaning, and coal preparation operations (e.g., culm and gob) contain coal, matrix material, clay, and other organic and inorganic material.

2.2.2. Cold Cleaning Machine. Any device or piece of equipment that contains and/or uses liquid solvent, into which parts are placed to remove soil and other contaminants from the surfaces of the parts or to dry the parts. Cleaning machines that contain and use heated, non-boiling solvent to clean the parts are classified as cold cleaning machines.

2.2.3. Commercial and Industrial Solid Waste Incinerator (CISWI) Units. Any combustion device that combusts commercial and industrial waste in an enclosed device using controlled flame combustion without energy recovery that is a distinct operating unit of any commercial or industrial facility (including field-erected, modular, and custom incineration units operating with starved or excess air). CISWI units do NOT include Municipal Waste Combustor Units, Sewage Sludge Incinerators, Medical Waste Incinerators, and Hazardous Waste Combustion Units.

2.2.4. Controlled Substances. Chemicals (in both mixed and pure form) listed in Table 2.2.

2.2.5. De minimis. This term means that average person would regard an issue to be so minor that it is insignificant.

2.2.5. Fossil Fuel. Natural gas, petroleum, coal, and any form of solid, liquid, or gaseous fuel derived from such material for the purpose of creating useful heat.

2.2.6. Freeboard Ratio. The ratio of the solvent cleaning machine freeboard height to the smaller interior dimension (length, width, or diameter) of the solvent cleaning machine.

2.2.7. Hanging Inhalable Particles. Naturally hanging particles resulting from sand storms, forest fires, and volcanic activities, in addition to some industrial activities. They are classified according to size. Those between 0.1µm and 10µm are classified as hanging inhalable particles.

2.2.8. Hydrofluorocarbon (HFC). A compound consisting of hydrogen, fluorine, and carbon often used as a replacement for Ozone-Depleting Substances (ODS).

C2.2.9. Incinerator. Any furnace used in the process of burning solid or liquid waste for the purpose of reducing the volume of the waste by removing combustible matter, including equipment with heat recovery systems for either hot water or steam generation.

2.2.10. Most Appropriate Available Technique. The best standards, criteria, levels, and means available to prevent or reduce pollution from projects in the country and are defined by a specialized authority.

2.2.11. Motor Vehicle. Any commercially available vehicle that is not adapted to military use that is self-propelled and designed for transporting persons or property on a street or highway, including but not limited to, passenger cars, light duty vehicles, and heavy duty vehicles.

2.2.12. Municipal Waste Combustion (MWC) Units. Any equipment that combusts solid, liquid, or gasified municipal solid waste (MSW) including, but not limited to, field-erected MWC units (with or without heat recovery), modular MWC units (starved-air or excess-air), boilers (for example, steam generating units), furnaces (whether suspension-fired, grate-fired, mass-fired, air curtain incinerators, or fluidized bed-fired), and pyrolysis/combustion units. Municipal waste combustion units do NOT include pyrolysis or MWC units located at a plastics or rubber recycling unit, cement kilns that combust MSW, internal combustion engines, gas turbines, or other combustion devices that combust landfill gases collected by landfill gas collection systems.

2.2.13. Municipal Solid Waste (MSW). Household, commercial/retail, or institutional waste. Household waste includes material discarded from residential dwellings, hotels, motels, and other similar permanent or temporary housing. Commercial/retail waste includes material discarded by stores, offices, restaurants, warehouses, non-manufacturing activities at industrial facilities, and other similar establishments or facilities. Institutional waste includes materials discarded by schools, hospitals (non-medical), non-manufacturing activities at prisons and government facilities, and other similar establishments or facilities. Household, commercial/retail, and institutional waste does include yard waste and refuse-derived fuel. Household, commercial/retail, and institutional waste does not include used oil; sewage sludge; wood pallets; construction, renovation, and demolition wastes (which include railroad ties and telephone poles); clean wood; industrial process or manufacturing wastes; medical waste; or motor vehicles (including motor vehicle parts or vehicle fluff).

2.2.14. Ozone-Depleting Substances. Those substances listed in Tables 2.2 and 2.3.

2.2.15. Pathological Waste. Waste material consisting of only human or animal remains, anatomical parts, and/or tissue, the bags/containers used to collect and transport the waste material, and animal bedding (if applicable).

2.2.16. Perfluorocarbon (PFC). A compound consisting solely of carbon and fluorine often used as a replacement for ODS.

2.2.17. Process Heater. A device that is primarily used to heat a material to initiate or promote a chemical reaction in which the material participates as a reactant or catalyst.

2.2.18. Pyrolysis. The endothermic gasification of hospital waste and/or medical/infectious waste using external energy.

2.2.19. Stack. Any point in a source covered by criteria contained in 2.3.1., 2.3.2., 2.3.3., 2.3.4., or 2.3.5. designed to emit pollutants.

2.2.20. Steam/Hot Water Generating Unit. A device that combusts any fuel and produces steam or heats water or any other heat transfer medium. This definition does not include nuclear steam generators or process heaters.

2.2.21. Substantially-Modified. Any modification to a facility/building, the cost of which exceeds 377,100 BD ($1 million), regardless of funding source.

2.2.22. Vapor Cleaning Machine. A batch or in-line solvent cleaning machine that boils liquid solvent which generates solvent vapor that is used as a part of the cleaning or drying cycle.

2.3. CRITERIA

2.3.1. Steam/Hot Water Generating Units. The following standards apply to units that commenced construction on or after 1 October 1994 or that were substantially modified since 1 October 1994.

2.3.1.1. Air Emission Standards. The following criteria apply to units with a maximum design heat input capacity ≥ 3.0 MW or 10 million Btu/hr.

2.3.1.1.1. Steam/hot water generating units and associated emissions controls, if applicable, must be designed to meet the emission standards for specific sized units shown in Table 2.1. at all times.

2.3.1.1.2. For units combusting liquid or solid fossil fuels, fuel sulfur content (weight %) and higher heating value will be measured and recorded for each new shipment of fuel. Document compliance with the SO_2 limits using the limits in Table 2.1. Alternatively, install a properly calibrated and maintained continuous emissions monitoring system to measure the flue gas for SO_2 and either oxygen (O_2) or carbon dioxide (CO_2). Otherwise SO_2 shall be measured using the fluorescent method, or any other internationally-approved method.

2.3.1.2. Air Emissions Monitoring. Steam/hot water generating units subject to opacity or nitrogen oxides (NO_X) standards in Table 2.1, must have a properly calibrated and maintained continuous emissions monitoring system (CEMS) to measure the flue gas as follows:

2.3.1.2.1. For units with a maximum design heat input capacity > 9 MW (30 million Btu/hr): Opacity, except that CEMS is not required where gaseous or distillate fuels are the only fuels combusted.

2.3.1.2.2. For fossil fuel fired units with a maximum design heat input capacity > 30 MW (100 million Btu/hr): NO_X and either O_2 or CO_2.

2.3.2. Incinerators. The following requirements do not apply to incinerators combusting hazardous waste or munitions. Refer to Chapter 6, "Hazardous Waste," for information regarding hazardous waste disposal and incineration.

2.3.2.1. Commercial and Industrial Solid Waste Incinerators (CISWI). All CISWI units must comply with the applicable emission standards in Table 2.4. and operating limits in Table 2.5.

2.3.2.2. Municipal Waste Combustion (MWC) Units. Each MWC unit must comply with the applicable emission standards in Table 2.4. and operating limits in Table 2.5.

2.3.2.3. Sewage Sludge Incinerators. All sewage sludge incinerators that commenced construction on or after 1 October 1994 or that were substantially modified since 1 October 1994 and that burn more than 0.907 tons per day (tpd)) of sewage sludge or more than 10% sewage sludge, must also be designed to meet a particulate emission limit of 0.65 g/kg dry sludge (1.30 lb/ton dry sludge) and an opacity limit of 20% at all times, except during periods of startup, shut down, malfunction, or when emergency conditions exist.

2.3.2.4. Medical Waste Incinerators (MWI). The following standards apply to all units. These requirements do not apply to any portable units (field deployable), pyrolysis units, or units that burn only pathological, low-level radioactive waste, or chemotherapeutic waste. Refer to Chapter 8, "Medical Waste Management," for other requirements pertaining to medical waste management.

2.3.2.4.1. All MWI must be designed and operated according to the following good combustion practices (GCP):

2.3.2.4.1.1. Unit design: dual chamber.

2.3.2.4.1.2. Minimum temperature in primary chamber: ***760-871°C*** (1400-1600°F).

2.3.2.4.1.3. Minimum temperature in secondary chamber: ***982-1204°C*** (1800-2200°F).

2.3.2.4.1.4. Minimum residence time in the secondary chamber: 2 seconds.

2.3.2.4.1.5. Incinerator operators must be trained in accordance with applicable Service requirements.

2.3.2.4.1.6. Medical waste incinerators shall operate within the emission standards listed on Tables 2.6, 2.7, and 2.8.

2.3.3. Perchloroethylene (PCE) Dry Cleaning Machines. The following requirements apply to all dry cleaning machines. Chemicals listed on Table 2.2 shall NOT be used in dry cleaning and vapor degreasing activities.

2.3.3.1. Emissions from PCE dry cleaning machines installed before 1 October 1994 that use more than ***7,571 liters*** (2,000 gallons) per year of PCE (installation wide) in dry cleaning operations, must be controlled with a refrigerated condenser, unless a carbon absorber was already installed. The temperature of the refrigerated condenser must be maintained at ***7.2°C*** (45°F) or less. Dry cleaning machines and control devices must be operated according to manufacturer recommendations.

2.3.3.2. All PCE dry cleaning systems installed on or after 1 October 1994 must be of the dry-to-dry design with emissions controlled by a refrigerated condenser. The temperature of the refrigerated condenser must be maintained at ***7.2°C*** (45°F) or less. Dry cleaning machines and control devices must be operated according to manufacturer recommendations.

2.3.4. Chromium Electroplating and Chromium Anodizing Tanks. Electroplating and anodizing tanks must comply with one of the three methods below for controlling chromium emissions. Implement one of the following methods that are most appropriate to suit local conditions:

2.3.4.1. Option 1: Limit chromium emissions in the ventilation exhaust to 0.015 milligrams per dry standard cubic meter (mg/dscm). Control devices/methods must be operated according to manufacturer recommendations.

2.3.4.2. Option 2: Use chemical tank additives to prevent surface tension of the electroplating or anodizing bath from exceeding 45 dynes per centimeter (cm) as measured by a stalagmometer or 35 dynes/cm as measured by a tensiometer. Measure the surface tension prior to the first initiation of electric current on a given day and every 4 hours thereafter.

2.3.4.3. Option 3: Limit chromium emissions to the maximum allowable mass emission rate (MAMER) calculated using the following equation: MAMER = ETSA x K x 0.015 mg/dscm, where: MAMER = the alternative emission rate for enclosed hard chromium electroplating tanks in mg/hr; ETSA = the hard chromium electroplating tank surface area in square feet (ft^2); K = a conversion factor, 425 dscm/(ft^2-hr). Option 3 is ONLY applicable to hard chrome electroplating tanks equipped with an enclosing hood and ventilated at half the rate or less than that of an open surface tank of the same surface area.

2.3.5. Halogenated Solvent Cleaning Machines. These requirements apply to all solvent cleaning machines that use solvent which contains > 5 % by weight: methylene chloride (CAS No. 75-09-2), perchloroethylene (CAS No. 127-18-4), trichloroethylene (CAS No. 79-01-6), 1,1,1-trichloroethane (CAS No. 71-55-6), chloroform (CAS No. 67-66-3), or any combination of these halogenated solvents. The use of carbon tetrachloride (CAS No. 56-23-5) in any equipment or appliance is prohibited.

2.3.5.1. All cold cleaning machines (remote reservoir and immersion tanks) must be covered when not in use. Additionally, immersion type cold cleaning machines must have either a 2.54 cm (1-inch) water layer or a freeboard ratio of at least 0.75.

2.3.5.2. All vapor cleaning machines (vapor degreasers) must incorporate design and work practices which minimize the direct release of halogenated solvent to the atmosphere.

2.3.6. Units Containing ODS. The following criteria apply to direct atmospheric emissions of ODS, hydrofluorocarbons (HFC), and perfluorocarbons (PFC) from refrigeration equipment and ODS from fire suppression equipment. With regard to equipment containing controlled substances (Table 2.2), new equipment shall be prohibited from utilizing controlled substances, while existing equipment containing controlled substances shall comply with the gradual phase-out schedule. Contact the LEC to obtain the phase-out schedule and to obtain approval for laboratory and medical equipment exemptions.

2.3.6.1. Refrigerant Recovery/Recycling. All repairs, including leak repairs or services to appliances, industrial process refrigeration units, air conditioning units, or motor vehicle air conditioners, must be performed using commercially available refrigerant recovery/recycling equipment operated by trained personnel. Refrigerant technicians shall be trained in proper recovery/recycling procedures, leak detection, safety, shipping, and disposal in accordance with recognized industry standards or Bahraini equivalent.

2.3.6.2. Refrigerant Venting Prohibition. Any class I or class II ODS, HFC, and PFC refrigerant listed in Tables 2.2 and 2.3 shall not be intentionally released in the course of maintaining, servicing, repairing, or disposing of appliances, industrial process refrigeration units, air conditioning units, or motor vehicle air conditioners. *De minimis* releases associated with good faith attempts to recycle or recover ODS, HFC, and PFC refrigerants listed in ***Table 2.3*** are not subject to this prohibition.

2.3.6.3. Refrigerant Leak Monitoring and Repair. Monitor and repair refrigeration equipment for leakage in accordance with the following criteria and repair, if found to be leaking.

2.3.6.3.1. Commercial Refrigeration Equipment. Commercial refrigeration equipment normally containing > 22.70 kg (50 pounds) of refrigerant must have leaks repaired if the appliance is leaking at a rate such that the loss of refrigerant will exceed 35 % of the total charge during a 12-month period.

2.3.6.3.2. Industrial Process Refrigeration Equipment. Industrial process refrigeration equipment normally containing > 22.70 kg (50 pounds) of refrigerant must have leaks repaired if the appliance is leaking at a rate such that the loss of refrigerant will exceed 35% of the total charge during a 12-month period.

2.3.6.3.3. Comfort Cooling Appliances. Comfort cooling appliances normally containing > 22.70 kg (50 pounds) of refrigerant and not covered by subparagraphs 2.3.6.3.1. or 2.3.6.3.2. of this chapter must have leaks repaired if the appliance is leaking at a rate such that the loss of refrigerant will exceed 15 % of the total charge during a 12-month period.

2.3.6.4. ODS Fire Suppression Agent (Halon) Venting Prohibition. Halons listed in Tables 2.2 and 2.3 shall not be intentionally released into the environment while testing, maintaining, servicing, repairing, or disposing of halon-containing equipment or using such equipment for technician training. This venting prohibition does NOT apply to the following types of releases of halons listed in Table 2.3:

2.3.6.4.1. *De minimis* releases associated with good faith attempts to recycle or recover halons (i.e., release of residual halon contained in fully discharged total flooding fire extinguishing systems).

2.3.6.4.2. Emergency releases for the legitimate purpose of fire extinguishing, explosion, or other emergency applications for which the equipment or systems were designed.

2.3.6.4.3. Releases during the testing of fire extinguishing systems if each of the following is true: systems or equipment employing suitable alternative fire extinguishing agents are not available; release of extinguishing agent is essential to demonstrate equipment functionality; failure of system or equipment would pose great risk to human safety or the environment; and a simulant agent cannot be used.

2.3.7. Motor Vehicles. These criteria apply to DoD-owned motor vehicles as defined in paragraph 2.2.11.

2.3.7.1. All imported vehicles shall have a catalytic converter or equivalent form of emission control equipment.

2.3.7.*2*. All vehicles shall be inspected every two years to ensure that no tampering with factory-installed emission control equipment (catalytic converters or equivalent) has occurred.

2.3.7.*3*. If available on the local economy, use only unleaded gasoline in vehicles that are designed for this fuel.

2.3.7.4. Particulate emissions from diesel exhaust shall not exceed a concentration of 193 mg/m^3.

2.3.8. Stack Heights. H_g is the good engineering practice stack height necessary to minimize downwash of stack emissions due to aerodynamic influences from nearby structures.

2.3.8.1. Stacks shall be designed and constructed to heights at least equal to the largest H_g calculated from either of the following two criteria:

2.3.8.1.1. $H_g = H + 1.5L$, where H is the height of the nearby structure measured from the ground level elevation at the base of the stack, and L is the lesser of height or projected width of the nearby structure(s). A structure is determined to be nearby when the stack is located within 5L of the structure envelope but not greater than 0.8 km (0.5 mile). This calculation shall be performed for each structure nearby the stack being studied to determine the greatest H_g.

2.3.8.1.2. H_g is the height demonstrated by a fluid model or a field study, which ensures that the emissions from a stack do not result in maximum ground-level concentrations of any air pollutant as a result of atmospheric downwash, wakes, or eddy effects created by the source itself, nearby structures, or nearby terrain features at least 40 % in excess of the maximum ground-level concentrations of any air pollutant experienced in the absence of such atmospheric downwash, wakes, or eddy effects. For purposes of this paragraph, "nearby" means not greater than 0.8 km (0.5 mile), except that the portion of a terrain feature may be considered to be nearby which falls within a distance of up to 10 times the maximum height (H_t) of the feature, not to

exceed 3.2 km (2 miles) if such feature achieves a height (H_t) 0.8 km (0.5 mile) from the stack that is at least 40 % of the good engineering practice stack height determined by the formulae provided in 2.3.8.1.1. of this part or 26 meters (85 feet), whichever is greater, as measured from the ground-level elevation at the base of the stack. The height of the structure or terrain feature is measured from the ground-level elevation at the base of the stack.

2.3.9. Emissions Monitoring. The following monitoring requirements shall apply to all installations, including steam/ hot water generating units. These requirements do not apply to motor vehicles.

2.3.9.1. Air emissions monitoring shall be conducted on a quarterly basis and averaged over an 8 hour period. Monitoring can be conducted more frequently if instructed by the LEC.

2.3.9.2. Installations shall submit results of the analyses to the LEC within 15 days of conducting measurements, or as instructed by the LEC.

2.3.9.3. NOx shall be monitored through the chemiluminescent method, or through any other approved method.

2.3.9.4. Particulate matter shall be monitored through the Tapered Element Oscillating Membrane (TEOM) method, or through any other approved method.

2.3.9.5. . Installations releasing pollutants which do not conform to permissible limits may be granted a grace period of ten one month periods. Contact the LEC for grace period determination."

2.3.10. Emissions Reporting. Installations releasing air pollutant emissions to the environment shall maintain data forms for their stacks. Bahrain inspector requests to examine these forms should be coordinated through the LEC. Forms can be obtained through the LEC. Installations should also consult the LEC to determine the period of time the forms should be kept. The forms shall contain the following information:

2.3.10.1. Name of company/ owner of the source of emissions

2.3.10.2. Source of emissions

2.3.10.3. Type of pollutants released

2.3.10.4. Concentration of pollutants

2.3.10.5. Point of emissions

2.3.10.6. Temperature

2.3.10.7. Stack height

2.3.10.8. Stack diameter

2.3.10.9. Location of stack

2.3.10.10. Speed/ velocity

2.3.10.11. Rate of emission

2.3.11. Volatile Organic Compounds. Installations shall establish appropriate cleaning methods, a good maintenance system, and continual inspection and control procedures at points where vapor emissions are likely for any activities utilizing VOCs.

Table 2.1. Emission Standards for Fuel Combustion Sources

Fuel Source	Pollutants	Emission Limits (mg/Nm^3 unless otherwise specified) (for units with size 10 – 100 MMBtu/hr)[1]	Emission Limits (mg/Nm^3 unless otherwise specified) (for units with size >100MMBtu/hr)[1]
All Sources	Visible Emissions	20% Opacity	20% Opacity
	Carbon Monoxide (CO)	100	100
Oil Fuel (liquid)	Nitrogen Oxides (NO_x)	150	150
	Sulfur Dioxide (SO_2)	0.43lb/MMBtu	0.43lb/MMBtu
	Hanging Particles (PM)	100	100 for units with size <50MW or 171MMBtu/hr) 50 (for units with size equal to 50 MW or 171MMBtu/hr) 129 (for units with size >171MMBtu/hr)
Gas Fuel	Nitrogen Oxides (NO_x)	100	100
	Sulfur Dioxide (SO_2)	2.3 lb/MMBtu	2.3 lb/MMBtu
	Hydrogen Sulfide (H_2S)[2]	150ppm or $228mg/Nm^3$	150ppm or $228mg/Nm^3$
	Hanging Particles (PM)	0.1lb/MMBtu	0.1lb/MMBtu
Coal-Derived Gas Fuel	Nitrogen Oxides (NO_x)	-	645
	Hanging Particles (PM)	50	50
	Sulfur Dioxide (SO_2)	500	500
Solid Fossil Fuel	Nitrogen Oxides (NO_x)	-	852
	Sulfur Dioxide (SO_2)	1460	1460
	Hanging Particles	122	122
Other Solid Fuel	Hanging Particles	0.3 lb/MMBtu	0.2 lb/MMBtu

Notes:

1. Gases shall be under dry conditions, temperature 273K, Pressure 101.325kpa, 15% O_2 reference
2. If the % of H_2S in gas is greater than the standard, SO_2 shall be used to lower this limit.

Table 2.2. Controlled ODS in Bahrain

Groups	Common Product Name	Chemical Formula	Chemical Name Description [1]	CAS No.
Group I (CFCs)	CFC-11 (R11)	$CFCl_3$	Trichlorofluoromethane	75-69-4
	CFC-12 (R12)	CF_2Cl_2	Dichlorodifluoromethane	75-71-8
	CFC-113	$C_2F_3Cl_3$	1,1,2-Trichlorotrifluoroethane	76-13-1
	CFC-114	$C_2F_4Cl_2$	Dichlorotetrafluoroethane	76-14-2
	CFC-115	C_2F_5Cl	Monochloropentafluoroethane	76-15-3
Group II (Halons)	Halon 1211	CF_2BrCl	Bromochlorodifluoromethane	353-59-3
	Halon 1301	CF_3Br	Bromotrifluoromethane	75-63-8
	Halon 2402	$C_2F_4Br_2$	Dibromotetrafluoroethane	124-73-2
Group III Fully Halogenated Compounds	CFC-13	$CClF_3$	Chlorotrifluoromethane	75-72-9
	CFC-111	C_2Cl_5F	Pentachloro-2-fluoroethane	354-56-3
	CFC-112	$C_2Cl_4F_2$	Tetrachlorodifluoroethane	76-12-0
	CFC-211	C_3Cl_7F	Heptachlorofluoropropane	422-78-6
	CFC-212	$C_3F_2Cl_6$	Hexachlorodifluoropropane	3182-26-1
	CFC-213	$C_3Cl_5F_3$	Pentachlorotrifluoropropane	2354-06-5
	CFC-214	$C_3Cl_4F_4$	Tetrachlorotetrafluoropropane	29255-31-0
	CFC-215	$C_3Cl_3F_5$	Trichloropentafluoropropane	4259-43-2
	CFC-216	$C_3F_6Cl_2$	Dichlorohexafluoropropane	661-97-2
	CFC-217	C_3F_7Cl	Chloroheptafluoropropane	422-86-6
Group IV	-	CCl_4	Carbon Tetrachloride	56-23-5
Group V	-	CH_3Br	Methyl Bromide	74-83-9
	-	CH_3CCl_3	Methyl Chloroform	71-55-6
Group VI	-	HBFCs	Hydrobromofluorocarbons	-

Table 2.3. Additional Ozone Depleting Substances Controlled on DoD Installations

Class II			
HCFC – 21	HCFC – 133a	HCFC – 225cb	HCFC – 243
HCFC – 22	HCFC – 141b	HCFC – 226	HCFC – 244
HCFC – 31	HCFC – 142b	HCFC – 231	HCFC – 251
HCFC – 121	HCFC – 151	HCFC – 232	HCFC – 252
HCFC – 122	HCFC – 221	HCFC - 233	HCFC – 253
HCFC – 123	HCFC – 222	HCFC – 234	HCFC – 261
HCFC – 124	HCFC – 223	HCFC – 235	HCFC – 262
HCFC – 131	HCFC – 224	HCFC – 241	HCFC – 271
HCFC – 132b	HCFC – 225ca	HCFC – 242	

Table 2.4. Emission Standards for Incinerators

Pollutant	**Emission Standards[1]**				
Incinerator Type	**Existing MWC units[2]**		**MWC units that begin new construction or undergo substantial modification[2]**		**CISWI units**
Rated Capacity	**35-250 tpd**	**>250 tpd**	**35-250 tpd**	**>250tpd**	**All units**
Particulate	70 mg/dscm	27 mg/dscm	24 mg/dscm		70 mg/dscm
Opacity	10%		10%		10%
NO_x	N/A	See Note 3	500 ppmv	150 ppmv	388 ppmv
SO_2	50% reduction or 77 ppmv	75% reduction or 29 ppmv	80% reduction or 30 ppmv		20 ppmv
Dioxins/furans	125 ng/dscm	See Note 4	13 ng/dscm		0.41 ng/dscm
Cadmium	0.10 mg/dscm	0.040 mg/dscm	0.020 mg/dscm		0.004 mg/dscm
Lead	1.6 mg/dscm	0.44 mg/dscm	0.20 mg/dscm		0.04 mg/dscm
Mercury	85% reduction or 0.080 mg/dscm		85% reduction or 0.080 mg/dscm		0.47 mg/dscm
HCl	50% reduction or 250 ppmv	95% reduction or 29 ppmv	80% reduction or 30 ppmv	95% reduction or 25 ppmv	62 ppmv
Fugitive ash	5% of hourly observation period		5% of hourly observation period		N/A

Notes:

1 Emission standard concentrations (mg/dscm, ppmv) are corrected to 7% oxygen, dry basis at standard conditions. mg/dscm = milligram per dry standard cubic meter, ng = nanogram, ppm = parts per million.

2 Construction or modifications that were undertaken pursuant to existing (or previous) FGS are not subject to these requirements. These criteria are not intended to require retrofitting of MWC units.

3 NO_x limits for units rated > 250 tons/day (tpd) capacity: mass burn refractory-no limit; mass burn waterwall-205 ppmv; mass burn rotary waterwall: 250 ppmv; refuse-derived fuel combustor-250 ppmv; fluidized bed combustor-180 ppmv.

4 Dioxins/furans limits for units rated >250 tpd capacity: MWC with electrostatic precipitator (ESP)-60 ng/dscm; MWC with non-ESP-30 ng/dscm.

Table 2.5. Carbon Monoxide Operating Limits for Incinerators[1]

Incinerator Type	**Existing MWC units[2]**		**MWC units that begin new construction or undergo substantial modification[2]**		**CISWI units**
Rated Capacity	**35-250 tpd**	**>250 tpd**	**35-250 tpd**	**>250tpd**	**All units**
Fluidized bed	100 ppmv (4-hr avg)		100 ppmv (4-hr avg)		157 ppmv
Fluidized bed, mixed fuel (wood/refuse-derived fuel)	200 ppmv (24-hr avg)		200 ppmv (24-hr avg)	100 ppmv (4-hr avg)	
Mass burn rotary refractory	100 ppmv (4-hr avg)		100 ppmv (24-hr avg)		
Mass burn rotary waterfall	250 ppmv (24-hr avg)		100 ppmv (24-hr avg)		
Mass burn waterfall and refractory	100 ppmv (4-hr avg)		100 ppmv (4-hr avg)		
Mixed fuel-fired (pulverized coal/refuse-derived fuel)	150 ppmv (4-hr avg)		150 ppmv (4-hr avg)		
Modular starved-air and excess air	50 ppmv (4-hr avg)		50 ppmv (4-hr avg)		
Spreader stoker, mixed fuel-fired (coal/refuse-derived fuel)	200 ppmv (24-hr avg)		150 ppmv (24-hr avg)		
Stoker, refuse-derived fuel	200 ppmv (24-hr avg)		150 ppmv (24-hr avg)		

Notes:

1. Compliance is determined by continuous emission monitoring systems.
2. Construction or modifications that were undertaken pursuant to existing (or previous) FGS are not subject to these requirements. These criteria are not intended to require retrofitting of MWC units.

Table 2.6. Air Emission Standards for Medical Waste Incinerators with a Capacity > 1 Ton Per Hour

Pollutants	Limits (mg/m^3 unless otherwise specified)
Total Plankton particles [1]	30
Carbon Monoxide [1]	50
Carbon Dioxide [2]	300
Hydrogen Chloride [2]	30
Hydrogen Fluoride [2]	2
Nitric Oxide [2]	350
Organic Compounds[2]	20
Dioxins and Furans (In operating units with design capacity of > 50 kg/hour) [3]	1 ng TEV/m^3 Refer to Table No. 2.8
Cadmium and its compounds (referred to as Cadmium)[3]	0.1
Mercury and its compounds (referred to as Mercury) [3]	0.1
Other heavy metal and their compounds Referred to as Metal [total of each Pb (Lead) As (Arsenic), CR (Chrome)] [3]	0.1

Notes:
[1] Average daily values
[2] Measurement of emissions produced once every 6 months
[3] Measurement of emissions produced once every year
TEV means Total Equivalency Quantity (Toxic Equivalent). See Table 2.8.

Table 2.7. Air Emission Standards for Medical Waste Incinerators with a Capacity < 1 Ton Per Hour

Pollutants	Limits (mg/m^3 unless otherwise specified)
Total Plankton particles[1]	30
Carbon Monoxide[1]	50
Carbon Dioxide[2]	300
Hydrogen Chloride[2]	30
Organic Compounds[2]	20
Dioxins and Furans (In operating units with design capacity of > 50kg/hour)[3]	1 ng TEV/m^3 Refer to Table 2.8
Cadmium and its compounds (referred to as Cadmium)[3]	0.1
Mercury and its compounds (referred to as Mercury)[3]	0.1
Other heavy metal and their compounds Referred to as Metal [total of each Pb (Lead) As (Arsenic), CR (Chrome)] [3]	0.1

Notes:
[1] Average daily values
[2] Measurement of emissions produced once every 6 months
[3] Measurement of emissions produced once every year
TEV means Total Equivalency Quantity (Toxic Equivalent). See Table 2.8.

Table 2.8. Dioxins and Furans

Chemical Substance(s)	Equation Value/ Factor
2, 3, 7, 8, Tetrachlorapitrodioxin	1.0
1, 2, 3, 7, 8, Pentachlorapitrodioxin	0.5
1, 2, 3, 4, 7, 8, Hexachlorapitrodioxin	0.1
1, 2, 3, 7, 8, 9, Hexachlorapitrodioxin	0.1
1, 2, 3, 6, 7, 8, Hexachlorapitrodioxin	0.1
1, 2, 3, 4, 6, 7, 8, Heptachlorapitrodioxin	0.01
Octachlorapitrodioxin	0.001
2, 3, 7, 8, Tetrachlorapitrodioxin Furan	0.1
2, 3, 4, 7, 8, Pentachlorapitrodioxin Furan	0.5
1, 2, 3, 7, 8, Pentachlorapitrodioxin Furan	0.05
1, 2, 3, 4, 7, 8, Hexachlorapitrodioxin Furan	0.1
1, 2, 3, 7, 8, 9, Hexachlorapitrodioxin Furan	0.1
1, 2, 3, 6, 7, 8, Hexachlorapitrodioxin Furan	0.1
2, 3, 4, 6, 7, 8, Hexachlorapitrodioxin Furan	0.1
1, 2, 3, 4, 6, 7, 8, Heptachlorapitrodioxin Furan	0.01
1, 2, 3, 4, 5, 8, 9, Heptachlorapitrodioxin Furan	0.01
Octachlorapitrodioxin Furan	0.001

Notes:
TEV means Total Equivalency Quantity (Toxic Equivalent), being the sum total of the concentrations of each of the dioxin and furan compounds specified in the first column of this table multiplied by their corresponding factor specified in the second column. TEV = Σ (TEF x Concentration) for each type of Dioxin/Furan.
TEV for all dioxins and furans shall not exceed 1ng TEV/m^3.

CHAPTER 3

DRINKING WATER

3.1. SCOPE

This Chapter contains criteria for providing potable water.

3.2. DEFINITIONS

3.2.1. Action Level. The concentration of a substance in water that establishes appropriate treatment for a water system.

3.2.2. Appropriate DoD Medical Authority. The medical professional designated by the in-theater DoD Component commander to be responsible for resolving medical issues necessary to provide safe drinking water at the DoD Component's installations.

3.2.3. Concentration/Time (CT). The product of residual disinfectant concentration, C, in milligrams per liter (mg/L) determined before or at the first customer, and the corresponding disinfectant contact time, T, in minutes. CT values appear in Tables C3.T11. through C3.T24.

3.2.4. Conventional Treatment. Water treatment, including chemical coagulation, flocculation, sedimentation, and filtration.

3.2.5. Diatomaceous Earth Filtration. A water treatment process of passing water through a precoat of diatomaceous earth deposited onto a support membrane while additional diatomaceous earth is continuously added to the feed water to maintain the permeability of the precoat, resulting in substantial particulate removal from the water.

3.2.6. Direct Filtration. Water treatment, including chemical coagulation, possibly flocculation, and filtration, but not sedimentation.

3.2.7. Disinfectant. Any oxidant, including but not limited to, chlorine, chlorine dioxide, chloramines, and ozone, intended to kill or inactivate pathogenic microorganisms in water.

3.2.8. DoD Water System. A public or non-public water system.

3.2.9. Emergency Assessment. Evaluation of the susceptibility of the water source, treatment, storage and distribution system(s) to disruption of service caused by natural disasters, accidents, and sabotage.

3.2.10. First Draw Sample. A one-liter sample of tap water that has been standing in plumbing at least six hours and is collected without flushing the tap.

3.2.11. Haloacetic Acids. The sum of the concentrations in milligrams per liter of the haloacetic acid compounds (monochloroacetic acid, dichloroacetic acid, trichloroacetic acid,

monobromoacetic acid, and dibromoacetic acid), rounded to two significant figures after addition.

3.2.12. Groundwater Under the Direct Influence of Surface Water (GWUDISW). Any water below the surface of the ground with significant occurrence of insects or other microorganisms, algae, or large diameter pathogens such as *Giardia lamblia*; or significant and relatively rapid shifts in water characteristics, such as turbidity, temperature, conductivity, or pH, which closely correlate to climatological or surface water conditions.

3.2.13. Lead-free. A maximum lead content of 0.2% for solder and flux, and 8.0% for pipes and fittings.

3.2.14. Lead Service Line. A service line made of lead that connects the water main to the building inlet, and any lead pigtail, gooseneck, or other fitting that is connected to such line.

3.2.15. Maximum Contaminant Level (MCL). The maximum permissible level of a contaminant in water that is delivered to the free-flowing outlet of the ultimate user of a public water system except for turbidity for which the maximum permissible level is measured after filtration. Contaminants added to the water under circumstances controlled by the user, except those resulting from the corrosion of piping and plumbing caused by water quality, are excluded.

3.2.16. Maximum Residual Disinfectant Level (MRDL). The level of a disinfectant added for water treatment measured at the consumer's tap, which may not be exceeded without the unacceptable possibility of adverse health effects.

3.2.17. Point-of-Entry (POE) Treatment Device. A treatment device applied to the drinking water entering a facility to reduce contaminants in drinking water throughout the facility.

3.2.18. Point-of-Use (POU) Treatment Device. A treatment device applied to a tap to reduce contaminants in drinking water at that tap.

3.2.19. Potable Water. Water that has been examined and treated to meet the standards in this Chapter, and has been approved as potable by the appropriate DoD medical authority.

3.2.20. Public Water System (PWS). A system for providing piped water to the public for human consumption, if such system has at least 15 service connections or regularly serves a daily average of at least 25 individuals at least 60 days of the year. This also includes any collection, treatment, storage, and distribution facilities under control of the operator of such systems, and any collection or pretreatment storage facilities not under such control that are used primarily in connection with such systems. A PWS is either a "community water system" or a "non-community system":

3.2.20.1. Community Water System (CWS). A PWS that has at least 15 service connections used by year-round residents, or which regularly serves at least 25 year-round residents.

3.2.20.2. Non-Community Water System (NCWS). A PWS that serves the public, but does not serve the same people year-round.

3.2.20.2.1. Non-transient, Non-community Water System (NTNCWS). A PWS that supplies water to at least 25 of the same people at least six months per year, but not year round. Examples include schools, factories, office buildings, and hospitals that have their own water systems.

3.2.20.2.2. Transient, Non-Community Water System (TNCWS). A PWS that provides water to at least 25 persons (but not the same 25 persons) at least six months per year. Examples include but are not limited to gas stations, motels, and campgrounds that have their own water sources.

3.2.21. Sanitary Survey. An on-site review of the water source, facilities, equipment, operation, and maintenance of a public water system to evaluate the adequacy of such elements for producing and distributing potable water.

3.2.22. Slow Sand Filtration. Water treatment process where raw water passes through a bed of sand at a low velocity (0.37 m/hr (1.2 ft/hr)), resulting in particulate removal by physical and biological mechanisms.

3.2.23. Total Trihalomethanes. The sum of the concentration in milligrams per liter of chloroform, bromoform, dibromochloromethane, and bromodichloromethane.

3.2.24. Underground Injection. A subsurface emplacement through a bored, drilled, driven or dug well where the depth is greater than the largest surface dimension, whenever the principal function of the well is emplacement of any fluid.

3.2.25. Vulnerability Assessment. The process the commander uses to determine the susceptibility to attack from the full range of threats to the security of personnel, family members, and facilities, which provide a basis for determining antiterrorism measures that can protect personnel and assets from terrorist attacks.

3.3. CRITERIA

3.3.1. DoD water systems, regardless of whether they produce or purchase water, will:

3.3.1.1. Maintain a map/drawing of the complete potable water system.

3.3.1.2. Update the potable water system master plan at least every 5 years.

3.3.1.3. Protect all water supply aquifers (groundwater) and surface water sources from contamination by suitable placement and construction of wells, by suitable placing of the new intake (heading) to all water treatment facilities, by siting and maintaining septic systems and onsite treatment units, and by appropriate land use management on DoD installations.

3.3.1.4. Conduct sanitary surveys of the water system at least every 3 years for systems using surface water, and every 5 years for systems using groundwater, or as warranted, including review of required water quality analyses. Off-installation surveys will be coordinated with HN authorities.

3.3.1.5. Provide proper treatment for all water sources. Surface water supplies, including GWUDISW, must conform to the surface water treatment requirements set forth in Table C3.T1. Groundwater supplies, at a minimum, must be disinfected.

3.3.1.6. Maintain a continuous positive pressure of at least 137.9 kPa (20 pounds per square inch (psi)) in the water distribution system.

3.3.1.7. Perform water distribution system operation and maintenance practices consisting of:

3.3.1.7.1. Maintenance of a disinfectant residual throughout the water distribution system (except where determined unnecessary by the appropriate DoD medical authority);

3.3.1.7.2. Proper procedures for repair and replacement of mains (including disinfection and bacteriological testing);

3.3.1.7.3. An effective annual water main flushing program;

3.3.1.7.4. Proper operation and maintenance of storage tanks and reservoirs; and

3.3.1.7.5. Maintenance of distribution system appurtenances (including hydrants and valves).

3.3.1.8. Establish an effective cross connection control and backflow prevention program.

3.3.1.9. Manage underground injection on DoD installations to protect underground water supply sources. At a minimum, conduct monitoring to determine the effects of any underground injection wells on nearby groundwater supplies.

3.3.1.10. Develop and update as necessary an emergency contingency plan to ensure the provision of potable water despite interruptions from natural disasters and service interruptions. At a minimum, the plan will include:

3.3.1.10.1. Plans, procedures, and identification of equipment that can be implemented or utilized in the event of an intentional or un-intentional disruption:

3.3.1.10.2. Identification of key personnel;

3.3.1.10.3. Procedures to restore service;

3.3.1.10.4. Procedures to isolate damaged lines;

3.3.1.10.5. Identification of alternative water supplies; and

3.3.1.10.6. Installation public notification procedures.

3.3.1.11. Use only lead-free pipe, solder, flux, and fittings in the installation or repair of water systems and plumbing systems for drinking water. Provide installation public notification concerning the lead content of materials used in distribution or plumbing systems, or the corrosivity of water that has caused leaching, which indicates a potential health threat if exposed to leaded water, and remedial actions which may be taken.

3.3.1.12. Maintain records showing monthly operating reports for at least 3 years, and records of bacteriological results for not less than 5 years, and chemical results for not less than 10 years.

3.3.1.13. Document corrective actions taken to correct breaches of criteria and maintain such records for at least three years. Cross connection and backflow prevention testing and repair records should be kept for at least 10 years.

3.3.1.14. Conduct vulnerability assessments, which include, but are not limited to, a review of:

3.3.1.14.1. Pipes and constructed conveyances, physical barriers, water collection, pretreatment, treatment, storage, and distribution facilities, electronic, computer, or other automated systems utilized by the PWS;

3.3.1.14.2. Use, storage, or handling of various chemicals; and

3.3.1.14.3. Operation and maintenance of the water storage, treatment, and distribution systems.

3.3.2. Regardless of whether a DoD water system produces or purchases water, it will, by independent testing or validated supplier testing, ensure conformance with the following:

3.3.2.1. Total Coliform Bacteria Requirements

3.3.2.1.1. An installation responsible for a PWS will conduct a bacteriological monitoring program to ensure the safety of water provided for human consumption and allow evaluation with the total coliform-related MCL. The MCL is based only on the presence or absence of total coliforms. The MCL is no more than 5% positive samples per month for a system examining $\geq$ 40 samples a month, and no more than one positive sample per month when a system analyzes < 40 samples per month. Further, the MCL is exceeded whenever a routine sample is positive for fecal coliforms or *E. coli* or any repeat sample is positive for total coliforms.

3.3.2.1.2. Each system must develop a written, site-specific monitoring plan and collect routine samples according to Table 3.2., "Total Coliform Monitoring Frequency."

3.3.2.1.3. Systems with initial samples testing positive for total coliforms will collect repeat samples as soon as possible, preferably the same day. Repeat sample locations are required at the same tap as the original sample plus an upstream and downstream sample, each within five service connections of the original tap. Any additional repeat sampling which may be required

will be performed according to the appropriate DoD medical authority. Monitoring will continue until total coliforms are no longer detected.

3.3.2.1.4. When any routine or repeat sample tests positive for total coliforms, it will be tested for fecal coliform or *E. coli*. Fecal-type testing can be foregone on a total coliform positive sample if fecal or *E. coli* is assumed to be present.

3.3.2.1.5. If a system has exceeded the MCL for total coliforms, the installation will complete the notification in subsection 3.3.3. to:

3.3.2.1.5.1. The appropriate DoD medical authority, as soon as possible, but in no case later than the end of the same day the command responsible for operating the PWS is notified of the result.

3.3.2.1.5.2. The installation public as soon as possible, but not later than 72 hours after the system is notified of the test result that an acute risk to public health may exist.

3.3.2.2. Inorganic Chemical Requirements

3.3.2.2.1. An installation responsible for a PWS will ensure that the water distributed for human consumption does not exceed applicable limitations set out in Table 3.3. Except for nitrate, nitrite, and total nitrate/nitrite, for systems monitored quarterly or more frequently, a system is out of compliance if the annual running average concentration of an inorganic chemical exceeds the MCL. For systems monitored annually or less frequently, a system is out of compliance if a single sample exceeds the MCL. For nitrate, nitrite, and total nitrate/nitrite, system compliance is determined by averaging the single sample that exceeds the MCL with its confirmation sample; if this average exceeds the MCL, the system is out of compliance.

3.3.2.2.2. Systems will be monitored for inorganic chemicals at the frequency set in Table 3.4., “Inorganics Monitoring Requirements.”

3.3.2.2.3. If a system is out of compliance, the installation will complete the notification in paragraph 3.3.3. as soon as possible. If the nitrate, nitrite, or total nitrate and nitrite MCLs are exceeded, then this is considered an acute health risk and the installation will complete the notification to:

3.3.2.2.3.1. The appropriate DoD medical authority as soon as possible, but in no case later than the end of the same day the command responsible for operating the PWS is notified of the result.

3.3.2.2.3.2. The installation public as soon as possible, but not later than 72 hours after the system is notified of the test results. If the installation is only monitoring annually on the basis of direction from the appropriate DoD medical authority, it will immediately increase monitoring in accordance with Table 3.4., "Inorganics Monitoring Requirements," until remedial actions are completed and authorities determine the system is reliable and consistent.

3.3.2.2.4. The MCL for arsenic applies to CWS and NTNCWS.

3.3.2.3. Fluoride Requirements

3.3.2.3.1. An installation commander responsible for a PWS will ensure that the fluoride content of drinking water does not exceed the MCL of 4 mg/L, as stated in Table 3.3., "Inorganic Chemical MCLs."

3.3.2.3.2. Systems will be monitored for fluoride by collecting one treated water sample annually at the entry point to the distribution system for surface water systems, and once every three years for groundwater systems. Daily monitoring is recommended for systems practicing fluoridation using the criteria in Table 3.5., "Recommended Fluoride Concentrations at Different Temperatures."

3.3.2.3.3. If any sample exceeds the MCL, the installation will complete the notification in paragraph 3.3.3. as soon as possible, but in no case later than 14 days after the violation.

3.3.2.4. Lead and Copper Requirements

3.3.2.4.1. DoD CWS and NTNCWS will comply with action levels (distinguished from the MCL) of 0.015 mg/L for lead and 1.3 mg/L for copper to determine if corrosion control treatment, public education, and removal of lead service lines, if appropriate, are required. Actions are triggered if the respective lead or copper levels are exceeded in more than 10% of all sampled taps.

3.3.2.4.2. Affected DoD systems will conduct monitoring in accordance with Table 3.6., "Monitoring Requirements for Lead and Copper Water Quality Parameters." High risk sampling sites will be targeted by conducting a materials evaluation of the distribution system. Sampling sites will be selected as stated in Table 3.6.

3.3.2.4.3. If an action level is exceeded, the installation will collect additional water quality samples specified in Table 3.6., "Monitoring Requirements for Lead and Copper Water Quality Parameters." Optimal corrosion control treatment will be pursued. If action levels are exceeded after implementation of applicable corrosion control and source water treatment, lead service lines will be replaced if the lead service lines cause the lead action level to be exceeded. The installation commander will implement an education program for installation personnel (including U.S. and host nation) within 60 days and will complete the notification in paragraph 3.3.3. as soon as possible, but in no case later than 14 days after the violation.

3.3.2.5. Synthetic Organics Requirements

3.3.2.5.1. An installation responsible for CWS and NTNCWS will ensure that synthetic organic chemicals in water distributed to people do not exceed the limitations delineated in Table 3.7., "Synthetic Organic Chemical MCLs." For systems monitored quarterly or more frequently, a system is out of compliance if the annual running average concentration of an organic chemical exceeds the MCL. For systems monitored annually or less frequently, a system is out of compliance if a single sample exceeds the MCL.

3.3.2.5.2. Systems will be monitored for synthetic organic chemicals according to the schedule stated in Table 3.8., "Synthetic Organic Chemical Monitoring Requirements."

3.3.2.5.3. If a system is out of compliance, the notification set out in paragraph 3.3.3. shall be completed as soon as possible, but in no case later than 14 days after the violation. The installation will immediately begin quarterly monitoring and will increase quarterly monitoring if the level of any contaminant is at its detection limit but less than its MCL, as noted in Table 3.8., "Synthetic Organic Chemical Monitoring Requirements," and will continue until the installation commander determines the system is back in compliance, and all necessary remedial measures have been implemented.

3.3.2.6. Disinfectant/Disinfection Byproducts (DDBP) Requirements

3.3.2.6.1. An installation responsible for a CWS and NTNCWS that adds a disinfectant (oxidant, such as chlorine, chlorine dioxide, chloramines, or ozone) to any part of its treatment process (to include the addition of disinfectant by a local water supplier) will:

3.3.2.6.1.1. Ensure that the MCL of 0.08 mg/L for total trihalomethanes (TTHM), the MCL of 0.06 mg/L for haloacetic acids (HAA5), the MCL of 1.0 mg/L for chlorite, and the MCL of 0.01 mg/L for bromate are met in drinking water.

3.3.2.6.1.2. Ensure that the maximum residual disinfectant level (MRDL) of 4.0 mg/L for chlorine, the MRDL of 4.0 mg/L (measured as combined total chlorine) for chloramines when ammonia is added during chlorination, and the MRDL of 0.8 mg/L for chlorine dioxide are met in drinking water. Operators may increase residual disinfectant levels of chlorine or chloramines (but not chlorine dioxide) in the distribution system to a level and for a time necessary to protect public health to address specific microbiological contamination problems caused by circumstances such as distribution line breaks, storm runoff events, source water contamination, or cross-connections.

3.3.2.6.2. Such systems that add a disinfectant will monitor TTHM and HAA5 in accordance with Table 3.9., "Disinfectant/Disinfection Byproducts Monitoring Requirements." Additional disinfectant and disinfection byproduct monitoring for systems that utilize chlorine dioxide, chloramines, or ozone are also included in Table 3.9.

3.3.2.6.3. For TTHM and HAA5 a system is noncompliant when the running annual average of quarterly averages of all samples taken in the distribution system, computed quarterly, exceed the MCL for TTHM, 0.080 mg/L, or the MCL for HAA5, 0.060 mg/L. Refer to Table 3.9. for chlorine, chloramine, and chlorine dioxide compliance requirements. If a system is out of compliance as described in Table 3.9., the installation will accomplish the notification requirements outlined in paragraph 3.3.3. as soon as possible, but in no case later than 14 days after the violation, and undertake remedial measures.

3.3.2.7. Radionuclide Requirements

3.3.2.7.1. An installation responsible for a CWS will test the system for conformance with the applicable radionuclide limits contained in Table 3.10., "Radionuclide MCLs and Monitoring Requirements."

3.3.2.7.2. Systems will perform radionuclide monitoring as stated in Table 3.10.

3.3.2.7.3. If the average annual MCL for gross alpha activity for radium is exceeded, the installation will complete the notification according to the procedures in paragraph 3.3.3. within 14 days. Monitoring will continue until remedial actions are completed and the average annual concentration no longer exceeds the respective MCL. Continued monitoring for gross alpha-related contamination will occur quarterly, while gross beta-related monitoring will be monthly. If any gross beta MCL is exceeded, the major radioactive components will be identified.

3.3.2.8. Surface Water Treatment Requirements. DoD water systems that use surface water sources or GWUDISW will meet the surface water treatment requirements delineated in Table 3.1. If the turbidity readings in Table 3.1. are exceeded, the installation will complete the notification in paragraph 3.3.3. as soon as possible, but in no case later than 14 days after the violation and undertake remedial action. Surface water and GWUDISW systems that make changes to their disinfection practices (e.g., change in disinfectant or application point) in order to meet DDBP requirements (3.3.2.6.), will ensure that protection from microbial pathogens is not compromised.

3.3.2.9. Non-Public Water Systems. DoD NPWSs will be monitored for total coliforms, at a minimum, and disinfectant residuals periodically.

3.3.2.10. Alternative Water Supplies. DoD installations will, if necessary, only utilize alternative water sources, including POE/POU treatment devices and bottled water supplies, which are approved by the installation commander.

3.3.2.11. Filter Backwash Requirements. To prevent microbes and other contaminants from passing through and into finished drinking water, DoD PWSs will ensure that recycled streams (i.e., recycled filter backwash water, sludge thickener supernatant, and liquids from dewatering processes) are treated by direct and conventional filtration processes. This requirement only applies to DoD PWSs that:

3.3.2.11.1. Use surface water or GWUDISW;

3.3.2.11.2. Use direct or conventional filtration processes; and

3.3.2.11.3. Recycle spent filter backwash water, sludge thickener supernatant, or liquids from dewatering processes.

3.3.3. Notification Requirements. When a DoD water system is out of compliance as set forth in the preceding criteria, the appropriate DoD medical authority and installation personnel (U.S. and host nation) will be notified. The notice will provide a clear and readily understandable explanation of the violation, any potential adverse health effects, the population at risk, the steps being taken to correct the violation, the necessity for seeking an alternative water supply, if any, and any preventive measures the consumer should take until the violation is corrected. The appropriate DoD medical authority will coordinate notification of host authorities in cases where off-installation populations are at risk.

3.3.3.1. Additional Notification Requirements. The Competent Authority shall be notified, via the LEC, regarding any waterworks to be connected to their supply system five working days prior to any connection.

3.3.4. System Operator Requirements. DoD installations will ensure that personnel are appropriately trained to operate DoD water systems.

Table 3.1. Surface Water Treatment Requirements

1. Unfiltered Systems

a. Systems which use unfiltered surface water or GUDISW will analyze the raw water for total coliforms or fecal coliforms at least weekly and for turbidity at least daily, and must continue as long as the unfiltered system is in operation. If the total coliforms and/or fecal coliforms exceed 100/100 milliliters (mL) and 20/100 mL, respectively, in excess of 10% of the samples collected in the previous 6 months, appropriate filtration must be applied. Appropriate filtration must also be applied if turbidity of the source water immediately prior to the first or only point of disinfectant application exceeds 5 Nephelometric Turbidity Units (NTU).

b. Disinfection must achieve at least 99.9% (3-log) inactivation of *Giardia lamblia* cysts and 99.99% (4-log) inactivation of viruses by meeting applicable CT values, as shown in Tables C3.T11. through C3.T24.

c. Disinfection systems must have redundant components to ensure uninterrupted disinfection during operational periods.

d. Disinfectant residual monitoring immediately after disinfection is required once every four hours that the system is in operation. Disinfectant residual measurements in the distribution system will be made at the same times as total coliforms are sampled.

e. Disinfectant residual of water entering the distribution system cannot be < 0.2 mg/L for greater than four hours.

f. Water in a distribution system with a heterotrophic bacteria concentration ≤ 500/mL measured as heterotrophic plate count is considered to have a detectable disinfectant residual for the purpose of determining compliance with the Surface Water Treatment Requirements.

g. If disinfectant residuals in the distribution system are undetected in more than 5% of monthly samples for 2 consecutive months, appropriate filtration must be implemented.

2. Filtered Systems

a. Filtered water systems will provide a combination of disinfection and filtration that achieves a total of 99.9% (3-log) removal of *Giardia lamblia* cysts and 99.99% (4-log) removal of viruses.

b. The turbidity of filtered water will be monitored at least once every four hours. The turbidity of filtered water for direct and conventional filtration systems will not exceed 0.5 NTU (1 NTU for slow sand and diatomaceous earth filters) in 95% of the analyses in a month, with a maximum of 5 NTU.

c. Disinfection must provide the remaining log-removal of *Giardia lamblia* cysts and viruses not obtained by the filtration technology applied.*

d. Disinfection residual maintenance and monitoring requirements are the same as those for unfiltered systems.

*Proper conventional treatment typically removes 2.5-log *Giardia*/ 2.0-log viruses. Proper direct filtration and diatomaceous earth filtration remove 2.0-log *Giardia*/ 1.0-log viruses. Slow sand filtration removes typically removes 2.0-log *Giardia*/ 2.0-log viruses. Less log-removal may be assumed if treatment is not properly applied.

3. SW or GWUDISW systems will provide at least 99% (2-log) removal of Cryptosporidium. A system is considered to be compliant with the Cryptosporidium removal requirements if:

a. For conventional and direct filtration systems, the turbidity level of the system's combined filter effluent water does not exceed 0.3 NTU in at least 95% of the measurements taken each month and at no time exceeds 1 NTU.

b. For slow sand and diatomaceous earth filtration plants, the turbidity level of the system's combined filter effluent water does not exceed 1 NTU in at least 95% of measurements taken each month and at no time exceeds 5 NTUs.

c. For alternative systems, the system demonstrates to the appropriate medical authority that the alternative filtration technology, in combination with disinfection treatment, consistently achieves 3-log removal and/or inactivation of Giardia lamblia cysts, 4-log removal and/or inactivation of viruses, and 2-log removal of Cryptosporidium oocysts.

d. For unfiltered systems, the system continues to meet the source water monitoring requirements noted in 1a above to remain unfiltered.

4. Individual Filter Effluent Monitoring. Conventional or direct filtration systems must continuously monitor (every 15 minutes) the individual filter turbidity for each filter used at the system. Systems with two or fewer filters may monitor combined filter effluent turbidity continuously, in lieu of individual filter turbidity monitoring. If a system exceeds 1.0 NTU in two consecutive measurements for three months in a row (for the same filter), the installation must conduct a self-assessment of the filter within 14 days. The self-assessment must include at least the following components: assessment of filter performance; development of a filter profile; identification and prioritization of factors limiting filter performance; assessment of the applicability of corrections; and preparation of a self-assessment report. If a system exceeds 2.0 NTU (in two consecutive measurements 15 minutes apart) for two months in a row, a Comprehensive Performance Evaluation (CPE) must be conducted within 90 days by a third party.

5. Covers for Finished Water Storage Facilities. Installations must physically cover all finished water reservoirs, holding tanks, or storage water facilities.

Table 3.2. Total Coliform Monitoring Frequency

Population Served	Number of Samples [1]	Population Served	Number of Samples [1]
25 to 1,000 [2]	1	59,001 to 70,000	70
1,001 to 2,500	2	70,001 to 83,000	80
2,501 to 3,300	3	83,001 to 96,000	90
3,301 to 4,100	4	96,001 to 130,000	100
4,101 to 4,900	5	130,001 to 220,000	120
4,901 to 5,800	6	220,001 to 320,000	150
5,801 to 6,700	7	320,001 to 450,000	180
6,701 to 7,600	8	450,001 to 600,000	210
7,601 to 8,500	9	600,001 to 780,000	240
8,501 to 12,900	10	780,001 to 970,000	270
12,901 to 17,200	15	970,001 to 1,230,000	300
17,201 to 21,500	20	1,230,001 to 1,520,000	330
21,501 to 25,000	25	1,520,001 to 1,850,000	360
25,001 to 33,000	30	1,850,001 to 2,270,000	390
33,001 to 41,000	40	2,270,001 to 3,020,000	420
41,001 to 50,000	50	3,020,001 to 3,960,000	450
50,001 to 59,000	60	3,960,001 or more	480

Notes:

1. Minimum Number of Routine Samples Per Month

2. A non-community water system using groundwater and serving ≤ 1,000 people may monitor once in each calendar quarter during which the system provides water provided a sanitary survey conducted within the last 5 years shows the system is supplied solely by a protected groundwater source and free of sanitary defects.

Systems that use groundwater, serve < 4,900 people, and collect samples from different sites, may collect all samples on a single day. All other systems must collect samples at regular intervals throughout the month.

Table 3.3. Inorganic Chemical MCLs

Contaminant	MCL	
Arsenic [1]	0.010	mg/L
Antimony [1]	0.006	mg/L
Asbestos [1]	7 million	fibers/L (longer than 10 um)
Barium	2.0	mg/L
Beryllium [1]	0.004	mg/L
Cadmium [1]	0.005	mg/L
Chromium [1]	0.1	mg/L
Cyanide [1]	0.2	mg/L (as free cyanide)
Fluoride [2]	4.0	mg/L
Mercury [1]	0.002	mg/L
Nickel [1]	0.1	mg/L
Nitrate [3]	10	mg/L (as N)
Nitrite [3]	1	mg/L (as N)
Total Nitrite and Nitrate [3]	10	mg/L (as N)
Selenium [1]	0.05	mg/L
Sodium [4]		
Thallium	0.002	mg/L

Notes:

1. MCLs apply to CWS and NTNCWS.
2. Fluoride also has a secondary MCL at 2.0 mg/L. MCL applies only to CWS.
3. MCLs apply to CWS, NTNCWS, and TNCWS.
4. No MCL established. Monitoring is required so concentration levels can be made available on request. Sodium levels shall be reported to the DoD medical authority upon receipt of analysis.

Table 3.4. Inorganics Monitoring Requirements

Contaminant	Groundwater Baseline Requirement [1]	Surface Water Baseline Requirement	Trigger That Increases Monitoring [2]	Reduced Monitoring
Arsenic	1 sample / 3 yr	Annual sample	>MCL	---
Antimony	1 sample / 3 yr	Annual sample	>MCL	---
Barium	1 sample / 3 yr	Annual sample	>MCL	---
Beryllium	1 sample / 3 yr	Annual sample	>MCL	---
Cadmium	1 sample / 3 yr	Annual sample	>MCL	---
Chromium	1 sample / 3 yr	Annual sample	>MCL	---
Cyanide	1 sample / 3 yr	Annual sample	>MCL	---
Fluoride	1 sample / 3 yr	Annual sample	>MCL	
Mercury	1 sample / 3 yr	Annual sample	>MCL	---
Nickel	1 sample / 3 yr	Annual sample	>MCL	---
Selenium	1 sample / 3 yr	Annual sample	>MCL	---
Thallium	1 sample / 3 yr	Annual sample	>MCL	---
Sodium	1 sample / 3 yr	Annual sample	---	---
Asbestos [3]	1 sample every 9 years	1 sample every 9 years	>MCL	Yes
Total Nitrate/Nitrite	Annual sample	Quarterly	>50% Nitrite MCL	---
Nitrate	Annual sample [4]	Quarterly [4]	>50% MCL [5]	Yes [6]
Nitrite	Annual sample [4]	Quarterly [4]	>50% MCL [5]	Yes [7]
Corrosivity [8]	Once	Once	---	---

Notes:

1. Samples shall be taken as follows: groundwater systems shall take a minimum of one sample at every entry point to the distribution system which is representative of each well after treatment; surface water systems shall take at least one sample at every entry point to the distribution system after any application of treatment or in the distribution system at a point which is representative of each source after the treatment.
2. Increased quarterly monitoring requires a minimum of 2 samples per quarter for groundwater systems and at least 4 samples per quarter for surface water systems.
3. Necessity for analysis is predicated upon a sanitary survey conducted by the PWS.
4. Any sampling point with an analytical value ≥ 0.5 mg/L as N, (50% of the Nitrite MCL) must begin sampling for nitrate and nitrite separately. Since nitrite readily converts to nitrate, a system can conclude that if the total nitrate/nitrite value of a sample is less than half of the nitrite MCL, then the value of nitrite in the sample would also be below half of its MCL.
5. Increased quarterly monitoring shall be undertaken for nitrate and nitrate if a sample is >50% of the MCL.
6. The appropriate DoD medical authority may reduce repeat sampling frequency for surface water systems to annually if after 1 year results are <50% of MCL.
7. The appropriate DoD medical authority may reduce repeat sampling frequency to 1 annual sample if results are 50% of MCL.
8. PWSs shall be analyzed within 1 year of the effective date of country-specific FGS to determine the corrosivity entering the distribution system. Two samples (one mid-winter and one mid-summer) will be collected at the entry point of the distribution system for systems using surface water and GWUDISW. One sample will be collected for systems using only groundwater. Corrosivity characteristics of the water shall include measurements of pH, calcium, hardness, alkalinity, temperature, total dissolved solids, and calculation of the Langelier Saturation Index.

Table 3.5. Recommended Fluoride Concentrations at Different Temperatures

Annual Average of Maximum Daily Air Temperatures (□F)	**Control Limits (mg/L)**		
	Lower	**Optimum**	**Upper**
50.0 - 53.7	0.9	1.2	1.7
53.8 - 58.3	0.8	1.1	1.5
58.4 - 63.8	0.8	1.0	1.3
63.9 - 70.6	0.7	0.9	1.2
70.7 - 79.2	0.7	0.8	1.0
79.3 - 90.5	0.6	0.7	0.8

Table 3.6. Monitoring Requirements for Lead and Copper Water Quality Parameters

Population Served	**No. of Sites for Standard Monitoring [1], [2]**	**No. of Sites for Reduced Monitoring [3]**	**No. of Sites for Water Quality Parameters [4]**
>100,000	100	50	25
10,001 - 100,000	60	30	10
3,301 - 10,000	40	20	3
501 - 3,300	20	10	2
101 - 500	10	5	1
<100	5	5	1

Notes:

1. Every 6 months for lead and copper.
2. Sampling sites shall be based on a hierarchical approach. For CWS, priority will be given to single family residences which contain copper pipe with lead solder installed after 1982, contain lead pipes, or are served by lead service lines; then, structures, including multi-family residences with the foregoing characteristics; and finally, residences and structures with copper pipe with lead solder installed before 1983. For NTNCWS, sampling sites will consist of structures that contain copper pipe with lead solder installed after 1982, contain lead pipes, and/or are served by lead service lines. First draw samples will be collected from a cold water kitchen or bathroom tap; non-residential samples will be taken at an interior tap from which water is typically drawn for consumption.
3. Annually for lead and copper if action levels are met during each of 2 consecutive 6-month monitoring periods. Any small or medium-sized system (<50,000) that meets the lead and copper action levels during three consecutive years may reduce the monitoring for lead and copper from annually to once every three years. Annual or triennial sampling will be conducted during the four warmest months of the year.
4. This monitoring must be conducted by all large systems (>50,000). Small and medium sized systems must monitor water quality parameters when action levels are exceeded. Samples will be representative of water quality throughout the distribution system and include a sample from the entry to the distribution system. Samples will be taken in duplicate for pH, alkalinity, calcium, conductivity or total dissolved solids, and water temperatures to allow a corrosivity determination (via a Langelier saturation index or other appropriate saturation index); additional parameters are orthophosphate when a phosphate inhibitor is used and silica when a silicate inhibitor is used.

Table 3.7. Synthetic Organic Chemical MCLs

Synthetic Organic Chemical	mg/L	Detection limit, mg/L
Pesticides/PCBs		
Alachlor	0.002	0.0002
Aldicarb	0.003	0.0005
Aldicarb sulfone	0.003	0.0008
Aldicarb sulfoxide	0.004	0.0005
Atrazine	0.003	0.0001
Benzo[a]pyrene	0.0002	
Carbofuran	0.04	0.0009
Chlordane	0.002	0.0002
Dalapon	0.2	
2,4-D	0.07	0.0001
1,2-Dibromo-3-chloropropane (DBCP)	0.0002	0.00002
Di (2-ethylhexyl) adipate	0.4	
Di (2-ethylhexyl) phthalate	0.006	
Dinoseb	0.007	
Diquat	0.02	
Endrin	0.002	0.00002
Endothall	0.1	
Ethylene dibromide (EDB)	0.00005	0.00001
Glyphosphate	0.7	
Heptachlor	0.0004	0.00004
Heptachlorepoxide	0.0002	0.00002
Hexachlorobenzene	0.001	
Hexachlorocyclopentadiene	0.05	
Lindane	0.0002	0.00002
Methoxychlor	0.04	0.0001
Oxamyl (Vydate)	0.2	
PCBs (as decachlorobiphenyls)	0.0005	0.0001
Pentachlorophenol	0.001	0.00004
Picloram	0.5	
Simazine	0.004	
2,3,7,8-TCDD (Dioxin)	0.00000003	
Toxaphene	0.003	0.001
2,4,5-TP (Silvex)	0.05	0.0002
Volatile Organic Chemicals		
Benzene	0.005	0.0005
Carbon tetrachloride	0.005	0.0005
o-Dichlorobenzene	0.6	0.0005
cis-1,2-Dichloroethylene	0.07	0.0005
trans-1,2-Dichloroethylene	0.1	0.0005
1,1-Dichloroethylene	0.007	0.0005
1,1,1-Trichloroethane	0.20	0.0005
1,2-Dichloroethane	0.005	0.0005
Dichloromethane	0.005	
1,1,2-Trichloroethane	0.005	
1,2,4-Trichloro-benzene	0.07	
1,2-Dichloropropane	0.005	0.0005
Ethylbenzene	0.7	0.0005
Monochlorobenzene	0.1	0.0005
para-Dichlorobenzene	0.075	0.0005
Styrene	0.1	0.0005

Table 3.7. Synthetic Organic Chemical MCLs

Synthetic Organic Chemical	**mg/L**	**Detection limit, mg/L**
Tetrachloroethylene	0.005	0.0005
Trichloroethylene	0.005	0.0005
Toluene	1.0	0.0005
Vinyl chloride	0.002	0.0005
Xylene (total)	10	0.0005
Other Organics		
Acrylamide	0.05% dosed at 1 ppm [1]	
Epihydrochlorin	treatment technique 0.01% dosed at 20 ppm [1]	

Note

1. [1] Only applies when adding these polymer flocculants to the treatment process. No sampling is required; the system certifies that dosing is within specified limits.

Table 3.8. Synthetic Organic Chemical Monitoring Requirements

Contaminant	Base Requirement 1		Trigger for more monitoring [2]	Reduced monitoring
	Groundwater	Surface water		
VOCs	Quarterly	Quarterly	>0.0005 mg/L	Yes [3, 4]
Pesticides/PCBs	4 quarterly samples/3 years during most likely period for their presence		>Detection limit [5]	Yes [4, 6]

Notes:

1. Groundwater systems shall take a minimum of one sample at every entry point which is representative of each well after treatment; surface water systems will take a minimum of one sample at every entry point to the distribution system at a point which is representative of each source after treatment. For CWS, monitoring compliance is to be met within 1 year of the publishing of the OEBGD (FGS); for NTNCW, compliance is to be met within 2 years of the publishing of the OEBGD (FGS).
2. Increased monitoring requires a minimum of 2 quarterly samples for groundwater systems, and at least 4 quarterly samples for surface water systems.
3. Repeat sampling frequency may be reduced to annually after 1 year of no detection, and every 3 years after three rounds of no detection.
4. Monitoring frequency may be reduced if warranted based on a sanitary survey of the PWS.
5. Detection limits noted in Table C3.T7., or as determined by the best available testing methods.
6. Repeat sampling frequency may be reduced to the following if after one round of no detection: systems >3,300 reduce to a minimum of 2 quarterly samples in one year during each repeat compliance period, or systems <3,300 reduce to a minimum of 1 sample every 3 years.
7. Compliance is based on an annual running average for each sample point for systems monitoring quarterly or more frequently; for systems monitoring annually or less frequently, compliance is based on a single sample, unless the appropriate DoD medical authority requests a confirmation sample. A system is out of compliance if any contaminant exceeds the MCL.

Table 3.9. Disinfectant/Disinfection Byproducts Monitoring Requirements

Source Water Type	Population Served by System	Analyte & Frequency of Samples	Number of Samples
Surface Water (SW) or Groundwater Under the Direct Influence of Surface Water (GWUDISW)	10,000 or more	TTHM & HAA5 – Quarterly[1,2]	4[1,2,3]
SW or GWUDISW	Serving 500 to 9,999	TTHM & HAA5 - Quarterly4	1[5,6]
SW or GWUDISW	499 or less	TTHM & HAA5 - Yearly	1[7,8]
Ground Water (GW)	10,000 or more	TTHM & HAA5 - Quarterly[9]	1[10,11]
GW	9,999 or less	TTHM & HAA5 - Yearly[12]	1[13,14]
		Chlorite - Daily & Monthly[15,16,17,18]	
		Bromate - Monthly[19,20]	
		Chlorine[21,22]	
		Chloramines[23,24]	
		Chlorine Dioxide[25,26,27]	
		TOC[28]	

Notes:

1. For TTHM and HAA5, a DoD system using surface water or GWUDISW that treats its water with a chemical disinfectant must collect the number of samples listed above. One of the samples must be taken at a location in the distribution system reflecting the maximum residence time of water in the system. The remaining samples shall be taken at representative points in the distribution system.
2. To be eligible for reduced monitoring, a system must meet all of the following conditions: a) the annual average for TTHM is no more than 0.040 mg/L; b) the annual average for HAA5 is no more than 0.030 mg/L; c) at least one year of routine monitoring has been completed; and d) the annual average source water total organic carbon level is no more than 4.0 mg/L prior to treatment. Systems may then reduce monitoring of TTHM and HAA5 to one sample per treatment plant per quarter. Systems remain on the reduced schedule as long as the average of all samples taken in the year is no more than 0.060 mg/L for TTHM and 0.045 mg/L for HAA5. Systems that do not meet these levels must revert to routine monitoring the following quarter.
3. A system is noncompliant if the running annual average for any quarter exceeds the TTHM MCL, 0.080 mg/L or the HAA5 MCL, 0.060 mg/L.
4. One sample must be collected per treatment plant in the system at the point of maximum residence time in the distribution system.
5. Systems meeting the eligibility requirements in Note 2 may reduce monitoring frequency to one sample per treatment plant per year. Sample must be taken at the point of maximum residence time in the distribution system and during the month of warmest water temperature. Systems remain on the reduced schedule as long as the average of all samples taken in the year is no more than 0.060 mg/L for TTHM and 0.045 mg/L for HAA5. Systems that do not meet these levels must revert to routine (quarterly) monitoring the following quarter.
6. A system is noncompliant if the annual average of all samples taken that year exceeds the TTHM MCL, 0.080 mg/L or the HAA5 MCL, 0.060 mg/L.
7. Sample must be taken at the point of maximum residence time in the distribution system and during the month of warmest water temperature. If annual sample exceeds MCL (TTHM or HAA5) the system must increase monitoring to one sample per treatment plant per quarter at the point of maximum residence time. The system may return to routine monitoring if the annual average of quarterly samples is no more than 0.060 mg/L for TTHM and 0.045 mg/L for HAA5.

Table 3.9. Disinfectant/Disinfection Byproducts Monitoring Requirements (continued)

8. No reduced monitoring schedule is available. Noncompliance exists when the annual sample (or average of annual samples is conducted) exceeds the TTHM MCL, 0.080 mg/L or if the HHA5 concentration exceeds the MCL, 0.060 mg/L.
9. For TTHM and HAA5, a DoD system using only ground water NOT under the influence of surface water that treats its water with a chemical disinfectant must collect the number of samples listed above. Samples must be taken at a location in the distribution system reflecting the maximum residence time of water in the system.
10. System may reduce monitoring to one sample per treatment plant per year if the system meets all of the following conditions: a) the annual average for TTHM is no more than 0.040 mg/L; b) the annual average for HAA5 is no more than 0.030 mg/L; and c) at least one year of routine monitoring has been completed. Sample must be taken at the point of maximum residence time in the distribution system and during the month of warmest water temperature. Systems remain on the reduced schedule as long as the average of all samples taken in the year is no more than 0.060 mg/L for TTHM and 0.045 mg/L for HAA5. Systems that do not meet these levels must revert to routine monitoring the following quarter.
11. Noncompliance exists when the annual average of quarterly averages of all samples, compounded quarterly, exceeds the TTHM MCL, 0.080 mg/L or the HHA5 the MCL, 0.060 mg/L.
12. For TTHM and HAA5, a DoD system using only ground water NOT under the influence of surface water that treats its water with a chemical disinfectant must collect the number of samples listed above. One sample per treatment plant must be taken at a location in the distribution system reflecting the maximum residence time of water in the system and during the month of warmest water temperature. If the sample exceeds the MCL, the system must increase monitoring to quarterly.
13. System may reduce monitoring to one sample per three-year monitoring cycle if the system meets all the following conditions: a) the annual average for TTHM is no more than 0.040 mg/L; b) the annual average for HAA5 is no more than 0.030 mg/L; and c) at least one year of routine monitoring has been completed. Sample must be taken at the point of maximum residence time in the distribution system and during the month of warmest water temperature. Systems remain on the reduced schedule as long as the average of all samples taken in the year is no more than 0.060 mg/L for TTHM, and 0.045 mg/L for HAA5. Systems that do not meet these levels must revert to routine monitoring. Systems on increased monitoring may return to routine monitoring if the annual average of quarterly samples does not exceed 0.060 mg/L for TTHM and 0.045 mg/L for HAA5.
14. Noncompliance exists when the annual sample (or average of annual samples) exceeds the TTHM MCL, 0.080 mg/L or the HHA5 the MCL, 0.060 mg/L.
15. For systems using chlorine dioxide for disinfection or oxidation, daily samples are taken for chlorite at the entrance to the distribution system for chlorite. The monthly chlorite samples are collected within the distribution system, as follows: one as close as possible to the first customer, one in a location representative of average residence time, and one as close as possible to the end of the distribution system (reflects maximum residence time within the distribution system).
16. Additional monitoring is required when a daily sample exceeds the chlorite MCL, 1.0 mg/L. A three-sample set (following the monthly sample set protocol) is required to be collected the following day. Further distribution system monitoring will not be required in that month unless the chlorite concentration at the entrance to the distribution system again exceeds the MCL, 1.0 mg/L.
17. For chlorite, systems may reduce routine distribution system monitoring from monthly to quarterly if the chlorite concentration in all samples taken in the distribution system is below the MCL, 1.0 mg/L, for a period of one year and the system has not been required to conduct any additional monitoring. Daily samples must still be collected. Monthly sample set monitoring resumes when if any one daily sample exceeds the MCL, 1.0 mg/L.
18. Noncompliance for chlorite exists if the average concentration of any three-sample set (i.e., one monthly sample set from within the distribution system) exceeds the MCL, 1.0 mg/L.
19. Systems using ozone for disinfection or oxidation are required to take at least one sample per month from the entrance to the distribution system for each treatment plant in the system using ozone under normal operating conditions. Systems may reduce monitoring from monthly to once per quarter if the system demonstrates that the yearly average raw water bromide concentration is < 0.05 mg/L based upon monthly measurements for one year.
20. Noncompliance is based on a running yearly average of samples, computed quarterly, that exceeds the MCL, 0.01 mg/L.
21. Chlorine samples must be measured at the same points in the distribution system and at the same time as total coliforms. Not withstanding the MRDL, operators may increase residual chlorine levels in the distribution system to a level and for a time necessary to protect public health to address specific microbiological contamination problems.

22. Noncompliance is based on a running yearly average of monthly averages of all samples, computed quarterly, exceeds the MRDL, 4.0 mg/L.
23. Chloramine samples (as either total chlorine or combined chlorine) must be measured at the same points in the distribution system and at the same time as total coliforms. Notwithstanding the MRDL, operators may increase residual chlorine levels in the distribution system to a level and for a time necessary to protect public health to address specific microbiological contamination problems.
24. Noncompliance is based on a running yearly average of monthly averages of all samples, computed quarterly, exceeds the MRDL, 4.0 mg/L.
25. For systems using chlorine dioxide for disinfection or oxidation, samples must be taken daily at the entrance to the distribution system. If the MRDL, 0.8 mg/L, is exceeded, three additional samples must be taken the following day as follows: one as close as possible to the first customer, one in a location representative of average residence time, and one as close as possible to the end of the distribution system (reflects maximum residence time within the distribution system). Systems not using booster chlorination systems after the first customer must take three samples in the distribution system as close as possible to the first customer at intervals of not less than 6 hours.
26. If any daily sample from the distribution system exceeds the MRDL and if one or more of the three samples taken the following day from within the distribution system exceeds the MRDL, the system is in violation of the MRDL and must issue public notification in accordance with paragraph C3.3.3. If any two consecutive daily samples exceed the MRDL but none of the distribution samples exceed the MRDL, the system is in violation of the MRDL. Failure to monitor at the entrance to the distribution system on the day following exceedances of the chlorine dioxide MRDL is also an MRDL violation.
27. The MRDL for chlorine dioxide may NOT be exceeded for short periods to address specific microbiological contamination problems.
28. Systems that use conventional filtration treatment must monitor each treatment plant water source for TOC on a monthly basis. Samples must be taken from the source water prior to treatment and the treated water not later than the point of combined filter effluent turbidity monitoring. Source water alkalinity must also be monitored at the same time. Surface water and GWUDISW systems with average treated water TOC of < 2.0 mg/L for two consecutive years, or < 1.0 mg/L for one year, may reduce TOC and alkalinity to one paired sample per plant per quarter.

Table 3.10. Radionuclide MCLs and Monitoring Requirements

Contaminant	MCL
Gross Alpha[1]	15 pCi/L
Combined Radium-226 and -228	5 pCi/L
Beta Particle and Photon Radioactivity[2]	4 mrem/yr
Uranium	30 μg/L

Notes:

1. Gross alpha activity includes radium-226, but excludes radon and uranium.
2. Beta particle and photon activity is also referred to as gross beta activity from manmade radionuclides.

Monitoring Requirements:

All CWSs using ground water, surface water, or systems using both ground and surface water must sample at every point (i.e., sampling points) to the distribution system that is representative of all sources being used under normal operating conditions.

For gross alpha activity and radium-226 and radium-228, systems will be tested once every 4 years. Testing will be conducted using an annual composite of 4 consecutive quarterly samples or the average of four samples obtained at quarterly intervals at a representative point in the distribution system.

Gross alpha only may be analyzed if activity is <5 picoCuries per liter (pCi/L). Where radium-228 may be present, radium-226 and/or -228 analyses should be performed when activity is >2 pCi/L. If the average annual concentration is less than half the MCL, analysis of a single sample may be substituted for the quarterly sampling procedure. A system with two or more sources having different concentrations of radioactivity shall monitor source water in addition to water from a free-flowing tap. If the installation introduces a new water source, these contaminants will be monitored within the first year after introduction.

Table 3.11. CT Values for Inactivation of *Giardia* Cysts by Free Chlorine at 0.5°C or Lower*

Chlorine Concentration (mg/L)	pH< = 6 Log Inactivations						pH = 6.5 Log Inactivations						pH = 7.0 Log Inactivations						pH = 7.5 Log Inactivations					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
<=0.4	23	46	69	91	114	137	27	54	82	109	136	163	33	65	98	130	163	195	40	79	119	158	198	237
0.6	24	47	71	94	118	141	28	56	84	112	140	168	33	67	100	133	167	200	40	80	120	159	199	239
0.8	24	48	73	97	121	145	29	57	86	115	143	172	34	68	103	137	171	205	41	82	123	164	205	246
1	25	49	74	99	123	148	29	59	88	117	147	176	35	70	105	140	175	210	42	84	127	169	211	253
1.2	25	51	76	101	127	152	30	60	90	120	150	180	36	72	108	143	179	215	43	86	130	173	216	259
1.4	26	52	78	103	129	155	31	61	92	123	153	184	37	74	111	147	184	221	44	89	133	177	222	266
1.6	26	52	79	105	131	157	32	63	95	126	158	189	38	75	113	151	188	226	46	91	137	182	228	273
1.8	27	54	81	108	135	162	32	64	97	129	161	193	39	77	116	154	193	231	47	93	140	186	233	279
2	28	55	83	110	138	165	33	66	99	131	164	197	39	79	118	157	197	236	48	95	143	191	238	286
2.2	28	56	85	113	141	169	34	67	101	134	168	201	40	81	121	161	202	242	50	99	149	198	248	297
2.4	29	57	86	115	143	172	34	68	103	137	171	205	41	82	124	165	206	247	50	99	149	199	248	298
2.6	29	58	88	117	146	175	35	70	105	139	174	209	42	84	126	168	210	252	51	101	152	203	253	304
2.8	30	59	89	119	148	178	36	71	107	142	178	213	43	86	129	171	214	257	52	103	155	207	258	310
3	30	60	91	121	151	181	36	72	109	145	181	217	44	87	131	174	218	261	53	105	158	211	263	316
Chlorine Concentration (mg/L)	**pH< = 8 Log Inactivations**						**pH = 8.5 Log Inactivations**						**pH = 9.0 Log Inactivations**											
	0.5	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**	**0.5**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**	**0.5**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**						
<=0.4	46	92	139	185	231	277	55	110	165	219	274	329	65	130	195	260	325	390						
0.6	48	95	143	191	238	286	57	114	171	228	285	342	68	136	204	271	339	407						
0.8	49	98	148	197	246	295	59	118	177	236	295	354	70	141	211	281	352	422						
1	51	101	152	203	253	304	61	122	183	243	304	365	73	146	219	291	364	437						
1.2	52	104	157	209	261	313	63	125	188	251	313	376	75	150	226	301	376	451						
1.4	54	107	161	214	268	321	65	129	194	258	323	387	77	155	232	309	387	464						
1.6	55	110	165	219	274	329	66	132	199	265	331	397	80	159	239	318	398	477						
1.8	56	113	169	225	282	338	68	136	204	271	339	407	82	163	245	326	408	489						
2	58	115	173	231	288	346	70	139	209	278	348	417	83	167	250	333	417	500						
2.2	59	118	177	235	294	353	71	142	213	284	355	426	85	170	256	341	426	511						
2.4	60	120	181	241	301	361	73	145	218	290	363	435	87	174	261	348	435	522						
2.6	61	123	184	245	307	368	74	148	222	296	370	444	89	178	267	355	444	533						
2.8	63	125	188	250	313	375	75	151	226	301	377	452	91	181	272	362	453	543						
3	64	127	191	255	318	382	77	153	230	307	383	460	92	184	276	368	460	552						

*$CT_{99.9}$ =CT for 3 log inactivation.

Table 3.12. CT Values for Inactivation of *Giardia* Cysts by Free Chlorine at 5.0°C*

Chlorine Concentration (mg/L)	pH< = 6 Log Inactivations						pH = 6.5 Log Inactivations						pH = 7.0 Log Inactivations						pH = 7.5 Log Inactivations					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
<=0.4	16	32	49	65	81	97	20	39	59	78	98	117	23	46	70	93	116	139	28	55	83	111	138	166
0.6	17	33	50	67	83	100	20	40	60	80	100	120	24	48	72	95	119	143	29	57	86	114	143	171
0.8	17	34	52	69	86	103	20	41	61	81	102	122	24	49	73	97	122	146	29	58	88	117	146	175
1	18	35	53	70	88	105	21	42	63	83	104	125	25	50	75	99	124	149	30	60	90	119	149	179
1.2	18	36	54	71	89	107	21	42	64	85	106	127	25	51	76	101	127	152	31	61	92	122	153	183
1.4	18	36	55	73	91	109	22	43	65	87	108	130	26	52	78	103	129	155	31	62	94	125	156	187
1.6	19	37	56	74	93	111	22	44	66	88	110	132	26	53	79	105	132	158	32	64	96	128	160	192
1.8	19	38	57	76	95	114	23	45	68	90	113	135	27	54	81	108	135	162	33	65	98	131	163	196
2	19	39	58	77	97	116	23	46	69	92	115	138	28	55	83	110	138	165	33	67	100	133	167	200
2.2	20	39	59	79	98	118	23	47	70	93	117	140	28	56	85	113	141	169	34	68	102	136	170	204
2.4	20	40	60	80	100	120	24	48	72	95	119	143	29	57	86	115	143	172	35	70	105	139	174	209
2.6	20	41	61	81	102	122	24	49	73	97	122	146	29	58	88	117	146	175	36	71	107	142	178	213
2.8	21	41	62	83	103	124	25	49	74	99	123	148	30	59	89	119	148	178	36	72	109	145	181	217
3	21	42	63	84	105	126	25	50	76	101	126	151	30	61	91	121	152	182	37	74	111	147	184	221
Chlorine Concentration (mg/L)	**pH< = 8 Log Inactivations**						**pH = 8.5 Log Inactivations**						**pH = 9.0 Log Inactivations**											
	0.5	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**	**0.5**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**	**0.5**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**						
<=0.4	33	66	99	132	165	198	39	79	118	157	197	236	47	93	140	186	233	279						
0.6	34	68	102	136	170	204	41	81	122	163	203	244	49	97	146	194	243	291						
0.8	35	70	105	140	175	210	42	84	126	168	210	252	50	100	151	201	251	301						
1	36	72	108	144	180	216	43	87	130	173	217	260	52	104	156	208	260	312						
1.2	37	74	111	147	184	221	45	89	134	178	223	267	53	107	160	213	267	320						
1.4	38	76	114	151	189	227	46	91	137	183	228	274	55	110	165	219	274	329						
1.6	39	77	116	155	193	232	47	94	141	187	234	281	56	112	169	225	281	337						
1.8	40	79	119	159	198	238	48	96	144	191	239	287	58	115	173	230	288	345						
2	41	81	122	162	203	243	49	98	147	196	245	294	59	118	177	235	294	353						
2.2	41	83	124	165	207	248	50	100	150	200	250	300	60	120	181	241	301	361						
2.4	42	84	127	169	211	253	51	102	153	204	255	306	61	123	184	245	307	368						
2.6	43	86	129	172	215	258	52	104	156	208	260	312	63	125	188	250	313	375						
2.8	44	88	132	175	219	263	53	106	159	212	265	318	64	127	191	255	318	382						
3	45	89	134	179	223	268	54	108	162	216	270	324	65	130	195	259	324	389						

*$CT_{99.9}$ =CT for 3 log inactivation.

Table 3.13. CT Values for Inactivation of *Giardia* Cysts by Free Chlorine at 10°C*

Chlorine Concentration (mg/L)	pH< = 6 Log Inactivations						pH = 6.5 Log Inactivations						pH = 7.0 Log Inactivations						pH = 7.5 Log Inactivations					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
<=0.4	12	24	37	49	61	73	15	29	44	59	73	88	17	35	52	69	87	104	21	42	63	83	104	125
0.6	13	25	38	50	63	75	15	30	45	60	75	90	18	36	54	71	89	107	21	43	64	85	107	128
0.8	13	26	39	52	65	78	15	31	46	61	77	92	18	37	55	73	92	110	22	44	66	87	109	131
1	13	26	40	53	66	79	16	31	47	63	78	94	19	37	56	75	93	112	22	45	67	89	112	134
1.2	13	27	40	53	67	80	16	32	48	63	79	95	19	38	57	76	95	114	23	46	69	91	114	137
1.4	14	27	41	55	68	82	16	33	49	65	82	98	19	39	58	77	97	116	23	47	70	93	117	140
1.6	14	28	42	55	69	83	17	33	50	66	83	99	20	40	60	79	99	119	24	48	72	96	120	144
1.8	14	29	43	57	72	86	17	34	51	67	84	101	20	41	61	81	102	122	25	49	74	98	123	147
2	15	29	44	58	73	87	17	35	52	69	87	104	21	41	62	83	103	124	25	50	75	100	125	150
2.2	15	30	45	59	74	89	18	35	53	70	88	105	21	42	64	85	106	127	26	51	77	102	128	153
2.4	15	30	45	60	75	90	18	36	54	71	89	107	22	43	65	86	108	129	26	52	79	105	131	157
2.6	15	31	46	61	77	92	18	37	55	73	92	110	22	44	66	87	109	131	27	53	80	107	133	160
2.8	16	31	47	62	78	93	19	37	56	74	93	111	22	45	67	89	112	134	27	54	82	109	136	163
3	16	32	48	63	79	95	19	38	57	75	94	113	23	46	69	91	114	137	28	55	83	111	138	166

Chlorine Concentration (mg/L)	pH< = 8 Log Inactivations						pH = 8.5 Log Inactivations						pH = 9.0 Log Inactivations					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
<=0.4	25	50	75	99	124	149	30	59	89	118	148	177	35	70	105	139	174	209
0.6	26	51	77	102	128	153	31	61	92	122	153	183	36	73	109	145	182	218
0.8	26	53	79	105	132	158	32	63	95	126	158	189	38	75	113	151	188	226
1	27	54	81	108	135	162	33	65	98	130	163	195	39	78	117	156	195	234
1.2	28	55	83	111	138	166	33	67	100	133	167	200	40	80	120	160	200	240
1.4	28	57	85	113	142	170	34	69	103	137	172	206	41	82	124	165	206	247
1.6	29	58	87	116	145	174	35	70	106	141	176	211	42	84	127	169	211	253
1.8	30	60	90	119	149	179	36	72	108	143	179	215	43	86	130	173	216	259
2	30	61	91	121	152	182	37	74	111	147	184	221	44	88	133	177	221	265
2.2	31	62	93	124	155	186	38	75	113	150	188	225	45	90	136	181	226	271
2.4	32	63	95	127	158	190	38	77	115	153	192	230	46	92	138	184	230	276
2.6	32	65	97	129	162	194	39	78	117	156	195	234	47	94	141	187	234	281
2.8	33	66	99	131	164	197	40	80	120	159	199	239	48	96	144	191	239	287
3	34	67	101	134	168	201	41	81	122	162	203	243	49	97	146	195	243	292

*$CT_{99.9}$ =CT for 3 log inactivation.

Table 3.14. CT Values for Inactivation of *Giardia* Cysts by Free Chlorine at 15°C*

Chlorine Concentration (mg/L)	pH< = 6 Log Inactivations						pH = 6.5 Log Inactivations						pH = 7.0 Log Inactivations						pH = 7.5 Log Inactivations					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
<=0.4	8	16	25	33	41	49	10	20	30	39	49	59	12	23	35	47	58	70	14	28	42	55	69	83
0.6	8	17	25	33	42	50	10	20	30	40	50	60	12	24	36	48	60	72	14	29	43	57	72	86
0.8	9	17	26	35	43	52	10	20	31	41	51	61	12	24	37	49	61	73	15	29	44	59	73	88
1	9	18	27	35	44	53	11	21	32	42	53	63	13	25	38	50	63	75	15	30	45	60	75	90
1.2	9	18	27	36	45	54	11	21	32	43	53	64	13	25	38	51	63	76	15	31	46	61	77	92
1.4	9	18	28	37	46	55	11	22	33	43	54	65	13	26	39	52	65	78	16	31	47	63	78	94
1.6	9	19	28	37	47	56	11	22	33	44	55	66	13	26	40	53	66	79	16	32	48	64	80	96
1.8	10	19	29	38	48	57	11	23	34	45	57	68	14	27	41	54	68	81	16	33	49	65	82	98
2	10	19	29	39	48	58	12	23	35	46	58	69	14	28	42	55	69	83	17	33	50	67	83	100
2.2	10	20	30	39	49	59	12	23	35	47	58	70	14	28	43	57	71	85	17	34	51	68	85	102
2.4	10	20	30	40	50	60	12	24	36	48	60	72	14	29	43	57	72	86	18	35	53	70	88	105
2.6	10	20	31	41	51	61	12	24	37	49	61	73	15	29	44	59	73	88	18	36	54	71	89	107
2.8	10	21	31	41	52	62	12	25	37	49	62	74	15	30	45	59	74	89	18	36	55	73	91	109
3	11	21	32	42	53	63	13	25	38	51	63	76	15	30	46	61	76	91	19	37	56	74	93	111

Chlorine Concentration (mg/L)	pH< = 8 Log Inactivations						pH = 8.5 Log Inactivations						pH = 9.0 Log Inactivations					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
<=0.4	17	33	50	66	83	99	20	39	59	79	98	118	23	47	70	93	117	140
0.6	17	34	51	68	85	102	20	41	61	81	102	122	24	49	73	97	122	146
0.8	18	35	53	70	88	105	21	42	63	84	105	126	25	50	76	101	126	151
1	18	36	54	72	90	108	22	43	65	87	108	130	26	52	78	104	130	156
1.2	19	37	56	74	93	111	22	45	67	89	112	134	27	53	80	107	133	160
1.4	19	38	57	76	95	114	23	46	69	91	114	137	28	55	83	110	138	165
1.6	19	39	58	77	97	116	24	47	71	94	118	141	28	56	85	113	141	169
1.8	20	40	60	79	99	119	24	48	72	96	120	144	29	58	87	115	144	173
2	20	41	61	81	102	122	25	49	74	98	123	147	30	59	89	118	148	177
2.2	21	41	62	83	103	124	25	50	75	100	125	150	30	60	91	121	151	181
2.4	21	42	64	85	106	127	26	51	77	102	128	153	31	61	92	123	153	184
2.6	22	43	65	86	108	129	26	52	78	104	130	156	31	63	94	125	157	188
2.8	22	44	66	88	110	132	27	53	80	106	133	159	32	64	96	127	159	191
3	22	45	67	89	112	134	27	54	81	108	135	162	33	65	98	130	163	195

*$CT_{99.9}$ =CT for 3 log inactivation.

Table 3.15. CT Values for Inactivation of *Giardia* Cysts by Free Chlorine at 20°C*

Chlorine Concentration (mg/L)	pH< = 6 Log Inactivations						pH = 6.5 Log Inactivations						pH = 7.0 Log Inactivations						pH = 7.5 Log Inactivations					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
<=0.4	6	12	18	24	30	36	7	15	22	29	37	44	9	17	26	35	43	52	10	21	31	41	52	62
0.6	6	13	19	25	32	38	8	15	23	30	38	45	9	18	27	36	45	54	11	21	32	43	53	64
0.8	7	13	20	26	33	39	8	15	23	31	38	46	9	18	28	37	46	55	11	22	33	44	55	66
1	7	13	20	26	33	39	8	16	24	31	39	47	9	19	28	37	47	56	11	22	34	45	56	67
1.2	7	13	20	27	33	40	8	16	24	32	40	48	10	19	29	38	48	57	12	23	35	46	58	69
1.4	7	14	21	27	34	41	8	16	25	33	41	49	10	19	29	39	48	58	12	23	35	47	58	70
1.6	7	14	21	28	35	42	8	17	25	33	42	50	10	20	30	39	49	59	12	24	36	48	60	72
1.8	7	14	22	29	36	43	9	17	26	34	43	51	10	20	31	41	51	61	12	25	37	49	62	74
2	7	15	22	29	37	44	9	17	26	35	43	52	10	21	31	41	52	62	13	25	38	50	63	75
2.2	7	15	22	29	37	44	9	18	27	35	44	53	11	21	32	42	53	63	13	26	39	51	64	77
2.4	8	15	23	30	38	45	9	18	27	36	45	54	11	22	33	43	54	65	13	26	39	52	65	78
2.6	8	15	23	31	38	46	9	18	28	37	46	55	11	22	33	44	55	66	13	27	40	53	67	80
2.8	8	16	24	31	39	47	9	19	28	37	47	56	11	22	34	45	56	67	14	27	41	54	68	81
3	8	16	24	31	39	47	10	19	29	38	48	57	11	23	34	45	57	68	14	28	42	55	69	83

Chlorine Concentration (mg/L)	pH< = 8 Log Inactivations						pH = 8.5 Log Inactivations						pH = 9.0 Log Inactivations					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
<=0.4	12	25	37	49	62	74	15	30	45	59	74	89	18	35	53	70	88	105
0.6	13	26	39	51	64	77	15	31	46	61	77	92	18	36	55	73	91	109
0.8	13	26	40	53	66	79	16	32	48	63	79	95	19	38	57	75	94	113
1	14	27	41	54	68	81	16	33	49	65	82	98	20	39	59	78	98	117
1.2	14	28	42	55	69	83	17	33	50	67	83	100	20	40	60	80	100	120
1.4	14	28	43	57	71	85	17	34	52	69	86	103	21	41	62	82	103	123
1.6	15	29	44	58	73	87	18	35	53	70	88	105	21	42	63	84	105	126
1.8	15	30	45	59	74	89	18	36	54	72	90	108	22	43	65	86	108	129
2	15	30	46	61	76	91	18	37	55	73	92	110	22	44	66	88	110	132
2.2	16	31	47	62	78	93	19	38	57	75	94	113	23	45	68	90	113	135
2.4	16	32	48	63	79	95	19	38	58	77	96	115	23	46	69	92	115	138
2.6	16	32	49	65	81	97	20	39	59	78	98	117	24	47	71	94	118	141
2.8	17	33	50	66	83	99	20	40	60	79	99	119	24	48	72	95	119	143
3	17	34	51	67	84	101	20	41	61	81	102	122	24	49	73	97	122	146

*$CT_{99.9}$ =CT for 3 log inactivation.

Table 3.16. CT Values for Inactivation of *Giardia* Cysts by Free Chlorine at 25°C*

Chlorine Concentration (mg/L)	pH< = 6 Log Inactivations						pH = 6.5 Log Inactivations						pH = 7.0 Log Inactivations						pH = 7.5 Log Inactivations					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
<=0.4	4	8	12	16	20	24	5	10	15	19	24	29	6	12	18	23	29	35	7	14	21	28	35	42
0.6	4	8	13	17	21	25	5	10	15	20	25	30	6	12	18	24	30	36	7	14	22	29	36	43
0.8	4	9	13	17	22	26	5	10	16	21	26	31	6	12	19	25	31	37	7	15	22	29	37	44
1	4	9	13	17	22	26	5	10	16	21	26	31	6	12	19	25	31	37	8	15	23	30	38	45
1.2	5	9	14	18	23	27	5	11	16	21	27	32	6	13	19	25	32	38	8	15	23	31	38	46
1.4	5	9	14	18	23	27	6	11	17	22	28	33	7	13	20	26	33	39	8	16	24	31	39	47
1.6	5	9	14	19	23	28	6	11	17	22	28	33	7	13	20	27	33	40	8	16	24	32	40	48
1.8	5	10	15	19	24	29	6	11	17	23	28	34	7	14	21	27	34	41	8	16	25	33	41	49
2	5	10	15	19	24	29	6	12	18	23	29	35	7	14	21	27	34	41	8	17	25	33	42	50
2.2	5	10	15	20	25	30	6	12	18	23	29	35	7	14	21	28	35	42	9	17	26	34	43	51
2.4	5	10	15	20	25	30	6	12	18	24	30	36	7	14	22	29	36	43	9	17	26	35	43	52
2.6	5	10	16	21	26	31	6	12	19	25	31	37	7	15	22	29	37	44	9	18	27	35	44	53
2.8	5	10	16	21	26	31	6	12	19	25	31	37	8	15	23	30	38	45	9	18	27	36	45	54
3	5	11	16	21	27	32	6	13	19	25	32	38	8	15	23	31	38	46	9	18	28	37	46	55

Chlorine Concentration (mg/L)	pH< = 8 Log Inactivations						pH = 8.5 Log Inactivations						pH = 9.0 Log Inactivations					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
<=0.4	8	17	25	33	42	50	10	20	30	39	49	59	12	23	35	47	58	70
0.6	9	17	26	34	43	51	10	20	31	41	51	61	12	24	37	49	61	73
0.8	9	18	27	35	44	53	11	21	32	42	53	63	13	25	38	50	63	75
1	9	18	27	36	45	54	11	22	33	43	54	65	13	26	39	52	65	78
1.2	9	18	28	37	46	55	11	22	34	45	56	67	13	27	40	53	67	80
1.4	10	19	29	38	48	57	12	23	35	46	58	69	14	27	41	55	68	82
1.6	10	19	29	39	48	58	12	23	35	47	58	70	14	28	42	56	70	84
1.8	10	20	30	40	50	60	12	24	36	48	60	72	14	29	43	57	72	86
2	10	20	31	41	51	61	12	25	37	49	62	74	15	29	44	59	73	88
2.2	10	21	31	41	52	62	13	25	38	50	63	75	15	30	45	60	75	90
2.4	11	21	32	42	53	63	13	26	39	51	64	77	15	31	46	61	77	92
2.6	11	22	33	43	54	65	13	26	39	52	65	78	16	31	47	63	78	94
2.8	11	22	33	44	55	66	13	27	40	53	67	80	16	32	48	64	80	96
3	11	22	34	45	56	67	14	27	41	54	68	81	16	32	49	65	81	97

*$CT_{99.9}$ =CT for 3 log inactivation.

Table 3.17. CT Values for Inactivation of Viruses by Free Chlorine

	Log Inactivation		Log Inactivation		Log Inactivation	
	2.0 pH		3.0 pH		4.0 pH	
Temperature (C)	**6-9**	**10**	**6-9**	**10**	**6-9**	**10**
0.5	6	45	9	66	12	90
5	4	30	6	44	8	60
10	3	22	4	33	6	45
15	2	15	3	22	4	30
20	1	11	2	16	3	22
25	1	7	1	11	2	15

Table 3.18. CT Values for Inactivation of *Giardia* Cysts by Chlorine Dioxide

	Temperature (C)					
Inactivation	**<=1**	**5**	**10**	**15**	**20**	**25**
0.5-log	10	4.3	4	3.2	2.5	2
1-log	21	8.7	7.7	6.3	5	3.7
1.5-log	32	13	12	10	7.5	5.5
2-log	42	17	15	13	10	7.3
2.5-log	52	22	19	16	13	9
3-log	63	26	23	19	15	11

Table 3.19. CT Values for Inactivation of Viruses by Free Chlorine Dioxide pH 6-9

	Temperature (C)					
Removal	**<=1**	**5**	**10**	**15**	**20**	**25**
2-log	8.4	5.6	4.2	2.8	2.1	1.4
3-log	25.6	17.1	12.8	8.6	6.4	4.3
4-log	50.1	33.4	25.1	16.7	12.5	8.4

Table 3.20. CT Values for Inactivation of *Giardia* Cysts by Ozone

	Temperature (C)					
Inactivation	**<=1**	**5**	**10**	**15**	**20**	**25**
0.5-log	0.48	0.32	0.23	0.16	0.12	0.08
1-log	0.97	0.63	0.48	0.32	0.24	0.16
1.5-log	1.5	0.95	0.72	0.48	0.36	0.24
2-log	1.9	1.3	0.95	0.63	0.48	0.32
2.5-log	2.4	1.6	1.2	0.79	0.60	0.40
3-log	2.9	1.9	1.43	0.95	0.72	0.48

Table 3.21. CT Values for Inactivation of Viruses by Free Ozone

	Temperature (C)					
Inactivation	**<=1**	**5**	**10**	**15**	**20**	**25**
2-log	0.9	0.6	0.5	0.3	0.25	0.15
3-log	1.4	0.9	0.8	0.5	0.4	0.25
4-log	1.8	1.2	1.0	0.6	0.5	0.3

Table 3.22. CT Values for Inactivation of *Giardia* Cysts by Chloramine pH 6-9

	Temperature (C)					
Inactivation	**<=1**	**5**	**10**	**15**	**20**	**25**
0.5-log	635	365	310	250	185	125
1-log	1,270	735	615	500	370	250
1.5-log	1,900	1,100	930	750	550	375
2-log	2,535	1,470	1,230	1,000	735	500
2.5-log	3,170	1,830	1,540	1,250	915	625
3-log	3,800	2,200	1,850	1,500	1,100	750

Table 3.23. CT Values for Inactivation of Viruses by Chloramine

	Temperature (C)					
Inactivation	**<=1**	**5**	**10**	**15**	**20**	**25**
2-log	1,243	857	643	428	321	214
3-log	2,063	1,423	1,067	712	534	356
4-log	2,883	1,988	1,491	994	746	497

Table 3.24. CT Values for Inactivation of Viruses by UV

Log Inactivation	
2.0	**3.0**
21	36

CHAPTER 4

WASTEWATER

4.1. SCOPE

This Chapter contains criteria to control and regulate discharges of wastewater into surface waters. This includes, but is not limited to, storm water runoff associated with industrial activities, domestic and industrial wastewater discharges, and pollutants from indirect dischargers.

4.2. DEFINITIONS

4.2.1. 7-day Average. The arithmetic mean of pollutant parameter values for samples collected in a period of seven consecutive days.

4.2.2. 30-day Average. The arithmetic mean of pollutant parameter values for samples collected in a period of 30 consecutive days.

4.2.3. Average Monthly Discharge Limitations. The highest allowable average of "daily discharges" over a calendar month, calculated as the sum of all "daily discharges" measured during a calendar month divided by the number of "daily discharges" measured during that month.

4.2.4. Average Weekly Discharge Limitation. The highest allowable average of "daily discharges" over a calendar week, calculated as the sum of all "daily discharges" measured during a calendar week divided by the number of "daily discharges" measured during that week.)

4.2.5. Best Management Practices (BMP). Practical practices and procedures that will minimize or eliminate the possibility of pollution being introduced into waters of the host nation.

4.2.6. Biochemical Oxygen Demand (BOD_5). The five-day measure of the dissolved oxygen used by microorganisms in the biochemical oxidation of organic matter. The pollutant parameter is biochemical oxygen demand (i.e., biodegradable organics in terms of oxygen demand).

4.2.7. Carbonaceous BOD_5 ($CBOD_5$). The five-day measure of the pollutant parameter, $CBOD_5$. This test can substitute for the BOD_5 testing which suppresses the nitrification reaction/component in the BOD_5 test.

4.2.8. Conventional Pollutants. BOD_5, total suspended solids (TSS), oil and grease, fecal coliforms, and pH.

4.2.9. Daily Discharge. The "discharge of a pollutant" measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For

pollutants with limitations expressed in units of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement (e.g., concentration) "daily discharge" is calculated as the average measurement of the pollutant over the day.

4.2.10. Direct Discharge. Any "discharge of pollutants" other than an indirect discharge.

4.2.11. Discharge of a Pollutant. Any addition of any pollutant or combination of pollutants to waters of the host nation from any "point source."

4.2.12. Domestic Wastewater Treatment System (DWTS). Any DoD or HN facility designed to treat wastewater before its discharge to waters of the host nation and in which the majority of such wastewater is made up of domestic sewage.

4.2.13. Effluent Limitation. Any restriction imposed on quantities, discharge rates, and concentrations of pollutants that are ultimately discharged from point sources into waters of the host nation.

4.2.14. Existing Source. A source in operation, or under construction, prior to 1 October 1994, unless it is subsequently substantially modified, that discharges pollutants.

4.2.15. Indirect Discharge. An introduction of pollutants in process wastewater to a DWTS.

4.2.16. Industrial Activities Associated with Storm Water. Activities that may contribute pollutants to storm water runoff or drainage during wet weather events. (See Table 4.4, “Best Management Practices.”)

4.2.17. Industrial Wastewater Treatment System (IWTS). Any DoD facility other than a DWTS designed to treat process wastewater before its discharge to waters of the host nation.

4.2.18. Interference. Any addition of any pollutant or combination of pollutant discharges that inhibits or disrupts the DWTS, its treatment processes or operations, or its sludge handling processes, use or disposal.

4.2.19. Maximum Daily Discharge Limitation. The highest allowable daily discharge based on volume as well as concentration.

4.2.20. New Source. A source built or substantially modified on or after 1 October 1994 that directly or indirectly discharges pollutants to the wastewater system.

4.2.21. Point Source. Any discernible, confined, and discrete conveyance, including, but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, or rolling stock; but not including vessels, aircraft, or any conveyance that merely collects natural surface flows of precipitation.

4.2.22. Pollutant. Includes, but is not limited to, the following: dredged spoil; solid waste; incinerator residue; filter backwash; sewage; garbage; sewage sludge; munitions; chemical waste;

biological material; radioactive material; heat; wrecked or discarded equipment; rock; sand; cellar dirt; and industrial, municipal, and agricultural waste discharged into water.

4.2.23. Process Wastewater. Any water which during manufacturing or processing, comes into direct contact with, or results from the production or use of, any raw material, intermediate product, finished product, by-product, or waste product.

4.2.24. Regulated Facilities. Those facilities for which criteria are established under this Chapter, such as DWTS, IWTS, or industrial discharges.

4.2.25. Storm Water. Run-off and drainage from wet weather events such as rain, snow, ice, sleet, or hail.

4.2.26. Substantial Modification. Any modification to a facility, the cost of which exceeds $1,000,000, regardless of funding source.

4.2.27. Total Suspended Solids (TSS). The pollutant parameter total filterable suspended solids.

4.2.28. Total Toxic Organics (TTO). The summation of all quantifiable values > 0.01 mg/L for the toxic organics in Table 4.2, "Components of Total Toxic Organics."

4.2.29. Waters of the Host Nation. Surface water including the territorial seas recognized under customary international law, including:

4.2.29.1. All waters which are currently used, were used in the past, or may be susceptible to use in commerce.

4.2.29.2. Waters which are or could be used for recreation or other purposes.

4.2.29.3. Waters from which fish or shellfish are or could be taken and sold.

4.2.29.4. Waters which are used or could be used for industrial purposes by industries.

4.2.29.5. Waters including lakes, rivers, streams (including intermittent streams), sloughs, prairie potholes, or natural ponds.

4.2.29.6. Tributaries of waters identified in this definition.

4.2.29.7. Exclusions to waters of the host nation. Domestic or industrial waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of this Chapter, are not waters of the host nation. This exclusion applies only to manmade bodies of water that were neither originally waters of the host nation nor resulted from impoundment of waters of the host nation.

4.3. CRITERIA

4.3.1. Effluent Limitations for Direct Dischargers of Conventional Pollutants

4.3.1.1. All new sources of pollutants directly discharged to waters of host nations will comply with the following effluent limitations on Table 4.1.

4.3.1.2. Monitoring. Monitoring requirements apply to all regulated facilities. The monitoring frequency (including both sampling and analysis) given in Table 4.3, "Monitoring Requirements," includes all three parameters which are regulated (BOD_5, TSS, and pH). Samples shall be collected at the point of discharge to the waters of the host nation.

4.3.1.3. Recordkeeping Requirements. The following monitoring and recordkeeping requirements are BMPs and apply to all facilities. Retain records for three years.

4.3.1.3.1. The effluent, concentration, or other measurement specified for each regulated parameter.

4.3.1.3.2. The daily volume of effluent discharge from each point source.

4.3.1.3.3. Test procedures for the analysis of pollutants.

4.3.1.3.4. The date, exact place, and time of sampling and/or measurements.

4.3.1.3.5. The name of the person who performed the sampling and/or measurements.

4.3.1.3.6. The date of analysis.

4.3.1.3.7. Additional record-keeping requirements for waste treatment units. An Operations Register shall be maintained for a period of three years. In addition to the criteria above, it shall comprise of the following information, depending on the type of discharge:

4.3.1.3.7.1. Concentration of pollutants in sludge, wastes or secondary remains arising from the treatment process.

4.3.1.3.7.2. Concentrations of emissions to air arising from the treatment process .

4.3.1.3.7.3. Concentration of pollutants in industrial drainage water arising from the treatment process and released into the sea every 3 months in accordance with Table 4.1 effluent limits.

4.3.1.3.7.4. Concentration of pollutants in soil/ groundwater at the treatment unit site.

4.3.1.3.7.5. Information describing the waste/secondary remains from the treatment process including the name of both generator and carrier and the dates of receipt, treatment or disposal.

4.3.1.4. Complaint System. A system for investigating water pollution complaints from individuals or HN water pollution control authorities will be established, involving the EEA, as appropriate.

4.3.1.5. Limited Effluent Standards. If DWTS plant capacity is between 0.0 and 185.49 m^3 (0.0 and 0.049 million gallons per day (MGD)), monthly sample must comply with level for 30-day average.

4.3.2. Effluent Limitations For Non-Categorical Industrial Indirect Dischargers

4.3.2.1. Effluent Limits. The following effluent limits will apply to all discharges of pollutants to DWTSs and associated collection systems from process wastewater for which categorical standards have not been established (see subparagraphs 4.3.3.1.8., 4.3.3.1.9., and 4.3.3.1.10. for a list of categorical standards).

4.3.2.1.1. Solid or Viscous Pollutants. The discharge of solid or viscous pollutants that would result in an obstruction to the domestic wastewater treatment plant flow is prohibited.

4.3.2.1.2. Ignitability and Explosiveness

4.3.2.1.2.1. The discharge of wastewater with a closed cup flashpoint of < 60°C (140°F) is prohibited.

4.3.2.1.2.2. The discharge of waste with any of the following characteristics is prohibited:

4.3.2.1.2.2.1. A liquid solution that contains > 24% alcohol by volume and has a flash point < 60°C (140°F).

4.3.2.1.2.2.2. A non-liquid which under standard temperature and pressure can cause a fire through friction.

4.3.2.1.2.2.3. An ignitable compressed gas.

4.3.2.1.2.2.4. An oxidizer, such as peroxide.

4.3.2.1.3. Reactivity and Fume Toxicity. The discharge of any of the following wastes is prohibited:

4.3.2.1.3.1. Wastes that are normally unstable and readily undergo violent changes without detonating;

4.3.2.1.3.2. Wastes that react violently with water;

4.3.2.1.3.3. Wastes that form explosive mixtures with water or forms toxic gases or fumes when mixed with water;

4.3.2.1.3.4. Cyanide or sulfide waste that can generate potentially harmful toxic fumes, gases, or vapors;

4.3.2.1.3.5. Waste capable of detonation or explosive decomposition or reaction at standard temperature and pressure;

4.3.2.1.3.6. Wastes that contain explosives regulated by Chapter 5, "Hazardous Material"; and

4.3.2.1.3.7. Wastes that produce any toxic fumes, vapors, or gases with the potential to cause safety problems or harm to workers.

4.3.2.1.4. Corrosivity. It is prohibited to discharge pollutants with the potential to be structurally corrosive to the DWTS. In addition, no discharge of wastewater below a pH of 5.0 is allowed, unless the DWTS is specifically designed to handle that type of wastewater.

4.3.2.1.5. Oil and Grease. The discharge of the following oils that can pass through or cause interference to the DWTS is prohibited: petroleum oil, non-biodegradable cutting oil, and products of mineral oil origin.

4.3.2.1.6. Spills and Batch Discharges (slugs). Installations treating or disposing liquid hazardous wastes shall prepare an emergency plan (Section 4.3.8.). Activities or installations that have a significant potential for spills or batch discharges will develop a slug prevention plan. Each plan must contain the following minimum requirements:

4.3.2.1.6.1. Description of discharge practices, including non-routine batch discharges;

4.3.2.1.6.2. Description of stored chemicals;

4.3.2.1.6.3. Plan for immediately notifying the DWTS of slug discharges and discharges that would violate prohibitions under this Chapter, including procedures for subsequent written notification within five days;

4.3.2.1.6.4. Necessary practices to prevent accidental spills. This would include proper inspection and maintenance of storage areas, handling and transfer of materials, loading and unloading operations, control of plant site runoff, and worker training;

4.3.2.1.6.5. Proper procedures for building containment structures or equipment;

4.3.2.1.6.6. Necessary measures to control toxic organic pollutants and solvents; and

4.3.2.1.6.7. Proper procedures and equipment for emergency response, and any subsequent plans necessary to limit damage suffered by the treatment plant or the environment.

4.3.2.1.7. Trucked and Hauled Waste. The discharge of trucked and hauled waste into the DWTS, except at locations specified by the DWTS operator, is prohibited. Approval is required for the transport and disposal of hazardous waste (see Chapter 6, "Hazardous Waste"). Disposal of hazardous waste/ sludge into sewers, sea or soil is prohibited.

4.3.2.1.8. Heat. Heat in amounts that inhibit biological activity in the DWTS resulting in interference, but in no case in such quantities that the temperature of the process water at the DWTS exceeds 40°C (104°F).

4.3.2.2. Complaint System. A system for investigating water pollution complaints from HN water pollution control authorities will be established, involving the EEA as appropriate.

4.3.3. Effluent Limitations for Categorical Industrial Dischargers (Direct or Indirect). Any installations which have activities that fall into any of the industrial categories listed below must comply with the following effluent limitations (i.e., either direct or indirect discharge limitations at the source of the discharge). For most categories, the effluent limitations are the same for new and existing activities. Where differences in limitations exist, activities constructed or substantially modified on or after 1 October 1994 will meet the limitations for new activities.

4.3.3.1. Electroplating. The following discharge standards apply to electroplating operations in which metal is electroplated on any basis material and to related metal finishing operations as set forth in the various subparts. These standards apply whether such operations are conducted in conjunction with electroplating, independently, or as part of some other operation. Electroplating subparts are identified as follows:

4.3.3.1.1. Electroplating of Common Metals. Discharges of pollutants in process waters resulting from the process in which a material is electroplated with copper, nickel, chromium, zinc, tin, lead, cadmium, iron, aluminum, or any combination thereof.

4.3.3.1.2. Electroplating of Precious Metals. Discharges of pollutants in process waters resulting from the process in which a material is plated with gold, silver, iridium, palladium, platinum, rhodium, ruthenium, or any combination thereof.

4.3.3.1.3. Anodizing. Discharges of pollutants in process waters resulting from the anodizing of ferrous and nonferrous materials.

4.3.3.1.4. Metal Coatings. Discharges of pollutants in process waters resulting from the chromating, phosphating, or immersion plating on ferrous and nonferrous materials.

4.3.3.1.5. Chemical Etching and Milling. Discharges of pollutants in process waters resulting from the chemical milling or etching of ferrous and nonferrous materials.

4.3.3.1.6. Electroless Plating. Discharges of pollutants in process waters resulting from the electroless plating of a metallic layer on a metallic or nonmetallic substrate.

4.3.3.1.7. Printed Circuit Board Manufacturing. Discharges of pollutants in process waters resulting from the manufacture of printed circuit boards, including all manufacturing operations required or used to convert an insulating substrate to a finished printed circuit board.

4.3.3.1.8. The following discharge standards apply to new and existing facilities in the above electroplating subparts which directly or indirectly discharge < 38,000 liters per day (10,000 gallons per day):

Pollutant	Daily Maximum (mg/L)	4-day Average (mg/L)
Cyanide, amenable	5.0	2.7
Lead	0.6	0.4
Cadmium	1.2	0.7
Total Toxic Organics	4.57	---

4.3.3.1.9. The following discharge standards apply to new and existing facilities in the above electroplating subparts that directly, or indirectly, discharge 38,000 liters per day (10,000 gallons per day) or more:

Pollutant	Daily Maximum (mg/L)	4-day Average (mg/L)
Cyanide, total	1.9	1.0
Copper	4.5	2.7
Nickel	4.1	2.6
Chrome	7.0	4.0
Zinc	4.2	2.6
Lead	0.6	0.4
Cadmium	1.2	0.7
Total Metals	10.5	6.8
Total Toxic Organics	2.13	---

4.3.3.1.10. In addition to the above standards, new and existing facilities that electroplate precious metals and that directly or indirectly discharge 38,000 liters per day (10,000 gallons per day) or more must comply with the following standard:

Pollutant	Daily Maximum (mg/L)	4-day Average (mg/L)
Silver	1.2	0.7

4.3.3.2. Monitoring. Monitoring of categorical industrial dischargers (including both sampling and analysis) will be accomplished quarterly and will include all parameters that are specified in the paragraph of this Chapter dealing with industrial dischargers. Samples should be collected at the point of discharge prior to any mixing with the receiving water. Sampling for TTO may not be required if the commanding officer determines that no discharge of concentrated toxic organics into the wastewater has occurred and the facility has implemented a TTO management plan. (See Table 4.3, “Monitoring Requirements.”)

4.3.4. Storm Water Management

4.3.4.1. Develop and implement storm water pollution prevention (P2) plans (SWPPP) for activities listed in Table 4.4, "Best Management Practices." Update the SWPPP annually using in-house resources.

4.3.4.2. Employee Training. Personnel who handle hazardous substances or perform activities that could contribute pollution in wet weather events should be trained in appropriate BMPs. Such training should stress P2 principles and awareness of possible pollution sources, including non-traditional sources such as sediment, nitrates, pesticides, and fertilizers.

4.3.5. Septic System. Discharge to a septic system of wastewater containing industrial pollutants in levels that will inhibit biological activity is prohibited. Known discharges of industrial pollutants to existing septic systems shall be eliminated, and appropriate actions should be taken to eliminate contamination. Siting of such systems is addressed in Chapter 3, "Drinking Water."

4.3.6. Sludge Disposal. All sludge produced during the treatment of wastewater will be disposed in accordance with the guidance under Chapter 6, "Hazardous Waste" or Chapter 7, "Solid Waste," as appropriate. In particular, installations shall note that:

4.3.6.1. Sludge resulting from the treatment processes described in Table 6.1 through Tables 6.12 of Chapter 6, "Hazardous Wastes" shall be disposed of as hazardous waste.

4.3.6.2. Disposal of sludge arising from the cleaning of transport vehicle tanks to sewers, soil or sea is prohibited.

Table 4.1. Monthly Average and Maximum Discharge Standards to Receiving Waters

Parameter	**Monthly Average[1] (mg/l unless otherwise specified)**	**Maximum Value (mg/l unless otherwise specified)**
Physiochemical		
Floating particles (no units)	Nil	-
pH (no units)	6-9	-
Total Suspended Solids	20	35
Temperature (°C)	(ΔT) ± 3	-
Turbidity (NTU)	25	75
Biochemical		
Biochemical Oxygen Demand	25	50
Chemical Oxygen Demand	150	350
Total Organic Carbon	50	-
Total Kjeldahl Nitrogen	5	10
Oil & Grease	8	15
Fluorescent Petroleum Matter	0.1	0.1
Phenols	0.5	1
Chemical		
Ammoniacal Nitrogen (as N)	1	3
Residual Chlorine	0.5	2
Total Cyanide (CN)	0.05	0.1
Nitrite (NO_2/N)	-	10
Nitrate (NO_3/N)	-	1
Sulfide	0.5	1
Total Phosphate (P)	1	2
Arsenic	0.1	0.5
Cadmium	0.01	0.05
Chromium total	0.1	1
Copper	0.2	0.5
Lead	0.2	1
Mercury	0.001	0.005
Nickel	0.2	0.5
Aluminum	15	25
Iron	5	10
Zinc	2	5
Biological		
Total Coliform (MPN/100ml)	1000	1000

Notes:

[1] Average reading during 30 days.

[2] Maximum values must not be exceeded at any time

Table 4.2. Components of Total Toxic Organics

Volatile Organics	
Acrolein (Propenyl)	Bromodichloromethane
Acrylonitrile	1,1,2,2-Tetrachloroethane
Methyl chloride (chloromethane)	1,2-Dichloropropane
Methyl bromide (bromomethane)	1,3-Dichloropropylene (1,3-Dichloropropene)
Vinyl Chloride (chloroethylene)	Trichloroethene
Chloroethane	Dibromochloromethane
Methylene Chloride (9 dichloromethane)	1,1,2-Trichloroethane
1,1-Dichloroethene	Benzene
1,1-Dichloroethane	2-Chloroethyl vinyl ether (mixed)
1,2-Dichloroethane	Bromoform (tribromomethane)
1,2-trans-Dichloroethene	Tetrachloroethene
Chloroform (trichloromethane)	Toluene
1,1,1-Trichloroethane	Chlorobenzene
Carbon Tetrachloride (tetrachloromethane)	Ethylbenzene
Base/Neutral Extractable Organics	
N-nitrosodimethylamine	Diethyl phthalate
bis (2-chloroethyl) ether	1,2-Diphenylhydrazine
1,3-Dichlorobenzene	N-nitrosodiphenylamine
1,4-Dichlorobenzene	4-Bromophenyl phenyl ether
1,2-Dichlorobenzene	Hexachlorobenzene
bis(2-chloroisopropyl)-ether	Phenanthrene
Hexachloroethane	Anthracene
N-nitrosodi-n-propylamine	Di-n-butyl phthalate
Nitrobenzene	Fluoranthene
Isophorone	Pyrene
bis (2-chloroethoxy) methane	Benzidine
1,2,4-trichlorobenzene	Butyl benzyl phthalate
Naphthalene	1,2-benzoanthracene (benzo (a) anthracene)
Hexachlorobutadiene	Chrysene
Hexachlorocyclopentadiene	3,3-Dichlorobenzidine
2-Chloronaphthalene	bis (2-ethylhexyl) phthalate
Acenaphthylene	Di-n-octyl phthalate
Dimethyl Phthalate	3,4-Benzofluoranthene (benzo (b) fluoranthene)
2,6-Dinitrotoluene	11,12-Benzofluoranthene (benzo (k) fluoranthene)
Acenaphthene	Benzo (a) pyrene (3,4-benzopyrene)
2,4-Dinitrotoluene	Indeno (1,2,3-cd) pyrene (2,3-o-phenylene pyrene)
Fluorene	1,2,5,6-Dibenzanthracene (dibenezo (a,h) anthracene)
4-Chlorophenyl phenyl ether	1,12-Benzoperylene (benzo (g,h,i) perylene)
Acid Extractables Organics	
2-Chlorophenol	2,4,6-Trichlorphenol
Phenol	2,4-Dinitrophenol
2-Nitrophenol	4-Nitrophenol
2,4-Dimethylphenol	p-Chloro-m-cresol
2,4-Dichlorophenol	Pentachlorophenol
4,6-Dinitro-o-cresol	
Pesticides/PCBs	
Alpha-Endosulfan	Endrin
Beta-Endosulfan	Endrin aldehyde
Endosulfan sulfate	Heptachlor

Table 4.2. Components of Total Toxic Organics

Alpha-BHC	Heptachlor Epoxide (BHC-hexachlorocyclohexane)
Beta-BHC	Toxaphene
Delta-BHC	PCB-1242 (Arochlor 1242)
Gamma-BHC	PCB-1254 (Arochlor 1254)
4,4-DDT	PCB-1221 (Arochlor 1221)
4,4-DDE (p,p-DDX)	PCB-1232 (Arochlor 1232)
(p,p-TDE)	PCB-1248 (Arochlor 1248)
Aldrin	PCB-1260 (Arochlor 1260)
Chlordane (technical mixture and metabolites)	PCB-1016 (Arochlor 1016)
Dieldrin	

Table 4.3. Monitoring Requirements

Plant Capacity (MGD)	Monitoring Frequency
0.001 - 0.99	Monthly
1.0 - 4.99	Weekly
> 5.0	Daily

Table 4.4. Best Management Practices

Activity	**Best Management Practice**
Aircraft Ground Support Equipment Maintenance	Perform maintenance/repair activities inside Use drip pans to capture drained fluids Cap hoses to prevent drips and spills
Aircraft/runway deicing	Perform anti-icing before the storm Put critical aircraft in hangars/shelters
Aircraft/vehicle fueling operations	Protect fueling areas from the rain Provide spill response equipment at fueling station
Aircraft/vehicle maintenance & repair	Perform maintenance/repair activities inside Use drip pans to capture drained fluids
Aircraft/vehicle washing	Capture wash water and send to wastewater treatment plant Treat wash water with oil water separator before discharge
Bulk fuel storage areas	Use dry camlock connectors to reduce fuel loss Capture spills with drip pans when breaking connections Curb fuel transfer areas, treat with oil water separator
Construction activities	Construct sediment dams/silt fences around construction sites
Corrosion control activities	Capture solvent/soaps used to prepare aircraft for painting Perform corrosion control activities inside
Hazardous material storage	Store hazardous materials inside or under cover Reduce use of hazardous materials
Outdoor material storage areas	Cover and curb salt, coal, urea piles Store product drums inside or under cover Reduce quantity of material stored outside
Outdoor painting/depainting operations	Capture sandblasting media for proper disposal Capture paint clean up materials (thinners, rinsates)
Pesticide operations	Capture rinse water when mixing chemicals Store spray equipment inside
Power production	Capture leaks and spills from power production equipment using drip pans, etc.
Vehicle storage yards	Check vehicles in storage for leaks and spills Use drip pans to capture leaking fluids

CHAPTER 5

HAZARDOUS MATERIAL

5.1. SCOPE

This Chapter contains criteria for the storage, handling, and disposition of hazardous materials. It does not cover solid or hazardous waste, underground storage tanks, petroleum storage, and related spill contingency and emergency response requirements, which are covered under other Chapters. This Guide does not cover munitions.

5.2. DEFINITIONS

5.2.1. Hazardous Chemical Warning Label. A label, tag, or marking on a container that provides the following information:

5.2.1.1. Identification/name of hazardous chemicals;

5.2.1.2. Appropriate hazard warnings; and

5.2.1.3. The name and address of the manufacturer, importer, or other responsible party; and that is prepared in accordance with DoDI 6050.05 (DoD Hazard Communication (HAZCOM) Program).

5.2.2. Hazardous Material. Any material that is capable of posing an unreasonable risk to health, safety, or the environment if improperly handled, stored, issued, transported, labeled, or disposed because it displays a characteristic listed in Table 5.1., "Typical Hazardous Materials Characteristics," or the material is listed in Table AP1.4., "List of Hazardous Waste/Substances/Materials." Munitions are excluded.

5.2.2.1. Classification of hazardous material is in accordance with the following hazard classes:

5.2.2.1.1. Explosives (Class 1)

5.2.2.1.2. Compressed or Liquefied Gases (Class 2)

5.2.2.1.3. Flammable Liquids (Class 3)

5.2.2.1.4. Flammable Solids (Class 4)

5.2.2.1.5. Oxidizing Agents (Class 5)

5.2.2.1.6. Toxic Materials (Class 6)

5.2.2.1.7. Radioactive Materials (Class 7)

5.2.2.1.8. Corrosive Materials (Class 8)

5.2.3. Hazardous Material Information Resource System (HMIRS). The computer-based information system developed to accumulate, maintain and disseminate important information on hazardous material used by the Department of Defense in accordance with DoDI 6050.05, "DoD Hazard Communication (HAZCOM) Program."

5.2.4. Hazardous Material Shipment. Any movement of hazardous material in a DoD land vehicle, either from an installation to a final destination off the installation, or from a point of origin off the installation to a final destination on the installation, in which certification of the shipment is involved.

5.2.5. Material Safety Data Sheet (MSDS). A form prepared by manufacturers or importers of chemical products to communicate to users the chemical and physical properties and the hazardous effects of a particular product.

5.3. CRITERIA

5.3.1. Storage and handling of hazardous materials will adhere to the DoD Component policies, including Joint Service Publication on Storage and Handling of Hazardous Materials. Defense Logistics Agency Instruction (DLAI) 4145.11, Army Technical Manual (TM) 38-410, Naval Supply Publication (NAVSUP PUB) 573, Air Force Joint Manual (AFJMAN) 23-209, and Marine Corps Order (MCO) 4450.12A (Storage and Handling of Hazardous Materials), provide additional guidance on the storage and handling of hazardous materials. The International Maritime Dangerous Goods (IMDG) Code and appropriate DoD and Component instructions provide requirements for international maritime transport of hazardous materials originating from DoD installations. International air shipments of hazardous materials originating from DoD installations are subject to International Civil Aviation Organization Technical Instructions or DoD Component guidance, including Air Force Interservice Manual 24-204(I), Army Technical Order (TO) 38-250, NAVSUP PUB 505, MCO P4030.19I, and DLAI 4145.3, DCMAD1, Ch3.4 (HM24), (Preparing Hazardous Materials for Military Air Shipments).

5.3.2. Hazardous material dispensing areas will be properly maintained. Drums/containers must not be leaking. Drip pans/absorbent materials will be placed under containers as necessary to collect drips or spills. Container contents will be clearly marked. Dispensing areas will be located away from catch basins and floor/storm drains.

5.3.3. Installations will ensure that for each hazardous material shipment:

5.3.3.1. The shipment is accompanied throughout by shipping papers that clearly describe the quantity and identity of the material and include an MSDS;

5.3.3.2. All drivers are trained on the hazardous material included in the shipment

including health risks of exposure and the physical hazards of the material, including potential for fire, explosion, and reactivity;

5.3.3.3. Drivers will be trained on spill control and emergency notification procedures;

5.3.3.4. For any hazardous material categorized on the basis of section AP1.1. of this Guide, the shipping papers and briefing for the driver include identification of the material in terms of the nine United Nations (UN) Hazard Classes;

5.3.3.5. The transport vehicles are subjected to a walk-around inspection by the driver before and after the hazardous material is loaded and may also be subjected to a request by the Competent Authority to conduct external and internal vehicle inspections (e.g. internal pressure levels)(Bahraini inspector requests shall be coordinated through the LEC); and

5.3.3.6. Packages are labeled in accordance with paragraph 5.3.7.

5.3.3.7. Transport shall be in accordance with paragraph 5.3.12.

5.3.3.8. Storage requirements shall be in accordance with paragraph 5.3.13.

5.3.4. Each installation will maintain a master listing of all storage locations for hazardous material as well as an inventory of all hazardous materials contained therein. (See paragraph 18.3.2.).

5.3.5. Each MSDS shall be in English or the predominant language in the work place, and shall contain at least the following information:

5.3.5.1. The identity used on the label.

5.3.5.1.1. If the hazardous chemical is a single substance, its chemical and common name.

5.3.5.1.2. If the hazardous chemical is a mixture that has been tested as a whole to determine its hazards, the chemical and common name(s) of the ingredients that contribute to these known hazards, and the common name(s) of the mixture itself; or

5.3.5.1.3. If the hazardous chemical is a mixture that has not been tested as a whole:

5.3.5.1.3.1. The chemical and common name(s) of all ingredients that have been determined to be health hazards, and that comprise 1% or greater of the composition, except that chemicals identified as carcinogens shall be listed if the concentrations are 0.1% or greater;

5.3.5.1.3.2. The chemical and common name(s) of all ingredients that have been determined to be health hazards, and that comprise < 1% (0.1% for carcinogens) of the mixture, if there is evidence that the ingredient(s) could be released from the mixture in concentrations that would exceed an established Occupational Safety and Health Administration (OSHA)-permissible exposure limit, or could present a health hazard to employees; and

5.3.5.1.3.3. The chemical and common name(s) of all ingredients that have been determined to present a physical hazard when present in the mixture.

5.3.5.2. Physical and chemical characteristics of the hazardous chemical (such as vapor pressure, flash point);

5.3.5.3. The physical hazards of the hazardous chemical, including the potential for fire, explosion, and reactivity;

5.3.5.4. The health hazards of the hazardous chemical, including signs and symptoms of exposure, and any medical conditions that are generally recognized as being aggravated by exposure to the chemical;

5.3.5.5. The primary route(s) of entry (inhalation, skin absorption, ingestion, etc.);

5.3.5.6. The appropriate occupational exposure limit recommended by the chemical manufacturer, importer, or employer preparing the MSDS, where available;

5.3.5.7. Whether the hazardous chemical has been found to be a potential carcinogen;

5.3.5.8. Any generally applicable precautions for safe handling, storage, transportation, use, and disposal that are known to the chemical manufacturer, importer, or employer preparing the MSDS, including appropriate hygienic practices, protective measures during repair and maintenance of contaminated equipment, and procedures for clean-up of spills and leaks;

5.3.5.9. Any generally applicable control measures that are known to the chemical manufacturer, importer, or employer preparing the MSDS, such as appropriate engineering controls, work practices, or personal protective equipment;

5.3.5.10. Emergency and first aid procedures;

5.3.5.11. The date of preparation of the MSDS or the last change to it; and

5.3.5.12. The name, address and telephone number of the chemical manufacturer, importer, employer, or other responsible party preparing or distributing the MSDS who can provide additional information on the hazardous chemical and appropriate emergency procedures, if necessary.

5.3.6. Each work center will maintain a file of MSDSs for each hazardous material procured, stored, or used at the work center. MSDSs that are not contained in the HMIRS and those MSDSs prepared for locally purchased items should be incorporated into the HMIRS. A file of MSDS information not contained in the HMIRS should be maintained on site.

5.3.7. All hazardous materials on DoD installations will have Hazardous Chemical Warning Labels in accordance with DoD Instruction 6050.05, "DoD Hazard Communication (HAZCOM) Program" (or Bahraini equivalent) and have MSDS information either available or in the HMIRS

in accordance with DoD Instruction 6050.05, "DoD Hazard Communication (HAZCOM) Program" and other DoD Component instructions. These requirements apply throughout the life-cycle of these materials.

5.3.8. DoD installations will reduce the use of hazardous materials where practical through resource recovery, recycling, source reduction, acquisition, or other minimization strategies in accordance with Service guidance on improved hazardous material management processes and techniques.

5.3.9. All excess hazardous material will be processed through the Defense Logistics Agency (DLA) Disposition Services in accordance with the procedures in DoD 4160.21-M (Defense Materiel Disposition Manual). The DLA Disposition Services will only donate, transfer, or sell hazardous material to environmentally responsible parties. This paragraph is not intended to prohibit the transfer of usable hazardous material between DoD activities participating in a regional or local pharmacy or exchange program.

5.3.10. All personnel who use, handle, or store hazardous materials will be trained in accordance with DoD Instruction 6050.05, "DoD Hazard Communication (HAZCOM) Program" and other DoD Component instructions.

5.3.11. The installation must prevent the unauthorized entry of persons or livestock into the hazardous materials storage area.

5.3.12. Land carriers shall transport hazardous material in a safe manner.

5.3.12.1. Vehicles shall comply with the required speed limit and use the appropriate lanes identified for transport vehicles.

5.3.12.2. Vehicles shall be appropriately labelled on all sides of their outer surfaces indicating the level of danger of the contained substances. Labels shall be weather-resistant and painted in a reflecting color

5.3.12.3. Vehicles shall fix a yellow intermittent light on the driver cabin.

5.3.12.4. Installations transporting hazardous material shall consult the LEC to determine approval and licensing requirements for the transport method and drivers. Back up plans in case of accident or emergency are required for approval and licensing.

5.3.13. Installations shall comply with the following requirements for tanks/ containers used for storage of hazardous material:

5.3.13.1. Containers shall be made of a suitable material fit for the external environment (e.g. heat variation, vibration etc.) and the hazardous material.

5.3.13.2. Liquid hazardous material containers shall be coated on the inside to prevent corrosion or reaction.

5.3.13.3. Solid hazardous material containers shall not be made of cardboard but rather material strong enough to sustain transport conditions.

5.3.13.4. Containers shall be designed in accordance with international rules and regulations.

5.3.13.5. Contaners shall have an opening for inspection purposes.

5.3.13.6. Containers shall be equipped with an instrument to release pressure.

5.3.13.7. Filling activities shall comply with United Nations specifications.

5.3.13.8. Containers shall not be stacked up to a height beyond 3 meters (9.84 feet), unless stored on shelves.

5.3.14. Hazardous material storage areas shall be designed as follows:

5.3.14.1. Emergency exits shall be easily noticeable in case of darkness or thick smoke.

5.3.14.2. Suitable air filters/conditions in accordance to the stored substances shall be provided.

5.3.14.3. A smooth, non-slippery floor free of cracks shall be maintained.

5.3.14.4. Kitchen areas or changing facilities shall be situated no less than 10 meters (32.81 feet) from storage areas.

5.3.14.5. Grounding facilities for electrical circuits and appropriate protective gear in case of electrical sparks shall be provided inside storage units.

5.3.14.6. Battery charging and heating devices are prohibited from use inside storage areas.

5.3.14.7. Installations shall prepare a plan outlining the type of danger associated with each part of the storage area. The plan shall contain a list of places and amounts of the stored hazardous materials with the respective dangers, a list and the location of the emergency and fire resistant equipment, and the location of the emergency passages/exits. The plan must be regularly updated and kept in a place far away from the storage area.

5.3.15. Hazardous Material Approval. Installations may require approval for the handling of hazardous materials including their production, storage, transport, and use. Contact the LEC to determine approval requirements.

Table 5.1. Typical Hazardous Materials Characteristics

1. The item is a health or physical hazard. Health hazards include carcinogens, corrosive materials, irritants, sensitizers, toxic materials, and materials that damage the skin, eyes, or internal organs. Physical hazards include combustible liquids, compressed gases, explosives, flammable materials, organic peroxides, oxidizers, pyrophoric materials, unstable (reactive) materials and water-reactive materials.
2. The item and/or its disposal is regulated by the host nation because of its hazardous nature.
3. The item has a flashpoint below 93°C (200°F) closed cup, or is subject to spontaneous heating or is subject to polymerization with release of large amounts of energy when handled, stored, and shipped without adequate control.
4. The item is a flammable solid or is an oxidizer or is a strong oxidizing or reducing agent with a standard reduction potential of > 1.0 volt or < -1.0 volt.
5. In the course of normal operations, accidents, leaks, or spills, the item may produce dusts, gases, fumes, vapors, mists, or smokes with one or more of the above characteristics.
6. The item has special characteristics that, in the opinion of the manufacturer or the DoD Components, could cause harm to personnel if used or stored improperly.

CHAPTER 6

HAZARDOUS WASTE

6.1. SCOPE

This Chapter contains criteria for a comprehensive management program to ensure that hazardous waste is identified, stored, transported, treated, disposed and recycled in an environmentally sound manner.

6.2. DEFINITIONS

6.2.1. Acute Hazardous Waste. Those wastes listed in Table AP1.T4., "List of Hazardous Waste/Substances/Material." with a U.S. Environmental Protection Agency (USEPA) waste number with the "P" designator, or those hazardous wastes in Table AP1.T4. with Hazard Code "H".

6.2.2. Disposal. The discharge, deposit, injection, dumping, spilling, leaking, or placing of any hazardous waste into or on any land or water that would allow the waste or constituent to enter the environment. Proper disposal effectively mitigates hazards to human health and the environment.

6.2.3. DoD Hazardous Waste Generator. The Department of Defense considers a generator to be the installation, or activity on an installation, that produces a hazardous waste.

6.2.4. Hazardous Constituent. A chemical compound listed by name in Table AP1.T4., "List of Hazardous Waste/Substances/Material," or that possesses the characteristics described in section AP1.1.

6.2.5. Hazardous Waste. A discarded material that may be solid, semi-solid, liquid, or contained gas, and either exhibit a characteristic of a hazardous waste as defined in section AP1.1. or is listed as a hazardous waste in Tables AP1.T1. through AP1.T4. Excluded from this definition are domestic sewage sludge, and household and medical wastes not possessing the properties in Table 6.1.

6.2.5.1. It includes the following:

6.2.5.1.1. Discarded materials that contain one or more of the characteristics or properties described in 6.1 or 6.2.

6.2.5.1.2. All hazardous waste described in Tables 6.3 through 6.8.

6.2.5.1.3. Any other form of waste defined as hazardous by the Competent Authority

6.2.6. Hazardous Waste Accumulation Point (HWAP). A shop, site, or other work center where hazardous wastes are accumulated until removed to a Hazardous Waste Storage Area

(HWSA) or shipped for treatment or disposal. An HWAP may be used to accumulate no more than 208 liters (55 gallons) of hazardous waste, or 1 liter (1 quart) of acute hazardous waste, from each waste stream. The HWAP must be at or near the point of generation and under the control of the operator.

6.2.7. Hazardous Waste Fuel. Hazardous wastes burned for energy recovery. Fuel produced from hazardous waste by processing, blending, or other treatment is also hazardous waste fuel.

6.2.8. Hazardous Waste Generation. Any act or process that produces hazardous waste (HW) as defined in this Guide.

6.2.9. Hazardous Waste Profile Sheet (HWPS). A document that identifies and characterizes the waste by providing user's knowledge of the waste, and/or lab analysis, and details the physical, chemical, and other descriptive properties or processes that created the hazardous waste.

6.2.10. Hazardous Waste Storage Area (HWSA). One or more locations on a DoD installation where HW is collected prior to shipment for treatment or disposal. An HWSA may store more than ***208 liters*** (55 gallons) of a HW stream, and more than one quart of an acute HW stream.

6.2.11. Hazardous Waste Storage Area Manager. A person, or agency, on the installation assigned the operational responsibility for receiving, storing, inspecting, and general management of the installation's HWSA or HWSA program.

6.2.12. Land Disposal. Placement in or on the land, including, but not limited to, land treatment, facilities, surface impoundments, underground injection wells, salt dome formations, salt bed formations, underground mines or caves.

6.2.13. Treatment. Any method, technique, or process, excluding elementary neutralization, designed to change the physical, chemical, or biological characteristics or composition of any hazardous waste that would render such waste non-hazardous, or less hazardous; safer to transport, store, or dispose of; or amenable for recovery, amenable for storage, or reduced in volume.

6.2.14. Unique Identification Number. A number assigned to generators of hazardous waste to identify the generator and used to assist in tracking the waste from point of generation to ultimate disposal. The number could be the Unit Identification Code (UIC) or the DoD Activity Address Code (DoDAAC). The EEA should specify the method for determining the unique identification number in the FGS.

6.2.15. Used Oil Burned for Energy Recovery. Used oil that is burned for energy recovery is termed "used oil fuel." Used oil fuel includes any fuel produced from used oil by processing, blending, or other treatment. "Used oil," means any oil or other waste petroleum, oil, or lubricant (POL) product that has been refined from crude oil, or is synthetic oil, has been used and as a result of such use, is contaminated by physical or chemical impurities, or is off specification and cannot be used as intended. Although used oil may exhibit the characteristics of reactivity,

toxicity, ignitability, or corrosivity, it is still considered used oil, unless it has been mixed with hazardous waste. Used oil mixed with hazardous waste is a hazardous waste and will be managed as such.

6.2.16. Hazardous Waste Log. A listing of HW deposited and removed from an HWSA. Information such as the waste type, volume, location, and storage removal dates should be recorded.

6.2.17. Elementary Neutralization. A process of neutralizing a HW, that is hazardous only because of the corrosivity characteristic. It must be accomplished in a tank, transport vehicle, or container.

6.3. CRITERIA

6.3.1. DoD Hazardous Waste Generators

6.3.1.1. Hazardous Waste Determination and Characterization. Generators will identify and characterize the wastes generated at their site using their knowledge of the materials and processes that generated the waste or through laboratory analysis of the waste. Generators will identify inherent hazardous characteristics associated with a waste in terms of physical properties (e.g., solid, liquid, contained gases), chemical properties (e.g., chemical constituents, technical or chemical name), and/or other descriptive properties (e.g., ignitable, corrosive, reactive, toxic). The properties defining the characteristics should be measurable by standardized, and available testing protocols.

6.3.1.2**.** An HWPS will be used to identify each hazardous waste stream. Table 6.1 through Table 6.10 (appended to this FGS) shall also be utilized in the identification process. The HWPS must be updated by the generator, as necessary, to reflect any new waste streams, or process modifications that change the character of the hazardous waste being handled at the storage area.

6.3.1.3. Each generator will use a unique identification number for all recordkeeping, reports, and manifests for hazardous waste.

6.3.1.4. Pre-Transport Requirements.

6.3.1.4.1. Generators shall ensure that they comply with the following pre-transport requirements for hazardous waste:

6.3.1.4.1.1. Soundness of drums/containers

6.3.1.4.1.2. Labeling of drums and containers including generators name, quantity of HW and date of transportation

6.3.1.4.1.3. Waste transportation form accompanies the shipment

6.3.1.4.1.4. Waste carrier is approved by the Competent Authority

6.3.1.4.1.5. Waste is being delivered to a treatment unit or disposal site approved by the Competent Authority

6.3.1.4.2. Transportation

6.3.1.4.2.1. When transporting HW via commercial transportation on Bahrain public roads and highways, HW generators will prepare off-installation HW shipments in compliance with applicable Bahrain transportation regulations. Requirements may include placarding, marking, containerization and labeling. Hazardous waste designated for international transport will be prepared in accordance with applicable international regulations. In the absence of Bahrain regulations, international standards will be used.

6.3.1.4.2.2. When transporting HW via military vehicle on Bahrain public roads and highways, generators will ensure compliance with Service regulations for the transport of hazardous materials and, if required by applicable international agreement (Status of Forces Agreement (SOFA), basing, etc.), Bahrain transportation regulations such as those ensuring that:

6.3.1.4.2.2.1. Vehicle has a hazardous waste transport approval (Section 6.3.12).

6.3.1.4.2.2.2. Hazardous waste shipment is accompanied by a transportation form .

6.3.1.4.2.2.3. Hazardous chemical waste is accompanied by a MSDS and is compliant with chemical safety requirements of the Competent Authority.

6.3.1.4.2.2.4. Waste is transported to approved treatment units or disposal sites.

6.3.1.4.2.2.5. Vehicle placarding.

6.3.1.4.2.2.6. Over pack in the case of damage to drums or tanks.

6.3.1.4.2.2.7. Comply with spill response, disposal and area decontamination procedures during transport (see Chapter 16).

6.3.1.4.2.2.8. Transportation schedule or route is provided to the Competent Authority, if required.

6.3.1.4.3. Manifesting. All HW leaving the installation will be accompanied by a manifest to ensure a complete audit trail from point of origin to ultimate disposal. The manifest will include the information listed below. Bahrain waste transportation forms will be used when applicable, or the DD Form 1348-1A, "Issue Release/Receipt Document," and DD Form 1348-2, "Issue Release/Receipt Document with Address Label," may be used. This manifest should include:

6.3.1.4.3.1. Generator's name, address, and telephone number;

6.3.1.4.3.2. Generator's unique identification number;

6.3.1.4.3.3. Transporter's name, address, and telephone number;

6.3.1.4.3.4. Destination name, address, and telephone number;

6.3.1.4.3.5. Description of waste;

6.3.1.4.3.6. Total quantity of waste;

6.3.1.4.3.7. Date of shipment; and

6.3.1.4.3.8. Date of receipt.

6.3.1.4.4. Generators will maintain an audit trail of HW from the point of generation to disposal. Generators using DLA Disposition Services (DLA-DS) will obtain a signed copy of the manifest from the initial DLA Disposition Services recipient of the waste, at which time DLA-DS Services will assume responsibility. A generator, as provided in a host-tenant agreement, that uses the HW management and/or disposal program of a DoD Component that has a different unique identification number (see definition 6.2.14.) will obtain a signed copy of the manifest from the receiving component, at which time the receiving component will assume responsibility for subsequent storage, transfer, and disposal of the waste. Activities desiring to dispose of their HW outside DLA-DS system will develop their own manifest tracking system to provide an audit trail from point of generation to ultimate disposal.

6.3.2. Hazardous Waste Accumulation Point (HWAP)

6.3.2.1. An HWAP is defined in paragraph 6.2.6. Each HWAP must be designed and operated to provide appropriate segregation for different waste streams, including those that are chemically incompatible. Each HWAP will have warning signs (National Fire Protection Association or appropriate international sign) appropriate for the waste being accumulated at that site.

6.3.2.2. An HWAP will comply with the storage limits in paragraph 6.2.6. When these limits have been reached, the generator will make arrangements within five working days to move the HW to an HWSA or ship it off-site for treatment or disposal. Arrangements must include submission of all appropriate turn-in documents to initiate the removal (e.g., DD 1348-1A) to appropriate authorities responsible for removing the HW (e.g., DLA-DS). Wastes intended to be recycled or used for energy recovery (for example, used oil or antifreeze) are exempt from the 208-liter (55-gallons)/1-liter (1-quart) volume accumulation limits, but must be transported off-site to a final destination facility within one year.

6.3.2.3. All criteria of paragraph 6.3.4., “Use and Management of Containers,” apply to HWAPs with the exception of subparagraph 6.3.4.1.5., “Weekly Inspections.”

6.3.2.4. The following provisions of paragraph 6.3.5., "Recordkeeping Requirements," apply to HWAPs: 6.3.5.1. ("Turn-in Documents"), 6.3.5.5. ("Manifests"), and 6.3.5.6. ("Waste Analysis/Characterization Records").

6.3.2.5. Personnel Training. Personnel assigned HWAP duty must successfully complete appropriate HW training necessary to perform their assigned duties. At a minimum, this must include pertinent waste handling and emergency response procedures. Generic HW training requirements are described in paragraph 6.3.9.

6.3.3. Hazardous Waste Storage Area (HWSA)

6.3.3.1. Location Standards. To the maximum extent possible, all HWSAs will be located to minimize the risk of release due to seismic activity, floods, or other natural events. For facilities located where they may face such risks, the installation spill prevention and control plan must address the risk.

6.3.3.2. Design and Operation of HWSAs. HWSAs must be designed, constructed maintained, and operated to minimize the possibility of a fire, explosion, or any unplanned release of HW or HW constituents to air, soil, groundwater or surface water that could threaten human health or the environment. Hazardous waste should not be stored longer than one year in an HWSA.

6.3.3.3. Waste Analysis and Verification

6.3.3.3.1. Waste Analysis Plan. The HWSA manager, in conjunction with the installation(s) served will develop a plan to determine how and when wastes are to be analyzed. The waste analysis plan will include procedures for characterization (Section 6.3.1.1) and verification testing of both on-site and off-site hazardous waste. The plan should include: parameters for testing and rationale for choosing them, frequency of analysis, test methods, and sampling methods.

6.3.3.3.2. Maintenance of Waste Analysis File. The HWSA must have, and keep on file, an HWPS for each waste stream that is stored at each HWSA.

6.3.3.3.3. Waste Verification. Generating activities will provide identification of incoming waste on the HWPS to the HWSA manager. Prior to accepting the waste, the HWSA manager will:

6.3.3.3.3.1. Inspect the waste to ensure it matches the description provided.

6.3.3.3.3.2. Ensure that no waste is accepted for storage unless an HWPS is provided, or is available and properly referenced.

6.3.3.3.3.3. Request a new HWPS from the generator if there is reason to believe that the process generating the waste has changed;

6.3.3.3.4. Analyze waste shipments in accordance with the waste analysis plan to determine whether it matches the waste description on the accompanying manifest and documents; and

6.3.3.3.4.1. Reject shipments that do not match the accompanying waste descriptions unless the generator provides an accurate description.

6.3.3.4. Security

6.3.3.4.1. General. The installation must prevent the unknowing entry, and minimize the possibility for unauthorized entry, of persons or livestock onto the HWSA grounds.

6.3.3.4.2. Security System Design. An acceptable security system for a HWSA consists of either:

6.3.3.4.2.1. A 24-hour surveillance system (e.g., television monitoring or surveillance by guards or other designated personnel) that continuously monitors and controls entry into the HWSA; or

6.3.3.4.2.2. An artificial or natural barrier (e.g., a fence in good repair or a fence combined with a cliff) that completely surrounds the HWSA, combined with a means to control entrance at all times (e.g., an attendant, television monitors, locked gate, or controlled roadway access).

6.3.3.4.3. Required Signs. A sign with the legend "Danger Unauthorized Personnel Keep Out," must be posted at each entrance to the HWSA, and at other locations, in sufficient numbers to be seen from any approach to the HWSA. The legend must be written in English and in any other language predominant in the area surrounding the installation, and must be legible from a distance of at least 7.62 meters (25 feet). Existing signs with a legend other than "Danger Unauthorized Personnel Keep Out," may be used if the legend on the sign indicates that only authorized personnel are allowed to enter the HWSA, and that entry can be dangerous.

6.3.3.5. Required Aisle Space. Aisle space must allow for unobstructed movement of personnel, fire protection equipment, spill control equipment, and decontamination equipment to any area of facility operation during an emergency. Containers must not obstruct an exit.

6.3.3.6. Access to Communications or Alarm System

6.3.3.6.1. General. Whenever HW is being poured, mixed, or otherwise handled, all personnel involved in the operation must have immediate access to an internal alarm or emergency communication device, either directly or through visual or voice contact with another person.

6.3.3.6.2. If there is only one person on duty at the HWSA premises, that person must have immediate access to a device, such as a telephone (immediately available at the scene of operation) or a hand-held two-way radio, capable of summoning external emergency assistance.

6.3.3.7. Required Equipment. All HWSAs must be equipped with the following:

6.3.3.7.1. An internal communications or alarm system capable of providing immediate emergency instruction (voice or signal) to HWSA personnel.

6.3.3.7.2. A device, such as an intrinsically safe telephone (immediately available at the scene of operations) or a hand-held two-way radio, capable of summoning emergency assistance from installation security, fire departments, or emergency response teams.

6.3.3.7.3. Portable fire extinguishers, fire control equipment appropriate to the material in storage (including special extinguishing equipment as needed, such as that using foam, inert gas, or dry chemicals), spill control equipment, and decontamination equipment.

6.3.3.7.4. Water at adequate volume and pressure to supply water hose streams, foam-producing equipment, automatic sprinklers, or water spray systems.

6.3.3.7.5. Readily available personal protective equipment appropriate to the materials stored, and eyewash and shower facilities.

6.3.3.7.6. Testing and Maintenance of Equipment. All HWSA communications alarm systems, fire protection equipment, spill control equipment, and decontamination equipment, where required, must be maintained to ensure its proper operation in time of emergency.

6.3.3.8. General Inspection Requirements

6.3.3.8.1. General. The installation must inspect the HWSA for malfunctions and deterioration, operator errors, and discharges that may be causing, or may lead to, a release of HW constituents to the environment or threat to human health. The inspections must be conducted often enough to identify problems in time to correct them before they harm human health or the environment.

6.3.3.8.2. Types of Equipment Covered. Inspections must include all equipment and areas involved in storage and handling of HW, including all containers and container storage areas, tank systems and associated piping, and all monitoring equipment, safety and emergency equipment, security devices, and operating and structural equipment (such as dikes and sump pumps) that are important to preventing, detecting, or responding to environmental or human health hazards.

6.3.3.8.3. Inspection Schedule. Inspections must be conducted according to a written schedule that is kept at the HWSA. The schedule must identify the types of problems (e.g., malfunctions or deterioration) that are to be looked for during the inspection (e.g., inoperative sump pump, leaking fitting, or eroding dike).

6.3.3.8.4. Frequency of Inspections. Minimum frequencies for inspecting containers and container storage areas are found in subparagraph 6.3.4.1.5. Minimum frequencies for inspecting tank systems are found in subparagraph 6.3.7.5.2. For equipment not covered by those paragraphs, inspection frequency should be based on the rate of possible deterioration of the

equipment and probability of an environmental or human health incident if the deterioration or malfunction or any operator error goes undetected between inspections. Areas subject to spills, such as loading and unloading areas, must be inspected daily when in use.

6.3.3.8.5. Remedy of Problems Revealed by Inspection. The installation must remedy any deterioration or malfunction of equipment or structures that the inspection reveals on a schedule, which ensures that the problem does not lead to an environmental or human health hazard. Where a hazard is imminent or has already occurred, action must be taken immediately.

6.3.3.8.6. Maintenance of Inspection Records. The installation must record inspections in an inspection log or summary, and keep the records for at least three years from the date of inspection. At a minimum, these records must include the date and time of inspection, the name of the inspector, a notation of the observations made, and the date and nature of any repairs or other remedial actions.

6.3.3.9. Personnel Training. Personnel assigned HWSA duty must successfully complete an appropriate HW training program in accordance with the training requirements in paragraph 6.3.9.

6.3.3.10. Storage Practices

6.3.3.10.1. Compatible Storage. The storage of ignitable, reactive, or incompatible wastes must be handled so that it does not threaten human health or the environment. Incompatible hazardous waste types shall be kept in separate drums or containers and not mixed during waste transport. Dangers resulting from improper storage of incompatible wastes include generation of extreme heat, fire, explosion, and generation of toxic gases.

6.3.3.10.2. General requirements for ignitable, reactive, or incompatible wastes. The HWSA manager must take precautions to prevent accidental ignition or reaction of ignitable or reactive waste. This waste must be separated and protected from sources of ignition or reaction including but not limited to: open flames, smoking, cutting and welding, hot surfaces, frictional heat, sparks (static, electrical, or mechanical), spontaneous ignition (e.g., from heat producing chemical reactions), and radiant heat. While ignitable or reactive waste is being handled, the HWSA personnel must confine smoking and open flame to specially designated locations. "No Smoking" signs, or the appropriate icon, must be conspicuously placed wherever there is a hazard from ignitable or reactive waste. In areas where access by non-English speaking persons is expected, the "No Smoking" legend must be written in English and in any other language predominant in the area. Water reactive waste cannot be stored in the same area as flammable and combustible liquid.

6.3.3.11. Closure and Closure Plans

6.3.3.11.1. Closure. At closure of an HWSA, HW and HW waste residues must be removed from the containment system, including remaining containers, liners, and bases. Closure should be done in a manner which eliminates or minimizes the need for future maintenance or the potential for future releases of HW and according to the Closure Plan.

6.3.3.11.2. Closure Plan. Closure plans will be developed before a new HWSA is opened. Each existing HWSA will also develop a Closure Plan. The Closure Plan will be implemented concurrent with the decision to close the HWSA. The Closure Plan will include: estimates of the storage capacity of the HW, steps to be taken to remove or decontaminate all waste residues, and estimate of the expected date for closure.

6.3.4. Use and Management of Containers

6.3.4.1. Container Handling and Storage. To protect human health and the environment, the following guidelines will apply when handling and storing HW containers.

6.3.4.1.1. Containers holding HW will be in good condition, free from severe rusting, bulging, or structural defects.

6.3.4.1.2. Containers used to store HW, including overpack containers, must be compatible with the materials stored.

6.3.4.1.3. Management of Containers

6.3.4.1.3.1. A container holding HW must always be closed during storage, except when it is necessary to add or remove waste.

6.3.4.1.3.2. A container holding HW must not be opened, handled, or stored in a manner which may rupture the container or cause it to leak.

6.3.4.1.3.3. Containers of flammable liquids must be grounded when transferring flammable liquids from one container to the other.

6.3.4.1.4. Containers holding HW will be marked with a HW marking, and a label indicating the hazard class of the waste contained (flammable, corrosive, etc.).

6.3.4.1.5. Areas where containers are stored must be inspected weekly for leaking and deteriorating containers as well as deterioration of the containment system caused by corrosion or other factors. Secondary containment systems will be inspected for defects and emptied of accumulated releases or retained storm water.

6.3.4.2. Containment. Container storage areas must have a secondary containment system meeting the following:

6.3.4.2.1. Must be sufficiently impervious to contain leaks, spills, and accumulated precipitation until the collected material is detected and removed.

6.3.4.2.2. The secondary containment system must have sufficient capacity to contain 10% of the volume of stored containers or the volume of the largest container, whichever is greater.

6.3.4.2.3. Storage areas that store containers holding only wastes that do not contain free liquids need not have a containment system as described in subparagraph 6.3.4.2.1., provided the storage area is sloped or is otherwise designed and operated to drain and remove liquid resulting from precipitation, or the containers are elevated or are otherwise protected from contact with accumulated liquid.

6.3.4.2.4. Rainwater captured in secondary containment areas should be inspected and/or tested prior to release. The inspection or testing must be reasonably capable of detecting contamination by the HW in the containers. Contaminated water shall be treated as HW until determined otherwise.

6.3.4.3. Special Requirements for Ignitable or Reactive Waste. Areas that store containers holding ignitable or reactive waste must be located at least 15 meters (50 feet) inside the installation's boundary.

6.3.4.4. Special Requirements for Incompatible Wastes

6.3.4.4.1. Incompatible wastes and materials must not be placed in the same container.

6.3.4.4.2. Hazardous waste must not be placed in an unwashed container that previously held an incompatible waste or material.

6.3.4.4.3. A storage container holding HW that is incompatible with any waste or other materials stored nearby in other containers, piles, open tanks, or surface impoundments, must be separated from the other materials or protected from them by means of a dike, berm, wall, or other device.

6.3.5. Recordkeeping Requirements

6.3.5.1. Turn-in Documents. Turn-in documents, e.g., DD 1348-1A, hazardous waste transportation forms or manifests, must be maintained for 3 years.

6.3.5.2. Hazardous Waste Log. A written HW log will be maintained at the HWSA to record all HW handled and should consist of the following:

6.3.5.2.1. Name/address of generator;

6.3.5.2.2. Description and hazard class of the hazardous waste;

6.3.5.2.3. Number and types of containers;

6.3.5.2.4. Quantity of hazardous waste;

6.3.5.2.5. Date stored;

6.3.5.2.6. Storage location; and

6.3.5.2.7. Disposition data, to include: dates received, sealed, and transported, and transporter used.

6.3.5.3. The HW log will be available to emergency personnel in the event of a fire or spill. Logs will be maintained until closure of the installation.

6.3.5.4. Inspection Logs. Records of inspections should be maintained for a period of 3 years.

6.3.5.5. Manifests. Manifests of incoming and outgoing hazardous wastes will be retained for a period of 3 years.

6.3.5.6. Waste Analysis/Characterization Records. These records will be retained until 3 years after closure of the HWSA.

6.3.5.7. The installation will maintain records, identified in subparagraphs 6.3.5.1., 6.3.5.5., and 6.3.5.6. for all HWAPs on the installation.

6.3.6. Contingency Plan

6.3.6.1. Each installation will have a contingency plan that describes actions to be taken to contain and clean up spills and releases of HW in accordance with the provisions of Chapter 18., "Spill Prevention and Response Planning."

6.3.6.2. A current copy of the installation contingency plan must be:

6.3.6.2.1. Maintained at each HWSA and HWAP, (HWAPs need maintain only portions of the contingency plan that are pertinent to their facilities and operation); and

6.3.6.2.2. Submitted to all police departments, fire departments, hospitals, and emergency response teams identified in the plan, and upon which the plan relies to provide emergency services. Contingency Plans should be available in both English and the language of the host nation.

6.3.7. Tank Systems. The following criteria apply to all storage tanks containing HW. See Chapter 19, "Underground Storage Tanks," for criteria dealing with underground storage tanks containing POLs and hazardous substances.

6.3.7.1. Application. The requirements of this subparagraph apply to HWSAs that use tank systems for storing or treating HW. Tank systems that are used to store or treat HW that contain no free liquids and are situated inside a building with an impermeable floor are exempted from the requirements in subparagraph 6.3.7.4., Containment and Detection of Releases. Tank systems, including sumps that serve as part of a secondary containment system to collect or contain releases of HW, are exempted from the requirements in subparagraph 6.3.7.4.

6.3.7.2. Assessment of the Integrity of an Existing Tank System. For each existing tank system that does not have secondary containment meeting the requirements of subparagraph 6.3.7.4., installations must determine annually whether the tank system is leaking or is fit for use. Installations must obtain, and keep on file at the HWSA, a written assessment of tank system integrity reviewed and certified by a competent authority.

6.3.7.3. Design and Installation of New Tank Systems or System Components. Managers of HWSAs installing new tank systems or system components must obtain a written assessment, reviewed and certified by a competent authority attesting that the tank system has sufficient structural integrity and is acceptable for storing and treating HW. The assessment must show that the foundation, structural support, seams, connections, and pressure controls (if applicable) are adequately designed and that the tank system has sufficient structural strength, compatibility with the waste(s) to be stored or treated, and corrosion protection to ensure that it will not collapse, rupture, or fail.

6.3.7.4. Containment and Detection of Releases. To prevent the release of HW or hazardous constituents to the environment, secondary containment that meets the requirements of this subparagraph must be:

6.3.7.4.1. Provided for all new tank systems or components, prior to their being put into service;

6.3.7.4.2. Provided for those existing tank systems when the tank system annual leak test detects leakage;

6.3.7.4.3. Provided for tank systems that store or treat HW by 1 January 1999;

6.3.7.4.4. Designed, installed, and operated to prevent any migration of wastes or accumulated liquid out of the system to the soil, groundwater, or surface water at any time during the use of the tank system; and capable of detecting and collecting releases and accumulated liquid until the collected material is removed; and

6.3.7.4.5. Constructed to include one or more of the following: a liner external to the tank, a vault, or double-walled tank.

6.3.7.5. General Operating Requirements

6.3.7.5.1. Hazardous wastes or treatment reagents must not be placed in a tank system if they could cause the tank, its ancillary equipment, or the containment system to rupture, leak, corrode, or otherwise fail.

6.3.7.5.2. The installation must inspect and log at least once each operating day:

6.3.7.5.2.1. The above-ground portions of the tank system, if any, to detect corrosion or releases of waste;

6.3.7.5.2.2. Data gathered from monitoring and leak detection equipment (e.g., pressure or temperature gauges, monitoring wells) to ensure that the tank system is being operated according to its design; and

6.3.7.5.2.3. The construction materials and the area immediately surrounding the externally accessible portion of the tank system, including the secondary containment system (e.g., dikes) to detect erosion or signs of releases of HW (e.g., wet spots, dead vegetation).

6.3.7.5.3. The installation must inspect cathodic protection systems to ensure that they are functioning properly. The proper operation of the cathodic protection system must be confirmed within 6 months after initial installation and annually thereafter. All sources of impressed current must be inspected and/or tested, as appropriate, or at least every other month. The installation manager must document the inspections in the operating record of the HWSA.

6.3.7.5.4. During tank cleaning operations, HW or sludge generated must not be disposed of to soil, sewerage system, or the marine environment.

6.3.7.6. Response to Leaks or Spills and Disposition of Leaking or Unfit-For-Use Tank Systems. A tank system or secondary containment system from which there has been a leak or spill, or that is unfit for use, must be removed from service immediately and repaired or closed. Installations must satisfy the following requirements:

6.3.7.6.1. Cessation of use; prevention of flow or addition of wastes. The installation must immediately stop the flow of HW into the tank system or secondary containment system and inspect the system to determine the cause of the release.

6.3.7.6.2. Containment of visible releases to the environment. The installation must immediately conduct an inspection of the release and, based on that inspection:

6.3.7.6.2.1. Prevent further migration of the leak or spill to soil or surface water;

6.3.7.6.2.2. Remove and properly dispose of any contaminated soil or surface water;

6.3.7.6.2.3. Remove free product to the maximum extent possible; and

6.3.7.6.2.4. Continue monitoring and mitigating for any additional fire and safety hazards posed by vapors or free products in subsurface structures.

6.3.7.6.3. Make required notifications and reports.

6.3.7.6.4. Over pack HW drums damaged during transport.

6.3.7.7. Closure. At closure of a tank system, the installation must remove or decontaminate HW residues, contaminated containment system components (liners, etc.), contaminated soil to the extent practicable, and structures and equipment.

6.3.8. Standards for the Management of Used Oil and Lead-Acid Batteries

6.3.8.1. Used Oil Burned for Energy Recovery. Used oil fuel may be burned only in the following devices:

6.3.8.1.1. Industrial furnaces.

6.3.8.1.2. Boilers that are identified as follows:

6.3.8.1.2.1. Industrial boilers located on the site of a facility engaged in a manufacturing process where substances are transformed into new products, including the component parts of products, by mechanical or chemical processes;

6.3.8.1.2.2. Utility boilers used to produce electric power, steam, heated or cooled air, or other gases or fluids;

6.3.8.1.2.3. Used oil-fired space heaters provided that:

6.3.8.1.2.3.1. The heater burns only used oil that the installation generates;

6.3.8.1.2.3.2. The heater is designed to have a maximum capacity of not more than 0.15 MW (0.5 million BTU per hour); and

6.3.8.1.2.3.3. The combustion gases from the heater are properly vented to the ambient air.

.3.8.2. Prohibitions on Dust Suppression or Road Treatment. Used oil, HW, or used oil contaminated with any HW will not be used for dust suppression or road treatment.

6.3.8.3. Lead-acid batteries that are to be recycled will be managed as hazardous material. Lead-acid batteries that are not recycled will be managed as HW.

6.3.8.4. Additional Used Oil Criteria. Additional criteria for the management of used oil are included in Chapter 9, “POL”.

6.3.9. Hazardous Waste Training

6.3.9.1. Application. Personnel and their supervisors who are assigned duties involving actual or potential exposure to HW must successfully complete an appropriate training program prior to assuming those duties. Personnel assigned to such duty after the effective date of this Guide must work under direct supervision until they have completed appropriate training. Additional guidance is contained in DoDI 6050.05 (DoD Hazard Communication (HAZCOM) Program).

6.3.9.2. Refresher Training. All personnel performing HW duties must successfully complete annual refresher HW training.

6.3.9.3. Training Contents and Requirements. The training program must:

6.3.9.3.1. Include sufficient information to enable personnel to perform their assigned duties and fully comply with pertinent HW requirements.

6.3.9.3.2. Be conducted by qualified trainers who have completed an instructor training program in the subject, have comparable academic credentials, or experience.

6.3.9.3.3. Be designed to ensure that facility personnel are able to respond effectively to emergencies by familiarizing them with emergency procedures, emergency equipment, and emergency systems.

6.3.9.3.4. Address the following areas, in particular for personnel whose duties include HW handling and management:

6.3.9.3.4.1. Emergency procedures (response to fire/explosion/spills; use of communications/alarm systems; body and equipment clean up);

6.3.9.3.4.2. Drum/container handling/storage; safe use of HW equipment; proper sampling procedures;

6.3.9.3.4.3. Employee Protection, to include Personal Protective Equipment (PPE), safety and health hazards, hazard communication, worker exposure; and

6.3.9.3.4.4. Recordkeeping, security, inspections, contingency plans, storage requirements, and transportation requirements.

6.3.9.4. Documentation of Training. Installations must document all HW training for each individual assigned duties involving actual or potential exposure to HW. Updated training records on personnel assigned duties involving actual or potential exposure to HW must be kept by the HWSA manager or the responsible installation office and retained for at least three years after termination of duty of these personnel.

6.3.10. Hazardous Waste Disposal

6.3.10.1. All DoD HW should normally be disposed of through DLA Disposition Services. A decision not to use DLA-DS for HW disposal may be made in accordance with DoDD 4001.1 (Installation Management) to best accomplish the installation mission, but should be concurred with by the component chain of command to ensure that installation contracts and disposal criteria are at least as protective as criteria used by DLA-DS.

6.3.10.2. The DoD Components must ensure that wastes generated by DoD operations and considered hazardous under either U.S. law or Bahrain law are not disposed of in the host nation unless the disposal is conducted in accordance with FGS and the following:

6.3.10.2.1. When HW cannot be disposed of in accordance with FGS within the host nation, it will either be retrograded to the United States or, if permissible under international

agreements, transferred to another country outside the United States where it can be disposed of in an environmentally sound manner and in compliance with FGS applicable to the country of disposal, if any exist. Transshipment of HW to a country other than the United States for disposal must be approved by, at a minimum, the DUSD(I&E). The following record-keeping requirements apply for HW disposed outside Bahrain:

6.3.10.2.1.1. Generators may be required to provide a notification containing the information in Table 6.12. Installations shall contact the LEC to determine Competent Authority notification requirements. When required, a general notification shall be used for regular shipments of hazardous wastes with the same physical and chemical characteristics.

6.3.10.2.1.2. Waste shipments outside of Bahrain shall be accompanied by the waste transportation form and additional required information included in Table 6.13.

6.3.10.2.2. The determination of whether particular DoD-generated HW may be disposed of in a host nation will be made by the EEA, in coordination with the unified combatant commander, the Director of Defense Logistics Agency, other relevant DoD Components, and the Chief of the U.S. Diplomatic Mission.

6.3.10.2.3. Generators shall notify the Competent Authority via the LEC in writing in the event of rejection of hazardous waste shipments by the treatment unit or disposal site and comply with its procedures for disposal. The following requirements shall be met when sending HW for treatment/disposal:

6.3.10.2.3.1. Installations shall use approved carriers

6.3.10.2.3.2. HW shall be accompanied with the completed waste transportation form

6.3.10.2.3.3. HW shall conform with the description on the completed waste transportation form

6.3.10.2.3.4. Chemical or biological waste shall be accompanied by its MSDS

6.3.10.3. Disposal Procedures

6.3.10.3.1. The determination of whether HW may be disposed of in a host nation must include consideration of whether the means of treatment and/or containment technologies employed in the Bahrain program, as enacted and enforced, effectively mitigate the hazards of such waste to human health and the environment, and must consider whether the Bahrain program includes:

6.3.10.3.1.1. An effective system for tracking the movement of HW to its ultimate destination.

6.3.10.3.1.2. An effective system for granting authorization or permission to those engaged in the collection, transportation, storage, treatment, and disposal of HW.

6.3.10.3.1.3. Appropriate standards and limitations on the approved methods that may be used to treat and dispose of HW.

6.3.10.3.1.4. Standards designed to minimize the possibility of fire, explosion, or any unplanned release or migration of HW or its constituents to air, soil, surface, or groundwater.

6.3.10.3.2. The EEA must also be satisfied, either through reliance on the HN regulatory system and/or provisions in the disposal contracts, that:

6.3.10.3.2.1. Persons and facilities in the waste management process have demonstrated the appropriate level of training and reliability; and

6.3.10.3.2.2. Effective inspections, monitoring, and recordkeeping will take place.

6.3.10.3.2.2.1. A monitoring program for the treatment unit and all its facilities and equipment including storage areas, emergency equipment, and safety program shall be developed.

6.3.10.3.2.2.2. See Section 6.3.5. for record-keeping requirements (e.g. waste transportation forms, Operation Register, etc.)

6.3.10.4. Bahrain facilities that either store, treat, or dispose of DoD-generated waste must be evaluated and approved by the host nation as being in compliance with their regulatory requirements. This evaluation and approval may-consist of having a valid permit or HN equivalent for the HW that will be handled.

6.3.10.5. Hazardous waste will be recycled or reused to the maximum extent practical. Generators shall work toward preventing or reducing waste generation by upgrading equipment, adopting safe and environmentally acceptable methods to identify, store, prevent leakage, and dispose of HW, to minimize risks to health and the environment. They shall also take into account social, technological and economic aspects of the appropriate measures to ensure that the generation of hazardous wastes and other wastes is reduced to a minimum.

6.3.10.6. Land Disposal Requirements. Hazardous wastes will only be land-disposed when there is a reasonable degree of certainty that there will be no migration of hazardous constituents from the disposal site for as long as the wastes remain hazardous. Hazardous waste may be land-disposed only in facilities meeting the following criteria:

6.3.10.6.1. The land disposal facility has a liner and a leachate collection system. The liner will be of natural or man-made materials and restrict the downward or lateral escape of HW, hazardous constituents, or leachate. The permeability of such liners will be no greater than 10^{-7} cm/sec;

6.3.10.6.2. The land disposal facility has a groundwater monitoring program capable of determining the facility's impact on the quality of water in the aquifers underlying the facility

as well as monitoring programs for soil, air emissions, industrial drainage water, and hazardous waste treatment products; and

6.3.10.6.3. The requirements of subparagraphs 6.3.10.6.1. or 6.3.10.6.2., above, may be waived for a particular land disposal facility by the LEC if a written determination is made by a qualified geologist or geotechnical engineer that there is a low potential for migration of HW, hazardous constituents, or leachate from the facility to water supply wells, irrigation wells, or surface water. This determination will be based on an analysis of local precipitation, geologic conditions, physical properties, depth to groundwater, and proximity of water supply wells or surface water, as well as use of alternative design and operating practices. Methods for preventing migration will be at least as effective as liners and leachate collection systems required in subparagraph 6.3.10.6.1.

6.3.10.7. Incinerator Standards. This subparagraph applies to incinerators that incinerate HW as well as boilers and industrial furnaces that burn HW for any recycling purposes.

6.3.10.7.1. Incinerators used to dispose of HW must be licensed or permitted by a component HN authority or approved by the EEA. This license, permit, or approval must comply with the criteria listed in subparagraph 6.3.10.7.2.

6.3.10.7.2. A license, permit, or EEA approval for incineration of HW must require the incinerator to be designed to include appropriate equipment as well as to be operated according to management practices (including proper combustion temperature, waste feed rate, combustion gas velocity, and other relevant criteria) to effectively destroy hazardous constituents and control harmful emissions. A permitting, licensing, or approval scheme that would require an incinerator to achieve the standards set forth in either subparagraphs 6.3.10.7.2.1. or 6.3.10.7.2.2. is acceptable.

6.3.10.7.2.1. The incinerator achieves a destruction and removal efficiency of 99.99% for the organic hazardous constituents that represent the greatest degree of difficulty of incineration in each waste or mixture of waste. The incinerator must minimize carbon monoxide in stack exhaust gas, minimize emission of particulate matter, and emit no more than 1.8 Kg (4 pounds) of hydrogen chloride per hour.

6.3.10.7.2.2. The incinerator has demonstrated, as a condition for obtaining a license, permit, or EEA approval, the ability to effectively destroy the organic hazardous constituents that represent the greatest degree of difficulty of incineration in each waste or mixture of waste to be burned. For example, this standard may be met by requiring the incinerator to conduct a trial burn, submit a waste feed analysis and detailed engineering description of the facility, and provide any other information that may be required to enable the competent HN authority or the EEA to conclude that the incinerator will effectively destroy the principal organic hazardous constituents of each waste to be burned.

6.3.10.8. Treatment Technologies. The following treatment technologies may be used to reduce the volume or hazardous characteristics of wastes. Wastes categorized as hazardous on the basis of section AP1.1. and which, after treatment as described herein, no longer exhibit any hazardous characteristic, may be disposed of as solid waste. Treatment residues of wastes

categorized as hazardous under any other section of Appendix 1 will continue to be managed as HW under the criteria of this Guide, including those for disposal. The treatment technologies listed below are provided as baseline treatment/disposal technologies for use in determining suitability of HN disposal alternatives. These technologies should not be implemented without consultation with the EEA, or the Combatant Commander, if there is no EEA.

6.3.10.8.1. Organics

6.3.10.8.1.1. Incineration in accordance with the requirements of subparagraph 6.3.10.7.1.

6.3.10.8.1.2. Fuel substitution where the units are operated such that destruction of hazardous constituents are at least as efficient, and hazardous emissions are no greater than those produced by incineration.

6.3.10.8.1.3. Biodegradation. Wastes are degraded by microbial action. Such units will be operated under aerobic or anaerobic conditions so that the concentrations of a representative compound or indicator parameter (e.g., total organic carbon) has been substantially reduced in concentration. The level to which biodegradation must occur and the process time vary depending on the HW being biodegraded.

6.3.10.8.1.4. Recovery. Wastes are treated to recover organic compounds. This will be done using, but not limited to, one or more of the following technologies: distillation; thin film evaporation; steam stripping; carbon adsorption; critical fluid extraction; liquid extraction; precipitation/crystallization, or phase separation techniques, such as decantation, filtration, and centrifugation when used in conjunction with one of the above techniques.

6.3.10.8.1.5. Chemical Degradation. The wastes are chemically degraded in such a manner to destroy hazardous constituents and control harmful emissions.

6.3.10.8.2. Heavy Metals

6.3.10.8.2.1. Stabilization or Fixation. Wastes are treated in such a way that soluble heavy metals are fixed by oxidation/reduction, or by some other means that renders the metals immobile in a landfill environment.

6.3.10.8.2.2. Recovery. Wastes are treated to recover the metal fraction by thermal processing, precipitation, exchange, carbon absorption, or other techniques that yield non-hazardous levels of heavy metals in the residuals.

6.3.10.8.3. Reactives. Any treatment that changes the chemical or physical composition of a material so it no longer exhibits the characteristic for reactivity defined in Appendix 1.

6.3.10.8.4. Corrosives. Corrosive wastes as defined in paragraph AP1.1.3., will be neutralized to a pH value between 6.0 and 9.0. Other acceptable treatments include recovery, incineration, chemical or electrolytic oxidation, chemical reduction, or stabilization.

6.3.10.8.5. Batteries. Mercury, nickel-cadmium, lithium, and lead-acid batteries will be processed in accordance with subparagraphs 6.3.10.8.2.1. or 6.3.10.8.2.2. to stabilize, fix or recover heavy metals, as appropriate, and in accordance with subparagraph 6.3.10.8.4. to neutralize any corrosives before disposal.

6.3.10.9. DoD generators of HW shall not treat HW at the point of generation except for elementary neutralization. This shall not preclude installations from treating HW in accord with subparagraphs 6.3.10.7. and 6.3.10.8. On-site treatment units shall be approved via the LEC by the Competent Authority (see Section 6.3.12); alternatively, HW may be sent to an off-site treatment unit or disposal site.

6.3.11. Record-Keeping Requirements for Treatment Units. The following records shall be maintained by treatment units:

6.3.11.1. Operations Register for no less than three years which includes the following information:

6.3.11.1.1. Quantity and quality of waste shipments including both name of generator, carrier, date of receipt and treatment or disposal

6.3.11.1.2. Description of waste/secondary remains post-treatment including quantity, method and site of disposal

6.3.11.1.3. Analysis results (emissions to air, pollutants in soil/ groundwater and pollutant concentrations in sludge, industrial drainage waste or secondary waste from the treatment process) and describing the quantity, method and site of disposal for waste remaining from the treatment process

6.3.11.2. Periodic report regarding treatment unit/ disposal site activities submitted to the Competent Authority via the LEC every 6 months from the date of operation and whenever requested by the Competent Authority. It shall contain details and measures as per the criteria in Section 6.3.11.1

6.3.12. Hazardous Waste Approval. Installations may require approval for the transport off installation and treatment or disposal of hazardous wastes. Contact the LEC to determine approval requirements.

Table 6.1. List of hazardous characteristics

UN Class[1]	Code	Characteristics
1	H1	Explosive: An explosive substance or waste is a solid or liquid substance or waste (or mixture of substances or wastes) which is in itself capable by chemical reaction of producing gas at such a temperature and pressure and at such a speed as to cause damage to the surroundings.
3	H3	Flammable liquids: The word "flammable" has the same meaning as "inflammable". Flammable liquids are liquids, or mixtures of liquids, or liquids containing solids in solution or suspension (for example, paints, varnishes, lacquers, etc., but not including substances or wastes otherwise classified on account of their dangerous characteristics) which give off a flammable vapor at temperatures of not more than 60.5ºC, closed-cup test, or not more than 65.6ºC, open-cup test. (Since the results of open-cup tests and of closed-cup tests are not strictly comparable and even individual results by the same test are often variable, regulations varying from the above figures to make allowance for such differences would be within the spirit of this definition.)
4.1	H4.1	Flammable solids: Solids, or waste solids, other than those classed as explosives, which under conditions encountered in transport are readily combustible, or may cause or contribute to fire through friction.
4.2	H4.2	Substances or wastes liable to spontaneous combustion: Substances or wastes which are liable to spontaneous heating under normal conditions encountered in transport, or to heating up on contact with air, and being then liable to catch fire.
4.3	H4.3	Substances or wastes which, in contact with water emit flammable gases: Substances or wastes which, by interaction with water, are liable to become spontaneously flammable or to give off flammable gases in dangerous quantities.
5.1	H5.1	Oxidizing: Substances or wastes which, while in themselves not necessarily combustible, may, generally by yielding oxygen cause, or contribute to, the combustion of other materials.
5.2	H5.2	Organic Peroxides: Organic substances or wastes which contain the bivalent-o-o-structure are thermally unstable substances which may undergo exothermic self-accelerating decomposition.
6.1	H6.1	Poisonous (Acute): Substances or wastes liable either to cause death or serious injury or to harm human health if swallowed or inhaled or by skin contact.
6.2	H6.2	Infectious substances: Substances or wastes containing viable microorganisms or their toxins which are known or suspected to cause disease in animals or humans.
8	H8	Corrosives: Substances or wastes which, by chemical action, will cause severe damage when in contact with living tissue, or, in the case of leakage, will materially damage, or even destroy, other goods or the means of transport; they may also cause other hazards.
9	H10	Liberation of toxic gases in contact with air or water: Substances or wastes which, by interaction with air or water, are liable to give off toxic gases in dangerous quantities.
9	H11	Toxic (Delayed or chronic): Substances or wastes which, if they are inhaled or ingested or if they penetrate the skin, may involve delayed or chronic effects, including carcinogenicity.
9	H12	Ecotoxic: Substances or wastes which if released present or may present immediate or delayed adverse impacts to the environment by means of bioaccumulation and/or toxic effects upon biotic systems.
9	H13	Capable, by any means, after disposal, of yielding another material, e.g., leachate, which possesses any of the characteristics listed above.

Table 6.2. Controlled Waste Categories

Code	A – Wastes Streams
Y1	Clinical wastes from medical care in hospitals, medical centers and clinics
Y2	Wastes from the production and preparation of pharmaceutical products
Y3	Waste pharmaceuticals, drugs and medicines
Y4	Wastes from the production, formulation and use of biocides and phytopharmaceuticals
Y5	Wastes from the manufacture, formulation and use of wood preserving chemicals
Y6	Wastes from the production, formulation and use of organic solvents
Y7	Wastes from heat treatment and tempering operations containing cyanides
Y8	Waste mineral oils unfit for their originally intended use
Y9	Waste oils/water, hydrocarbons/water mixtures, emulsions
Y10	Waste substances and articles containing or contaminated with polychlorinated biphenyls (PCBs) and/or polychlorinated terphenyls (PCTs) and/or polybrominated biphenyls (PBBs)
Y11	Waste tarry residues arising from refining, distillation and any pyrolytic treatment
Y12	Wastes from production, formulation and use of inks, dyes, pigments, paints, lacquers, varnish
Y13	Wastes from production, formulation and use of resins, latex, plasticizers, glues/adhesives
Y14	Waste chemical substances arising from research and development or teaching activities which are not identified and/or are new and whose effects on man and/or the environment are not known
Y15	Wastes of an explosive nature not subject to other legislation
Y16	Wastes from production, formulation and use of photographic chemicals and processing materials
Y17	Wastes resulting from surface treatment of metals and plastics
Y18	Residues arising from industrial waste disposal operations
	B – Waste Having The Following As Constituents
Y19	Metal carbonyls
Y20	Beryllium; beryllium compounds
Y21	Hexavalent chromium compounds
Y22	Copper compounds
Y23	Zinc compounds
Y24	Arsenic; arsenic compounds
Y25	Selenium; selenium compounds
Y26	Cadmium; cadmium compounds
Y27	Antimony; antimony compounds
Y28	Tellurium; tellurium compounds
Y29	Mercury; mercury compounds
Y30	Thallium; thallium compounds
Y31	Lead; lead compounds
Y32	Inorganic fluorine compounds excluding calcium fluoride
	B – Waste Having The Following As Constituents
Y33	Inorganic cyanides
Y34	Acidic solutions or acids in solid form
Y35	Basic solutions or bases in solid form
Y36	Asbestos (dust and fibers)
Y37	Organic phosphorus compounds
Y38	Organic cyanides
Y39	Phenols; phenol compounds including chlorophenols
Y40	Ethers
Y41	Halogenated organic solvents
Y42	Organic solvents excluding halogenated solvents
Y43	Any congenor of polychlorinated dibenzo-furan
Y44	Any congenor of polychlorinated dibenzo-p-dioxin
Y45	Organohalogen compounds other than substances referred to in this Table (e.g. Y39, Y41, Y42, Y43, Y44)
	C – Categories of Waste Requiring Special Consideration
Y46	Wastes collected from households

Y47	Residues arising from the incineration of household wastes

Table 6.3. Wastes Characterized as Hazardous Metal and Metal-Bearing

A1010	Metal wastes and waste consisting of alloys of any of the following: • Antimony • Arsenic • Beryllium • Cadmium • Lead • Mercury • Selenium • Tellurium • Thallium but excluding such wastes specifically listed on list B.
A1020	Waste having as constituents or contaminants, excluding metal waste in massive form, any of the following: • Antimony; antimony compounds • Beryllium; beryllium compounds • Cadmium; cadmium compounds • Lead; lead compounds • Selenium; selenium compounds • Tellurium; tellurium compounds
A1030	Wastes having as constituents or contaminants any of the following: • Arsenic; arsenic compounds • Mercury; mercury compounds • Thallium; thallium compounds
A1040	Wastes having as constituents any of the following: • Metal carbonyls • Hexavalent chromium compounds
A1050	Galvanic sludges
A1060	Waste liquors from the pickling of metals
A1070	Leaching residues from zinc processing, dust and sludges such as jarosite, hematite, etc.
A1080	Waste zinc residues not included on list B, containing lead and cadmium in concentrations sufficient to exhibit Table 6.1 characteristics
A1090	Ashes from the incineration of insulated copper wire
A1100	Dusts and residues from gas cleaning systems of copper smelters
A1110	Spent electrolytic solutions from copper electrorefining and electrowinning operations
A1120	Waste sludges, excluding anode slimes, from electrolyte purification systems in copper electrorefining and electrowinning operations
A1130	Spent etching solutions containing dissolved copper
A1140	Waste cupric chloride and copper cyanide catalysts
A1150	Precious metal ash from incineration of printed circuit boards not included on list B[1]
A1160	Waste lead-acid batteries, whole or crushed
A1170	Unsorted waste batteries excluding mixtures of only list B batteries. Waste batteries not specified on list B containing Table 6.2 A, B and C constituents to an extent to render them hazardous
A1180	Waste electrical and electronic assemblies or scrap[2] containing components such as accumulators and other batteries included on list A, mercury-switches, glass from cathode-ray tubes and other activated glass and PCB-capacitors, or contaminated with Table 6.2 constituents (e.g., cadmium, mercury, lead, polychlorinated biphenyl) to an extent that

[1] Note that mirror entry on list B (B1160) does not specify exceptions.
[2] This entry does not include scrap assemblies from electric power generation.

Table 6.3. Wastes Characterized as Hazardous Metal and Metal-Bearing

	they possess any of the characteristics contained in Table 6. 1 (note the related entry on list B B1110)[3]

[3] PCBs are at a concentration level of 50 mg/kg or more.

Table 6.4. Wastes Containing Principally Inorganic Constituents, which may Contain Metals and Organic Materials

A2010	Glass waste from cathode-ray tubes and other activated glasses
A2020	Waste inorganic fluorine compounds in the form of liquids or sludges but excluding such wastes specified on list B
A2030	Waste catalysts but excluding such wastes specified on list B
A2040	Waste gypsum arising from chemical industry processes, when containing Table 6.22 constituents to the extent that it exhibits an Table 6.1 hazardous characteristic (note the related entry on list B B2080)
A2050	Waste asbestos (dusts and fibers)
A2060	Coal-fired power plant fly-ash containing Table 6.2 substances in concentrations sufficient to exhibit Table 6.1 characteristics (note the related entry on list B B2050)

Table 6.5. Wastes Containing Principally Organic Constituents, which may Contain Metals and Inorganic Materials

A3010	Waste from the production or processing of petroleum coke and bitumen
A3020	Waste mineral oils unfit for their originally intended use
A3030	Wastes that contain, consist of or are contaminated with leaded anti-knock compound sludges
A3040	Waste thermal (heat transfer) fluids
A3050	Wastes from production, formulation and use of resins, latex, plasticizers, glues/adhesives excluding such wastes specified on list B (note the related entry on list B B4020)
A3060	Waste nitrocellulose
A3070	Waste phenols, phenol compounds including chlorophenol in the form of liquids or sludges
A3080	Waste ethers not including those specified on list B
A3090	Waste leather dust, ash, sludges and flours when containing hexavalent chromium compounds or biocides (note the related entry on list B B3100)
A3100	Waste paring and other waste of leather or of composition leather not suitable for the manufacture of leather articles containing hexavalent chromium compounds or biocides (note the related entry on list B B3090)
A3110	Fellmongery wastes containing hexavalent chromium compounds or biocides or infectious substances (note the related entry on list B B3110)
A3120	Fluff - light fraction from shredding
A3130	Waste organic phosphorous compounds
A3140	Waste non-halogenated organic solvents but excluding such wastes specified on list B
A3150	Waste halogenated organic solvents
A3160	Waste halogenated or unhalogenated non-aqueous distillation residues arising from organic solvent recovery operations
A3170	Wastes arising from the production of aliphatic halogenated hydrocarbons (such as chloromethane, dichloro-ethane, vinyl chloride, vinylidene chloride, allyl chloride and epichlorhydrin)
A3180	Wastes, substances and articles containing, consisting of or contaminated with polychlorinated biphenyl (PCB), polychlorinated terphenyl (PCT), polychlorinated naphthalene (PCN) or polybrominated biphenyl (PBB), or any other polybrominated analogues of these compounds, at a concentration level of 50 mg/kg or more[4]

[4] The 50 mg/kg level is considered to be an internationally practical level for all wastes. However, many individual

A3190	Waste tarry residues (excluding asphalt cements) arising from refining, distillation and any pyrolitic treatment of organic materials

countries have established lower regulatory levels (e.g., 20 mg/kg) for specific wastes.

Table 6.6. Wastes which may Contain Either Inorganic or Organic Constituents

A4010	Wastes from the production, preparation and use of pharmaceutical products but excluding such wastes specified on list B
A4020	Clinical and related wastes; that is wastes arising from medical, nursing, dental, veterinary, or similar practices, and wastes generated in hospitals or other facilities during the investigation or treatment of patients, or research projects
A4030	Wastes from the production, formulation and use of biocides and phytopharmaceuticals, including waste pesticides and herbicides which are off-specification, outdated,[5] or unfit for their originally intended use
A4040	Wastes from the manufacture, formulation and use of wood-preserving chemicals[6]
A4050	Wastes that contain, consist of or are contaminated with any of the following: • Inorganic cyanides, excepting precious-metal-bearing residues in solid form containing traces of inorganic cyanides • Organic cyanides
A4060	Waste oils/water, hydrocarbons/water mixtures, emulsions
A4070	Wastes from the production, formulation and use of inks, dyes, pigments, paints, lacquers, varnish excluding any such waste specified on list B (note the related entry on list B B4010)
A4080	Wastes of an explosive nature (but excluding such wastes specified on list B)
A4090	Waste acidic or basic solutions, other than those specified in the corresponding entry on list B (note the related entry on list B B2120)
A4100	Wastes from industrial pollution control devices for cleaning of industrial off-gases but excluding such wastes specified on list B
A4110	Wastes that contain, consist of or are contaminated with any of the following: • Any congenor of polychlorinated dibenzo-furan • Any congenor of polychlorinated dibenzo-dioxin
A4120	Wastes that contain, consist of or are contaminated with peroxides
A4130	Waste packages and containers containing Table 6.2 substances in concentrations sufficient to exhibit Table 6.1 hazard characteristics
A4140	Waste consisting of or containing off specification or outdated[7] chemicals corresponding to Table 6.2 A, B and C categories and exhibiting Table 6.1 hazard characteristics
A4150	Waste chemical substances arising from research and development or teaching activities which are not identified and/or are new and whose effects on human health and/or the environment are not known
A4160	Spent activated carbon not included on list B (note the related entry on list B B2060)

[5] "Outdated" means unused within the period recommended by the manufacturer.
[6] This entry does not include wood treated with wood preserving chemicals.
[7] "Outdated" means unused within the period recommended by the manufacturer.

Table 6.7. B1 Metal and Metal-Bearing Wastes

B1010	Metal and metal-alloy wastes in metallic, non-dispersible form: • Precious metals (gold, silver, the platinum group, but not mercury) • Iron and steel scrap • Copper scrap • Nickel scrap • Aluminum scrap • Zinc scrap • Tin scrap • Tungsten scrap • Molybdenum scrap • Tantalum scrap • Magnesium scrap • Cobalt scrap • Bismuth scrap • Titanium scrap • Zirconium scrap • Manganese scrap • Germanium scrap • Vanadium scrap • Scrap of hafnium, indium, niobium, rhenium and gallium • Thorium scrap • Rare earths scrap • Chromium scrap
B1020	Clean, uncontaminated metal scrap, including alloys, in bulk finished form (sheet, plate, beams, rods, etc), of: • Antimony scrap • Beryllium scrap • Cadmium scrap • Lead scrap (but excluding lead-acid batteries) • Selenium scrap • Tellurium scrap
B1030	Refractory metals containing residues
B1040	Scrap assemblies from electrical power generation not contaminated with lubricating oil, PCB or PCT to an extent to render them hazardous
B1050	Mixed non-ferrous metal, heavy fraction scrap, not containing Table 6.2 A, B and C type materials in concentrations sufficient to exhibit Table 6.1 characteristics[8]
B1060	Waste selenium and tellurium in metallic elemental form including powder
B1070	Waste of copper and copper alloys in dispersible form, unless they contain Table 6.2 constituents to an extent that they exhibit Table 6.1 characteristics
B1080	Zinc ash and residues including zinc alloys residues in dispersible form unless containing Table 6.2 A, B and C type constituents in concentration such as to exhibit Table 6.1 characteristics or exhibiting hazard characteristic H4.3 (Table 6.1)[9]
B1090	Waste batteries conforming to a specification, excluding those made with lead, cadmium or mercury

[8] Note that even where low level contamination with these materials initially exists, subsequent processes, including recycling processes, may result in separated fractions containing significantly enhanced concentrations of these materials.

[9] The status of zinc ash is currently under review.

Table 6.7. B1 Metal and Metal-Bearing Wastes

B1100	Metal-bearing wastes arising from melting, smelting and refining of metals: • Hard zinc scrap • Zinc-containing drosses: - Galvanizing slab zinc top dross (>90% Zn) - Galvanizing slab zinc bottom dross (>92% Zn) - Zinc die casting dross (>85% Zn) - Hot dip galvanizers slab zinc dross (batch)(>92% Zn) - Zinc skimmings • Aluminum skimmings (or skims) excluding salt slag • Slags from copper processing for further processing or refining not containing arsenic, lead or cadmium to an extent that they exhibit Table 6.1 hazard characteristics • Wastes of refractory linings, including crucibles, originating from copper smelting • Slags from precious metals processing for further refining • Tantalum-bearing tin slags with less than 0.5% tin
B1110	Electrical and electronic assemblies: • Electronic assemblies consisting only of metals or alloys • Waste electrical and electronic assemblies or scrap[10] (including printed circuit boards) not containing components such as accumulators and other batteries included on list A, mercury-switches, glass from cathode-ray tubes and other activated glass and PCB-capacitors, or not contaminated with Table 6.2 constituents (e.g., cadmium, mercury, lead, polychlorinated biphenyl) or from which these have been removed, to an extent that they do not possess any of the characteristics contained in Table 6.1 (note the related entry on list A A1180) • Electrical and electronic assemblies (including printed circuit boards, electronic components and wires) destined for direct reuse,[11] and not for recycling or final disposal[12]
B1120	Spent catalysts excluding liquids used as catalysts, containing any of:

Transition metals, excluding waste catalysts (spent catalysts, liquid used catalysts or other catalysts) on list A:	Scandium Vanadium Manganese Cobalt Copper Yttrium Niobium Hafnium Tungsten	Titanium Chromium Iron Nickel Zinc Zirconium Molybdenum Tantalum Rhenium
Lanthanides (rare earth metals):	Lanthanum Praseodymium Samarium Gadolinium Dysprosium Erbium Ytterbium	Cerium Neody Europium Terbium Holmium Thulium Lutetium

[10] This entry does not include scrap from electrical power generation.
[11] Reuse can include repair, refurbishment or upgrading, but not major reassembly
[12] In some countries these materials destined for direct re-use are not considered wastes.

Table 6.7. B1 Metal and Metal-Bearing Wastes

B1130	Cleaned spent precious-metal-bearing catalysts
B1140	Precious-metal-bearing residues in solid form which contain traces of inorganic cyanides
B1150	Precious metals and alloy wastes (gold, silver, the platinum group, but not mercury) in a dispersible, non-liquid form with appropriate packaging and labeling
B1160	Precious-metal ash from the incineration of printed circuit boards (note the related entry on list A, A1150)
B1170	Precious-metal ash from the incineration of photographic film
B1180	Waste photographic film containing silver halides and metallic silver
B1190	Waste photographic paper containing silver halides and metallic silver
B1200	Granulated slag arising from the manufacture of iron and steel
B1210	Slag arising from the manufacture of iron and steel including slags as a source of TiO_2 and vanadium
B1220	Slag from zinc production, chemically stabilized, having a high iron content (above 20%) and processed according to industrial specifications (e.g., DIN 4301) mainly for construction
B1230	Mill scaling arising from the manufacture of iron and steel
B1240	Copper oxide mill-scale
B1250	Waste end-of-life motor vehicles, containing neither liquids nor other hazardous components

Table 6.8. B2 Wastes Containing Principally Inorganic Constituents, which may Contain Metals and Organic Materials

B2010	Wastes from mining operations in non-dispersible form: • Natural graphite waste • Slate waste, whether or not roughly trimmed or merely cut, by sawing or otherwise • Mica waste • Leucite, nepheline and nepheline syenite waste • Feldspar waste • Fluorspar waste • Silica wastes in solid form excluding those used in foundry operations
B2020	Glass waste in non-dispersible form: • Cullet and other waste and scrap of glass except for glass from cathode-ray tubes and other activated glasses
B2030	Ceramic wastes in non-dispersible form: • Cermet wastes and scrap (metal ceramic composites) • Ceramic based fibers not elsewhere specified or included
B2040	Other wastes containing principally inorganic constituents: • Partially refined calcium sulfate produced from flue-gas desulphurization (FGD) • Waste gypsum wallboard or plasterboard arising from the demolition of buildings • Slag from copper production, chemically stabilized, having a high iron content (above 20%) and processed according to industrial specifications (e.g., DIN 4301 and DIN 8201) mainly for construction and abrasive applications • Sulfur in solid form • Limestone from the production of calcium cyanamide (having a pH less than 9) • Sodium, potassium, calcium chlorides • Carborundum (silicon carbide) • Crushed concrete • Lithium-tantalum and lithium-niobium containing glass scraps
B2050	Coal-fired power plant fly-ash, not included on list A (note the related entry on list A A2060)
B2060	Spent activated carbon resulting from the treatment of potable water and processes of the food industry and vitamin production (note the related entry on list A, A4160)
B2070	Calcium fluoride sludge
B2080	Waste gypsum arising from chemical industry processes not included on list A (note the related entry on list A, A2040)
B2090	Waste anode butts from steel or aluminum production made of petroleum coke or bitumen and cleaned to normal industry specifications (excluding anode butts from chlor alkali electrolyses and from metallurgical industry)
B2100	Waste hydrates of aluminum and waste alumina and residues from alumina production excluding such materials used for gas cleaning, flocculation or filtration processes
B2110	Bauxite residue (“red mud”) (pH moderated to less than 11.5)
B2120	Waste acidic or basic solutions with a pH greater than 2 and less than 11.5, which are not corrosive or otherwise hazardous (note the related entry on list A, A4090)

Table 6.9. B3 Wastes Containing Principally Organic Constituents, which may Contain Metals and Inorganic Materials

B3010	Solid plastic waste: The following plastic or mixed plastic materials, provided they are not mixed with other wastes and are prepared to a specification: • Scrap plastic of non-halogenated polymers and co-polymers, including but not limited to the following[13] - ethylene - styrene - polypropylene - polyethylene terephthalate - acrylonitrile - butadiene - polyacetals - polyamides - polybutylene terephthalate - polycarbonates - polyethers - polyphenylene sulfides - acrylic polymers - alkanes C10-C13 (plasticizer) - polyurethane (not containing CFCs) - polysiloxanes - polymethyl methacrylate - polyvinyl alcohol - polyvinyl butyral - polyvinyl acetate • Cured waste resins or condensation products including the following: - urea formaldehyde resins - phenol formaldehyde resins - melamine formaldehyde resins - epoxy resins - alkyd resins - polyamides • The following fluorinated polymer wastes[14] - perfluoroethylene/propylene (FEP) - perfluoro alkoxyl alkane - tetrafluoroethylene/per fluoro vinyl ether (PFA) - tetrafluoroethylene/per fluoro methylvinyl ether (MFA) - polyvinylfluoride (PVF) - polyvinylidenefluoride (PVDF)
B3020	Paper, paperboard and paper product wastes The following materials, provided they are not mixed with hazardous wastes: Waste and scrap of paper or paperboard of: • unbleached paper or paperboard or of corrugated paper or paperboard • other paper or paperboard, made mainly of bleached chemical pulp, not colored in the mass • paper or paperboard made mainly of mechanical pulp (for example,

[13] It is understood that such scraps are completely polymerized.

[14] Post-consumer wastes are excluded from this entry:

- Wastes shall not be mixed
- Problems arising from open-burning practices to be considered

Table 6.9. B3 Wastes Containing Principally Organic Constituents, which may Contain Metals and Inorganic Materials

	newspapers, journals and similar printed matter) • other, including but not limited to 1) laminated paperboard 2) unsorted scrap
B3030	Textile wastes The following materials, provided they are not mixed with other wastes and are prepared to a specification: • Silk waste (including cocoons unsuitable for reeling, yarn waste and garnetted stock) - not carded or combed - other • Waste of wool or of fine or coarse animal hair, including yarn waste but excluding garnetted stock - noils of wool or of fine animal hair - other waste of wool or of fine animal hair - waste of coarse animal hair • Cotton waste (including yarn waste and garnetted stock) - yarn waste (including thread waste) - garnetted stock - other • Flax tow and waste • Tow and waste (including yarn waste and garnetted stock) of true hemp (Cannabis sativa L.) • Tow and waste (including yarn waste and garnetted stock) of jute and other textile based fibers (excluding flax, true hemp and ramie) • Tow and waste (including yarn waste and garnetted stock) of sisal and other textile fibers of the genus Agave • Tow, noils and waste (including yarn waste and garnetted stock) of coconut • Tow, noils and waste (including yarn waste and garnetted stock) of abaca (Manila hemp or Musa textilis Nee) • Tow, noils and waste (including yarn waste and garnetted stock) of ramie and other vegetable textile fibers, not elsewhere specified or included • Waste (including noils, yarn waste and garnetted stock) of man-made fibers - of synthetic fibers - of artificial fibers • Worn clothing and other worn textile articles • Used rags, scrap twine, cordage, rope and cables and worn out articles of twine, cordage, rope or cables of textile materials - sorted - other
B3040	Rubber wastes The following materials, provided they are not mixed with other wastes: • Waste and scrap of hard rubber (e.g., ebonite) • Other rubber wastes (excluding such wastes specified elsewhere)
B3050	Untreated cork and wood waste: • Wood waste and scrap, whether or not agglomerated in logs, briquettes, pellets or similar forms • Cork waste: crushed, granulated or ground cork
B3060	Wastes arising from agro-food industries provided it is not infectious: • Wine lees • Dried and sterilized vegetable waste, residues and byproducts, whether or not in the form of pellets, of a kind used in animal feeding, not elsewhere specified or included

Table 6.9. B3 Wastes Containing Principally Organic Constituents, which may Contain Metals and Inorganic Materials

	• Degras: residues resulting from the treatment of fatty substances or animal or vegetable waxes • Waste of bones and horn-cores, unworked, defatted, simply prepared (but not cut to shape), treated with acid or degelatinized • Fish waste • Cocoa shells, husks, skins and other cocoa waste • Other wastes from the agro-food industry excluding by-products which meet national and international requirements and standards for human or animal consumption
B3070	The following wastes: • Waste of human hair • Waste straw • Deactivated fungus mycelium from penicillin production to be used as animal feed
B3080	Waste parings and scrap of rubber
B3090	Paring and other wastes of leather or of composition leather not suitable for the manufacture of leather articles, excluding leather sludges, not containing hexavalent chromium compounds and biocides (note the related entry on list A A3100)
B3100	Leather dust, ash, sludges or flours not containing hexavalent chromium compounds or biocides (note the related entry on list A A3090)
B3110	Fellmongery wastes not containing hexavalent chromium compounds or biocides or infectious substances (note the related entry on list A A3110)
B3120	Wastes consisting of food dyes
B3130	Waste polymer ethers and waste non-hazardous monomer ethers incapable of forming peroxides
B3140	Waste pneumatic tires, excluding those destined for the disposal operations in Section A of Table 6.11.

Table 6.10. B4 Wastes which may Contain Either Inorganic or Organic Constituents

B4010	Wastes consisting mainly of water-based/latex paints, inks and hardened varnishes not containing organic solvents, heavy metals or biocides to an extent to render them hazardous (note the related entry on list A A4070)
B4020	Wastes from production, formulation and use of resins, latex, plasticizers, glues/adhesives, not listed on list A, free of solvents and other contaminants to an extent that they do not exhibit Table 6.1 characteristics, e.g., water-based, or glues based on casein starch, dextrin, cellulose ethers, polyvinyl alcohols (note the related entry on list A A3050)
B4030	Used single-use cameras, with batteries not included on list A

Note: Production waste that is not included as an item in this list:

1. Products that do not comply with specifications
2. Expired products
3. Unusable parts (e.g. spent batteries, spent catalysts)
4. Industrial waste processes (e.g. slag)
5. Waste arising from pollution control operations (e.g. sludge from gas washing equipment, bags used for collecting soot from chimneys and spent air filters)
6. Waste arising from industrial processes and subsequent operations (e.g. lathe waste, grain skin from mills)
7. Waste arising from the processing of raw materials (e.g. mining waste, materials polluted with oil)
8. Fake counterfeit materials (e.g. oils contaminated with polychlorinated biphenyls (PCBs))
9. Unwanted or unusable products (e.g. unwanted commercial, household, agricultural, and commercial products)
10. Materials or products categorized as waste by the producers but are not included in the items listed herewith

Table 6.11. Resource Recovery, Recycling, Reclamation, Direct re-use or Alternative Uses

Section A	Disposal Operations which do not lead to the possibility of resource recovery, recycling, reclamation, direct re-use or alternative uses
D1	Deposit into or onto land, (e.g., landfill, etc.)
D2	Land treatment, (e.g., biodegradation of liquid or sludgy discards in soils, etc.)
D3	Deep injection, (e.g., injection of pumpable discards into wells, salt domes of naturally occurring repositories, etc.)
D4	Surface impoundment, (e.g., placement of liquid or sludge discards into pits, ponds or lagoons, etc.)
D5	Specially engineered landfill, (e.g., placement into lined discrete cells which are capped and isolated from one another and the environment, etc.)
D6	Release into a water body except seas/oceans
D7	Release into seas/oceans including sea-bed insertion
D8	Biological treatment not specified elsewhere in this Table which results in final compounds or mixtures which are discarded by means of any of the operations in this section (Section A)
D9	Physico chemical treatment not specified elsewhere in this Table which results in final compounds or mixtures which are discarded by means of any of the operations in Section A, (e.g., evaporation, drying, calcination, neutralization, precipitation, etc.)
D10	Incineration on land
D11	Incineration at sea
D12	Permanent storage (e.g., emplacement of containers in a mine, etc.)
D13	Blending or mixing prior to submission to any of the operations in this section (Section A)
D14	Repackaging prior to submission to any of the operations in this section (Section A)
D15	Storage pending any of the operations in this section (Section A)
Section B	Operations which may Lead to Resource Recovery, Recycling Reclamation, Direct Re-use or Alternative Uses
R1	Use as a fuel (other than in direct incineration) or other means to generate energy
R2	Solvent reclamation/regeneration
R3	Recycling/reclamation of organic substances which are not used as solvents
R4	Recycling/reclamation of metals and metal compounds
R5	Recycling/reclamation of other inorganic materials
R6	Regeneration of acids or bases
R7	Recovery of components used for pollution abatement
R8	Recovery of components from catalysts
R9	Used oil re-refining or other reuses of previously used oil
R10	Land treatment resulting in benefit to agriculture or ecological improvement
R11	Uses of residual materials obtained from any of the operations numbered R1-R10
R12	Exchange of wastes for submission to any of the operations numbered R1-R11
R13	Accumulation of material intended for any operation in

Note: Section B encompasses all such operations with respect to materials legally defined as or considered to be hazardous wastes and which otherwise would have been destined for operations included in Section A.

Table 6.12. Generator Requirements for the Competent Authority

The following information shall be provided by generators upon notifying Competent Authority of the need to export hazardous waste for disposal:

1. Reason for waste export
2. Exporter of the waste[1]
3. Generator(s) of the waste and site of generation[1]
4. Disposer of the waste and actual site of disposal[1]
5. Intended carrier(s) of the waste or their agents, if known[1]
6. Country of export of the waste
   Competent authority[2]
7. Expected countries of transit
   Competent authority[2]
8. Country of import of the waste
   Competent authority[2]
9. General or single notification
10. Projected date(s) of shipment(s) and period of time over which waste is to be exported and proposed itinerary (including point of entry and exit)[3]
11. Means of transport envisaged (road, rail, sea, air, inland waters)
12. Information relating to insurance[4]
13. Designation and physical description of the waste including Y number and UN number and its composition [5] and information on any special handling requirements including emergency provisions in case of accidents
14. Type of packaging envisaged (e.g. bulk, drummed, tanker)
15. Estimated quantity in weight/volume[6]
16. Process by which the waste is generated[7]
17. For wastes listed in Table 6.2, classifications from Table 6.1: hazardous characteristic, H number, and UN class
18. Method of disposal as per Table 6.11
19. Declaration by the generator and exporter that the information is correct
20. Information transmitted (including technical description of the plant) to the exporter or generator from the disposer of the waste upon which the latter has based his assessment that there was no reason to believe that the wastes will not be managed in an environmentally sound manner in accordance with the laws and regulations of the country of import
21. Information concerning the contract between the exporter and disposer.

Notes

[1] Full name and address, telephone, telex or telefax number and the name, address, telephone, telex or telefax number of the person to be contacted.

[2] Full name and address, telephone, telex or telefax number.

[3] In the case of a general notification covering several shipments, either the expected dates of each shipment or, if this is not known, the expected frequency of the shipments will be required.

[4] Information to be provided on relevant insurance requirements and how they are met by exporter, carrier and disposer.

[5] The nature and the concentration of the most hazardous components, in terms of toxicity and other dangers presented by the waste both in handling and in relation to the proposed disposal method.

[6] In the case of a general notification covering several shipments, both the estimated total quantity and the estimated quantities for each individual shipment will be required.

[7] Insofar as this is necessary to assess the hazard and determine the appropriateness of the proposed disposal operation.

Table 6.13. Information Requirements for Waste Disposal Outside Bahrain

For waste disposed outside of Bahrain, the following information shall be provided:

1. Exporter of the waste[1]
2. Generator(s) of the waste and site of generation[1]
3. Disposer of the waste and actual site of disposal[1]
4. Carrier(s) of the waste[1] or his agent(s)
5. Subject of general or single notification
6. The date the trans boundary movement started and date(s) and signature on receipt by each person who takes charge of the waste
7. Means of transport (road, rail, inland waterway, sea, air) including countries of export, transit and import, also point of entry and exit where these have been designated
8. General description of the waste (physical state, proper UN shipping name and class, UN number, Y number and H number as applicable)
9. Information on special handling requirements including emergency provision in case of accidents
10. Type and number of packages
11. Quantity in weight/volume
12. Declaration by the generator or exporter that the information is correct
13. Declaration by the generator or exporter indicating no objection from the competent authorities of all States concerned which are Parties
14. Certification by disposer of receipt at designated disposal facility and indication of method of disposal and of the approximate date of disposal.

Notes

The information required on the movement document shall where possible be integrated in one document with that required under transport rules. Where this is not possible the information should complement rather than duplicate that required under the transport rules. The movement document shall carry instructions as to who is to provide information and fill-out any form.

[1] Full name and address, telephone, telex or telefax number and the name, address, telephone, telex or telefax number of the person to be contacted in case of emergency.

CHAPTER 7

SOLID WASTE

7.1. SCOPE

This Chapter contains criteria to ensure that solid wastes are identified, classified, collected, transported, stored, treated, and disposed of safely and in a manner protective of human health and the environment. These criteria apply to residential and commercial solid waste generated at the installation level. These criteria are part of integrated waste management. Policies concerning the recycling portion of integrated waste management are found in DoDI 4715.4, "Pollution Prevention", and service solid waste management manuals. The criteria in this Chapter deal with general solid waste. Criteria for specific types of solid waste that require special precautions are provided in Chapter 6, "Hazardous Waste," Chapter 8, "Medical Waste Management," Chapter 11, "Pesticides," and Chapter 14, "Polychlorinated Biphenyls."

7.2. DEFINITIONS

7.2.1. Bulky Waste. Large items of solid waste such as household appliances, furniture, large auto parts, trees, branches, stumps, and other oversize wastes whose large size precludes or complicates their handling by normal solid wastes collection, processing, or disposal methods.

7.2.2. Carry-out Collection. Collection of solid waste from a storage area proximate to the dwelling unit(s) or establishment where generated.

7.2.3. Collection. The act of consolidating solid wastes (or materials that have been separated for the purpose of recycling) from various locations.

7.2.4. Collection Frequency. The number of times collection is provided in a given period of time.

7.2.5. Commercial Solid Waste. All types of solid wastes generated by stores, offices, restaurants, warehouses, and other non-manufacturing activities, excluding residential and industrial wastes**,** that do not contain solvents or degreasing materials, oils, ink, sludge, acids, alkaline, or other non-household materials.

7.2.6. Compactor Collection Vehicle. A vehicle with an enclosed body containing mechanical devices that convey solid waste into the main compartment of the body and compress it into a smaller volume of greater density.

7.2.7. Construction and Demolition Waste. The waste building materials, packaging, and rubble resulting from construction, remodeling, repair and demolition operations on pavements, houses, commercial buildings, and other structures.

7.2.8. Curb Collection. Collection of solid waste placed adjacent to a street.

7.2.9. Cover Material. Material that is used to cover compacted solid wastes in a land disposal site.

7.2.10. Daily Cover. Soil that is spread and compacted or synthetic material that is placed on the top and side slopes of compacted solid waste at least at the end of each operating day to control vectors, fire, moisture, and erosion and to assure an aesthetic appearance. Mature compost or other natural material may be substituted for soil if soil is not reasonably available in the vicinity of the landfill and the substituted material will control vectors, fire, moisture, and erosion and will assure an aesthetic appearance.

7.2.11. Disposal. Processes such as burial, treatment (biological, physical or chemical), permanent storage or incineration**.**

7.2.12. Final Cover. A layer of soil, mature compost, other natural material (or synthetic material with an equivalent minimum permeability) that is applied to the landfill after completion of a cell or trench, including a layer of material that will sustain native vegetation, if any.

7.2.13. Food Waste. The organic residues generated by the handling, storage, sale, preparation, cooking, and serving of foods, commonly called garbage.

7.2.14. Generation. The act or process of producing solid waste.

7.2.15. Hazardous Waste. Refer to Chapter 6, "Hazardous Waste."

7.2.16. Industrial Solid Waste. The solid waste generated by industrial processes and manufacturing.

7.2.17. Inert Waste. Chemically or biologically inactive materials in the natural environment including, but not limited to, glass, building debris, plastic parts, wood, rubber, wires or metal plates as well as uncontaminated soil free of plants.

7.2.18. Institutional Solid Waste. Solid waste generated by educational, health care, correctional, and other institutional facilities, but not including medical waste as defined by Chapter 8.

7.2.19. Land Application Unit. An area where wastes are applied onto or incorporated into the soil surface (excluding manure spreading operations) for agricultural purposes or for treatment or disposal.

7.2.20. Lower Explosive Limit. The lowest percent by volume of a mixture of explosive gases in air that will propagate a flame at 25°C (77°F) and atmospheric pressure.

7.2.21. Municipal Solid Waste (MSW). Normally, residential, institutional and commercial solid waste generated within a community, including food waste, but not including yard waste or

hazardous waste as defined in Chapter 6, “Hazardous Waste.” (See also definition in Chapter 2, “Air Emissions.”)

7.2.22. Municipal Solid Waste Landfill (MSWLF) Unit. A discrete area of land or an excavation, on or off an installation, that receives household waste, and that is not a land application unit, surface impoundment, injection well, or waste pile. An MSWLF unit also may receive other types of wastes, such as commercial solid waste and industrial waste.

7.2.23. Open Burning. Burning of solid wastes in the open, such as in an open dump.

7.2.24. Open Dump. A land disposal site at which solid wastes are disposed of in a manner that does not protect the environment, is susceptible to open burning, and is exposed to the elements, vectors, and scavengers.

7.2.25. Residential Solid Waste. The wastes generated by normal household activities, including, but not limited to, food wastes, rubbish, ashes, and bulky wastes.

7.2.26. Rubbish. A general term for solid waste, excluding food wastes and ashes, taken from residences, commercial establishments, and institutions.

7.2.27. Sanitary Landfill. A land disposal site employing an engineered method of disposing of solid wastes on land in a manner that minimizes environmental hazards by spreading the solid wastes in thin layers, compacting the solid wastes to the smallest practical volume, and applying and compacting cover material at the end of each operating day.

7.2.28. Satellite Vehicle. A small collection vehicle that transfers its load into a larger vehicle operating in conjunction with it.

7.2.29. Scavenging. The uncontrolled and unauthorized removal of materials at any point in the solid waste management system.

7.2.30. Service Solid Waste Management Manual. Naval Facility Manual of Operation (NAVFAC MO) 213, Air Force Regulation (AFR) 91-8, Army TM 5-634, Solid Waste Management , or their successor documents.

7.2.31. Sludge. The accumulated semi-liquid suspension of settled solids deposited from wastewaters or other fluids in tanks or basins. It does not include solids or dissolved material in domestic sewage or other significant pollutants in water resources, such as silt, dissolved or suspended solids in industrial wastewater effluent, dissolved materials in irrigation return flows, or other common water pollutants.

7.2.32. Solid Wastes. Garbage, refuse, sludge, and other discarded materials, including solid, semi-solid, liquid, and contained gaseous materials resulting from industrial and commercial operations and from community activities. It does not include solids or dissolved material in domestic sewage or other significant pollutants in water resources, such as silt, dissolved or suspended solids in industrial wastewater effluent, dissolved materials in irrigation return flows, or other common water pollutants.

7.2.33. Solid Waste Storage Container. A receptacle used for the temporary storage of solid waste while awaiting collection.

7.2.34. Stationary Compactor. A powered machine that is designed to compact solid waste or recyclable materials and that remains stationary when in operation.

7.2.35. Storage. The interim containment of solid waste after generation and prior to collection for treatment, ultimate recovery or disposal.

7.2.36. Street Wastes. Material picked up by manual or mechanical sweepings of alleys, streets, and sidewalks; wastes from public waste receptacles; and material removed from catch basins.

7.2.37. Transfer Station. A site at which solid wastes are concentrated for transport to a processing facility or land disposal site. A transfer station may be fixed or mobile.

7.2.38. Vector. A carrier that is capable of transmitting a pathogen from one organism to another.

7.2.39. Yard Waste. Grass and shrubbery clippings, tree limbs, leaves, and similar organic materials commonly generated in residential yard maintenance (also known as green waste).

7.3. CRITERIA

7.3.1. DoD solid wastes will be treated, stored, and disposed of in facilities that have been evaluated against paragraphs 7.3.12., 7.3.14., and 7.3.15. These evaluated facilities will be used to the maximum extent practical.

7.3.2. Installations will cooperate with Bahrain officials, to the extent possible, in the solid waste management planning process.

7.3.3. Installations will develop and implement a solid waste management strategy to reduce solid waste disposal. This strategy could include recycling, composting, and waste minimization efforts.

7.3.4. All solid wastes or materials that have been separated for the purpose of recycling will be stored in such a manner that they do not constitute a fire, health or safety hazard or provide food or harborage for vectors, and will be contained or bundled *and covered* to avoid spillage.

7.3.5. Storage of bulky wastes will include, but will not be limited to, removing all doors from large household appliances and covering the items to reduce both the problems of an attractive nuisance, and the accumulation of solid waste and water in and around the bulky items. Bulky wastes will be screened for the presence of ozone depleting substances as defined in Chapter 2, “Air Emissions,” or hazardous constituents as defined in Chapter 6, “Hazardous

Waste." Readily detachable or removable hazardous waste will be segregated and disposed of in accordance with Chapters 6, 14, and 15 of this Guide.

7.3.6. In the design of all buildings or other facilities that are constructed, modified, or leased after the effective date of this Guide, there will be provisions for storage in accordance with these guidelines that will accommodate the volume of solid waste anticipated. Storage areas will be easily cleaned and maintained, and will allow for safe, efficient collection.

7.3.7. Storage containers should be leak-proof, waterproof, and vermin-proof, including sides, seams and bottoms, and be durable enough to withstand anticipated usage and environmental conditions without rusting, cracking, or deforming in a manner that would impair serviceability. Containers shall be made of either strengthened plastic, galvanized steel, or polyethylene bags and be large enough to collect and contain waste for a period of 24 hours. Storage containers should have functional lids.

7.3.8. Containers should be stored on a firm, level, well-drained surface that is large enough to accommodate all of the containers and that is maintained in a clean, spillage-free condition.

7.3.9. Recycling programs will be instituted on DoD installations in accordance with the policies in DODI 4715.4, "Pollution Prevention".

7.3.10. Installations will not initiate new or expand existing waste landfill units without approval of the Combatant Commander with responsibility for the area where the landfill would be located, and only after justification that unique circumstances mandate a new unit. Consult the Lead Environmental Component (LEC) regarding the location of approved landfill sites.

7.3.11. New DoD MSWLF units will be designed and operated in a manner that incorporates the following broad factors:

7.3.11.1. Location restrictions with regard to airport safety (i.e., bird hazards), floodplains, wetlands, aquifers, seismic zones, unstable areas;

7.3.11.2. Procedures for excluding hazardous waste;

7.3.11.3. Cover material criteria (e.g., daily cover), disease vector control, explosive gas control, air quality criteria (e.g., no open burning), access requirements, liquids restrictions, and record keeping requirements; and

7.3.11.4. Inspection program.

7.3.11.5. Liner and leachate collection system designed consistent with location to prevent groundwater contamination that would adversely affect human health.

7.3.11.6. A groundwater monitoring system unless the installation operating the landfill, after consultation with the LEC, determines that there is no reasonable potential for migration of hazardous constituents from the MSWLF to the uppermost aquifer during the active life of the facility and the post-closure care period.

7.3.12. Installations operating MSWLF units will:

7.3.12.1. Use standard sanitary landfill techniques of spreading and compacting solid wastes and placing daily cover over disposed solid waste at the end of each operating day.

7.3.12.2. Establish criteria for unacceptable wastes based on site-specific factors such as hydrology, chemical and biological characteristics of the waste, available alternative disposal methods, environmental and health effects, and the safety of personnel.

7.3.12.3. Implement a program to detect and prevent the disposal of hazardous wastes, infectious wastes, PCBs, and wastes determined unsuitable for the specific MSWLF unit.

7.3.12.4. Investigate options for composting of MSW as an alternative to landfilling or treatment prior to landfilling.

7.3.12.5. Prohibit open burning, except for infrequent burning of agricultural wastes, silvicultural wastes, land-clearing debris, diseased trees, or debris from emergency clean-up operations.

7.3.12.6. Develop procedures for dealing with yard waste and construction debris that keeps it out of MSWLF units to the maximum extent possible (e.g., composting, recycling).

7.3.12.7. Operate the MSWLF unit in a manner to protect the health and safety of personnel associated with the operation.

7.3.12.8. Maintain conditions that are unfavorable for the harboring, feeding, and breeding of disease vectors.

7.3.12.9. Ensure that methane gas generated by the MSWLF unit does not exceed 25% of the lower explosive limit for methane in structures on or near the MSWLF.

7.3.12.10. Operate in an aesthetically acceptable manner.

7.3.12.11. Operate in a manner to protect aquifers.

7.3.12.12. Control public access to landfill facilities.

7.3.12.13. Prohibit the disposal of bulk or non-containerized liquids if possible.

7.3.12.14. Maintain records on the preceding criteria.

7.3.12.15. During closure and post-closure operations, installations will:

7.3.12.15.1. Install a final cover system that is designed to minimize infiltration and erosion.

7.3.12.15.2. Ensure that the infiltration layer is composed of a minimum of 46 cm (18 inches) of earthen material, geotextiles, or a combination thereof, that have a permeability less than or equal to the permeability of any bottom liner system or natural subsoil present, or a permeability no greater than .00005 cm/sec, whichever is less.

7.3.12.15.3. Ensure that the final layer consists of a minimum of 21 cm (8 inches) of earthen material that is capable of sustaining native plant growth.

7.3.12.15.4. If possible, re-vegetate the final cap with native plants that are compatible with the landfill design, including the liner.

7.3.12.15.5. Prepare a written Closure Plan that includes, at a minimum, a description of the monitoring and maintenance activities required to ensure the integrity of the final cover, a description of the planned uses of the site during the post-closure period, plans for continuing (during the post-closure period) leachate collection, groundwater monitoring, and methane monitoring, and a survey plot showing the exact site location. The plan will be kept as part of the installation's permanent records. The post-closure period will be a minimum of 5 years.

7.3.13. Open burning will not be the regular method of solid waste disposal. Where burning is the method, incinerators meeting air quality requirements of Chapter 2, “Air Emissions,” will be used.

7.3.14. A composting facility that is located on a DoD installation and that processes annually > 5000 tons of sludge from a domestic wastewater treatment plant (see Chapter 4, “Wastewater”) will comply with the following criteria:

7.3.14.1. Operators must maintain a record of the characteristics of the waste composted, sewage sludge, and other materials, such as nutrient or bulking agents being composted, including the source and volume or weight of the material.

7.3.14.1.1. Access to the facility must be controlled. All access points must be secured when the facility is not in operation.

7.3.14.1.2. By-products, including residuals and materials that can be recycled, must be stored to prevent vector intrusion and aesthetic degradation. Materials that are not composted must be removed periodically.

7.3.14.1.3. Run-off water that has come in contact with composted waste, materials stored for composting, or residual waste must be diverted to a leachate collection and treatment system.

7.3.14.1.4. The temperature and retention time for the material being composted must be monitored and recorded.

7.3.14.1.5. Periodic analysis of the compost must be completed for the following parameters: percentage of total solids, volatile solids as a percentage of total solids, pH,

ammonia, nitrate, nitrogen, total phosphorous, cadmium, chromium, copper, lead, nickel, zinc, mercury, and PCBs.

7.3.14.1.6. Compost must be produced by a process to further reduce pathogens. Two such acceptable methods are:

7.3.14.1.6.1. Windrowing, which consists of an unconfined composting process involving periodic aeration and mixing to maintain aerobic conditions during the composting process; and

7.3.14.1.6.2. The enclosed vessel method, which involves mechanical mixing of compost under controlled environmental conditions. The retention time in the vessel must be at least 72 hours with the temperature maintained at 55°C (131°F). A stabilization period of at least 7 days must follow the decomposition period.

7.3.15. Classification and Use of Compost From DoD Composting Facilities. Compost produced at a composting facility that is located on a DoD installation and that processes annually > 5000 tons of sludge from a domestic wastewater treatment plant (see Chapter 4, "Wastewater") must be classified as "Class A" or "Class B" based on the criteria below and, depending on this classification, shall be subject to the restrictions on certain uses.

7.3.15.1. Class A compost must be stored until the compost is matured, i.e., 60 % decomposition has been achieved. Class A compost may contain contaminant levels no greater than the levels indicated below. The compost must be stabilized and contain no greater amounts of inert material than indicated. Allowable average contaminant concentrations in milligrams per kilogram on a dry weight basis are:

PCB	1
Cadmium	10
Chromium	1,000
Copper	500
Lead	500
Mercury	5
Nickel	100
Zinc	1,000

7.3.15.2. Class B compost consists of any compost generated that fails to meet Class A standards.

7.3.15.3. Compost distribution and end use:

7.3.15.3.1. Class A compost may be distributed for unrestricted use, including agricultural applications.

7.3.15.3.2. Class B compost may not be distributed for agricultural applications.

CHAPTER 8

MEDICAL WASTE

8.1. SCOPE

This Chapter contains criteria for the management of medical waste at medical, dental, research and development, and veterinary facilities generated in the diagnosis, treatment, or immunization of human beings or animals or in the production or testing of biologicals subject to certain exclusions. This waste also includes mixtures of medical waste and hazardous waste. It does not apply to what would otherwise be household waste.

8.2. DEFINITIONS

8.2.1. Infectious Agent. Any organism (such as a virus or bacterium) that is capable of being communicated by invasion and multiplication in body tissues and capable of causing disease or adverse health impacts in humans.

8.2.2. Infectious Hazardous Waste. Mixtures of infectious medical waste and hazardous waste to include solid waste such as fluids from a parasitology laboratory.

8.2.3. Infectious Medical Waste. Solid waste produced by medical and dental treatment facilities, nursing, laboratories, research centers, veterinary clinics, and pharmaceutical factories and warehouses, that is specially managed because it has the potential for causing disease in humans and may pose a risk to both individuals or community health if not managed properly, and that includes the following classes:

8.2.3.1. Microbiology waste, including cultures and stocks of etiologic agents which, due to their species, type, virulence, or concentration, are known to cause disease in humans.

8.2.3.2. Pathology waste, including human tissues and organs, amputated limbs or other body parts, fetuses, placentas, and similar tissues from surgery, delivery, or autopsy procedures. Animal carcasses, body parts, blood, and bedding from contaminated animals are also included.

8.2.3.3. Human blood and blood products (including serum, plasma, and other blood components), items contaminated with liquid or semi-liquid blood or blood products and items saturated or dripping with blood or blood products, and items caked with blood or blood products, that are capable of releasing these materials during handling.

8.2.3.4. Potentially infectious materials, including human body fluids such as semen, vaginal secretions, cerebrospinal fluid, pericardial fluid, pleural fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, any body fluid that is visibly contaminated with blood, and all body fluids in situations where it is difficult or impossible to differentiate between body fluids.

8.2.3.5. Sharps, including hypodermic needles, syringes, biopsy needles, and other types of needles used to obtain tissue or fluid specimens, needles used to deliver intravenous solutions, scalpel blades, pasteur pipettes, specimen slides, cover slips, glass petri plates, and broken glass potentially contaminated with infectious waste.

8.2.3.6. Infectious waste from isolation rooms, but only including those items that were contaminated or likely to have been contaminated with infectious agents or pathogens, including excretion exudates and discarded materials contaminated with blood.

8.2.3.7. Contagious, chemical or drug waste.

8.2.3.8. Medical waste contaminated with radioactive material.

8.2.4. Noninfectious Medical Waste. Solid waste created that does not require special management because it has been determined to be incapable of causing disease in humans or which has been treated to render it noninfectious.

8.2.5. Solid Waste. Any solid waste as defined in Chapter 7, "Solid Waste."

8.2.6. Treatment. Any method, technique, or process designed to change the physical, chemical, or biological character or composition of any infectious hazardous or infectious waste so as to render such waste non-hazardous, or less hazardous; safer to transport, store, or dispose of; or amenable for recovery, amenable for storage, or reduced in volume. Treatment methods for infectious waste must eliminate infectious agents so that they no longer pose a hazard to persons who may be exposed.

8.2.7. Treatment Unit. A facility where the chemical, biological or physical properties of infectious hazardous waste are changed with the use of environmentally-sound technologies with the aim of reducing the hazards of such waste.

8.3. CRITERIA

8.3.1. Infectious medical waste will be separated, if practical, from other solid waste at the point of origin.

8.3.1.1. Medical waste shall be further separated within storage areas. Medical waste shall be segregated into the following categories on a daily basis prior to storage and transport:

8.3.1.1.1. Contagious/infectious waste

8.3.1.1.2. Sharp materials waste

8.3.1.1.3. Chemical drug waste including damaged and expired drugs

8.3.1.1.4. Chemical laboratory waste including chemicals used in laboratories

8.3.1.1.5. Bed item waste including bed-sheets, blankets, containers for receiving the patients secretions not infected with contagious diseases and their intestine waste

8.3.1.1.6. Mortuary and laboratory room waste including clothing, contaminated covers, petri dishes and containers used to deal with biological tissues and bacteria.

8.3.2. Mixtures of infectious medical wastes and hazardous wastes will be handled as infectious hazardous waste under DoD 4160.21-M (Defense Materiel Disposition Manual) and are the responsibility of the generating DoD Component. Priority will be given to the hazard that presents the greatest risk. DLA Disposition Services has no responsibility for this type of property until it is rendered noninfectious as determined by the appropriate DoD medical authority.

8.3.3. Solid waste that is classified as a hazardous waste in accordance with Appendix 1 will be managed in accordance with the criteria in Chapter 6, “Hazardous Waste.”

8.3.4. Mixtures of other solid waste and infectious medical waste will be handled as infectious medical waste.

8.3.5. Radioactive medical waste will be managed in accordance with Service Directives.

8.3.6. Infectious medical waste will be segregated, transported, and stored in bags or receptacles a minimum of 3 mils thick having such durability, puncture resistance, and burst strength as to prevent rupture or leaks during ordinary use.

8.3.6.1. Medical waste shall not be left in bags and containers in the collection area for a period exceeding 24 hours before it is transported outside the health facility.

8.3.7. All bags or receptacles used to segregate, transport or store infectious medical waste will be clearly marked with the universal biohazard symbol and the word "BIOHAZARD" in English and Arabic, and will include markings that identifies the generator, date of generation, and the contents. All medical waste types (Section 8.3.1.), including infectious medical waste, shall be labeled with suitable adhesive cards providing details of their contents, and the hazards associated with their contents. Contact the Lead Environmental Component (LEC) regarding label requirements.

8.3.8. Sharps will only be discarded into rigid receptacles. Needles will not be clipped, cut, bent, or recapped before disposal.

8.3.9. Medical waste will be transported and stored to minimize human exposure and protect the environment. Infectious medical waste, in particular, will not be placed in chutes or dumbwaiters. Consult the LEC regarding additional storage requirements.

8.3.10. Infectious medical waste will not be compacted unless converted to noninfectious medical waste by treatment as described in paragraph 8.3.18. Containers holding sharps will not be compacted.

8.3.11. All anatomical pathology waste (i.e., large body parts) must be placed in containers lined with plastic bags that comply with paragraph C8.3.6., and may only be disposed of in a landfill or by burial in a designated area after being treated for disposal by incineration or cremation.

8.3.12. Blood, blood products, and other liquid infectious wastes will be handled as follows:

8.3.12.1. Bulk blood and blood products may be decanted into a sewer system connection (sinks, drains, etc.), unless pre-treatment is required. If pre-treatment is required, the methods contained in Table 8.1, "Treatment and Disposal Methods for Infectious Medical Waste," will be employed prior to discharge to the sewer system. The emptied containers will continue to be managed as infectious medical waste.

8.3.12.2. Suction canister waste from operating rooms will either be decanted into a clinical sink or will be sealed into leak-proof containers and incinerated.

8.3.13. All personnel handling infectious medical waste will wear appropriate protective apparel or equipment such as gloves, coveralls, masks, and goggles sufficient to prevent the risk of exposure to infectious agents or pathogens.

8.3.14. If infectious medical waste cannot be treated on-site, it will be managed during storage as follows:

8.3.14.1. Infectious medical waste will be maintained in a nonputrescent state, using refrigeration as necessary.

8.3.14.2. Infectious medical waste with multiple hazards (i.e., infectious hazardous waste or infectious radioactive waste) will be segregated from the general infectious waste stream when additional or alternative treatment is required.

8.3.15. Storage sites must be:

8.3.15.1. Specifically designated;

8.3.15.2. Constructed to prevent entry of insects, rodents, and other pests;

8.3.15.3. Prevent access by unauthorized personnel;

8.3.15.4. Marked on the outside with the universal biohazard symbol and the word "BIOHAZARD" in both English and Arabic.

8.3.16. Generators shall abide by the following conditions prior to transporting medical waste off installation:

8.3.16.1. Ensure safety and soundness of all the bags and containers which contain medical waste. Bags and receptacles containing infectious medical waste, in particular, must be placed into rigid or semi-rigid, leak-proof containers before being transported off-site.

8.3.16.2. Adhesive labels shall be placed on the containers in accordance with Section 8.3.7.

8.3.16.3. Ensure that completed transportation form is turned over with waste to transporter.

8.3.16.4. Prior to waste being transported, ensure the transporter has the proper approval issued by the Competent Authority for transporting medical waste.

8.3.16.5. Ensure that the medical waste treatment unit has been approved by the Competent Authority. If the installation treats their own waste, contact the LEC for approval procedures.

8.3.17. Installations transporting medical waste off installation are required to obtain approval (Section 8.3.22.).

8.3.18. Infectious medical waste must be treated in accordance with Table 8.1, "Treatment and Disposal Methods for Infectious Medical Waste," and the following before disposal:

8.3.18.1. Sterilizers must maintain the temperature at 121°C (250°F) for at least 30 minutes at 103.4 kPa (15 psi).

8.3.18.2. The effectiveness of sterilizers must be checked at least weekly using *Bacillus stearo thermophilus* spore strips or an equivalent biological performance test.

8.3.18.3. Incinerators used to treat medical waste must be designed and operated to maintain a minimum temperature and retention time sufficient to destroy all infectious agents and pathogens and must meet applicable criteria in Chapter 2, "Air Emissions."

8.3.18.4. Ash or residue from the incineration of infectious medical waste must be assessed for classification as hazardous waste in accordance with the criteria in Chapter 6, "Hazardous Waste." Ash that is determined to be hazardous waste must be managed in accordance with Chapter 6. All other residue will be disposed of in a landfill that complies with the criteria of Chapter 7, "Solid Waste."

8.3.18.5. Chemical disinfection must be conducted using procedures and compounds approved by appropriate DoD medical authority for use on any pathogen or infectious agent suspected to be present in the waste.

8.3.18.6. Waste Treatment Units. Installations operating their own waste treatment units for medical waste shall comply with the following requirements:

8.3.18.6.1. Treatment units shall refuse waste if the waste is:

8.3.18.6.1.1. From non-DoD carriers not approved by the Competent Authority

8.3.18.6.1.2. Not accompanied by a duly-completed and signed waste transport form from the producer and carrier or consignment's which do not conform with the details indicated in the form

8.3.18.6.1.3. Of a chemical nature that is not accompanied by their safety details (e.g. Material Safety Data Sheet)

8.3.18.6.2. Waste shall be over packed if the original bag or container is damaged and if temporary storage prior to treatment in the treatment unit is required.

8.3.18.6.3. Dispose of waste and sludge arising from the treatment process at authorized waste disposal sites. Contact the LEC to determine appropriate sites.

8.3.18.6.4. Measure the concentration of the following substances arising from the treatment process:

8.3.18.6.4.1. Emissions to air, on the dates determined by the LEC and according to the standards in Chapter 2, Air Emission

8.3.18.6.4.2. Concentration of contaminants in the industrial discharge water according to the discharge standards in Chapter 4, Wastewater

8.3.18.6.4.3. Concentration of contaminants in sludge and solid waste arising from the waste treatment process on the dates and according to the standards in the waste treatment unit approval, if applicable

8.3.18.6.5. Upon use of incineration technology in waste treatment, a treatment unit shall:

8.3.18.6.5.1. Ensure all chimney emissions to air are colorless and free from heavy smoke at all times

8.3.18.6.5.2. Prohibit the leakage of odors from the emissions produced by the chimney outside the boundaries of the incineration site

8.3.18.6.5.3. Ensure the levels of concentrations emitted into the air shall not exceed the standards in Chapter 2, Air Emissions

8.3.19. Installations will develop contingency plans for treatment or disposal of infectious medical waste should the primary means become inoperable.

8.3.20. Spills of infectious medical waste will be cleaned up as soon as possible in accordance with the following:

8.3.20.1. Response personnel must comply with paragraph 8.3.13.

8.3.20.2. Blood, body fluid, and other infectious fluid spills must be removed with an absorbent material that must then be managed as infectious medical waste.

8.3.20.3. Surfaces contacted by infectious medical waste must be washed with soap and water and chemically decontaminated in accordance with subparagraph C8.3.18.5.

8.3.21. Installations with waste management/treatment units will keep the following records of medical waste disposal for at least three years after the date of disposal:

8.3.21.1. A description of the type and quantity of each waste consignment received, including producer's name, carrier's name, date of hand-over and treatment date

8.3.21.2. A description of the waste produced from the treatment process, its quantity, method and location of disposal

8.3.21.3. Results of the measurements of the concentration of emissions in the air arising from the treatment process

8.3.21.4. Results of the analysis of concentration in sludge and solid waste arising from the treatment process

8.3.21.5. Results of the analysis of the concentration of contaminants in the discharge water arising from the treatment process and released into the sea

8.3.21.6. Waste transportation forms

8.3.22. Installations without waste management/ treatment units shall keep the following records for at least three years after the date of disposal:

8.3.22.1. Type of waste

8.3.22.2. Amount of waste (volume or weight) being transported outside the health facility, date of such transport, and waste carrier's name

8.3.22.3. Treatment, if any, including date of treatment

8.3.22.4. Name of treatment unit

8.3.22.5. Disposition, including date of disposition, and if the waste was transferred to Bahrain facilities, and receipts acknowledging subparagraphs 8.3.22.1. - 8.3.22.3. for each transfer

8.3.22.6. A dedicated register shall be submitted quarterly to the LEC

8.3.23. Medical Waste Approval Installations may require approval to operate a waste treatment unit or transport medical waste. Contact the LEC to determine approval requirements.

Table 8.1. Treatment and Disposal Methods for Infectious Medical Waste

Type of Medical Waste	Method of Treatment	Method of Disposal
Microbiological	[1] Steam sterilization	[2] Municipal solid waste landfill (MSWLF)
	Chemical disinfection	MSWLF
	Incineration	MSWLF
Pathological	[3] Incineration	MSWLF
	[3] Cremation	Burial
	[4] Chemical Sterilization	[5] Domestic wastewater treatment plant (DWTP)
	[4] Steam sterilization	DWTP
Bulk blood & suction canister waste	[6] Steam sterilization Chemical disinfection	DWTP
	[6] Incineration	MSWLF
Sharps in sharps containers	Steam sterilization	MSWLF
	Incineration	MSWLF

Notes

1. Preferred method for cultures and stocks because they can be treated at point of generation
2. See Chapter 7 for criteria for solid waste landfills.
3. Anatomical pathology waste (i.e., large body parts) must be treated either by incineration or cremation prior to disposal.
4. This only applies to placentas, small organs and small body parts which may be steam sterilized or chemically sterilized, ground, and discharged to a domestic wastewater treatment plant.
5. See Chapter 4 for criteria for domestic wastewater treatment plants.
6. Bulk blood or suction canister waste known to be infectious must be treated by incineration or steam sterilization before disposal.

CHAPTER 9

PETROLEUM, OIL, AND LUBRICANTS

9.1. SCOPE

This Chapter contains criteria to control and abate pollution resulting from the storage, transport and distribution of petroleum products. Criteria for underground storage tanks (UST) containing POL or hazardous material products are addressed in Chapter 19, "Underground Storage Tanks." POL spill prevention and response planning criteria are contained in Chapter 18, "Spill Prevention and Response Planning."

9.2. DEFINITIONS

9.2.1. Aboveground Storage Container. POL storage containers, exempt from UST criteria, that are normally placed on or above the surface of the ground. POL storage containers located above the floor and contained in vaults or basements, bunkered containers, and also partially buried containers are considered aboveground storage containers. For the purposes of this Chapter, this includes any mobile or fixed structure, tank, equipment, pipe, or pipeline (other than a vessel or a public vessel) used in oil well drilling operations, oil production, oil refining, oil storage, oil gathering, oil processing, oil transfer, and oil distribution. This also includes equipment in which oil is used as an operating fluid, but excludes equipment in which oil is used solely for motive power.

9.2.2. Below Ground Storage Container. Completely buried POL storage containers, including deferred USTs, that are exempt from all criteria in Chapter 19, "Underground Storage Tanks." For purposes of this paragraph, ONLY below ground storage containers that are exempt from requirements of Chapter 19 are counted toward the aggregate thresholds in subparagraph C9.2.7.2 below.

9.2.3. Loading/ Unloading Racks. Location where tanker trucks/rail cars are loaded and unloaded by pipes, pumps, and loading arms.

9.2.4. Loading/ Unloading Areas. Any location where POL is authorized to be loaded or unloaded to or from a POL storage container.

9.2.5. Pipeline Facility. Includes new and existing pipes, pipeline rights of way, auxiliary equipment (e.g., valves and manifolds), and buildings or other facilities used in the transportation of POL.

9.2.6. POL. Refined petroleum, oils, and lubricants, including, but not limited to, petroleum, fuel, lubricant oils, synthetic oils, mineral oils, animal fats, vegetable oil, sludge, and POL mixed with wastes other than dredged spoil.

9.2.7. POL Facility. An installation with either:

9.2.7.1. An aggregate aboveground storage container capacity (excluding below ground storage containers) of 5,000 liters (1,320 gallons) or greater; or

9.2.7.2. An aggregate below ground storage container capacity of 159,091 liters (42,000 gallons) or greater; or

9.2.7.3. A pipeline facility as identified in the "Pipeline Facility" description

9.2.8. POL Storage Container. POL containers with capacities > 208 liters (55 gallons) (mobile/portable and fixed; and above and below ground storage containers). USTs required to meet all requirements of Chapter 19 are EXCLUDED from the definition of POL storage containers.

9.2.9. Used Oil. Any liquid or semi-solid material which contains entirely or partially metallic or manufactured hydrocarbon oils such as waste oil resulting from maintenance activities of vehicles, engines and other machinery or oil mixed with water produced from a facility or oil used for oiling such engines and other machinery where the original characteristics of oil has been changed during usage. In Bahrain, used oil is only considered hazardous waste if mixed with polychlorinated biphenyls (PCBs) or other hazardous substances (see Chapter 6, "Hazardous Waste.")

9.3. CRITERIA

9.3.1. Applicability. The below criteria, excluding the used oil criteria in Section 9.3.7, apply only at POL Facilities as defined in paragraph 9.2.7. Used oil criteria (9.3.7.) apply for all activities involving used oil.

9.3.2. General POL Storage Container Criteria

9.3.2.1. Inspection and Testing. Inspection and testing shall be conducted on all POL storage containers in accordance with recognized industry standards.

9.3.2.2. Secondary Containment. POL storage containers must be provided with a secondary means of containment (e.g., dike) capable of holding the entire contents of the largest single tank plus sufficient freeboard to allow for precipitation and expansion of product. Alternatively, POL storage containers that are equipped with adequate technical spill and leak prevention options (such as overfill alarms and flow shutoff or restrictor devices) may provide secondary containment by use of a double wall container. Below ground storage containers may meet this criterion by use of a leak barrier with a leak detection pipe and basin. A licensed technical authority may waive this secondary containment criteria for below ground storage containers.

9.3.2.3. Permeability. Permeability for containment areas will be a maximum of 10^{-7} cm/sec.

9.3.2.4. Containment Area Drainage. Drainage of stormwater from containment areas will be controlled by a valve that is locked closed when not in active use. Stormwater will be inspected for petroleum sheen before being drained from containment areas. If a petroleum sheen is present it must be collected with sorbent materials prior to drainage, or treated using an oil-water separator. Disposal of sorbent material exhibiting the hazardous characteristics in Appendix 1 will be in accordance with Chapter 6, "Hazardous Waste."

9.3.2.5. Valves and Piping. All aboveground valves, piping, and appurtenances associated with POL storage containers shall be periodically inspected in accordance with recognized industry standards.

9.3.3. Additional POL Storage Container Criteria

9.3.3.1. Testing. Buried piping associated with POL storage containers shall be tested for integrity and leaks at the time of installation, modification, construction, relocation, or replacement. New buried piping must be protected against corrosion in accordance with recognized industry standards.

9.3.3.2. Storage Container Design. POL storage containers shall be designed or modernized in accordance with good engineering practice to prevent unintentional discharges by use of overflow prevention devices. Chapter 5, "Hazardous Material," includes additional storage design criteria for hazardous chemical substances such as POL.

9.3.3.3. Completely and Partially Buried Metallic POL Storage Containers. These must be protected from corrosion in accordance with recognized industry standards.

9.3.3.4. Additional storage criteria, such as labeling requirements, are included in Chapter 5, "Hazardous Material."

9.3.4. Storage Container Wastes. POL container cleaning wastes frequently have hazardous characteristics (as defined in Appendix 1) and must be handled and disposed of in accordance with requirements of Chapter 6, "Hazardous Waste." POL container waste and handling procedures include:

9.3.4.1. POL container cleaning wastes (sludge and wash waters) must be disposed of in accordance with the criteria of Chapter 6, unless sampling and testing confirms the waste does not exhibit hazardous waste characteristics.

9.3.4.2. POL container bottom waters, which are periodically drained, must be collected and disposed of in accordance with Chapter 6, unless sampling and testing determine that the waste does not exhibit hazardous waste characteristics.

9.3.5. General Transport and Distribution Criteria

9.3.5.1. Loading/Unloading Racks and Areas

9.3.5.1.1. Secondary Containment. Loading/unloading racks shall be designed to handle discharges of at least the maximum capacity of any single compartment of a rail car or tank truck loaded or unloaded at the loading/unloading rack.

9.3.5.1.2. Departing Vehicle Warning Systems. Provide an interlocked warning light or physical barrier system, warning signs, wheel chocks, or vehicle break interlock system at loading/unloading racks to prevent vehicles from departing before complete disconnection of flexible or fixed oil transfer lines.

9.3.5.1.3. Vehicle Inspections. Prior to filling and prior to departure of any tank car or tank truck, closely inspect for discharges from the lowermost drain and all outlets of such vehicles, and if necessary, ensure that they are tightened, adjusted, or replaced to prevent liquid discharge while in transit. In addition, inspectors of the Competent Authority may request external and internal vehicle inspections (e.g., internal pressure levels). Bahrain inspector requests shall be coordinated through the LEC.

9.3.5.1.4. Loading/ Unloading Areas. Provide appropriate containment and/or diversionary structures (dikes, berms, culverts, spill diversion ponds, etc.) or equipment (sorbent materials, wiers, booms, other barriers, etc.) at loading/unloading areas to prevent a discharge of POL, which reasonably could be expected to cause a sheen on waters of the host nation defined in Chapter 4, "Wastewater."

9.3.5.2. POL Pipeline Facilities

9.3.5.2.1. Provisions for Testing and Maintenance. All pipeline facilities carrying POL must be tested and maintained in accordance with recognized industry standards, including:

9.3.5.2.1.1. Each pipeline operator handling POL will prepare and follow a procedural manual for operations, maintenance, and emergencies.

9.3.5.2.1.2. Each new pipeline facility and each facility in which pipe has been replaced or relocated must be tested in accordance with recognized industry standards, without leakage before being placed in service.

9.3.5.2.1.3. All new POL pipeline facilities must be designed and constructed to meet recognized industry construction standards.

9.3.5.3. Additional Transport Requirements. Installations shall comply with the additional hazardous chemical transport requirements included in Section 5.3.12 of Chapter 5, "Hazardous Material" if the POL meets the definition of a hazardous chemical substance in Chapter 5.

9.3.6. Personnel Training. At a minimum, all personnel handling POL shall be trained annually in the operation and maintenance of equipment to prevent discharges; discharge procedure protocols; general facility operations; and the applicable contents of the facility Spill Plan.

9.3.7. Used Oil Management

9.3.7.1. Applicability. The criteria in this sub-paragraph shall apply to all activities which are entirely or partially linked with used oil, including its collection, transport and treatment.

9.3.7.2. Exceptions. Used oil--polychlorinated biphenyls (PCBs) mixtures and any other used oil if designated by the Competent Authority to be dangerous or unsuitable for recycling, are exempt from these requirements. See Chapter 6 for requirements regarding used oil-PCB.

9.3.7.3. Used Oil Generation. Generators of used oil shall comply with the following:

9.3.7.3.1. Soundness of drums/containers used in the transportation of used oil.

9.3.7.3.2. Consignments are accompanied by a transportation form.

9.3.7.3.3. Used oil is not mixed with transformer oil, flammable liquids or any other material which contains halogen-containing compounds or which has been identified specifically by the Competent Authority.

9.3.7.3.4. Used oil transporters and treatment units are approved by the Competent Authority. Approval requirements are the same as for hazardous waste. Installations shall refer to Section 6.3.13. of Chapter 6, “Hazardous Waste.”

9.3.7.3.5. Compliance with transporter duties listed in Section 9.3.7.5. in the case of producer transporting their own used oil.

9.3.7.4. Used Oil Storage Criteria. Used oil shall be loaded into barrels or tankers and stored in designated areas.

9.3.7.5. Used Oil Transportation. Transportation of used oil shall comply with the following transportation requirements:

9.3.7.5.1. Transportation Forms. Used oil consignments shall be accompanied by completed transportation forms (from generators) at all times.

9.3.7.5.2. Used oil shall be packaged in accordance with the provisions of Section 9.3.7.4.

9.3.7.5.3. Used oil shall be kept in separate containers or drums and not mixed with other types of used oil or other substances.

9.3.7.5.4. Consignments shall be compatible with the details included in the transportation form prior to transport.

9.3.7.6. Used Oil Treatment.

9.3.7.6.1. Approval. Used oil treatment units shall submit the details and documents listed in Section 6.3.11. of Chapter 6, "Hazardous Waste," to the Competent Authority via the LEC along with their application for approval.

9.3.7.6.2. Treatment Requirements. Used oil treatment units shall comply with the following requirements:

9.3.7.6.2.1. Ensure that transportation forms signed by the generator accompanies consignments.

9.3.7.6.2.2. Measure the concentration of industrial discharge water arising from the treatment process every three months to ensure compliance with the standards included in Chapter 4, "Wastewater."

9.3.7.6.2.3. Record-keeping. Treatment units shall comply with the record-keeping requirements included in Section 6.3.11. of Chapter 6, "Hazardous Waste."

9.3.8. Approvals. Installations may require approval for the handling of POL classified as hazardous material (see Chapter 5) or hazardous waste (see Chapter 6). Contact the LEC to determine approval requirements.

Chapter 10

Pesticides

10.1. SCOPE

This chapter contains criteria regulating the use, storage, and handling of pesticides, but does not address the use of these materials by individuals acting in an unofficial capacity in a residence or garden. The disposal of pesticides is covered in Chapter 6, "Hazardous Waste," and in Chapter 7, "Solid Waste."

10.2. DEFINITIONS

10.2.1. Certified Pesticide Applicators. Personnel who apply pesticides or supervise the use of pesticides, and who have been formally certified in accordance with DoD 4150.7-M, "DoD Pest Management Training and Certification" (which accepts HN certification in appropriate circumstances).

10.2.2. Hazardous Chemical Substances. Any chemical material with reactive characteristics whether on its own or within a mixture or whether this material is in its original form or manufactured. Classification of hazardous chemical substances is in accordance with the following 8 UN hazard classes:

10.2.2.1. Explosives (Class 1)

10.2.2.2. Compressed or Liquefied Gases (Class 2)

10.2.2.3. Flammable Liquids (Class 3)

10.2.2.4. Flammable Solids (Class 4)

10.2.2.5. Oxidizing Agents (Class 5)

10.2.2.6. Toxic materials (Class 6)

10.2.2.7. Radioactive Materials (Class 7)

10.2.2.8. Corrosive Materials (Class 8)

10.2.3. Integrated Pest Management (IPM). A planned program, incorporating continuous monitoring, education, record-keeping, and communication to prevent pests and disease vectors from causing unacceptable damage to operations, people, property, materiel, or the environment. IPM uses targeted, sustainable (effective, economical, environmentally sound) methods, including education, habitat modification, biological control, genetic control, cultural control,

mechanical control, physical control, regulatory control and, where necessary, the judicious use of least-hazardous pesticides.

10.2.4. Pests. Arthropods, birds, rodents, nematodes, fungi, bacteria, viruses, algae, snails, marine borers, snakes, weeds, undesirable vegetation, and other organisms (except for microorganisms that cause human or animal disease) that adversely affect the wellbeing of humans or animals; attack real property, supplies, equipment or vegetation; or are otherwise undesirable.

10.2.5. Pest Management Consultant. Professional DoD pest management personnel located at component headquarters, field operating agencies, major commands, facilities engineering field divisions or activities, or area support activities who provide technical and management guidance for the conduct of installation pest management operations. Some pest management consultants may be designated by their component as certifying officials.

10.2.6. Pesticide. Any substance or mixture of substances, including biological control agents, that may prevent, destroy, repel, or mitigate pests.

10.2.7. Pesticide Waste. Materials subject to pesticide disposal restrictions including:

10.2.7.1. Any pesticide that has been identified by the pest management consultant as cancelled under U.S. or HN authority;

10.2.7.2. Any pesticide that does not meet specifications, is contaminated, has been improperly mixed, or otherwise unusable, whether concentrated or diluted;

10.2.7.3. Any material used to clean up a pesticide spill; or

10.2.7.4. Any containers, equipment, or material contaminated with pesticides. Empty pesticide containers that have been triple rinsed are NOT considered hazardous waste, and can be disposed of as normal solid waste.

10.2.8. Registered Pesticide. A pesticide that has been registered and approved for sale or use within the United States and Bahrain.

10.3. CRITERIA

10.3.1. All pesticide applications, excluding arthropod skin and clothing repellents, will be recorded using DD Form 1532-1 “Pest Management Maintenance Report,” or a computer-generated equivalent. These records will be archived for permanent retention in accordance with specific service procedures. The Pest Management Maintenance Report has been assigned Report Control Symbol DD-A&T(A&AR)1080 in accordance with DoD 8910-M, “DoD Procedures for Management of Information Requirements.”

10.3.2. Installations will implement and maintain a current pest management plan that includes measures for all installation activities and satellite sites that perform pest control. This

written plan will include IPM procedures for preventing pest problems in order to minimize the use of pesticides. The plan must be reviewed and approved in writing by the appropriate pest management consultant.

10.3.3. All pesticide applications will be made by certified pesticide applicators, with the following exceptions:

10.3.3.1. New DoD employees who are not certified may apply pesticides during an apprenticeship period not to exceed 2 years and only under the supervision of a certified pesticide applicator;

10.3.3.2. Arthropod skin and clothing repellents; and

10.3.3.3. Pesticides applied as part of an installation's self-help program.

10.3.4. All pesticide applicators will be included in a medical surveillance program to monitor the health and safety of persons occupationally exposed to pesticides. Local national personnel shall be monitored in coordination with an approved professional medical clinic.

10.3.5. All pesticide applicators will be provided with personal protective equipment appropriate for the work they perform and the types of pesticides to which they may be exposed. In addition, applicators shall also ensure the use of such equipment when handling chemical pesticides and provide services for its maintenance and cleaning.

10.3.6. Installations will only use registered pesticides that are on the list approved by the Armed Forces Pest Management Board (AFPMB) that have Bahraini approved equivalents (i.e., same manufacturer and same formulations), or Bahraini registered pesticides approved in writing by the appropriate pest management consultant. This may be documented as part of the approval of the pest management plan.

10.3.7. Pesticides will be included in the installation spill contingency plan. (See Chapter 18, "Spill Prevention and Response Planning.")

10.3.8. Pest management facilities, including mixing and storage areas, will comply with AFPMB Technical Guide 17 "Military Handbook Design of Pest Management Facilities**"** and with relevant requirements included in Chapter 5 of this Guide which shall apply for the handling and use of chemical pesticides in Bahrain.

10.3.9. All pesticide applications will be in accordance with guidance given on the pesticide label. Labels will bear the appropriate use instructions and precautionary message based on the toxicity category of the pesticide ("danger," "warning," or "caution"). If foreign nationals will be using the pesticides, the precautionary messages and use instructions will be in English and in Arabic. Chemical pesticide labels shall additionally comply with the labeling requirements for hazardous chemical substances which are included in Chapter 5 of this Guide.

10.3.10. MSDSs and labels for all pesticides will be available at the storage and holding facility**,** in accordance with Chapter 5 of this Guide, "Hazardous Material**.**"

10.3.11. Pesticide storage areas will contain a readily-visible current inventory of all items in storage, including items awaiting disposal, and should be regularly inspected and secured to prevent unauthorized access.

10.3.12. Unless otherwise restricted or canceled, pesticides in excess of installation needs will be redistributed within the supply system or disposed of in accordance with procedures outlined below:

10.3.12.1. The generator of pesticide wastes will determine whether or not the waste is hazardous, in accordance with Chapter 6 of this Guide.

10.3.12.2. Pesticide waste determined to be hazardous waste will be disposed of in accordance with the criteria for hazardous waste disposal in Chapter 6 of this Guide.

10.3.12.3. Pesticide waste that is determined not to be a hazardous waste will be disposed of in accordance with the label instructions, through DLA-DS, as a solid waste. Pesticide containers shall be crushed or the top and bottom portions shall be removed to prevent reuse.

CHAPTER 11

HISTORIC & CULTURAL RESOURCES

11.1. SCOPE

This Chapter contains criteria for required plans and programs needed to ensure proper protection and management of cultural resources, such as properties on the World Heritage List or on the Bahraini list equivalent to the U.S. National Register of Historic Places.

11.2. DEFINITIONS

11.2.1. Adverse Effect. Changes that diminish the quality or significant value of historic or cultural resources.

11.2.2. Archeological Resource. Any material remains of prehistoric or historic human life or activities. Such resources include, but are not limited to: pottery, basketry, bottles, weapons, weapon projectiles, tools, structures or portions of structures, pit houses, rock paintings, rock carvings, intaglios, graves, human skeletal remains, or any portion of any of the foregoing items.

11.2.3. Cultural Mitigation. Specific steps designed to lessen the adverse effects of a DoD action on a historical or cultural resource, including:

11.2.3.1. Limiting the magnitude of the action

11.2.3.2. Relocating the action in whole or in part

11.2.3.3. Repairing, rehabilitating, or restoring the affected resources, affected property; and

11.2.3.4. Recovering and recording data from cultural properties that may be destroyed or substantially altered

11.2.4. Historic and Cultural Resources Program. Identification, evaluation, documentation, curation, acquisition, protection, rehabilitation, restoration, management, stabilization, maintenance, recording, and reconstruction of historic and cultural resources and any combination of the foregoing.

11.2.5. Historic or Cultural Resources. Physical remains of any prehistoric or historic district, site, building, structure, or object significant in world, national or local history, architecture, archeology, engineering, or culture. The term includes artifacts, archeological resources, records, and material remains that are related to such a district, site, building, structure, or object, and also includes natural resources (plants, animals, landscape features, etc.) that may be considered important as a part of a country's traditional culture and history. The

term also includes any property listed on the World Heritage List or the Bahraini equivalent of the National Register of Historic Places. Bahraini lists of properties should be evaluated to determine if they are equivalent with the National Register of Historic Places prior to application.

11.2.6. Inventory. To determine the location of historic and cultural resources that may have world, national, or local significance.

11.2.7. Material Remains. Physical evidence of human habitation, occupation, use, or activity, including the site, loci, or context in which such evidence is situated including:

11.2.7.1. Surface or subsurface structures

11.2.7.2. Surface or subsurface artifact concentrations or scatters

11.2.7.3. Whole or fragmentary tools, implements, containers, weapons, clothing, and ornaments

11.2.7.4. By-products, waste products, or debris resulting from manufacture or use

11.2.7.5. Organic waste

11.2.7.6. Human remains

11.2.7.7. Rock carvings, rock paintings, and intaglios

11.2.7.8. Rock shelters and caves

11.2.7.9. All portions of shipwrecks; or

11.2.7.10. Any portion or piece of any of the foregoing

11.2.8. Preservation. The act or process of applying measures to sustain the existing form, integrity, and material of a building or structure, and the existing form and vegetative cover of a site. It may include initial stabilization work where necessary, as well as ongoing maintenance of the historic building materials.

11.2.9. Protection. The act or process of applying measures designed to affect the physical condition of a property by safeguarding it from deterioration, loss, attack, or alteration, or to cover or shield the property from danger or injury. In the case of buildings and structures, such treatment is generally temporary and anticipates future historic preservation treatment; in the case of archaeological sites, the protective measure may be temporary or permanent.

11.3. CRITERIA

11.3.1. U.S. installation commanders shall take into account the effect of any action on any property listed on the World Heritage List or on Bahrain's equivalent of the National Register of Historic Places for purposes of avoiding or mitigating any adverse effects.

11.3.2. Installations shall have access to the World Heritage List and the Bahraini equivalent of the National Register of Historic Places. Contact the LEC for Bahraini equivalent.

11.3.3. U.S. installation commanders shall ensure that personnel performing historic or cultural resource functions have the requisite expertise in world, national, and local history and culture. This may be in-house, contract, or through consultation with another agency. Government personnel directing such functions must have training in historic or cultural resources management.

11.3.4. Installations shall, after coordination with the Bahraini installation commander or similar appropriate Bahraini authorities, prepare, maintain, and implement a cultural resources management plan that contains information needed to make appropriate decisions about cultural and historic resources identified on the installation inventory, and for mitigation of any adverse effects.

11.3.5. Installations shall, after coordination with the Bahraini installation commander or similar appropriate Bahraini authorities, and if financially and otherwise practical:

11.3.5.1. Inventory historic and cultural resources in areas under DoD control. An inventory shall be developed from a records search and visual survey.

11.3.5.2. Establish measures sufficient to protect known historic or cultural resources until appropriate mitigation or preservation can be completed.

11.3.5.3. Establish measures sufficient to protect known archeological resources until appropriate mitigation or preservation can be completed.

11.3.6. U.S. installation commanders shall establish measures to prevent DoD personnel from disturbing or removing historic or cultural resources without permission of the host nation.

11.3.7. U.S. Installation Commanders shall ensure that planning for major actions includes consideration of possible effects on historic or cultural resources.

11.3.7.1. Installations shall submit an application for the evaluation of the environmental impact of a major action to the Lead Environmental Component (LEC). If required, the LEC will notify the installation whether an environmental evaluation impact report and environmental approval is required. The installation should obtain environmental approval, if required, through the LEC, and should also consult the LEC prior to conducting environmental evaluations. Installations shall employ specialized consulting firms approved by the Competent Authority, or those with sufficient experience in the field of specialization as supported by relevant

documentation, to conduct studies and analyses as part of the environmental evaluation impact report.

11.3.7.2. Approved installations shall maintain a register listing the effects of major actions on the environment for a period of ten years. Bahraini inspector requests to examine these registers should be coordinated through the LEC.

11.3.8. If potential historic or cultural resources not previously inventoried are discovered in the course of a DoD action, the newly discovered items will be preserved and protected pending a decision on final disposition by the installation commander. The decision on final disposition will be made by the installation commander after coordination with the Bahraini installation commander or similar appropriate Bahraini authorities.

11.3.8.1. Consult the LEC prior to providing information to the Bahraini Base Commander/Competent Authority.

Chapter 12

Natural Resources and Endangered Species

12.1. SCOPE

This Chapter establishes criteria for required plans and programs needed to ensure proper protection, enhancement, and management of natural resources and any species (flora or fauna) declared endangered or threatened by either the U.S. or Bahrain governments.

12.2. DEFINITIONS

12.2.1. Adverse Effect. Changes that diminish the quality or significant value of natural resources. For biological resources, adverse effects include significant decreases in overall population diversity, abundance, and fitness.

12.2.2. Conservation. Planned management, use, and protection; continued benefit for present and future generations; and prevention of exploitation, destruction, and/or neglect of natural resources.

12.2.3. Bahrain-Protected Species. Any species of flora or fauna listed or designated by Bahrain, because continued existence of the species is, or is likely to be, threatened, and is therefore subject to special protection from destruction or adverse modification of associated habitat.

12.2.4. Management Plan. A document describing natural resources, their quantity, condition, and actions to ensure their conservation and good stewardship.

12.2.5. Natural Resources. All living and inanimate materials supplied by nature that are of aesthetic, ecological, educational, historical, recreational, scientific, or other value.

12.2.6. Natural Resources Management. Actions taken that combine science, economics, and policy, to study, manage, and restore natural resources to strike a balance with the needs of people and the ability of the ecosystem to support soil, water, forest, fish, wildlife, and coastal resources.

12.2.7. Significant Land or Water Area. Land or water area that is normally 202 hectares (500 acres) or more outside the cantonment area; areas of smaller size are included if they have natural resources that are especially vulnerable to disturbance.

12.2.8. Threatened and Endangered Species. Any species of fauna or flora, listed in Table 12.1. This also includes any species of fauna or flora listed on an equivalent Bahrain protected species list.

12.3. CRITERIA

12.3.1. Installations that have land and water areas shall take reasonable steps to protect and enhance known endangered or threatened species and Bahrain-protected species and their habitat.

12.3.2. Installations shall maintain, or have access to, Table 12.1, "Select Endangered and Threatened Species," as well as a current list of Bahrain-protected species, if applicable, and Table 13.2, "List of Bahrain Protected Areas."

12.3.3. Installations with significant land or water areas shall, after coordination with the Bahrain installation commander or LEC, develop natural resources management plans.

12.3.4. Installations with natural resources management plans shall, after coordination with the Bahrain installation commander or LEC, and if financially and otherwise practical, and in such a way that there is no net loss of mission capability:

12.3.4.1. Conduct a survey to determine the presence of any threatened or endangered species or Bahrain-protected species, or support Bahrain surveys.

12.3.4.2. Implement natural resources management plans

12.3.5. An environmental evaluation impact report and approval may be required for certain types of projects. Consult the LEC regarding project approval requirements. Only approved specialized consulting firms shall be utilized to conduct studies and analyses as part of an environmental evaluation impact report. Installations shall maintain environmental evaluation impact reports for ten years.

12.3.6. The LEC and Bahrain installation commander or, if there is no Bahrain installation commander, the U.S. Ambassador will be notified of the discovery of any endangered or threatened species and Bahrain-protected species not previously known to be present on the installation.

12.3.7. Installations shall maintain grounds to meet designated mission use and ensure harmony with the natural landscape and/or the adjacent Bahrain facilities where practical.

12.3.8. Installations shall ensure that personnel performing natural resource functions have the requisite expertise in the management of their discipline (i.e., endangered or threatened species, Bahraini -protected species, wetlands, soil stabilization). This may be in-house, contract, or through consultation with another agency. Government personnel directing such functions must have training in natural resources management.

12.3.9. Installations shall place emphasis on the maintenance and protection of habitats favorable to the reproduction and survival of indigenous flora and fauna.

12.3.10. Land and vegetative management activities will be consistent with current conservation and land use principles (e.g., ecosystem protection, biodiversity conservation, and mission-integrated land use).

12.3.11. Installations shall utilize protective vegetative cover or other standard soil erosion/sediment control practices to control dust, stabilize sites, and avoid silting of streams.

Table 12.1. Select Endangered & Threatened Species

Common Name	Scientific Name	OCONUS Country of Listing
FAUNA		
Mammals		
Cheetah	*Acinonyx jubatus*	Africa to India
Dugong	*Dugong dugon*	East Africa to southern Japan, including U.S.A. (Trust Territories)
Gazelle, sand	*Gazella subgutturosa marica*	Jordan, Arabian Peninsula
Gazelle, Saudi Arabian	*Gazella dorcas saudiya*	Israel, Iraq, Jordan, Syria, Arabian Peninsula
Oryx, Arabian	*Oryx, leucoryx*	Arabian Peninsula
Dolphin	*Not specified*	Bahrain
Birds		
Bulbul, White-Cheeked	*Pycnonotus leucogenys*	Bahrain
Bustards, Houbara	*Chlamydotis undulate*	Bahrain
Falcon, Eurasian peregrine	*Falco peregrinus peregrinus*	Europe, Eurasia south to Africa and Mideast
Ibis, northern bald	*Geronticus eremita*	Southern Europe
Reptiles		
Crocodile, Nile	*Crocodylus niloticus*	Africa, Middle East
Monitor, desert	*Varanus griseus*	North Africa to Aral Sea, through Central Asia to Pakistan, Northwest India
Sea turtle, green	*Chelonia mydas*	circumglobal in tropical and temperate seas and oceans
Sea turtle, loggerhead	*Caretta caretta*	Circumglobal in tropical and temperate seas and oceans
Sea turtle, olive ridley	*Lepidochelys olivacea*	Circumglobal in tropical and temperate seas
Crustaceans		
Shrimp	Not specified	Bahrain
Lobster	Not specified	Bahrain
Fish		
Rabbit Fish	*Siganus (genus)*	Bahrain
FLORA		
Palm tree	Not specified	Bahrain

Note: This table does not include a complete list of Bahraini-designated threatened and endangered species. The Competent Authority shall be consulted as needed regarding the determination of additional threatened, protected or endangered species in Bahrain.

Table 12.2. List of Bahrain Protected Areas

Protected Area	**Area Type**
Hawar islands and waters	Archipelago
Toubli Bay	Inshore coastal area
Al Areen Wildlife Park and Reserve	Terrestrial protected area
Mashtan Island	Offshore island
Douha Araad	Sheltered bay

Chapter 13

Polychlorinated Biphenyls

13.1. SCOPE

This Chapter contains criteria to control and abate threats to human health and the environment from the handling, use, storage, and disposal of polychlorinated biphenyls (PCB). These criteria include specific requirements for most uses of PCBs, including, but not limited to, transformers, capacitors, heat transfer systems, hydraulic systems, electromagnets, switches and voltage regulators, circuit breakers, reclosers, and cables.

13.2. DEFINITIONS

13.2.1. Capacitor - A device for accumulating and holding a charge of electricity and consisting of conducting surfaces separated by a dielectric.

13.2.2. Chemical Waste Landfill - A landfill at which a high level of protection against risk of injury to human health or the environment from migration of deposited PCBs to land, water, or the atmosphere is provided by incorporating special methods for locating, engineering, and operating the landfill.

13.2.3. Hazardous Chemical Substances - Any chemical material with reactive characteristics whether on its own or within a mixture or whether this material is in its original form or manufactured. Classification of hazardous chemical substances is in accordance with the following 8 UN hazard classes:

13.2.3.1. Explosives (Class 1)

13.2.3.2. Compressed or Liquefied Gases (Class 2)

13.2.3.3. Flammable Liquids (Class 3)

13.2.3.4. Flammable Solids (Class 4)

13.2.3.5. Oxidizing Agents (Class 5)

13.2.3.6. Toxic materials (Class 6)

13.2.3.7. Radioactive Materials (Class 7)

13.2.3.8. Corrosive Materials (Class 8)

13.2.4. In or Near Commercial Buildings - Within the interior of, on the roof of, attached to the exterior wall of, in the parking area serving, or within 30 meters (98.43 feet) of a non-industrial, non-substation building.

13.2.5. Incinerator - An engineered device using controlled-flame combustion to thermally degrade PCBs and PCB items. Examples include rotary kilns, liquid injection incinerators, cement kilns, and high temperature boilers.

13.2.6. Leak or Leaking - Any instance in which a PCB article, PCB container, or PCB equipment has any PCBs on any portion of its external surface.

13.2.7. Mark - The descriptive name, instructions, cautions, or other information applied to PCBs and PCB items, or other objects subject to this Guide.

13.2.8. Marked - PCB items and PCB storage areas and transport vehicles marked by applying a legible mark by painting, fixation of an adhesive label, or by any other method that meets these criteria.

13.2.9. Non-PCB Transformers - Any transformer that contains < 50 ppm PCB.

13.2.10. PCB Article - Any manufactured article, other than a PCB container, that contains PCBs and whose surface(s) has been in direct contact with PCB. This includes capacitors, transformers, electric motors, pumps, and pipes.

13.2.11. PCB Article Container - Any package, can, bottle, bag, barrel, drum, tank, or other device used to contain PCB articles or PCB equipment, and whose surface(s) has not been in direct contact with PCBs.

13.2.12. PCB Container - Any package, can, bottle, bag, barrel, drum, tank, or other device that contains PCBs or PCB articles, and whose surface(s) has been in direct contact with PCBs.

13.2.13. PCB-Contaminated Electrical Equipment - Any electrical equipment including, but not limited to, transformers, capacitors, circuit breakers, reclosers, voltage regulators, switches, electromagnets, and cable, that contain 50 ppm or greater PCB, but < 500 ppm PCB.

13.2.14. PCB Equipment - Any manufactured item, other than a PCB container or a PCB article container, which contains a PCB article or other PCB equipment, and includes microwave ovens, electronic equipment, and fluorescent light ballasts and fixtures.

13.2.15. PCB Item - Any PCB article, PCB article container, PCB container, or PCB equipment that deliberately or unintentionally contains or has as a part of it any PCB, or PCBs at a concentration of 50 ppm or greater.

13.2.16. PCB Transformer - Any transformer that contains 500 ppm PCB or greater.

13.2.17. Restricted Access Area - Areas where access by unauthorized personnel is controlled by fences, other man-made structures, or naturally occurring barriers such as mountains, cliffs, or rough terrain.

13.2.18. Substantial Contact Area - An area that is subject to public access on a routine basis or which could result in substantial dermal contact by employees.

13.2.19. PCB Large High Voltage Capacitor - A capacitor that contains 1.36 kg (3 lbs.) or more of dielectric fluid and which operates at 2,000 volts (alternating current (ac) or direct current (dc)) or above.

13.2.20. PCB Large Low Voltage Capacitor - A capacitor that contains 1.36 kg (3 lbs.) or more of dielectric fluid and which operates below 2,000 volts (ac or dc).

13.3. CRITERIA

13.3.1. General

13.3.1.1. The installation spill contingency plan will address PCB items, including temporary storage items. Chapter 18, "Spill Prevention and Response Planning," provides criteria on how to prepare these plans.

13.3.1.2. Spills of PCB liquids at concentrations of 50 ppm or greater will be responded to immediately upon discovery and cleaned up in accordance with the following:

13.3.1.2.1. Surfaces that are located in substantial contact areas will be cleaned to 10 micrograms (μg) per 100 square centimeters (cm^2).

13.3.1.2.2. Surfaces in all other contact areas will be cleaned to 100 μg per 100 cm^2.

13.3.1.2.3. Contaminated soil located in restricted access areas will be removed until the soil tests no higher than 25 ppm PCBs and will be backfilled with clean soil containing < 1 ppm PCBs. Restricted access areas in which PCB spills have been cleaned up shall have annotated on installation real property records the level of PCBs remaining in the soil, including the extent, date and type of sampling, and a reference to any reports documenting the site conditions.

13.3.1.2.4. Contaminated soil located in unrestricted access areas will be removed to a minimum depth of *25.4 cm* (10 inches) or until the soil tests no higher than 10 ppm PCBs, whichever is deeper, and will be backfilled with clean soil containing < 1 ppm PCBs.

13.3.1.3. All PCB transformers, PCB large high voltage capacitors, PCB containers, and certain PCB items containing PCBs at concentrations 50 ppm or greater (i.e., electric motors using PCB coolants, hydraulic systems using PCB hydraulic fluid, and heat transfer systems using PCBs), as well as any PCB article containers used to store the preceding items, must be prominently marked in English and Arabic. The marking must identify the item as containing

PCBs, warn against improper disposal and handling, and provide a phone number in case of spills or if questions arise about disposal. This marking criteria also applies to rooms, vaults, and storage areas containing PCB transformers or storing PCBs or PCB items for disposal**.** Storage containers for PCB-contaminated oil shall comply with container requirements included in Chapter 6, "Hazardous Wastes" as PCB-contaminated oil is considered to be hazardous waste. In addition, the following PCB items must be marked at the time of items' removal from use if not already marked: PCB large low voltage capacitors and equipment containing a PCB transformer or PCB large high voltage capacitor.

13.3.1.4. Each installation having PCB items will maintain a written inventory that includes a current list by type of all marked PCB items in use and PCB items (whether or not marked) placed into storage for disposal or disposed of for that year. Inventory records should be maintained for a period of time at least 3 years after disposal of the last item on the list.

13.3.1.5. Disposal of PCB items will only be through the servicing DLA-DS in accordance with DoD 4160.21-M, "Defense Demilitarization Manual" or paragraph 13.3.5 of this Guide.

13.3.1.6. All periodic inspections as required in this Chapter will be documented at the installation. Records of inspections and maintenance history will be maintained for three years after disposal of the transformer.

13.3.2. PCB Transformers (500 ppm PCB or greater)

13.3.2.1. PCB transformers that are in use or in storage for reuse will not be used in any application that poses a risk of contamination to food or feed.

13.3.2.2. All PCB transformers, including those in storage for reuse, will be registered with the servicing fire department.

13.3.2.3. PCB transformers in use in or near commercial buildings or located in sidewalk vaults will be equipped with electrical protection to minimize transformer failure that would result in the release of PCBs.

13.3.2.4. PCB transformers removed and stored for reuse will only be returned to their original application and location and will not be used at another location unless there is no practical alternative; and any such alternative use will not exceed one year.

13.3.2.5. PCB transformers will be serviced as follows:

13.3.2.5.1. Transformers classified as PCB-contaminated electrical equipment will only be serviced with dielectric fluid containing < 500 ppm PCB;

13.3.2.5.2. Any servicing of PCB transformers requiring removal of the transformer coil is prohibited;

13.3.2.5.3. PCBs removed during servicing will be captured and either reused as dielectric fluid or disposed of in accordance with paragraph 14.3.5;

13.3.2.5.4. PCB transformers may be serviced with dielectric fluid at any PCB concentration. However, the dielectric fluid from a PCB transformer will not be mixed with the dielectric fluid from PCB-contaminated electrical equipment;

13.3.2.5.5. Regardless of PCB concentration, dielectric fluids containing < 500 ppm PCBs that are mixed with fluids containing ≥ 500 ppm PCBs will not be used as dielectric fluid in any electrical equipment. The entire mixture must be considered to be > 500 ppm PCBs; and

13.3.2.5.6. Dielectric fluids containing ≥ 500 ppm PCBs will not be used as dielectric fluid in any transformers classified as PCB-contaminated electrical equipment.

13.3.2.6. All in-service PCB transformers (> 500 ppm) will be inspected at least every 3 months except that PCB transformers with impervious, undrained secondary containment capacity of 100 % of dielectric fluid or PCB transformers tested and found to contain < 60,000 ppm PCBs will be inspected at least every 12 months.

13.3.2.7. If any PCB transformer is involved in a fire and was subjected to heat and/or pressure sufficient to result in violent or nonviolent rupture, the installation will take measures to control water runoff, such as blocking floor drains. Runoff water will be tested and treated if required.

13.3.2.8. Leaking PCB transformers shall be repaired or replaced within 48 hours or as soon as possible after discovery of the leak. Leaking PCB transformers not repaired or replaced will be inspected daily. Leaking PCB fluid will be containerized.

13.3.2.9. All transformers will be considered and treated as PCB transformers unless information to the contrary exists.

13.3.3. Other PCB Items

13.3.3.1. Electromagnets, switches, and voltage regulators that may contain PCBs at any concentration are serviced as follows:

13.3.3.1.1. PCB-contaminated electrical equipment will only be serviced with dielectric fluid containing < 500 ppm PCB;

13.3.3.1.2. Servicing any electromagnet, switch, or voltage regulator with a PCB concentration of ≥ 500 ppm that requires the removal and rework of the internal components is prohibited;

13.3.3.1.3. PCBs removed during servicing will be captured and either reused as dielectric fluid or disposed of properly;

13.3.3.1.4. PCBs from electromagnets, switches, and voltage regulators with a PCB concentration of 500 ppm or greater will not be mixed with or added to dielectric fluid from PCB-contaminated electrical equipment; and

13.3.3.1.5. Dielectric fluids containing ≥ 500 ppm will not be used as dielectric fluid in any electromagnet, switch, or voltage regulator classified as PCB-contaminated electrical equipment.

13.3.3.2. Capacitors containing PCBs at any concentration must be managed as follows:

13.3.3.2.1. Use and storage for reuse of PCB large high-voltage capacitors and PCB large low-voltage capacitors that pose an exposure risk to food or feed is prohibited;

13.3.3.2.2. Use of PCB large high-voltage and PCB large low-voltage capacitors is prohibited unless the capacitor is used within a restricted-access electrical substation or in a contained and restricted-access indoor installation. The indoor installation will not have public access and will have an adequate roof, walls, and floor to contain any release of PCBs; and

13.3.3.3. Any PCB item removed from service will be marked with the date it is removed from service.

13.3.4. Storage

13.3.4.1. PCBs and PCB items at concentrations ≥ 50 ppm that are to be stored before disposal will be stored in a facility that will assure the containment of PCBs, including:

13.3.4.1.1. Roofs and walls of storage buildings that exclude rainfall;

13.3.4.1.2. A containment berm, at least 15.24 cm (6 inches) high, sufficient to contain twice the internal volume of the largest PCB article, or 25 % of the total internal volume of all PCB articles or containers stored, whichever is greater;

13.3.4.1.3. Drains, valves, floor drains, expansion joints, sewer lines, or other openings constructed to prevent any release from the bermed area;

13.3.4.1.4. Continuous, smooth, and impervious flooring material; and

13.3.4.1.5. To the maximum extent possible, a new PCB storage area will be located to minimize the risk of release due to seismic activity, floods, or other natural events. For facilities located where there is a high possibility of such risks, the installation spill prevention and control plan will address the risk.

13.3.4.1.6. Compliance with additional hazardous chemical storage requirements (see Chapter 5).

13.3.4.2. The following items may be stored temporarily in an area, subject to weekly inspection, that does not comply with the above requirements for up to 30 days from the date of removal from service:

13.3.4.2.1. Non-leaking PCB items, marked to indicate whether it is a PCB article or PCB equipment;

13.3.4.2.2. Leaking PCB articles and PCB equipment placed in a non-leaking PCB container that contains sufficient absorbent material to absorb fluid contained in the PCB article or equipment;

13.3.4.2.3. PCB containers in which non-liquid PCBs have been placed; and

13.3.4.2.4. PCB containers in which PCBs at a concentration between 50-499 ppm have been placed, and whose containers are marked to indicate there is < 500 ppm PCB.

13.3.4.3. Non-leaking and structurally undamaged large high-voltage PCB capacitors and PCB-contaminated electric equipment that have not been drained of free-flowing dielectric fluid may be stored on pallets, or raised platforms, next to a storage area meeting the criteria of paragraph 14.3.4. if they are inspected weekly.

13.3.4.4. All other PCB storage areas will be inspected at least monthly.

13.3.4.5. Containers used for the storage of PCBs will be at least as secure as those required for their transport for disposal by the servicing DLA-DS. In addition, PCB storage containers shall also comply with the criteria for hazardous chemical substance containers included in Chapter 5 of this guide.

13.3.5. Disposal. PCB wastes are considered to be hazardous waste and shall be disposed of in accordance with the requirements of Chapter 6, “Hazardous Waste.” In addition, installations shall also comply with the following disposal requirements for specific PCB waste products:

13.3.5.1. Installations that generate PCB waste of ≥ 50 ppm PCB will maintain an audit trail for the wastes at least as stringent as that required under the criteria in Chapter 6, “Hazardous Waste.” Installations will coordinate with the LEC to obtain host nation concurrence for in-country PCB disposal as for HW disposal.

13.3.5.2. PCB-contaminated dielectric fluid with concentrations > 500 ppm will only be disposed in an incinerator with 99.9 % combustion efficiency.

13.3.5.3. PCB-contaminated dielectric fluid with concentrations ≥ 50 ppm, but < 500 ppm, will only be disposed as follows:

13.3.5.3.1. In an incinerator with 99.9 % combustion efficiency; or

13.3.5.3.2. In a high-efficiency boiler that is rated at a minimum of 14.65 W (50 MBtu/hr) and is fueled by natural gas, oil, or coal.

13.3.5.4. Rags, soil, and other debris with PCBs at concentrations of ≥ 50 ppm will be disposed of:

13.3.5.4.1. In an incinerator with 99.9 %combustion efficiency; or

13.3.5.4.2. In a chemical waste landfill.

13.3.5.5. PCB transformers will be disposed of:

13.3.5.5.1. In an incinerator with 99.9 % combustion efficiency; or

13.3.5.5.2. In a chemical waste landfill, provided the transformers, and all their inner workings, are first drained of all free-flowing liquids.

13.3.5.6. PCB capacitors will be disposed of as follows:

13.3.5.6.1. PCB capacitors will be disposed of in an incinerator with 99.9 % combustion efficiency, except,

13.3.5.6.2. Intact non-leaking small PCB capacitors may be disposed of in a solid waste landfill unless large quantities (more than 45.36 kg (100 pounds)) are identified at the same time.

13.3.5.7. PCB hydraulic machines containing PCBs may be disposed of as municipal solid waste if:

13.3.5.7.1. The machines containing PCBs at concentrations of 50 ppm or greater are drained of all free-flowing liquid.

13.3.5.7.2. The machines containing PCB liquid of ≥1,000 ppm are flushed prior to disposal with a solvent containing < 50 ppm PCB.

13.3.5.8. PCB-contaminated electrical equipment, except capacitors, will be disposed of as municipal solid waste only after draining all free-flowing liquid.

13.3.5.9. PCB articles, other than those already described, will be disposed of:

13.3.5.9.1. In an incinerator with 99.9 % combustion efficiency; or

13.3.5.9.2. In a chemical waste landfill, provided the articles are first drained of all free-flowing liquids.

13.3.5.10. PCB containers with concentrations of ≥ 500 ppm may be disposed of:

13.3.5.10.1. In an incinerator with 99.9 % combustion efficiency; or

13.3.5.10.2. In a chemical waste landfill, provided the containers are first drained of all free-flowing liquids.

13.3.5.11. Where PCB fluids, items, or articles are disposed of in a high-temperature boiler, the following procedures will be followed:

13.3.5.11.1. The boiler must be rated at a minimum of 14.65 MW hours (50 million BTU hours);

13.3.5.11.2. If the boiler uses natural gas or oil as the primary fuel, the carbon monoxide concentration in the stack must be ≤ 50 ppm and the excess oxygen is at least 3 % when PCBs are being burned;

13.3.5.11.3. If the boiler uses coal as the primary fuel, the carbon monoxide concentration in the stack is ≤ 100 ppm and the excess oxygen is at least 3 % when PCBs are being burned;

13.3.5.11.4. The mineral oil dielectric fluid does not comprise more than 10 %, by volume, of the total fuel feed rate;

13.3.5.11.5. The mineral oil dielectric fluid is not fed into the boiler unless the boiler is operating at its normal operating temperature and is not fed during start up or shut down operations;

13.3.5.11.6. The performance of the boiler is continuously monitored for carbon monoxide and excess oxygen percentage in the stack gas while burning mineral oil dielectric fluid or, for boilers burning < 112,500 liters (30,000 gallons) of mineral oil dielectric fluid per year, monitoring is performed at least every 60 minutes;

13.3.5.11.7. The primary fuel feed rates, mineral oil dielectric fluid feed rates, and the total quantities of both primary fuel and mineral oil dielectric fluid fed to the boiler are measured and recorded at least every 15 minutes; and

13.3.5.11.8. The flow of mineral oil dielectric fluid is stopped if the criteria respecting carbon monoxide or excess oxygen are exceeded.

13.3.5.12. Where PCB fluids, items or articles are disposed of in an incinerator, the following procedures will be followed:

13.3.5.12.1. Combustion criteria shall maintain the introduced liquids for a 2-second dwell time at 1,200°C, plus or minus 100°C (2,200°F +/- 212°F), and 3 % excess oxygen in the stack gas or maintenance of the introduced liquids for a 1-1/2 second dwell time at 1,600°C, plus or minus 100°C (3,050°F +/- 212°F) and 2 % excess oxygen in the stack gas;

13.3.5.12.2. Combustion efficiency, measured by the ratio of the concentration of carbon dioxide to the total concentration of both carbon dioxide and carbon monoxide, will be maintained at least 99.9 %;

13.3.5.12.3. The rate and quantity of PCBs that are fed to the combustion system shall be measured and recorded at regular intervals not > 15 minutes;

13.3.5.12.4. The temperatures of the incineration process shall be continuously measured and recorded;

13.3.5.12.5. The flow of PCBs to the incinerator shall stop automatically if temperature criteria are not met;

13.3.5.12.6. Monitoring is conducted sufficient to determine that an incinerator to be used for disposal the first time will operate within the criteria above; and

13.3.5.12.7. Continuous monitoring is conducted during incineration of PCBs for oxygen and carbon monoxide and periodic monitoring for carbon dioxide.

13.3.5.13. PCB containers used to contain only PCBs at a concentration < 500 ppm may be disposed of as municipal solid waste only after draining all free-flowing liquid.

13.3.5.14. Retrogrades of PCB Items. DoD-generated PCB items manufactured in the United States will be returned to the United States for delivery to a permitted disposal facility if host country or third country disposal is not possible, is prohibited, or would not be managed in an environmentally sound manner. Ensure that all PCB items and equipment are marked in accordance with criteria in subparagraph 13.3.1.3.

13.3.6. Elimination of PCB Products

13.3.6.1. Installations shall minimize the use of PCBs and PCB items without degrading mission performance.

13.3.6.2. Installations shall not purchase or otherwise take control of PCBs or PCB items for use.

13.3.6.3. All procurement of transformers or any other equipment containing dielectric or hydraulic fluid shall be accompanied by a manufacturer’s certification that the equipment contains no detectable PCBs (< 2 ppm) at the time of shipment.

13.3.6.4. Such newly procured transformers and equipment shall have permanent labels affixed stating they are PCB-free (no detectable PCBs).

Chapter 14

Asbestos

14.1. SCOPE

This Chapter contains criteria to control and abate threats to human health and the environment from asbestos, and describes management of asbestos during removal and disposal. Policy requirements for a comprehensive Occupational Health and Safety program are not covered in this Chapter. To protect personnel from asbestos exposure, refer to DoDI 6055.1, "DoD Safety and Occupational Health (SOH) Program" and DoDI 6055.5, "Industrial Hygiene and Occupational Health" and concomitant service instructions.

14.2. DEFINITIONS

14.2.1. Adequately Wet. Sufficiently mix or penetrate with liquid to prevent the release of particulates. If visible emissions coming from ACM are observed, then that material has not been adequately wetted. However, the absence of visible emissions is not sufficient evidence of being adequately wet.

14.2.2. Asbestos. Generic term used to describe six distinctive varieties of fibrous mineral silicates, including chrysotile, amosite, crocidolite, tremolite asbestos, anthrophylite asbestos, actinolite asbestos, and any other of these materials that have been chemically treated and/or altered.

14.2.3. Asbestos-Containing Material (ACM). Any material containing > 1% asbestos by weight.

14.2.4. Friable Asbestos. Any material containing > 1% asbestos that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.

14.2.5. Category I Nonfriable ACM. Means asbestos containing packings, gaskets, resilient floor covering, and asphalt roofing products containing > 1% asbestos.

14.2.6. Category II Nonfriable ACM. Means any material, excluding Category I nonfriable ACM, containing > 1% asbestos that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

14.2.7. Regulated ACM. Means (a) Friable asbestos material, (b) Category I nonfriable ACM that has become friable, (c) Category I nonfriable ACM that will be or has been subjected to sanding grinding, cutting, or abrading, or (d) Category II nonfriable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of demolition or renovation operations.

14.3. CRITERIA. Installations shall contact the LEC to determine approval requirements for activities involving the handling, removal or disturbance of asbestos.

14.3.1. Installations will appoint an asbestos program manager to serve as the single point of contact for all asbestos-related activities.

14.3.2. Installations will prepare and implement an asbestos management plan. As a minimum, the plan will include the following:

14.3.2.1. An ACM inventory, conducted by sample and analysis or visual determination;

14.3.2.2. A notification and education program to tell workers, tenants, and building occupants where potentially friable ACM is located, and how and why to avoid disturbing the ACM; all persons affected should be properly informed;

14.3.2.3. Regular ACM surveillance to note, assess, and document any changes in the ACM's condition;

14.3.2.4. Work control/permit systems to control activities that might disturb ACM including;

14.3.2.4.1. Work Control. Barriers and/or markers to warn personnel of asbestos areas and preventing unauthorized access.

14.3.2.5. Operations and maintenance (O&M) work practices to avoid or minimize fiber release during activities affecting ACM such as daily maintenance of equipment and materials to clear asbestos particles and dust;

14.3.2.6. Record keeping to document O&M activities related to asbestos identification management and abatement;

14.3.2.7. Training for the asbestos program manager as well as custodial and maintenance staff;

14.3.2.8. Procedures to assess and prioritize identified hazards for abatement; and

14.3.2.9. Procedures to prevent the use of ACM in new construction.

14.3.2.10. Requirement for importers to provide customs with a certificate proving the asbestos-free nature of their products, if required and if importing suspect asbestos-containing materials.

14.3.3. Prior to demolition or renovation of a facility, the installation will make a determination whether or not the activity will remove or disturb ACM, and will record this determination on the project authorization document (e.g., work order).

14.3.4. Prior to demolition or renovation of a facility that involves removing or disturbing friable ACM, a written assessment of the action will be prepared and furnished to the installation commander. A copy of the assessment will also be kept on permanent file.

14.3.5. Installations will remove friable ACM when the ACM poses a threat to release airborne asbestos fibers and cannot be reliably repaired or isolated.

14.3.6. Before disturbing or demolishing a facility or part of a facility, installations will remove all regulated ACM.

14.3.7. When disposing of asbestos waste, installations will adequately wet all ACM waste, seal it in a leak-proof container, and properly dispose of it in an MSWLF as defined in Chapter 7, “Solid Waste.” Containers will be labeled in English and Arabic: "DANGER - CONTAINS ASBESTOS FIBERS - AVOID CREATING DUST - CANCER AND LUNG DISEASE HAZARD." Permanent records documenting the disposal action and site will be maintained. Asbestos dust and fiber waste are considered to be hazardous wastes and shall be disposed of in accordance with the provisions in Chapter 6 of this Guide.

14.3.8. DoD schools will comply with applicable requirements of 15 U.S.C. 2643(l) and implementing regulations in 40 CFR Part 763, Subpart E, “Asbestos-Containing Materials in Schools.”

CHAPTER 15

LEAD-BASED PAINT

15.1. SCOPE

This Chapter contains criteria to establish and implement a lead hazard management program to identify, control, or eliminate lead-based paint hazards, through interim controls or abatement, in child-occupied facilities and military family housing, in a manner protective of human health and the environment. Policy requirements for a comprehensive Occupational Health and Safety program are not covered in this Chapter. To protect personnel from lead exposure, refer to DoDI 6055.1, "DoD Safety and Occupational Health", DoDI 6055.5, "Industrial Hygiene and Occupational Health", and concomitant service instructions.

15.2. DEFINITIONS

15.2.1. Abatement. Any set of measures designed to permanently eliminate lead-based paint or lead-based paint hazards. Abatement includes the removal of lead-based paint and lead contaminated dust, the permanent enclosure or encapsulation of lead-based paint, the replacement of components or fixtures painted with lead-based paint, and the removal or covering of lead-contaminated soil. Abatement also includes all preparation, cleanup, disposal, and post-abatement clearance activities associated with such measures.

15.2.2. Accessible Surface. An interior or exterior surface painted with lead-based paint that is accessible for a young child to mouth or chew.

15.2.3. Bare Soil. Soil, including sand, not covered by grass, sod, or other live ground covers, or by wood chips, gravel, artificial turf, or similar covering.

15.2.4. Child-Occupied Facility. A facility, or portion of a facility, visited regularly by the same child, 6 years of age or under, on at least two different days within any week, provided that each days' visit lasts at least 3 hours and the combined weekly visits last at least 6 hours, and the combined annual visits last at least 60 hours. Child-occupied facilities may include, but are not limited to, day-care centers, preschools, playgrounds, and kindergarten classrooms.

15.2.5. Clearance. Visual evaluation and testing (collection and analysis of environmental samples) conducted after lead-based paint hazard reduction activities, interim controls, and standard treatments to determine that the work is complete and no lead-contaminated bare soil or lead-contaminated settled dust exist in a facility frequented by children under the age of 6.

15.2.6. Deteriorated Paint. Any interior or exterior paint or other coating that is peeling, chipping, chalking, cracking, or is otherwise damaged or separated from the substrate.

15.2.7. Elevated Blood Lead Level. A confirmed concentration of lead in whole blood of 20 μg/dl (micrograms of lead per deciliter) for a single test, or 15-19 μg/dl in two tests taken at least 3 months apart.

15.2.8. Encapsulation. The application of any covering or coating that acts as a barrier between the lead-based paint and the environment. Encapsulation may be used as a method of abatement if it is designed to be permanent.

15.2.9. Enclosure. The use of rigid, durable construction materials that are mechanically fastened to the substrate to act as a barrier between lead-based paint and the environment. Enclosure may be used as a method of abatement if it is designed to be permanent.

15.2.10. Evaluation. A visual evaluation, risk assessment, risk assessment screen, paint inspection, paint testing, or a combination of risk assessment and paint inspection to determine the presence of deteriorated paint, lead-based paint, or a lead-based paint hazard.

15.2.11. Friction Surface. An interior or exterior surface that is subject to abrasion or friction, including but not limited to, window, floor, and stair surfaces.

15.2.12. Hazardous Chemical Substances. Any chemical material with reactive characteristics whether on its own or within a mixture or whether this material is in its original form or manufactured. Classification of hazardous chemical substances is in accordance with the following 8 UN hazard classes:

15.2.12.1. Explosives (Class 1)

15.2.12.2. Compressed or Liquefied Gases (Class 2)

15.2.12.3. Flammable Liquids (Class 3)

15.2.12.4. Flammable Solids (Class 4)

15.2.12.5. Oxidizing Agents (Class 5)

15.2.12.6. Toxic materials (Class 6)

15.2.12.7. Radioactive Materials (Class 7)

15.2.12.8. Corrosive Materials (Class 8)

15.2.13. Hazard Reduction. Measures designed to reduce or eliminate human exposure to lead-based paint hazards through various methods, including interim controls or abatement or a combination of the two.

15.2.14. Impact Surface. An interior or exterior surface that is subject to damage by repeated sudden force, such as certain parts of doorframes.

15.2.15. Interim Controls. A set of measures designed to temporarily reduce human exposure or likely exposure to lead-based paint hazards. Interim controls include, but are not limited to, repairs, occasional and ongoing maintenance, painting, temporary containment, specialized cleaning, clearance, ongoing activities, and the establishment and operation of management and resident education programs.

15.2.16. Lead-Based Paint. Paint or other surface coatings that contain lead equal to or exceeding 1.0 milligram per cm^2, or 0.5 % by weight or 5,000 ppm by weight.

15.2.17. Lead-Based Paint Hazard includes paint-lead-hazard, dust-lead hazard or soil-lead hazard as identified below:

15.2.17.1. Paint-lead hazard. A paint-lead hazard is any of the following:

15.2.17.1. Any lead-based paint on a friction surface that is subject to abrasion and where the lead dust levels on the nearest horizontal surface underneath the friction surface (e.g., the window sill, or floor) are equal to or greater than the dust-lead hazard levels identified in the definition for dust-lead hazard (previously defined as lead-contaminated dust) – see below.

15.2.17.2. Any damaged or otherwise deteriorated lead-based paint on an impact surface that is caused by impact from a related building component (such as a doorknob that knocks into a wall or a door that knocks against its doorframe).

15.2.17.3. Any chewable lead-based painted surface on which there is evidence of teeth marks.

15.2.17.4. Any other deteriorated lead-based paint in any residential building or child-occupied facility or on the exterior of any residential building or child-occupied facility.

15.2.17.2. Dust-lead hazard (previously defined as lead-contaminated dust). Surface dust in a residential dwelling or child-occupied facility that contains a mass-per-area concentration of lead equal to or exceeding 40 $\mu g/ft^2$ on floors or 250 $\mu g/ft^2$ on interior window sills based on wipe samples.

15.2.17.3. Soil-lead hazard (previously defined as lead-contaminated soil). Bare soil on residential real property or on the property of a child-occupied facility that contains total lead equal to or exceeding 400 ppm ($\mu g/g$) in a play area, or an average of 1,200 ppm of bare soil in the rest of the yard based on soil samples.

15.2.18. Lead-Based Paint Inspection. A surface-by-surface investigation to determine the presence of lead-based paint, and the provision of a report explaining the results of the investigation.

15.2.19. Permanent. An expected design life of at least 20 years.

15.2.20. Reevaluation. A visual evaluation of painted surfaces and limited dust and soil sampling conducted periodically following lead-based paint hazard reduction where lead-based paint is still present.

15.2.21. Replacement. A strategy of abatement that entails removing building components that have surfaces coated with lead-based paint (such as windows, doors, and trim) and installing new components free of lead-based paint.

15.2.22. Risk Assessment. An on-site investigation to determine the existence, nature, severity, and location of lead-based paint hazards and the provision of a report explaining the results of the investigation and options for reducing lead-based paint hazards.

15.2.23. Risk Assessment Screen. A sampling protocol that is used in dwellings that are in relatively good condition and where the probability of finding lead-based hazards are low. The protocol involves inspecting such dwellings and collecting samples from representative locations on the floor, interior window sills, and window troughs to determine whether conducting a risk assessment is warranted.

15.3. CRITERIA

15.3.1. Installations will:

15.3.1.1. Develop and implement a multi-disciplinary lead-based paint hazard management program to identify, evaluate, and reduce lead-based paint hazards in child-occupied facilities and military family housing.

15.3.1.2. Manage identified lead-based paint hazards through interim controls or abatement. In addition, new projects or major alterations to existing projects which involve lead-based paints will utilize the best available technology to prevent or control pollution to reduce the risk of environmental deterioration.

15.3.1.3. Identify lead-based paint hazards in child-occupied facilities and military family housing using any or all of the following methods:

15.3.1.3.1. Lead-based paint risk assessment screen. If screen identifies dust-lead levels >25 μg/ft$_2$ for floors, >125 μg/ft^2 for interior window sills, a lead-based paint risk assessment should be performed.

15.3.1.3.2. Lead-based paint risk assessments.

15.3.1.3.3. Routine facility inspection for fire and safety.

15.3.1.3.4. Occupant, facility manager, and worker reports of deteriorated paint.

15.3.1.3.5. Results of childhood blood lead screening or reports of children identified to have elevated blood lead levels.

15.3.1.3.6. Lead-based paint reevaluations.

15.3.1.3.7. Review of construction, painting, and maintenance histories.

15.3.1.4. Ensure occupants and worker protection measures are taken during all maintenance, repair, and renovation activities that disturb areas known or assumed to have lead-based paint.

15.3.1.5. Disclose the presence of any known lead-based paint or lead-based paint hazards to occupants of child-occupied facilities and military family housing and provide information on lead-based paint hazard reduction. In addition, inform occupants of military family housing, prior to conducting remodeling or renovation projects, of the hazards associated with these activities, and provide information on protecting family members from the hazards of lead-based paint.

15.3.1.6. Ensure that all personnel involved in lead-based activities, including paint inspection, risk assessment, specification or design, supervision, and abatement, are properly trained.

15.3.1.7. Dispose of lead-contaminated waste that meets the definition of a hazardous waste in accordance with Chapter 6, “Hazardous Waste,” paragraph 6.2.5.

CHAPTER 16

SPILL PREVENTION AND RESPONSE PLANNING

16.1. SCOPE

This Chapter contains criteria to plan for, prevent, control, and report spills of POL and hazardous substances. It is DoD policy to prevent spills of these substances due to DoD activities and to provide for prompt, coordinated response to contain and clean up spills that might occur. Remediation beyond that required for the initial response is conducted pursuant to DoDI 4715.8 (Environmental Remediation for DoD Activities Overseas).

16.2. DEFINITIONS

16.2.1. Aboveground Storage Container. POL storage containers, exempt from UST criteria, that are normally placed on or above the surface of the ground. POL storage containers located above the floor and contained in vaults or basements, bunkered containers, and also partially buried containers are considered aboveground storage containers. For the purposes of this Chapter, this includes any mobile or fixed structure, tank, equipment, pipe, or pipeline (other than a vessel or a public vessel) used in oil well drilling operations, oil production, oil refining, oil storage, oil gathering, oil processing, oil transfer, and oil distribution. This also includes equipment in which oil is used as an operating fluid but excludes equipment in which oil is used solely for motive power.

16.2.2. Decontamination Wastes. Waste materials generated during the decontamination of equipment and personnel used during spill response including but not limited to purging water, rinsing water, plastic containers, rags, gloves, and other personal protective equipment.

16.2.3. Hazardous Substance. Any substance having the potential to do serious harm to human health or the environment if spilled or released in reportable quantity. A list of these substances and the corresponding reportable quantities is contained in Appendix 1, "Characteristics of Hazardous Waste and Lists of Hazardous Waste and Hazardous Material." Hazardous substances do not include:

16.2.3.1. Petroleum, including crude POL or any fraction thereof, that is not otherwise specifically listed or designated as a hazardous substance above.

16.2.3.2. Natural gas, natural gas liquids, liquefied natural gas, or synthetic gas usable for fuel (or mixtures of natural gas and such synthetic gas).

16.2.3.3. Classification of hazardous substances is in accordance with the following hazard classes:

16.2.3.3.1. Explosives (Class 1)

16.2.3.3.2. Compressed or Liquefied Gases (Class 2)

16.2.3.3.3. Flammable Liquids (Class 3)

16.2.3.3.4. Flammable Solids (Class 4)

16.2.3.3.5. Oxidizing Agents (Class 5)

16.2.3.3.6. Toxic Materials (Class 6)

16.2.3.3.7. Radioactive Materials (Class 7)

16.2.3.3.8. Corrosive Materials (Class 8)

16.2.4. Facility Incident Commander (FIC) (previously known as the Installation On-scene Coordinator). The official who coordinates and directs DoD control and cleanup efforts at the scene of a POL or hazardous substance spill due to DoD activities on or near the installation. This official is designated by the installation commander.

16.2.5. Facility Response Team (FRT) (previously known as the Installation Response Team). A team performing emergency functions as defined and directed by the FIC.

16.2.6. Oil. Oil of any kind or in any form, including, but not limited to, petroleum, fuel POL, lube oils, animal fats, vegetable oil, sludge, POL refuse, and POL mixed with wastes other than dredged spoil.

16.2.7. POL. Refined petroleum, oils, and lubricants. (See also definition in Chapter 9, "Petroleum, Oil, and Lubricants.")

16.2.8. Significant Spill. An uncontained release to the land or water in excess of any of the following quantities:

16.2.8.1. For hazardous wastes or hazardous substances identified as a result of inclusion in Table AP 1.T4., "List of Hazardous Waste/Substances/Materials," any quantity in excess of the reportable quantity listed in that table;

16.2.8.2. For POL or liquid or semi-liquid hazardous material, hazardous waste or hazardous substances, in excess of 400 liters (110 gallons);

16.2.8.3. For other solid hazardous material in excess of 225 Kg (500 pounds);

16.2.8.4. For combinations of POL and liquid, semi-liquid, and solid hazardous materials, hazardous waste or hazardous substance, in excess of 340 Kg (750 pounds); or

16.2.8.5. If a spill is contained inside an impervious berm, or on a nonporous surface, or inside a building and is not volatilized and is cleaned up, the spill is considered a contained release and is not considered a significant spill.

16.2.9. Worst Case Discharge. The largest foreseeable discharge from the facility, under adverse weather conditions, as determined using as a guide the worst case discharge planning volume criteria in Appendix 2, "Determination of Worst Case Discharge Planning Volume."

16.3. CRITERIA

16.3.1. Spill Prevention Control and Reporting Plan Requirement. All DoD installations will prepare, maintain, and implement a Spill Prevention and Response Plan, which provides for the prevention, control, and reporting of all spills of POL and hazardous substances. The plan will provide measures to prevent, and to the maximum extent practicable, to remove a worst case discharge from the facility. The plan should be kept in a location easily accessible to the FIC and FRT with an updated copy available in close proximity to, but not in, the storage areas, in the case of hazardous chemical substance spill.

16.3.1.1. The plan will be updated at least every 5 years or:

16.3.1.1.1. Within 6 months of any significant changes to operations.

16.3.1.1.2. When there have been two significant spills to navigable waters in any 12-month period;

16.3.1.1.3. When there has been a spill of 3,785 liters (1,000 gallons) or greater.

16.3.1.2. The plan shall be certified by an appropriately licensed or certified technical authority ensuring that the plan considers applicable industry standards for spill prevention and environmental protection, that the plan is prepared in accordance with good engineering practice, and is adequate for the facility. Technical changes (i.e., non-administrative) to the plan require recertification. The plan shall be submitted to the LEC who shall determine requirement to provide to Bahrain authorities.

16.3.2. Prevention Section. The prevention section of the plan will, at a minimum, contain the following:

16.3.2.1. Name, title, responsibilities, duties, and telephone number of the designated FIC and an alternate.

16.3.2.2. General information on the installation including name, type or function, location and address, charts of drainage patterns, designated water protection areas, maps showing locations of facilities described in subparagraph 18.3.2.3, critical water resources, land uses, and possible migration pathways.

16.3.2.3. An inventory of storage, handling, and transfer sites that could possibly produce a significant spill. For each listing, using maps as appropriate, a prediction of the direction and rate of flow should be included, as well as the total quantity of POL or hazardous substances that might be spilled as a result of a major failure and the types of dangers associated with hazardous chemical substances in every part of the storage site.

16.3.2.4. An inventory of all POL and hazardous substances at storage, handling, and transfer facilities described in subparagraph 18.3.2.3. A list of locations of the hazardous chemical substances, along with their associated dangers, shall also be provided.

16.3.2.5. Procedures for the periodic integrity testing of all aboveground storage containers, including visual inspection and where deemed appropriate, another form of nondestructive testing. The frequency and type of inspection and testing must take into account container size and design (floating/fixed roof, skid-mounted, elevated, cut-and cover, partially buried, vaulted above-ground, etc.) and industry standards.

16.3.2.6. Procedures for periodic inspection for all above ground valves, piping, and appurtenances associated with POL storage containers, in accordance with Chapter 9, "Petroleum, Oil, and Lubricants," subparagraph 9.3.2.5.

16.3.2.7. Arrangements for Emergency Services. The plan will describe arrangements with installation and/or local police departments, fire departments, hospitals, contractors, and emergency response teams to coordinate emergency services.

16.3.2.8. Means to Contact Emergency Services. The plan will include a telephone number or other means to contact the appropriate emergency service provider (e.g., installation fire department) on a 24-hour basis.

16.3.2.9. A detailed description of the facility's prevention, control, and countermeasures, including structures and equipment for diversion and containment of spills, for each site listed in the inventory. Measures should permit, as far as practical, reclamation of spilled substances. Chapters governing hazardous materials, hazardous waste, POL, underground storage tanks, pesticides, and PCBs provide specific criteria for containment structure requirements.

16.3.2.10. When secondary containment is not feasible for any container listed in the inventory, the plan shall include a detailed explanation of measures that will be taken to prevent spills (e.g., pre-booming, integrity testing, frequent inspection), as determined by the licensed or certified technical authority.

16.3.2.11. A list of all emergency equipment (such as fire extinguishing systems, spill control equipment, communications and alarm systems (internal and external), and decontamination equipment) at each site listed in the inventory where this equipment is required. This list will be kept up-to-date. In addition, the plan will include the location and a physical description of each item on the list, and a brief outline of its capabilities.

16.3.2.12. An evacuation plan for each site listed in the inventory, where there is a possibility that evacuation would be necessary. This plan will describe signal(s) to be used to begin evacuation, evacuation routes, alternate evacuation routes (in cases where the primary routes could be blocked by releases of hazardous waste or fires), and a designated meeting place.

16.3.2.13. A description of deficiencies in spill prevention and control measures at each site listed in the inventory, to include corrective measures required, procedures to be followed to

correct listed deficiencies and any interim control measures in place. Corrective actions must be implemented within 24 months of the date of plan preparation or revision.

16.3.2.14. Written procedures for:

16.3.2.14.1. Operations to preclude spills of POLs and hazardous substances;

16.3.2.14.2. Inspections; and

16.3.2.14.3. Record keeping requirements.

16.3.2.15. Site-specific procedures should be maintained at each site on the facility where significant spills could occur.

16.3.3. Spill Control Section. The control section of the plan (which may be considered a contingency plan) will identify resources for cleaning up spills at installations and activities, and to provide assistance to other agencies when requested. At a minimum, this section of the plan will contain:

16.3.3.1. Provisions specifying the responsibilities, duties, procedures, and resources to be used to contain and clean up spills.

16.3.3.2. A description of immediate response actions that should be taken when a spill is first discovered.

16.3.3.3. The responsibilities, composition, and training requirements of the FRT.

16.3.3.4. The command structure that will be established to manage a worst case discharge. Include an organization chart and the responsibilities and composition of the organization.

16.3.3.5. Procedures for FRT alert and response to include provisions for:

16.3.3.5.1. Access to a reliable communications system for timely notification of a POL spill or hazardous substance spill.

16.3.3.5.2. Public affairs involvement.

16.3.3.6. A current roster of the persons, and alternates, who must receive notice of a POL or hazardous substance spill, including a Defense Energy Support Center (DESC) representative if applicable. The roster will include name, organization mailing address, and work and home telephone number. Without compromising security, the plan will include provisions for the notification of the emergency coordinator after normal working hours.

16.3.3.7. The plan will provide for notification of the FIC, installation commander, and local authorities in the event of hazard to human health or environment.

16.3.3.8. Assignment of responsibilities for making the necessary notifications, including notification to the emergency services providers.

16.3.3.9. Surveillance procedures for early detection of POL and hazardous substance spills.

16.3.3.10. A prioritized list of various critical water and natural resources that will be protected in the event of a spill.

16.3.3.11. Other resources addressed in prearranged agreements that are available to the installation to cleanup or reclaim a large spill due to DoD activities, if such spill exceeds the response capability of the installation.

16.3.3.12. Cleanup methods, including procedures and techniques used to identify, contain, disperse, reclaim, and remove POL and hazardous substances used in bulk quantity on the installation.

16.3.3.13. Procedures for the proper reuse and disposal of recovered substances, decontamination wastes, contaminated POL and absorbent materials, and procedures to be accomplished prior to resumption of operations.

16.3.3.14. A description of general health, safety, and fire prevention precautions for spill cleanup actions.

16.3.3.15. A public affairs section that describes the procedures, responsibilities, and methods for releasing information in the event of a spill.

16.3.4. Reporting Section. The reporting section of the spill plan will address the following:

16.3.4.1. Recordkeeping when emergency procedures are invoked.

16.3.4.2. Any significant spill will be reported to the FIC immediately. Immediate actions will be taken to eliminate the source and contain the spill.

16.3.4.3. The FIC will immediately notify the appropriate In-Theater Component Commander and/or Defense Agency and the LEC and submit a follow-up written report when:

16.3.4.3.1. The spill occurs inside a DoD installation and cannot be contained within any required berm or secondary containment;

16.3.4.3.2. The spill exceeds 400 liters (110 gallons) of POLs;

16.3.4.3.3. A water resource has been polluted; or

16.3.4.3.4. The FIC has determined that the spill is significant.

16.3.4.4. When a significant spill occurs inside a DoD installation and cannot be contained within the installation boundaries or threatens the local Bahraini drinking water resource, the appropriate in-theater component commander and/or Defense Agency, EEA, and Bahraini Authorities will be notified immediately.

16.3.4.5. If a significant spill occurs outside of a DoD installation, the person in charge at the scene will immediately notify the authorities listed in subparagraph 16.3.4.4, and additionally will notify the local fire departments and obtain necessary assistance.

16.3.5. Installations will provide necessary training and spill response drills to ensure the effectiveness of personnel and equipment.

16.3.6. After completion of the initial response, any remaining free product and/or obviously contaminated soil will be appropriately removed and managed. Further action will be governed by DoDI 4715.8, “Environmental Remediation for DoD Activities Overseas.” Remains from container contents or any leaking materials belonging to one of the categories in Table 6.2 of Chapter 6, “Hazardous Waste”, shall be handled as hazardous waste.

CHAPTER 17

UNDERGROUND STORAGE TANKS

17.1. SCOPE

This Chapter contains criteria to control and abate pollution resulting from POL products and hazardous materials stored in underground storage tanks (USTs). Standards for USTs containing hazardous wastes are covered in Chapter 6, "Hazardous Waste." Criteria for aboveground and below ground POL storage containers are addressed in Chapter 9, "Petroleum, Oil, and Lubricants."

17.2. DEFINITIONS

17.2.1. POL. Refined petroleum, oils, and lubricants.

17.2.2. Hazardous Material. Any material defined as a hazardous material in Chapter 5, "Hazardous Material." The term does not include:

17.2.2.1. Petroleum, including crude POL or any fraction thereof, that is not otherwise specifically listed or designated as a hazardous material above.

17.2.2.2. Natural gas, natural gas liquids, liquefied natural gas, or synthetic gas usable for fuel (or mixtures of natural gas and such synthetic gas).

17.2.3. Tank Tightness Testing. A test that must be capable of detecting a 0.38 liter (0.1 gallon) per hour leak from any portion of the tank that routinely contains product while accounting for the effects of thermal expansion or contraction of the product, vapor pockets, tank deformation, evaporation or condensation, and the location of the water table.

17.2.4. Underground Storage Tank (UST). Any tank, including underground piping connected thereto, > 416 liters (110 gallons) that is used to contain POL products or hazardous material and the volume of which, including the volume of connected pipes, is 10 % or more beneath the surface of the ground, but does not include:

17.2.4.1. Tanks containing heating oil used for consumption on the premises where it is stored;

17.2.4.2. Septic tanks;

17.2.4.3. Stormwater or wastewater collection systems;

17.2.4.4. Flow through process tanks;

17.2.4.5. Surface impoundments, pits, ponds, or lagoons;

17.2.4.6. Field constructed tanks;

17.2.4.7. Hydrant fueling systems;

17.2.4.8. Storage tanks located in an accessible underground area (such as a basement or vault) if the storage tank is situated upon or above the surface of the floor;

17.2.4.9. UST containing de minimis concentrations of regulated substances, except where subparagraph 17.3.2.7. is applicable; and

17.2.4.10. Emergency spill or overflow containment UST systems that are expeditiously emptied after use.

17.2.5. Hazardous Material UST. A UST that contains a hazardous material (but not including hazardous waste as defined in Chapter 6) or any mixture of such hazardous materials and petroleum, and which is not a petroleum UST.

17.2.6. Deferred UST. A deferred UST is an underground tank system that fits into one of the following categories:

17.2.6.1. A hydrant fuel distribution system; or

17.2.6. 2. A field-constructed tank.

17.3. CRITERIA

17.3.1. All installations will maintain a UST inventory.

17.3.2. POL USTs. All petroleum UST systems will be properly installed, protected from corrosion, provided with spill/overfill prevention, and will incorporate leak detection as described below.

17.3.2.1. Corrosion Protection. USTs and piping must be provided with corrosion protection unless constructed of fiberglass or other non-corrodible materials. The corrosion protection system must be certified by competent authority.

17.3.2.2. Spill/Overflow Protection. USTs will be provided with spill and overfill prevention equipment, except where transfers are made in the amounts of 95 liters (25 gallons) or less. Where spill and over-fill protection are required, a spill containment box must be installed around the fill pipe. Overfill prevention will be provided by one of the following methods:

17.3.2.2.1. Automatic shut-off device (set at 95% of tank capacity).

17.3.2.2.2. High level alarm (set at 90% of tank capacity).

17.3.2.3. Leak Detection. Leak detection systems must be capable of detecting a 0.38-liter (0.1-gallon) per hour leak rate or a release of 568 liters (150 gallons) (or 1% of tank volume, whichever is less) within 30 days with a probability of detection of 0.95 and a probability of false alarm of not more than 0.05.

17.3.2.3.1. USTs will use at least one of the following leak detection methods:

17.3.2.3.1.1. Automatic tank gauging;

17.3.2.3.1.2. Vapor monitoring;

17.3.2.3.1.3. Groundwater monitoring; or

17.3.2.3.1.4. Interstitial monitoring.

17.3.2.3.2. All pressurized UST piping must be equipped with automatic line leak detectors and utilize either an annual tightness test or monthly monitoring.

17.3.2.3.3. Suction piping will either have a line tightness test conducted every three years or use monthly monitoring.

17.3.2.4. USTs and piping will be properly closed if not needed, or be upgraded or replaced.

17.3.2.5. Any UST and piping not incorporating a functioning leak detection system will require immediate corrective action. Such systems will be tightness tested annually in accordance with recognized U.S. industry standards and inventoried monthly to determine system tightness.

17.3.2.6. Any verified leaking UST or UST piping will be immediately removed from service. Any UST and piping suspected of leaking (e.g., leak detection equipment), will be verified for leakage to ensure there is not a false positive, or alternately, will immediately be removed from service. If the UST is still required, it will be repaired or replaced. If the UST is no longer required it will be removed from the ground. When a leaking UST is removed, exposed free product and/or obviously contaminated soil in the immediate vicinity of the tank will be appropriately removed and managed. Additional action will be governed by DoDI 4715.8 (Environmental Remediation for DoD Activities Overseas). Under extenuating circumstances (e.g., where the UST is located under a building), the UST will be cleaned and filled with an inert substance, and left in place.

17.3.2.7. When a UST has not been used for one year, or is determined to no longer be required, all of the product and sludges must be removed. Subsequently, the UST must be either cleaned and filled with an inert substance, or removed. UST wastes must be sampled and tested in accordance with Chapter 9, “Petroleum, Oil, and Lubricants,” paragraph 9.3.3.

17.3.2.8. When the product stored in a UST is changed, the UST must be emptied and cleaned by removing all liquid and accumulated sludge.

17.3.2.9. When a UST system is temporarily closed, corrosion protection and leak detection systems (if the UST is not empty) must be operated and maintained. If a UST system is temporarily closed for 3 months or greater, the following must be complied with:

17.3.2.9.1. Vent lines must be left open and functioning; and

17.3.2.9.2. All other lines, pumps, manways, and ancillary equipment must be secured and capped.

17.3.3. UST Recordkeeping. Installations will maintain a tank system inventory to include tank system installation, repair, removal, replacement, or upgrade, and operation of corrosion protection equipment for the life of the tank.

17.3.4. Hazardous Material USTs

17.3.4.1. All hazardous material USTs and piping must meet the same design and construction standards as required for petroleum USTs and piping, and in addition must be provided with secondary containment for both tank and piping. Secondary containment can be met by using double-walled tanks and piping, liners, or vaults.

17.3.4.2. Leak Detection. The interstitial space (space between the primary and secondary containment) for tanks and piping must be monitored monthly for liquids or vapors.

17.3.4.3. Hazardous material USTs and piping that do not incorporate the criteria contained in subparagraph C17.3.4.1. shall be immediately removed from service and upgraded or replaced as necessary.

17.3.5. Deferred USTs. Deferred USTs constructed after 8 May 1985 must be designed and constructed with corrosion protection, non-corrodible materials, or be otherwise designed and constructed to prevent releases from corrosion or structural failure. UST materials must be compatible with the substance(s) to be stored.

A1. APPENDIX 1
CHARACTERISTICS OF HAZARDOUS WASTES AND LISTS OF HAZARDOUS WASTES AND HAZARDOUS MATERIALS

A1.1. CHARACTERISTICS OF HAZARDOUS WASTE

A1.1.1. General

A1.1.1.1. A solid waste is a discarded material that may be solid, semi-solid, liquid, or that contained gas.

A1.1.1.2. A solid waste becomes a hazardous waste when it exhibits a characteristic of a hazardous waste or is listed as a hazardous waste in this Appendix. A hazardous waste or any mixture of a solid waste and a hazardous waste that is listed solely because it exhibits one or more characteristics of ignitability, corrosivity, or reactivity, is not a hazardous waste if the waste no longer exhibits any characteristic of hazardous waste.

A1.1.1.3. Each hazardous waste is identified by a USEPA Hazardous Waste Number (HW#). The HW# must be used in complying with the notification, recordkeeping, and reporting requirements.

A1.1.2. Characteristic of Ignitability

A1.1.2.1. A solid waste exhibits the characteristic of ignitability if a representative sample of the waste has any of the following properties:

A1.1.2.1.1. It is a liquid, other than an aqueous solution containing less than 24 percent alcohol by volume and has a flash point less than 60°C (140°F), as determined by a Pensky-Martens Closed Cup Tester, using the test method specified in American Society for Testing and Materials (ASTM) Standard D-93-79 or D-93-80 or a Setaflash Closed Cup Tester, using the test method specified in ASTM Standard D-3278-78, or as determined by an equivalent test method.

A1.1.2.1.2. It is not a liquid and is capable, under standard temperature and pressure, of causing fire through friction, absorption of moisture, or spontaneous chemical changes and, when ignited, burns so vigorously and persistently that it creates a hazard.

A1.1.2.1.3. It is an ignitable compressed gas as determined by appropriate test methods or USEPA.

A1.1.2.1.4. It is an oxidizer.

A1.1.2.2. A solid waste that exhibits the characteristic of ignitability has the USEPA HW# D001.

A1.1.3. Characteristic of Corrosivity

A1.1.3.1. A solid waste exhibits the characteristic of corrosivity if a representative sample of the waste has either of the following properties:

A1.1.3.1.1. It is aqueous and has a pH less than or equal to 2, or greater than or equal to 12.5, as determined by a pH meter.

A1.1.3.1.2. It is a liquid and corrodes steel (SAE 1020) at a rate greater than 6.35 mm (0.250 inch) per year at a test temperature of 55°C (130°F) as determined by the test method specified in National Association of Corrosion Engineers (NACE) Standard TM-01-69 as standardized in "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods."

A1.1.3.2. A solid waste that exhibits the characteristic of corrosivity has the USEPA HW# D002.

A1.1.4. Characteristic of Reactivity

A1.1.4.1. A solid waste exhibits the characteristic of reactivity if a representative sample of the waste has any of the following properties:

A1.1.4.1.1. It is normally unstable and readily undergoes violent change without detonating.

A1.1.4.1.2. It reacts violently with water.

A1.1.4.1.3. It forms potentially explosive mixtures with water.

A1.1.4.1.4. When mixed with water, it generates toxic gases, vapors, or fumes in a quantity sufficient to present a danger to human health or the environment.

A1.1.4.1.5. It is a cyanide or sulfide-bearing waste which, when exposed to pH conditions between 2 and 12.5, can generate toxic gases, vapors, or fumes in a quantity sufficient to present a danger to human health or the environment.

A1.1.4.1.6. It is capable of detonation or explosive reaction if it is subjected to a strong initiating source or if heated under confinement.

A1.1.4.1.7. It is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure.

A1.1.4.1.8. It is a forbidden explosive.

A1.1.4.2. A solid waste that exhibits the characteristic of reactivity has the USEPA HW# D003.

A1.1.5. Toxicity Characteristic

A1.1.5.1. A solid waste exhibits the characteristic of toxicity if, using the Toxicity Characteristic Leaching Procedure, the extract from a representative sample of the waste contains any of the contaminants listed in Table AP1.T1., "Maximum Concentration of Contaminants for the Toxicity Characteristic," or section A1.1. at the concentration equal to or greater than the respective value given in that table. Where the waste contains less than 0.5 percent filterable solids, the waste itself is considered to be the extract for the purpose of this section.

A1.1.5.2. A solid waste that exhibits the characteristic of toxicity has the USEPA HW# specified in Table AP1.T1 or section A1.2., which corresponds to the toxic contaminant causing it to be hazardous.

A1.2. LISTS OF HAZARDOUS WASTES

A1.2.1. General

A1.2.1.1. A solid waste is a hazardous waste if it is listed in this section.

A1.2.1.2. The basis for listing the classes or types of wastes listed employed one or more of the following Hazard Codes:

Ignitable Waste	(I)
Corrosive Waste	(C)
Reactive Waste	(R)
Toxicity Characteristic Waste	(E)
Acute Hazardous Waste	(H)
Toxic Waste	(T)

A1.2.1.3. Each hazardous waste listed in section A1.2 of this Appendix is assigned a USEPA HW# which precedes the name of the waste. This number must be used in complying with the notification, recordkeeping and reporting requirements of these alternate standards.

A1.2.2. Hazardous Wastes from Non-Specific Sources. The solid wastes in Table AP1.T3., "Listed Hazardous Wastes from Non-Specific Sources," are listed hazardous wastes from non-specific sources. These hazardous wastes are designated with an "F."

A1.2.3. Hazardous Wastes from Specific Sources. The solid wastes listed in Table AP1.T4., annotated "K" as the first character of the USEPA Hazardous Waste No. column, are listed hazardous wastes from specific sources.

A1.2.4. Discarded Commercial Chemical Products, Off-Specification Species, Container Residues, and Spill Residue.

A1.2.4.1. The following materials or items are hazardous wastes if and when they are discarded or intended to be discarded when they are mixed with waste oil or used oil or other material and applied to the land for dust suppression or road treatment, when they are otherwise applied to the land in lieu of their original intended use or when they are contained in products that are applied to the land in lieu of their original intended use, or when, in lieu of their original

intended use, are produced for use as (or as a component of) a fuel, distributed for use as a fuel or burned as a fuel.

A1.2.4.1.1. Any commercial chemical product, or manufacturing chemical intermediate having the generic name listed in Table AP1.T4., annotated "P" or "U" as the first character in the USEPA HW#.

A1.2.4.1.2. Any off-specification commercial chemical product or manufacturing chemical intermediate ***which, if it met specifications, would have the generic name listed in*** Table AP1.T4., annotated "P" or "U" as the first character in the USEPA HW#.

A1.2.4.1.3. Any residue remaining in a container or in an inner liner removed from a container that has held any commercial chemical product or manufacturing chemical intermediate having the generic name listed in Table AP1.T4., annotated "P" or "U" as the first character in the USEPA HW#, unless the container is empty. [Comment: Unless the residue is being beneficially used or reused, or legitimately recycled or reclaimed; or being accumulated, stored, transported or treated prior to such use, re-use, recycling or reclamation, the residue to be intended for discard, and thus, a hazardous waste. An example of a legitimate re-use of the residue would be where the residue remains in the container and the container is used to hold the same commercial chemical product or manufacturing chemical intermediate it previously held. An example of the discard of the residue would be where the drum is sent to a drum reconditioner who reconditions the drum but discards the residue.]

A1.2.4.1.4. Any residue or contaminated soil, water or other debris resulting from the cleanup of a spill into or on any land or water of any commercial chemical product or manufacturing chemical intermediate having the generic name listed in Table AP1.T4., annotated "P" or "U" as the first character in the USEPA HW#, or any residue or contaminated soil, water or other debris resulting from the cleanup of a spill into or on any land or water, of any off-specification chemical product and manufacturing chemical intermediate which, if it met specifications, would have the generic name listed in Table AP1.T4., annotated "P" or "U" as the first character in the USEPA HW#. [Comment: The phrase "commercial chemical product or manufacturing chemical intermediate having the generic name listed in..." refers to a chemical substance that is manufactured or formulated for commercial or manufacturing use which consists of the commercially pure grade of the chemical, any technical grades of the chemical that are produced or marketed, and all formulations in which the chemical is the sole active ingredient. It does not refer to a material, such as a manufacturing process waste, that contains any of the substances listed in Table AP1.T4., annotated "P" or "U" as the first character in the USEPA HW#. Where a manufacturing process waste is deemed to be a hazardous waste because it contains a substance listed in Table AP1.T4., annotated "P" or "U" as the first character in the USEPA HW#, such waste will be listed in paragraph AP1.2.2. above or will be identified as a hazardous waste by the characteristics set forth in section AP1.1. of this Appendix.]

A1.2.4.1.5. The commercial chemical products, manufacturing chemical intermediates or off-specification commercial chemical products or manufacturing chemical intermediates referred to in Table AP1.T4., annotated "P" as the first character in the USEPA HW# are hereby identified as acute hazardous waste (H). [Comment: For the convenience of the regulated community, the primary hazardous properties of these materials have been indicated by

the letters T (Toxicity), and R (Reactivity). Absence of a letter indicates that the compound is only listed for acute toxicity.] These wastes and their corresponding USEPA HW#s are listed in Table AP1.T4., annotated "P" as the first character in the USEPA HW#.

A1.2.4.1.6. The commercial chemical products, manufacturing chemical intermediates, or off-specification commercial chemical products referred to in Table AP1.T4., subparagraphs A1.2.4.1.1.1. through A1.2.4.1.1.4. of this section, are hereby identified as toxic wastes (T), unless otherwise designated. [Comment: For the convenience of the regulated community, the primary hazardous properties of these materials have been indicated by the letter T (Toxicity), R (Reactivity), I (Ignitability), and C (Corrosivity). Absence of a letter indicates that the compound is only listed for toxicity.]

Table AP1.T1. Maximum Concentration of Contaminants for the Toxicity Characteristic

USEPA HW No.[1]	Contaminant	CAS No. [2]	Regulatory Level (mg/L)
D004	Arsenic	7440-38-2	5.0
D005	Barium	7440-39-3	100.0
D006	Cadmium	7440-43-2	1.0
D007	Chromium	7440-47-3	5.0
D016	2,4-D	94-75-7	10.0
D012	Endrin	72-20-8	0.02
D008	Lead	7439-92-1	5.0
D013	Lindane	58-89-9	0.4
D009	Mercury	7439-97-6	0.2
D014	Methoxychlor	72-43-5	10.0
D010	Selenium	7782-49-2	1.0
D011	Silver	7440-22-4	5.0
D015	Toxaphene	8001-35-2	0.5
D017	2,4,5-TP (Silvex)	93-72-1	1.0

Notes

1. U.S. EPA Hazardous Waste number.
2. Chemical Abstracts Service number.

Table AP1.T2. Maximum Concentration of Contaminants for Non-Wastewater

USEPA HW No. [1]	Contaminant	CAS No. [2]	Regulatory Level (mg/kg)
D018	Benzene	71-43-2	0.5
D019	Carbon tetrachloride	56-23-5	0.5
D020	Chlordane	57-74-9	0.03
D021	Chlorobenzene	108-90-7	100.0
D022	Chloroform	67-66-3	6.0
D023	o-Cresol	95-48-7	200.0
D024	m-Cresol	108-39-4	200.0
D025	p-Cresol	106-44-5	200.0
D026	Cresol		200.0
D027	1,4-Dichlorobenzene	106-46-7	7.5
D028	1,2-Dichloroethane	107-06-2	0.5
D029	1,1-Dichloroethylene	75-35-4	0.7
D030	2,4-Dinitrotoluene	121-14-2	0.13
D031	Heptachlor (and its epoxide)	76-44-8	0.008
D032	Hexachlorobenzene	118-74-1	0.13
DO33	Hexachlorobutadiene	87-68-3	0.5
DO34	Hexachloroethane	67-72-1	3.0
DO35	Methyl Ethyl Ketone	78-93-3	200.0
DO36	Nitrobenzene	98-95-3	2.0
D037	Pentachlorophenol	87-86-5	100.0
D038	Pyridine	110-86-1	5.0
D039	Tetrachloroethylene	127-18-4	0.7
D040	Trichloroethylene	79-01-6	0.5
D041	2,4,5-Trichlorophenol	95-95-4	400.0
D042	2,4,6-Trichlorophenol	88-06-2	2.0
D043	Vinyl Chloride	75-01-4	0.2

Notes

1. U.S. EPA Hazardous Waste number.
2. Chemical Abstracts Service number.

Table AP1.T3. Listed Hazardous Wastes from Non-Specific Sources

USEPA HW No.[1]	Hazardous Waste	Hazard Code
F001	The following spent halogenated solvents used in degreasing: Tetrachloroethylene, trichloroethylene, methylene chloride, 1,1,1-trichloroethane, carbon tetrachloride, and chlorinated fluorocarbons; all spent solvent mixtures/blends used in degreasing containing, before use, a total of ten percent or more (by volume) of one or more of the above halogenated solvents or those solvents listed in F002, F004, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	(T)
F002	The following spend halogenated solvents: Tetrachloroethylene, methylene chloride, trichloroethylene, 1,1,1-trichloroethane, chlorobenzene, 1,1,2-trichloro-1,2,2-trifluoroethane, ortho-dichlorobenzene, trichlorofluoromethane, and 1,1,2-trichloroethane; all spent solvent mixtures/blends containing, before use, a total of ten percent or more (by volume) of one or more of the above halogenated solvents or those listed in F001, F004, or F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	(T)
F003	The following spent non-halogenated solvents: xylene, acetone, ethyl acetate, ethyl benzene, ethyl ether, methyl isobutyl ketone, n-butyl alcohol, cyclohexanone, and methanol; all spent solvent mixtures/blends containing, before use, only the above spent non-halogenated solvents; and all spent solvent mixtures/blends containing, before use, one or more of the above non-halogenated solvents, and, a total of ten percent or more (by volume) of one or more of those solvents listed in F001, F002, F004, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	(I)[2]
F004	The following spent non-halogenated solvents: Cresols and cresylic acid, and nitrobenzene; all spent solvent mixtures/blends containing, before use, a total of ten percent or more (by volume) of one or more of the above non-halogenated solvents or those solvents listed in F001, F002, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	(T)
F005	The following spent non-halogenated solvents: Toluene, methyl ethyl ketone, carbon disulfide, isobutanol, pyridine, benzene, 2-ethoxyethanol, and 2-nitropropane; all spent solvent mixtures/blends containing, before use, a total of ten percent or more (by volume) of one or more of the above non-halogenated solvents or those solvents listed in F001, F002, or F004; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	(I,T)
F006	Wastewater treatment sludges from electroplating operations except from the following processes: (1) sulfuric acid anodizing of aluminum; (2) tin plating on carbon steel; (3) zinc plating (segregated basis) on carbon steel; (4) aluminum or zinc-aluminum plating on carbon steel; (5) cleaning/stripping associated with tin, zinc and aluminum plating on carbon steel; and (6) chemical etching and milling of aluminum.	(T)
F007	Spent cyanide plating bath solutions from electroplating operations.	(R,T)

Table AP1.T3. Listed Hazardous Wastes from Non-Specific Sources

USEPA HW No.[1]	Hazardous Waste	Hazard Code
F008	Plating bath residues from the bottom of plating baths from electroplating operations where cyanides are used in the process.	(R,T)
F009	Spent stripping and cleaning bath solutions from electroplating operations where cyanides are used in the process.	(R,T)
F010	Quenching bath residues from oil baths from metal heat treating operations where cyanides are used in the process.	(R,T)
F011	Spent cyanide solutions from salt bath pot cleaning from metal heat treating operations.	(R,T)
F012	Quenching wastewater treatment sludges from metal heat treating operations where cyanides are used in the process.	(T)
F019	Wastewater treatment sludges from the chemical conversion coating of aluminum except from zirconium phosphating in aluminum can washing when such phosphating is an exclusion conversion coating process.	(T)
F020	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tri- or tetrachlorophenol, or of intermediates used to produce their pesticide derivatives (This listing does not include wastes from the production of Hexachlorophene from highly purified 2,4,5- trichlorophenol).	(H)
F021	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of pentachlorophenol, or of intermediates used to produce its derivatives.	(H)
F022	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tetra-, penta-, or hexachlorobenzenes under alkaline conditions.	(H)
F023	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production of materials on equipment previously used for the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tri- and tetrachlorophenols (This listing does not include wastes from equipment used only for the production or use of Hexachlorophene from highly purified 2,4,5- trichlorophenol).	(H)
F024	Process wastes, including but not limited to, distillation residues, heavy ends, tars, and reactor clean-out wastes, from the production of certain chlorinated aliphatic hydrocarbons by free radical catalyzed processes. These chlorinated aliphatic hydrocarbons are those having carbon chain lengths ranging from one to and including five, with varying amounts and positions of chlorine substitution (This listing does not include wastewaters, wastewater treatment sludges, spent catalysts, and wastes listed in Sec26131 or Sec26132).	(T)

Table AP1.T3. Listed Hazardous Wastes from Non-Specific Sources

USEPA HW No.[1]	Hazardous Waste	Hazard Code
F025	Condensed light ends, spent filters and filter aids, and spent desiccant wastes from the production of certain chlorinated aliphatic hydrocarbons, by free radical catalyzed processes. These chlorinated aliphatic hydrocarbons are those having carbon chain lengths ranging from one to and including five, with varying amounts and positions of chlorine substitution.	(T)
F026	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production of materials on equipment previously used for the manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tetra-, penta-, or hexachlorobenzene under alkaline conditions.	(H)
F027	Discarded unused formulations containing tri-, tetra-, or pentachlorophenol or discarded unused formulations containing compounds derived from these chlorophenols (This listing does not include formulations containing Hexachlorophene synthesized from prepurified 2,4,5- trichlorophenol as the sole component).	(H)
F028	Residues resulting from the incineration or thermal treatment of soil contaminated with EPA Hazardous Waste Numbers F020, F021, F022, F023, F026, and F027.	(T)
F032	Wastewaters (except those that have not come into contact with process contaminants), process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that currently use or have previously used chlorophenolic formulations (except potentially cross- contaminated wastes that have had the F032 waste code deleted in accordance with Sec 26135 of this chapter or potentially cross-contaminated wastes that are otherwise currently regulated as hazardous wastes (i.e., F034 or F035), and where the generator does not resume or initiate use of chlorophenolic formulations). This listing does not include K001 bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote and/or pentachlorophenol.	(T)
F034	Wastewaters (except those that have not come into contact with process contaminants), process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that use creosote formulations. This listing does not include K001 bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote and/or pentachlorophenol.	(T)
F035	Wastewaters (except those that have not come into contact with process contaminants), process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that use inorganic preservatives containing arsenic or chromium. This listing does not include K001 bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote and/or pentachlorophenol.	(T)

Table AP1.T3. Listed Hazardous Wastes from Non-Specific Sources

USEPA HW No.[1]	Hazardous Waste	Hazard Code
F037	Petroleum refinery primary oil/water/solids separation sludge—Any sludge generated from the gravitational separation of oil/water/ solids during the storage or treatment of process wastewaters and oily cooling wastewaters from petroleum refineries. Such sludges include, but are not limited to, those generated in: oil/water/ solids separators; tanks and impoundments; ditches and other conveyances; sumps; and stormwater units receiving dry weather flow. Sludge generated in stormwater units that do not receive dry weather flow, sludges generated from non- contact once-through cooling waters segregated for treatment from other process or oily cooling waters, sludges generated in aggressive biological treatment units as defined in Sec 26131(b)(2) (including sludges generated in one or more additional units after wastewaters have been treated in aggressive biological treatment units) and K051 wastes are not included in this listing.	(T)
F038	Petroleum refinery secondary (emulsified) oil/water/solids separation sludge—Any sludge and/or float generated from the physical and/or chemical separation of oil/water/ solids in process wastewaters and oily cooling wastewaters from petroleum refineries. Such wastes include, but are not limited to, all sludges and floats generated in: induced air flotation (IAF) units, tanks and impoundments, and all sludges generated in DAF units. Sludges generated in stormwater units that do not receive dry weather flow, sludges generated from non-contact once-through cooling waters segregated for treatment from other process or oily cooling waters, sludges and floats generated in aggressive biological treatment units as defined in Sec 26131(b)(2) (including sludges and floats generated in one or more additional units after wastewaters have been treated in aggressive biological treatment units) and F037, K048, and K051 wastes are not included in this listing.	(T)
F039	Leachate (liquids that have percolated through land disposed wastes) resulting from the disposal of more than one restricted waste classified as hazardous under subpart D of this part (Leachate resulting from the disposal of one or more of the following EPA Hazardous Wastes and no other Hazardous Wastes retains its EPA Hazardous Waste Number(s): F020, F021, F022, F026, F027, and/or F028)	(T)

Notes

1. U.S. EPA Hazardous Waste number.
2. (I,T) should be used to specify mixtures containing ignitable and toxic constituents.

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Acenaphthene	83329			100
Acenaphthylene	208968			5,000
Acetaldehyde (I)	75070		U001	1,000
Acetaldehyde, chloro-	107200		P023	1,000
Acetaldehyde, trichloro-	75876		U034	5,000
Acetamide	60355			100
Acetamide, N-(aminothioxomethyl)-	591082		P002	1,000
Acetamide, N-(4-ethoxyphenyl)-	62442		U187	100
Acetamide, 2-fluoro-	640197		P057	100
Acetamide, N-9H-fluoren-2-yl-	53963		U005	1
Acetic acid	64197			5,000
Acetic acid (2,4-dichlorophenoxy)-salts and esters	94757		U240	100
Acetic acid, lead(2+) salt	301042		U144	10
Acetic acid, thallium(1+) salt	563688		U214	1000
Acetic acid, (2,4,5-trichlorophenoxy)	93765		U232	1,000
Acetic acid, ethyl ester (I)	141786		U112	5,000
Acetic acid, fluoro-, sodium salt	62748		P058	10
Acetic anhydride	108247			5,000
Acetone (I)	67641		U002	5,000
Acetone cyanohydrin	75865	1,000	P069	10
Acetone thiosemicarbazide	1752303	1,000/10,000		1
Acetonitrile (I,T)	75058		U003	5,000
Acetophenone	98862		U004	5,000
2-Acetylaminofluorene	53963		U005	1
Acetyl bromide	506967			5,000
Acetyl chloride (C,R,T)	75365		U006	5,000
1-Acetyl-2-thiourea	591082		P002	1
Acrolein	107028	500	P003	1
Acrylamide	79061	1,000/10,000	U007	5,000
Acrylic acid (I)	79107		U008	5,000
Acrylonitrile	107131	10,000	U009	100
Acrylyl chloride	814686	100		1
Adipic acid	124049			5,000
Adiponitrile	111693	1,000		1
Aldicarb	116063	100/10,000	P070	1
Aldrin	309002	500/10,000	P004	1
Allyl alcohol	107186	1,000	P005	100

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Allylamine	107119	500		1
Allyl chloride	107051			1,000
Aluminum phosphide (R,T)	20859738	500	P006	100
Aluminum sulfate	10043013			5,000
4-Aminobiphenyl	92671			1
5-(Aminomethyl)-3-isoxazolol	2763964		P007	1,000
Aminopterin	54626	500/10,000		1
4-Aminopyridine	504245		P008	1,000
Amiton	78535	500		1
Amiton oxalate	3734972	100/10,000		1
Amitrole	61825		U011	10
Ammonia	7664417	500		100
Ammonium acetate	631618			5,000
Ammonium benzoate	1863634			5,000
Ammonium bicarbonate	1066337			5,000
Ammonium bichromate	7789095			10
Ammonium bifluoride	1341497			100
Ammonium bisulfite	10192300			5,000
Ammonium carbamate	1111780			5,000
Ammonium carbonate	506876			5,000
Ammonium chloride	12125029			5,000
Ammonium chromate	7788989			10
Ammonium citrate, dibasic	3012655			5,000
Ammonium fluoborate	13826830			5,000
Ammonium fluoride	12125018			100
Ammonium hydroxide	1336216			1,000
Ammonium oxalate	6009707			5,000
	5972736			
	14258492			
Ammonium picrate (R)	131748		P009	10
Ammonium silicofluoride	16919190			1,000
Ammonium sulfamate	7773060			5,000
Ammonium sulfide	12135761			100
Ammonium sulfite	10196040			5,000
Ammonium tartrate	14307438			5,000
	3164292			
Ammonium thiocyanate	1762954			5,000
Ammonium vanadate	7803556		P119	1,000

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Amphetamlne	300629	1,000		1
Amyl acetate	628637			5,000
Iso-Amyl acetate	123922			
Sec-Amyl acetate	626380			
Tert-Amyl acetate	625161			
Aniline (I,T)	62533	1,000	U012	5,000
Aniline, 2,4,6- trimethyl	88051	500		1
o-Anisidine	90040			100
Anthracene	120127			5,000
Antimony++	7440360			5,000
Antimony pentachloride	7647189			1,000
Antimony pentafluoride	7783702	500		1
Antimony potassium tartrate	28300745			100
Antimony tribromide	7789619			1,000
Antimony trichloride	10025919			1,000
Antimony trifluoride	7783564			1,000
Antimony trioxide	1309644			1,000
Antimycin A	1397940	1,000/10,000		1
ANTU (Thiourea 1-Naphthalenyl)	86884	500/10,000		100
Argentate(1-), bis(cyano-C)-, potassium	506616		P099	1
Aroclor 1016	12674112			1
Aroclor 1221	11104282			1
Aroclor 1232	11141165			1
Aroclor 1242	53469219			1
Aroclor 1248	12672296			1
Aroclor 1254	11097691			1
Aroclor 1260	11096825			1
Aroclors	1336363			1
Arsenic++	7440382			1
Arsenic acid H_3AsO_4	1327522		P010	1
	7778394			
Arsenic disulfide	1303328			1
Arsenic oxide As_2O_3	1327533		P012	1
Arsenic oxide As_2O_5	1303282		P011	1
Arsenic pentoxide	1303282	100/10,000	P011	1
Arsenic trichloride	7784341			1
Arsenic trioxide	1327533		P012	1

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Arsenic trisulfide	1303339			1
Arsenous oxide	1327533	100/10,000	P012	1
Arsenous trichloride	7784341	500		5,000
Arsine	7784421	100		1
Arsine, diethyl-	692422		P038	1
Arsinic acid, dimethyl-	75605		U136	1
Arsorous dichloride, phenyl-	696286		P036	1
Asbestos+++	1332214			1
Auramine	492808		U014	100
Azaserine	115026		U015	1
Aziridine	151564		P054	1
Azindine, 2-methyl-	75558		P067	1
Azirino[2',3',3,4]pyrrolo[1,2-a]indole-4, 7-dione,6-amino-8-[[aminocarbonylooxy) methyl]-1,1a,2,8,8a,8b-hexahydro-8a-methoxy-5-methyl-,[1aS-(1a-alpha, 8-beta, 8a-alpha, 8b-alpha)]-	50077		U010	10
Azinphos-ethyl	2642719	100/10,000		100
Azinphos-methyl	86500	10/10,000		1
Barium cyanide	542621		P013	10
Benz[j]aceanthrylene, 1,2-dihydro-3-methyl-	56495		U157	10
Benz[c]acridine	225514		U016	100
Benzal chloride	98873	500	U017	5,000
Benzamide, 3,5-dichloro-N-(1,1-dimethyl-2-propynyl)-	23950585		U192	5,000
Benz[a]anthracene	56553		U018	10
1,2-Benzanthracene	56553		U018	10
Benz[a]anthracene, 7,12-dimethyl-	57976		U094	1
Benzenamine (I,T)	62533		U012	5,000
Benzenamine, 3-(Trifluoromethyl)	98168	500		1
Benzenamine, 4,4'-carbonimidoylbis (N,N-dimethyl-	492808		U014	100
Benzenamine, 4-chloro-	106478		P024	1,000
Benzenamine, 4-chloro-2-methyl-, hydrochloride	3165933		U049	100

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Benzenamine, N,N-dimethyl-4-(phenylazo-)	60117		U093	10
Benzenamine, 2-methyl-	95534		U328	100
Benzenamine, 4-methyl-	106490		U353	100
Benzenamine, 4,4'-methylenebis(2-chloro-	101144		U158	10
Benzenamine, 2-methyl-, hydrochloride	636215		U222	100
Benzenamine, 2-methyl-5-nitro-	99558		U181	100
Benzenamine, 4-nitro-	100016		P077	5,000
Benzene (I,T)	71432		U109	10
Benzene, 1-(Chloromethyl)-4-Nitro-	100141	500/10,000		1
Benzeneacetic acid, 4-chloro-alpha-(4-chlorophenyl)-alpha-hydroxy-, ethyl ester	510156		U038	10
Benzene, 1-bromo-4-phenoxy-	101553		U030	100
Benzenearsonic Acid	98055	10/10,000		1
Benzenebutanoic acid, 4-[bis(2-chloroethyl)amino]-	305033		U035	10
Benzene, chloro-	108907		U037	100
Benzene, chloromethyl-	100447		P028	100
Benzenediamin, ar-methyl-	25376458		U221	10
	95807			
	496720			
	823405			
1,2-Benzenedicarboxylic acid, dioctyl ester	117840		U107	5,000
1,2-Benzenedicarboxylic acid, [bis(2-ethylhexyl)]-ester	117817		U028	100
1,2-Benzenedicarboxylic acid, dibutyl ester	84742		U069	10
1,2-Benzenedicarboxylic acid, diethyl ester	84662		U088	1,000
1,2-Benzenedicarboxylic acid, dimethyl ester	131113		U102	5,000
Benzene, 1,2-dichloro-	95501		U070	100
Benzene, 1,3-dichloro-	541731		U071	100
Benzene, 1,4-dichloro-	106467		U072	100

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Benzene, 1,1'-(2,2-dichloroethylidene)bis[4-chloro-	72548		U060	1
Benzene, dichloromethyl-	98873		U017	5,000
Benzene, 1,3-diisocyanotomethyl- (R,T)	584849		U223	100
	91087			
	264716254			
Benzene, dimethyl (I,T)	1330207		U239	100
m-Benzene, dimethyl	108383			1,000
o-Benzene, dimethyl	95476			1,000
p-Benzene, dimethyl	106423			100
1,3-Benzenediol	108463		U201	5,000
1,2-Benzenediol, 4-[1-hydroxy-2-(methylamino)ethyl]- (R) -	51434		P042	1,000
Benzeneethanamine, alpha, alpha-dimethyl-	122098		P046	5,000
Benzene, hexachloro-	118741		U127	10
Benzene, hexahydro- (I)	110827		U056	1,000
Benzene, hydroxy-	108952		U188	1,000
Benzene, methyl-	108883		U220	1,000
Benzene, 2-methyl-1,3-dinitro-	606202		U106	100
Benzene, 1-methyl-2,4-dinitro-	121142		U105	10
Benzene, 1-methylethyl- (I)	98828		U055	5,000
Benzene, nitro-	98953		U169	1,000
Benzene, pentachloro-	608935		U183	10
Benzene, pentachloronitro-	82688		U185	100
Benzenesulfonic acid chloride (C,R)	98099		U020	100
Benzenesulfonyl chloride	98099		U020	100
Benzene, 1,2,4,5-tetrachloro-	95943		U207	5,000
Benzenethiol	108985		P014	100
Benzene, 1,1'-(2,2,2-tri-chloroethylidene)bis[4-chloro-	50293		U061	1
Benzene, 1,1'-(2,2,2-trichloroethylidene) bis[4-methoxy-	72435		U247	1
Benzene, (trichloromethyl)-	98077		U023	10
Benzene, 1,3,5-trinitro-	99354		U234	10
Benzidine	92875		U021	1

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Benzimidazole, 4,5-Dichloro-2-(Trifluoromethyl)-	3615212	500/10,000		1
1,2-Benzisothiazol-3(2H)-one, 1,1-dioxide	81072		U202	100
Benzo[a]anthracene	56553		U018	10
Benzo[b]fluoranthene	205992			1
Benzo[k]fluoranthene	207089			5,000
Benzo[j,k]fluorene	206440		U120	100
1,3-Benzodioxole, 5-(1-propenyl)-	120581		U141	100
1,3-Benzodioxole, 5-(2-propenyl)-	94597		U203	100
1,3-Benzodioxole, 5-propyl-	94586		U090	10
Benzoic acid	65850			5,000
Benzonitrile	100470			5,000
Benzo[rst]pentaphene	189559		U064	10
Benzo[ghi]perylene	191242			5,000
2H-1-Benzopyran-2-one, 4-hydroxy-3-(3-oxo-1-phenyl-butyl)-, & salts, when present at concentrations greater than 0.3%	81812		P001	100
Benzo[a]pyrene	50328		U022	1
3,4-Benzopyrene	50328		U022	1
p-Benzoquinone	106514		U197	10
Benzotrichloride (C,R,T)	98077	500	U023	10
Benzoyl chloride	98884			1,000
1,2-Benzphenanthrene	218019		U050	100
Benzyl chloride	100447	500	P028	100
Benzyl cyanide	140294	500		1
Beryllium++	7440417		P015	10
Beryllium chloride	7787475			1
Beryllium fluoride	7787497			1
Beryllium nitrate	13597994			1
	7787555			
alpha-BHC	319846			10
beta-BHC	319857			1
delta-BHC	319868			1
gamma-BHC	58899		U129	1

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Bicyclo [2,2,1]Heptane-2-carbonitrile, 5-chloro-6-(((Methylamino)Carbonyl) Oxy)Imino)-,(1s-(1-alpha, 2-beta, 4-alpha, 5-alpha, 6E))-	15271417	500/10,000		1
2,2'-Bioxirane	1464535		U085	10
Biphenyl	92524			100
(1,1'-Biphenyl)-4,4'diamine	92875		U021	1
(1,1'-Biphenyl)-4,4'diamine, 3,3'dichloro-	91941		U073	1
(1,1'-Biphenyl)-4,4'diamine, 3,3'dimethoxy-	119904		U091	10
(1,1'-Biphenyl)-4,4'diamine, 3,3'dimethyl-	119937		U095	10
Bis(chloromethyl) ketone	534076	10/10,000		1
Bis(2-chloroethyl)ether	111444		U025	10
Bis(2-chloroethoxy)methane	111911		U024	1,000
Bis(2-ethylhexyl)phthalate	117817		U028	100
Bitoscanate	4044659	500/10,000		1
Boron trichloride	10294345	500		1
Boron trifluoride	7637072	500		1
Boron trifluoride compound with methyl ether (1:1)	353424	1,000		1
Bromoacetone	598312		P017	1,000
Bromadiolone	28772567	100/10,000		1
Bromine	7726956	500		1
Bromoform	75252		U225	100
4-Bromophenyl phenyl ether	101553		U030	100
Brucine	357573		P018	100
1,3-Butadiene	106990			10
1,3-Butadiene, 1,1,2,3,4,4-hexachloro-	87683		U128	1
1-Butanamine, N-butyl-N-nitroso-	924163		U172	10
1-Butanol	71363		U031	5,000
2-Butanone	78933		U159	5,000
2-Butanone peroxide (R,T)	1338234		U160	10
2-Butanone, 3,3-dimethyl-1-(methylthio)-, O[(methylamno)carbonyl] oxime	39196184		P045	100

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
2-Butenal	123739		U053	100
	4170303			
2-Butene, 1,4-dichloro- (I,T)	764410		U074	1
2-Butenoic acid, 2-methyl-, 7[[2,3-dihydroxy-2-(1-meth- oxyethyl)-3-methyl-1-oxobutoxy] methyl]-2,3,5,7a-tetrahydro-1H-pyrrolizin-1-yl ester, [1S-[1-alpha(Z),7(2S*,3R*), 7a-alpha]]-	303344		U143	10
Butyl acetate	123864			5,000
iso-Butyl acetate	110190			
sec-Butyl acetate	105464			
tert-Butyl acetate	540885			
n-Butyl alcohol (I)	71363		U031	5,000
Butylamine	109739			1,000
iso-Butylamine	78819			
sec-Butylamine	513495			
tert-Butylamine	13952846			
	75649			
Butyl benzyl phthalate	85687			100
n-Butyl phthalate	84742		U069	10
Butyric acid	107926			5,000
iso-Butyric acid	79312			
Cacodylic acid	75605		U136	1
Cadmium++ (2+)	7440439			10
Cadmium acetate	543908			10
Cadmium bromide	7789426			10
Cadmium chloride	10108642			10
Cadmium oxide	1306190	100/10,000		1
Cadmium stearate	2223930	1,000/10,000		1
Calcium arsenate	7778441	500/10,000		1
Calcium arsenite	52740166			1
Calcium carbide	75207			10
Calcium chromate	13765190		U032	10
Calcium cyanamide	156627			1,000
Calcium cyanide Ca(CN)2	592018		P021	10
Calcium dodecylbenzenesulfonate	26264062			1,000
Calcium hypochlorite	7778543			10

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Camphechlor	8001352	500/10,000		1
Camphene, octachloro-	8001352		P123	1
Cantharidin	56257	100/10,000		1
Carbachol chloride	51832	500/10,000		1
Caprolactum	105602			5,000
Captan	133062			10
Carbamic acid, ethyl ester	51796		U238	100
Carbamic acid, methylnitroso-, ethyl ester	615532		U178	1
Carbamic acid, Methyl-, 0-(((2,4-Dimethyl-1, 3-Dithiolan-2-yl)Methyllene)Amino)-	26419738	100/10,000		1
Carbamic chloride, dimethyl-	79447		U097	1
Carbamodithioic acid, 1,2-ethaneiylbis, salts & esters	111546		U114	5,000
Carbamothioic acid, bis(1-methylethyl)-, S-(2,3-dichloro-2-propenyl) ester	2303164		U062	100
Carbaryl	63252			100
Carbofuran	1563662	10/10,000		10
Carbon disulfide	75150	10,000	P022	100
Carbon oxyfluoride (R,T)	353504		U033	1,000
Carbon tetrachloride	56235		U211	10
Carbonic acid, dithallium(1+) salt	6533739		U215	100
Carbonic dichloride	75445		P095	10
Carbonic difluoride	353504		U033	1,000
Carbonochloridic acid, methyl ester	79221		U156	1,000
Carbonyl Sulfide	463581			100
Carbophenothion	786196	500		1
Catechol	120809			100
Chloral	75876		U034	5,000
Chlorambem	133904			100
Chlorambucil	305033		U035	10
Chlordane	57749	1,000	U036	1
Chlordane, alpha & gamma isomers	57749		U036	1
Chlordane, technical	57749		U036	1
Chlorfenvinfos	470906	500		1
Chlorinated champhene (Campheclor)	8001352			1

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Chlorine	7782505	100		10
Chlormephos	24934916	500		1
Chlormequat chloride	999815	100/10,000		1
Chlornaphazine	494031		U026	100
Choroacetaldehyde	107200		P023	1,000
Chloroacetophenone	532274			100
Chloroacetic acid	79118	100/10,000		100
p-Chloroaniline	106478		P024	1,000
Chlorobenzene	108907		U037	100
Chlorobenzilate	510156		U038	10
p-Chloro-m-cresol (4)	59507		U039	5,000
1-Chloro-2,3-epoxypropane	106898		U041	100
Chlorodibromomethane	124481			100
Chloroethane	75003			100
Chloroethanol	107073	500		1
Chloroethyl chlorofomate	627112	1,000		1
2-Chloroethyl vinyl ether	110758		U042	1,000
Chloroform	67663	10,000	U044	10
Chloromethane	74873		U045	100
Chloromethyl ether	542881	100	P016	1
Chloromethyl methyl ether	107302	100	U046	1
beta-Chloronaphthalene	91587		U047	5,000
2-Chloronaphthalene	91587		U047	5,000
Chlorophacinone	3691358	100/10,000		1
o-Chlorophenol (2)	95578		U048	100
4-Chlorophenyl phenyl ether	7005723			5,000
1-(o-Chlorophenyl)thiourea	5344821		P026	100
Chloroprene	126998			100
3-Chloropropionitrile	542767		P027	1,000
Chlorosulfonic acid	7790945			1,000
4-Chloro-o-toluidine, hydrochloride	3165933		U049	100
Chlorpyrifos	2921882			1
Chloroxuron	1982474	500/10,000		1
Chlorthiophos	21923239	500		1
Chromic acetate	1066304			1,000
Chromic acid	11115745			10
	7738945			
Chromic acid H_2CrO_4, calcium salt	13765190		U032	10

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Chromic chloride (Chromium chloride)	10025737	1/10,000		1
Chromic sulfate	10101538			1,000
Chromium++	7440473			5,000
Chromous chloride	10049055			1,000
Chrysene	218019		U050	100
Cobalt, ((2,2'-(1,2-ethanediylbis (Nitrilo-methylidyne))Bis(6-fluoro-phenolato))(2-)-N,N',O,O')-,	62207765	100/10,000		1
Cobaltous bromide	7789437			1,000
Cobalt carbonyl	10210681	10/10,000		1
Cobaltous formate	544183			1,000
Cobaltous sulfamate	14017415			1,000
Coke Oven Emissions	NA			1
Colchicine	64868	10/10,000		1
Copper++	7440508			5,000
Copper cyanide	544923		P029	10
Coumaphos	56724	100/10,000		10
Coumatetralyl	5836293	500/10,000		1
Creosote	8001589		U051	1
Cresol(s) (Phenol, Methyl)	1319773		U052	100
m-Cresol	108394	1,000/10,000		100
o-Cresol	95487			100
p-Cresol	106445			100
Cresylic acid	1319773		U052	100
m-Cresylic acid	108394			100
o-Cresylic acid	95487			100
p-Cresylic acid	106445			100
Crimidine	535897	100/10,000		1
Crotonaldehyde	123739	1,000	U053	100
	4170303	1,000		100
Cumene (I)	98828		U055	5,000
Cupric acetate	142712			100
Cupric acetoarsenite	12002038			1
Cupric chloride	7447394			10
Cupric nitrate	3251238			100
Cupric oxalate	5893663			100
Cupric sulfate	7758987			10

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Cupric sulfate, ammoniated	10380297			100
Cupric tartrate	815827			100
Cyanides (soluble salts and complexes) not otherwise specified	57125		P030	10
Cyanogen	460195		P031	100
Cyanogen bromide	506683	500/10,000	U246	1,000
Cyanogen chloride	506774		P033	10
Cyanogen iodide (Iodine cyanide)	506785	1,000/10,000		1
Cyanophos	2636262	1,000		1
Cyanuric fluoride	675149	100		1
2,5-Cyclohexadiene-1,4-dione	106514		U197	10
Cyclohexane (I)	110827		U056	1,000
Cyclohexane, 1,2,3,4,5,6-hexachloro, (1-alpha, 2-alpha, 3-beta, 4-alpha, 5-alpha, 6-beta)-	58899		U129	1
Cyclohexanone (I)	108941		U057	5,000
2-Cyclohexanone	131895		P034	100
Cycloheximide	66819	100/10,000		1
Cyclohexylamine	108918	10,000		1
1,3-Cyclopentadiene, 1,2,3,4,5,5-hexachloro-	77474		U130	10
Cyclophosphamide	50180		U058	10
2,4-D Acid	94757		U240	100
2,4-D Ester	94111			100
	94791			
	94804			
	1320189			
	1928387			
	1928616			
	1929733			
	2971382			
	25168267			
	53467111			
2,4-D, salts & esters (2,4-Dichlorophenoxyacetic Acid)	94757		U240	100
Daunomycin	20830813		U059	10
Decarborane(14)	17702419	500/10,000		1

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Demeton	8065483	500		1
Demeton-S-Methyl	919868	500		1
DDD, 4,4'DDD	72548		U060	1
DDE, 4,4'DDE	72559			1
DDT, 4,4'DDT	50293		U061	1
DEHP (Diethylhexyl phthalate)	117817		U028	100
Diallate	2303164		U062	100
Dialifor	10311849	100/10,000		1
Diazinon	333415			1
Diazomethane	334883			100
Dibenz[a,h]anthracene	53703		U063	1
1,2:5,6-Dibenzanthracene	53703		U063	1
Dibenzo[a,h]anthracene	53703		U063	1
Dibenzofuran	132649			100
Dibenz[a,i]pyrene	189559		U064	10
1,2-Dibromo-3-chloropropane	96128		U066	1
Dibromoethane	106934		U067	1
Diborane	19287457	100		1
Dibutyl phthalate	84742		U069	10
Di-n-butyl phthalate	84742		U069	10
Dicamba	1918009			1,000
Dichlobenil	1194656			100
Dichlone	117806			1
Dichlorobenzene	25321226			100
m-Dichlorobenzene (1,3)	541731		U071	100
o-Dichlorobenzene (1,2)	95501		U070	100
p-Dichlorobenzene (1,4)	106467		U072	100
3,3'-Dichlorobenzidine	91941		U073	1
Dichlorobromomethane	75274			5,000
1,4-Dichloro-2-butene (I,T)	764410		U074	1
Dichlorodifluoromethane	75718		U075	5,000
1,1-Dichloroethane	75343		U076	1,000
1,2-Dichloroethane	107062		U077	100
1,1-Dichloroethylene	75354		U078	100
1,2-Dichloroethylene	156605		U079	1,000
Dichloroethyl ether	11444	10,000	U025	10
Dichloroisopropyl ether	108601		U027	1,000
Dichloromethoxy ethane	111911		U024	1,000

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Dichloromethyl ether	542881		P016	1
Dichloromethylphenylsilane	149746	1,000		1
2,4-Dichlorophenol	120832		U081	100
2,6-Dichlorophenol	87650		U082	100
Dichlorophenylarsine	696286		P036	1
Dichloropropane	26638197			1,000
1,1-Dichloropropane	78999			
1,3-Dichloropropane	142289			
1,2-Dichloropropane	78875		U083	1,000
Dichloropropane--Dichloropropene (mixture)	8003198			100
Dichloropropene	26952238			100
2,3-Dichloropropene	78886			
1,3-Dichloropropene	542756		U084	100
2,2-Dichloropropionic acid	75990			5,000
Dichlorvos	62737	1,000		10
Dicofol	115322			10
Dicrotophos	141662	100		1
Dieldrin	60571		P037	1
1,2:3,4-Diepoxybutane (I,T)	1464535	500	U085	10
Diethanolamine	111422			100
Diethyl chlorophosphate	814493	500		1
Diethylamine	109897			1,000
Diethylarsine	692422		P038	1
Diethylcarbmazine citrate	1642542	100/10,000		1
1,4-Diethylenedioxide	123911		U108	100
Diethylhexyl phthalate	117817		U028	100
N,N-Diethylaniline	91667			1,000
N,N'-Diethylhydrazine	1615801		U086	10
O,O-Diethyl S-methyl dithiophosphate	3288582		U087	5,000
Diethyl-p-nitrophenyl phosphate	311455		P041	100
Diethyl phthalate	84662		U088	1,000
O,O-Diethyl O-pyrazinyl phosphorothioate	297972		P040	100
Diethylstilbestrol	56531		U089	1
Diethyl sulfate	64675			10
Digitoxin	71636	100/10,000		1
Diglycidyl ether	2238075	1,000		1

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Digoxin	20830755	10/10,000		1
Dihydrosafrole	94586		U090	10
Diisopropyfluorophosphate	55914		P043	100
Diisopropylfluorophosphate, 1,4,5,8-Dimethanonaphthalene, 1,2,3,4,10,10-10-hexachloro-1,4,4a,5,8,8a-hexahydro-, (1-alpha, 4-alpha, 4a-beta, 5-alpha, 8-alpha, 8a-beta)-	309002		P004	1
1,4,5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro, (1-alpha, 4-alpha, 4a-beta, 5a-beta, 8-beta, 8a-beta)-	465736		P060	1
2,7:3,6-Dimethanonaphth[2,3 b]oxirene,3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-,(1a-alpha, 2-beta, 2a-alpha, 3-beta, 6-beta, 6a-alpha, 7beta, 7aalpha)-	60571		P037	1
2,7:3,6 Dimethanonaphth[2,3-b]oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octa-hydro-, (1a-alpha, 2-beta, 2a-beta, 3-alpha, 6-alpha, 6a-beta, 7-beta, 7a-alpha)-	72208		P051	1
Dimethoate	60515		P044	10
3,3'-Dimethoxybenzidine	119904		U091	10
Dimefox	115264	500		1
Dimethoate	60515	500/10,000		10
Dimethyl Phosphorochloridothioate	2524030	500		1
Dimethyl sulfate	77781	500		100
Dimethylamine (I)	124403		U092	1,000
p-Dimethylaminoazobenzene	60117		U093	10
7,12-Dimethylbenz[a]anthracene	57976		U094	1
3,3'-Dimethylbenzidine	119937		U095	10
alpha,alpha-Dimethylbenzylhydroperoxide(R)	80159		U096	10
Dimethylcarbamoyl chloride	79447		U097	1
Dimethylformamide	68122			100
Dimethyldichlorosilane	75785	500		1
1,1-Dimethylhydrazine	57147	1,000	U098	10

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
1,2-Dimethylhydrazine	540738		U099	1
alpha, alpha-Dimethylphenethylamine	122098		P046	5,000
Dimethyl-p-phenylenediamine	99989	10/10,000		1
2,4-Dimethylphenol	105679		U101	100
Dimethyl phthalate	131113		U102	5,000
Dimethyl sulfate	77781		U103	100
Dimetilan	644644	500/10,000		1
Dinitrobenzene (mixed)	25154545			100
m-Dinitrobenzene	99650			
o-Dinitrobenzene	528290			
p-Dinitrobenzene	100254			
4,6-Dinitro-o-cresol and salts	534521	10/10,000	P047	10
Dinitrophenol	25550587			10
2,5-Dinitrophenol	329715			
2,6-Dinitrophenol	573568			
2,4-Dinitrophenol	51285		P048	10
Dinitrotoluene	25321146			10
3,4-Dinitrotoluene	610399			
2,4-Dinitrotoluene	121142		U105	10
2,6-Dinitrotoluene	606202		U106	100
Dinoseb	88857	100/10,000	P020	1,000
Dinoterb	1420071	500/10,000		1
Di-n-octyl phthalate	117840		U107	5,000
1,4-Dioxane	123911		U108	100
Dioxathion	78342	500		1
Diphacinone	82666	10/10,000		1
1,2-Diphenylhydrazine	122667		U109	10
Diphosphoramide, octamethyl-	152169	100	P085	100
Diphosphoric acid, tetraethyl ester	107493		P111	10
Dipropylamine	142847		U110	5,000
Di-n-propylnitrosamine	621647		U111	10
Diquat	85007			1,000
	2764729			
Disulfoton	298044	500	P039	1
Dithiazanine iodide	514738	500/10,000		1
Dithiobiuret	541537	100/10,000	P049	100
Diuron	330541			100
Dodecylbenzenesulfonic acid	27176870			1,000

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Emetine, Dihydrochloride	316427	1/10,000		1
Endosulfan	115297	10/10,000	P050	1
alpha-Endosulfan	959988			1
beta-Endosulfan	33213659			1
Endosulfant sulfate	1031078			1
Endothall	145733		P088	1,000
Endothion	2778043	500/10,000		1
Endrin	72208	500/10,000	P051	1
Endrin aldehyde	7421934			1
Endrin & metabolites	72208		P051	1
Epichlorohydrin	106898	1,000	U041	100
Epinephrine	51434		P042	1,000
EPN	2104645	100/10,000		1
1,2-Epoxybutane	106887			100
Ergocalciferol	50146	1,000/10,000		1
Ergotamine tartrate	379793	500/10,000		1
Ethanal	75070		U001	1,000
Ethanamine, N-ethyl-N-nitroso-	55185		U174	1
1,2-Ethanediamine, N,N-dimethyl-N'-2-pyridinyl-N'-(2-thienylmethyl)-	91805		U155	5,000
Ethane, 1,2-dibromo-	106934		U067	1
Ethane, 1,1-dichloro-	75343		U076	1,000
Ethane, 1,2-dichloro-	107062		U077	100
Ethanedinitrile	460195		P031	100
Ethane, hexachloro-	67721		U131	100
Ethane, 1,1'-[methylenebis(oxy)]bis(2-chloro-	111911		U024	1,000
Ethane, 1,1'-oxybis-	60297		U117	100
Ethane, 1,1'-oxybis(2-chloro-	111444		U025	10
Ethane, pentachloro-	76017		U184	10
Ethanesulfonyl chloride, 2-chloro	1622328	500		1
Ethane, 1,1,1,2-tetrachloro-	630206		U208	100
Ethane, 1,1,2,2-tetrachloro-	79345		U209	100
Ethanethioamide	62555		U218	10
Ethane, 1,1,1-trichloro-	71556		U226	1,000
Ethane, 1,1,2-trichloro-	79005		U227	100

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Ethanimidothioic acid, N-[[(methylamino) carbonyl]oxy]-, methyl ester	16752775		P066	100
Ethanol, 1,2-Dichloro-, acetate	10140871	1,000		1
Ethanol, 2-ethoxy-	110805		U359	1,000
Ethanol, 2,2'-(nitrosoimino)bis-	1116547		U173	1
Ethanone, 1-phenyl-	98862		U004	5,000
Ethene, chloro-	75014		U043	1
Ethene, 2-chloroethoxy-	110758		U042	1,000
Ethene, 1,1-dichloro-	75354		U078	100
Ethene, 1,2-dichloro- (E)	156605		U079	1,000
Ethene, tetrachloro-	127184		U210	100
Ethene, trichloro-	79016		U228	100
Ethion	563122	1,000		10
Ethoprophos	13194484	1,000		1
Ethyl acetate (I)	141786		U112	5,000
Ethyl acrylate (I)	140885		U113	1,000
Ethylbenzene	100414			1,000
Ethylbis(2-Chloroethyl)amine	538078	500		1
Ethyl carbamate (urethane)	51796		U238	100
Ethyl chloride	75003			100
Ethyl cyanide	107120		P101	10
Ethylenebisdithiocarbamic acid, salts & esters	111546		U114	5,000
Ethylenediamine	107153			5,000
Ethylenediamine-tetraacetic acid (EDTA)	60004			5,000
Ethylene dibromide	106934		U067	1
Ethylene dichloride	107062		U077	100
Ethylene fluorohydrin	371620	10		1
Ethylene glycol	107211			5,000
Ethylene glycol monoethyl ether	110805		U359	1,000
Ethylene oxide (I,T)	75218	1,000	U115	10
Ethylenediamine	107153	10,000		5,000
Ethylenethiourea	96457		U116	10
Ethyleneimine	151564	500	P054	1
Ethyl ether (I)	60297		U117	100
Ethylthiocyanate	542905	10,000		1

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Ethylidene dichloride	75343		U076	1,000
Ethyl methacrylate	97632		U118	1,000
Ethyl methanesulfonate	62500		U119	1
Famphur	52857		P097	1,000
Fenamlphos	22224926	10/10,000		1
Fenltrothion	122145	500		1
Fensulfothion	115902	500		1
Ferric ammonium citrate	1185575			1,000
Ferric ammonium oxalate	2944674			1,000
	55488874			
Ferric chloride	7705080			1,000
Ferric fluoride	7783508			100
Ferric nitrate	10421484			1,000
Ferric sulfate	10028225			1,000
Ferrous ammonium sulfate	10045893			1,000
Ferrous chloride	7758943			100
Ferrous sulfate	7720787			1,000
	7782630			
Fluenetil	4301502	100/10,000		1
Fluoranthene	206440		U120	100
Fluorene	86737			5,000
Fluorine	7782414	500	P056	10
Fluoroacetamide	640197	100/10,000	P057	100
Fluoracetic acid	144490	10/10,000		1
Fluoroacetic acid, sodium salt	62786		P058	10
Fluoroacetyl chloride	359068	10		1
Fluorouracil	51218	500/10,000		1
Fonofos	944229	500		1
Formaldehyde	50000	500	U122	100
Formaldehyde cyanohydrin	107164	1,000		1
Formetanate hydrochloride	23422539	500/10,000		1
Formothion	2540821	100		1
Formparanate	17702577	100/10,000		1
Formic acid (C,T)	64186		U123	5,000
Fosthletan	21548323	500		1
Fubendazole	3878191	100/10,000		1
Fulminic acid, mercury(2^{-}) salt (R,T)	628864		P065	10
Fumaric acid	110178			5,000

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Furan (I)	110009	500	U124	100
Furan, tetrahydro- (I)	109999		U213	1,000
2-Furancarboxaldehyde (I)	98011		U125	5,000
2,5-Furandione	108316		U147	5,000
Furfural (I)	98011		U125	5,000
Furfuran (I)	110009		U124	100
Gallium trichloride	13450903	500/10,000		1
Glucopyranose, 2-deoxy-2-(3-methyl-3-nitrosoureido)-	18883664		U206	1
D-Glucose, 2-deoxy-2-[[(methylnitrosoamino)-carbonyl]amino]-	18883664		U206	1
Glycidylaldehyde	765344		U126	10
Guanidine, N-methyl-N'-nitro-N-nitroso-	70257		U163	10
Guthion	86500			1
Heptachlor	76448		P059	1
Heptachlor epoxide	1024573			1
Hexachlorobenzene	118741		U127	10
Hexachlorobutadiene	87683		U128	1
Hexachlorocyclohexane (gamma isomer)	58899		U129	1
Hexachlorocyclopentadiene	77474	100	U130	10
Hexachloroethane	67721		U131	100
Hexachlorophene	70304		U132	100
Hexachloropropene	1888717		U243	1,000
Hexaethyl tetraphosphate	757584		P062	100
Hexamethylene-1, 6-diisocyanate	822060			100
Hexamethylphosphoramide	680319			1
Hexamethylenediamine, N,N'-Dibutyl	4835114	500		1
Hexane	110543			5,000
Hexone (Methyl isobutyl ketone)	108101		U161	5,000
Hydrazine (R,T)	302012	1,000	U133	1
Hydrazine, 1,2-diethyl-	1615801		U086	10
Hydrazine, 1,1-dimethyl-	57147		U098	10
Hydrazine, 1,2-dimethyl-	540738		U099	1
Hydrazine, 1,2-diphenyl-	122667		U109	10
Hydrazine, methyl-	60344		P068	10

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Hydrazinecarbothioamide	79196		P116	100
Hydrochloric acid	7647010			5,000
Hydrocyanic acid	74908	100	P063	10
Hydrofluoric acid	7664393		U134	100
Hydrogen chloride (gas only)	7647010	500		5,000
Hydrogen cyanide	74908		P063	10
Hydrogen fluoride	7664393	100	U134	100
Hydrogen peroxide (Conc. >52%)	7722841	1,000		1
Hydrogen phosphide	7803512		P096	100
Hydrogen selenide	7783075	10		1
Hydrogen sulfide	7783064	500	U135	100
Hydroperoxide, 1-methyl-1-phenylethyl-	80159		U096	10
Hydroquinone	123319	500/10,000		100
2-Imidazolidinethione	96457		U116	10
Indeno(1,2,3-cd)pyrene	193395		U137	100
Iodomethane	74884		U138	100
Iron, Pentacarbonyl-	13463406	100		1
Isobenzan	297789	100/10,000		1
1,3-Isobenzofurandione	85449		U190	5,000
Isobutyronitrile	78820	1,000		1
Isobutyl alcohol (I,T)	78831		U140	5,000
Isocyanic acid, 3,4-Dichlorophenyl ester	102363	500/10,000		1
Isodrin	465736	100/10,000	P060	1
Isofluorphate	55914	100		100
Isophorone	78591			5,000
Isophorone Diisocyanate	4098719	100		1
Isoprene	78795			100
Isopropanolamine dodecylbenzene sulfonate	42504461			1,000
Isopropyl chloroformate	108236	1,000		1
Isopropylmethylpryrazolyl dimethylcarbamate	119380	500		1
Isosafrole	120581		U141	100
3(2H)-Isoxazolone, 5-(aminomethyl)-	2763964		P007	1,000
Kepone	143500		U142	1
Lactonitrile	78977	1,000		1

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Lasiocarpine	303344		U143	10
Lead acetate	301042		U144	#
Lead arsenate	7784409			1
	7645252			
	10102484			
Lead, bis(acetato-O)tetrahydroxytri	1335326		U146	10
Lead chloride	7758954			10
Lead fluoborate	13814965			10
Lead fluoride	7783462			10
Lead iodide	10101630			10
Lead nitrate	10099748			10
Lead phosphate	7446277		U145	10
Lead stearate	7428480			10
	1072351			
	52652592			
	56189094			
Lead subacetate	1335326		U146	10
Lead sulfate	15739807			10
	7446142			
Lead sulfide	1314870			10
Lead thiocyanate	592870			10
Leptophos	21609905	500/10,000		1
Lewisite	541253	10		1
Lindane	58899	1,000/10,000	U129	1
Lithium chromate	14307358			10
Lithium hydride	7580678	100		1
Malathion	121755			100
Maleic acid	110167			5,000
Maleic anhydride	108316		U147	5,000
Maleic hydrazide	123331		U148	5,000
Malononitrile	109773	500/10,000	U149	1,000
Manganese, tricarbonyl methylcyclopentadienyl	12108133	100		1
MDI (Methylene diphenyl diisocyanate)	101688			5,000
Mechlorethamine	51752	10		1
MEK (Methyl ethyl ketone)	78933		U159	5,000
Melphalan	148823		U150	1

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Mephosfolan	950107	500		1
Mercaptodimethur	2032657			10
Mercuric acetate	1600277	500/10,000		1
Mercuric chloride	7487947	500/10,000		1
Mercuric cyanide	592041			1
Mercuric nitrate	10045940			10
Mercuric oxide	21908532	500/10,000		1
Mercuric sulfate	7783359			10
Mercuric thiocyanate	592858			10
Mercurous nitrate	10415755			10
	7782867			
Mercury	7439976		U151	1
Mercury (acetate-O)phenyl-	62384		P092	100
Mercury fulminate	628864		P065	10
Methacrolein diacetate	10476956	1,000		1
Methacrylic anhydride	760930	500		1
Methacrylonitrile (I,T)	126987	500	U152	1,000
Methacryloyl chloride	920467	100		1
Methacryloyloxyethyl isocyanate	30674807	100		1
Methamidophos	10265926	100/10,000		1
Methanamine, N-methyl-	124403		U092	1,000
Methanamine, N-methyl-N-nitroso-	62759		P082	10
Methane, bromo-	74839		U029	1,000
Methane, chloro- (I,T)	74873		U045	100
Methane, chloromethoxy-	107302		U046	1
Methane, dibromo-	74953		U068	1,000
Methane, dichloro-	75092		U080	1,000
Methane, dichlorodifluoro-	75718		U075	5,000
Methane, iodo-	74884		U138	100
Methane, isocyanato-	624839		P064	10
Methane, oxybis(chloro-	542881		P016	1
Methanesulfenyl chloride, trichloro-	594423		P118	100
Methanesulfonyl fluoride	558258	1,000		1
Methanesulfonic acid, ethyl ester	62500		U119	1
Methane, tetrachloro-	56235		U211	10
Methane, tetranitro- (R)	509148		P112	10
Methane, tribromo-	75252		U225	100
Methane, trichloro-	67663		U044	10

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Methane, trichlorofluoro-	75694		U121	5,000
Methanethiol (I,T)	74931		U153	100
6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10, 10-hexa-chloro-1,5,5a,6,9,9a-hexahydro-, 3-oxide	115297		P050	1
1,3,4-Metheno-2H-cyclobutal[cd]pentalen-2-one,1,1a,3,3a,4,5,5a,5b,6-decachloroctahydro-	143500		U142	1
4,7-Methano-1H-indene, 1,4,5,6,7,8,8 heptachloro-3a,4,7,7a-tetrahydro-	76448		P059	1
4,7-Methano-1H-indene, 1,2,4,5,6,7,8,8 octachloro-2,3,3a,4,7,7a-hexahydro-	57749		U036	1
Methanol (I)	67561		U154	5,000
Methapyrilene	91805		U155	5,000
Methidathion	950378	500/10,000		1
Methiocarb	2032657	500/10,000	P199	10
Methomyl	16752775	500/10,000	P066	100
Methoxychlor	72435		U247	1
Methoxyethylmercuric acetate	151382	500/10,000		1
Methyl alcohol (I)	67561		U154	5,000
Methyl aziridine	75558		P067	1
Methyl bromide	74839	1,000	U029	1,000
1-Methylbutadiene (I)	504609		U186	100
Methyl chloride (I,T)	74873		U045	100
Methyl 2-chloroacrylate	80637	500		1
Methyl chlorocarbonate (I,T)	79221		U156	1,000
Methyl chloroform	71556		U226	1,000
Methyl chloroformate	79221	500	U156	1,000
3-Methylcholanthrene	56495		U157	10
4,4'-Methylenebis(2-chloroaniline)	101144		U158	10
Methylene bromide	74953		U068	1,000
Methylene chloride	75092		U080	1,000
4,4’-Methylenedianiline	101779			10
Methylene diphenyl diisocyanate (MDI)	101688			5,000
Methyl ethyl ketone (MEK) (I,T)	78933		U159	5,000

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Methyl ethyl ketone peroxide (R,T)	1338234		U160	10
Methyl hydrazine	60344	500	P068	10
Methyl iodide	74884		U138	100
Methyl isobutyl ketone	108101		U161	5,000
Methyl isocyanate	624839	500	P064	10
Methyl isothiocyanate	556616	500		1
2-Methyllactonitrile	75865		P069	10
Methyl mercaptan	74931	500	U153	100
Methyl methacrylate (I,T)	80626		U162	1,000
Methyl parathion	298000		P071	100
Methyl phenkapton	3735237	500		1
Methyl phosphonic dichloride	676971	100		1
4-Methyl-2-pentanone (I)	108101		U161	5,000
Methyl tert-butyl ether	1634044			1,000
Methyl thiocyanate	556649	10,000		1
Methylthiouracil	56042		U164	10
Methyl vinyl ketone	78944	10		1
Methylmercuric dicyanamide	502396	500/10,000		1
Methyltrichlorosilane	75796	500		1
Metolcarb	1129415	100/10,000		1
Mevinphos	7786347	500		10
Mexacarbate	315184	500/10,000		1,000
Mitomycin C	50077	500/10,000	U010	10
MNNG	70257		U163	10
Monocrotophos	6923224	10/10,000		1
Monoethylamine	75047			100
Monomethylamine	74895			100
Muscimol	2763964	500/10,000	P007	1,000
Mustard gas	505602	500		1
Naled	300765			10
5,12-Naphthaacenedione, 8-acetyl-10-[3 amino-2,3,6-tri-deoxy-alpha-L-lyxo-hexopyranosyl)oxy]-7,8,9,10-tetrahydro-6,8,11-trihydroxy-1-methoxy-, (8S-cis)-	20830813		U059	10
1-Naphthalenamine	134327		U167	100
2-Naphthalenamine (beta-Naphthylamine)	91598		U168	1

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Naphthalenamine, N,N'-bis(2-chloroethyl)-	494031		U026	100
Naphthalene	91203		U165	100
Naphthalene, 2-chloro-	91587		U047	5,000
1,4-Naphthalenedione	130154		U166	5,000
2,7-Naphthalenedisulfonic acid, 3,3' [(3,3'-dimethyl-(1,1'-biphenyl)-4,4'-dryl)-bis(azo)] bis(5-amino-4-hydroxy)-tetrasodium salt	72571		U236	10
Naphthenic acid	1338245			100
1,4-Naphthoquinone	130154		U166	5,000
alpha-Naphthylamine	134327		U167	100
beta-Naphthylamine (2-Naphthalenamine)	91598		U168	1
alpha-Naphthylthiourea	86884		P072	100
Nickel++	7440020			100
Nickel ammonium sulfate	15699180			100
Nickel carbonyl	13463393	1	P073	10
Nickel carbonyl Ni(CO)4, (T-4)-	13463393		P073	10
Nickel chloride	7718549			100
	37211055			
Nickel cyanide	557197		P074	10
Nickel hydroxide	12054487			10
Nickel nitrate	14216752			100
Nickel sulfate	7786814			100
Nicotine & salts	54115	100	P075	100
Nicotine sulfate	65305	100/10,000		1
Nitric acid	7697372	1,000		1,000
Nitric acid, thallium(1+) salt	10102451		U217	100
Nitric oxide	10102439	100	P076	10
p-Nitroaniline	100016		P077	5,000
Nitrobenzene (I,T)	98953	10,000	U169	1,000
4-Nitrobiphenyl	92933			10
Nitrocyclohexane	1122607	500		1
Nitrogen dioxide	10102440	100	P078	10
	10544726			
Nitrogen oxide	10102439		P076	10
Nitroglycerine	55630		P081	10

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Nitrophenol (mixed)	25154556			100
m-Nitrophenol	554847			100
o-Nitrophenol (2)	88755			100
p-Nitrophenol (4)	100027		U170	100
2-Nitropropane (I,T)	79469		U171	10
N-Nitrosodi-n-butylamine	924163		U172	10
N-Nitrosodiethanolamine	1116547		U173	1
N-Nitrosodiethylamine	55185		U174	1
N-Nitrosodimethylamine	62759	1,000	P082	10
N-Nitrosodiphenylamine	86306			100
N-Nitroso-N-ethylurea	759739		U176	1
N-Nitroso-N-methylurea	684935		U177	1
N-Nitroso-N-methylurethane	615532		U178	1
N-Nitrosomethylvinylamine	4549400		P084	10
N-Nitrosomorpholine	59892			1
N-Nitrosopiperidine	100754		U179	10
N-Nitrosopyrrolidine	930552		U180	1
Nitrotoluene	1321126			1,000
m-Nitrotoluene	99081			
o-Nitrotoluene	88722			
p-Nitrotoluene	99990			
5-Nitro-o-toluidine	99558		U181	100
Norbromide	991424	100/10,000		1
Octamethylpyrophosphoramide	152169		P085	100
Organorhodium complex (PMN-82-147)	0	10/10,000		1
Osmium tetroxide	20816120		P087	1,000
Ouabain	630604	100/10,000		1
7-Oxabicyclo[2,2,1]heptane-2,3-dicarboxylic acid	145733		P088	1,000
Oxamyl	23135220	100/10,000	P194	1
1,2-Oxathiolane, 2,2-dioxide	1120714		U193	10
2H-1,3,2-Oxazaphosphorin-2-amine, N,N bis (2-chloroethyl)tetrahydro-, 2-oxide	50180		U058	10
Oxetane, 3,3-bis(chloromethyl)-	78717	500		1
Oxirane (I,T)	75218		U115	10
Oxiranecarboxyaldehyde	765344		U126	10

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Oxirane, (chloromethyl)-	106898		U041	100
Oxydisulfoton	2497076	500		1
Ozone	10028156	100		1
Paraformaldehyde	30525894			1,000
Paraldehyde	123637		U182	1,000
Paraquat	1910425	10/10,000		1
Paraquat methosulfate	2074502	10/10,000		1
Parathion	56382	100	P089	10
Parathion-methyl	298000	100/10,000		100
Paris green	12002038	500/10,000		100
PCBs	1336363			
Aroclor 1016	12674112			1
Aroclor 1221	11104282			1
Aroclor 1232	11141165			1
Aroclor 1242	53469219			1
Aroclor 1248	12672296			1
Aroclor 1254	11097691			1
Aroclor 1260	11096825			1
PCNB (Pentachloronitrobenzene)	82688		U185	100
Pentaborane	19624227	500		1
Pentachlorobenzene	608935		U183	10
Pentachloroethane	76017		U184	10
Pentachlorophenol	87865		U242	10
Pentachloronitrobenzene (PCNB)	82688		U185	100
Pentadecylamine	2570265	100/10,000		1
Paracetic acid	79210	500		1
1,3-Pentadiene (I)	504609		U186	100
Perachloroethylene	127184		U210	100
Perchloromethylmercaptan	594423	500		100
Phenacetin	62442		U187	100
Phenanthrene	85018			5,000
Phenol	108952	500/10,000	U188	1,000
Phenol, 2-chloro-	95578		U048	100
Phenol, 4-chloro-3-methyl-	59507		U039	5,000
Phenol, 2-cyclohexyl-4,6-dinitro-	131895		P034	100
Phenol, 2,4-dichloro-	120832		U081	100
Phenol, 2,6-dichloro-	87650		U082	100

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Phenol, 4,4'-(1,2-diethyl-1,2-ethenediyl)bis-, (E)	56531		U089	1
Phenol, 2,4-dimethyl-	105679		U101	100
Phenol, 2,4-dinitro-	51285		P048	10
Phenol, methyl-	1319773		U052	1,000
m-Cresol	108394			
o-Cresol	95487			
p-Cresol	106445			
Phenol, 2-methyl-4,6-dinitro-and salts	534521		P047	10
Phenol, 2,2'-methylenebis[3,4,6-trichloro-	70304		U132	100
Phenol, 2,2'-thiobis(4-chloro-6-methyl)-	4418660	100/10,000		1
Phenol, 2-(1-methylpropyl)-4,6-dinitro	88857		P020	1,000
Phenol, 3-(1-methylethyl)-, methylcarbamate	64006	500/10,000		1
Phenol, 4-nitro-	100027		U170	100
Phenol, pentachloro-	87865		U242	10
Phenol, 2,3,4,6-tetrachloro-	58902		U212	10
Phenol, 2,4,5-trichloro-	95954		U230	10
Phenol, 2,4,6-trichloro-	88062		U231	10
Phenol, 2,4,6-trinitro-, ammonium salt	131748		P009	10
Phenoxarsine, 10,10'-oxydi-	58366	500/10,000		1
L-Phenylalanine, 4-[bis(2-chloroethyl)aminol]	148823		U150	1
Phenyl dichloroarsine	696286	500		1
1,10-(1,2-Phenylene)pyrene	193395		U137	100
p-Phenylenediamine	106503			5,000
Phenylhydrazine hydrochloride	59881	1,000/10,000		1
Phenylmercury acetate	62384	500/10,000	P092	100
Phenylsilatrane	2097190	100/10,000		1
Phenylthiourea	103855	100/10,000	P093	100
Phorate	298022	10	P094	10
Phosacetim	4104147	100/10,000		1
Phosfolan	947024	100/10,000		1
Phosgene	75445	10	P095	10
Phosmet	732116	10/10,000		1
Phosphamidon	13171216	100		1

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Phosphine	7803512	500		100
Phosphorothioic acid, o,o-Dimethyl-s (2-Methylthio) ethyl ester	2587908	500		1
Phosphorothioic acid, methyl-, o-ethyl o-(4-(methylthio)phenyl) ester	2703131	500		1
Phosphorothioic acid, methyl-, s-(2-(bis(1-methylethyl)amino)ethyl o-ethyl ester	50782699	100		1
Phosphorothioic acid, methyl-, 0-(4-nitrophenyl) o-phenyl ester	2665307	500		1
Phosphoric acid	7664382			5,000
Phosphoric acid, diethyl 4-nitrophenyl ester	311455		P041	100
Phosphoric acid, dimethyl 4-(methylthio) phenyl ester	3254635	500		1
Phosphoric acid, lead(2+) salt (2:3)	7446277	500	U145	10
Phosphorodithioic acid, O,O-diethyl S-[2 (ethylthio)ethyl]ester	298044		P039	1
Phosphorodithioic acid, O,O-diethyl S-(ethylthio), methyl ester	298022		P094	10
Phosphorodithioic acid, O,O-diethyl S-methyl ester	3288582		U087	5,000
Phosphorodithoic acid, O,O-dimethyl S-[2(methyl-amino)-2-oxoethyl] ester	60515		P044	10
Phosphorofluondic acid, bis(1-methylethyl) ester	55914		P043	100
Phosphorothioic acid, O,O-diethyl O-(4-nitrophenyl) ester	56382		P089	10
Phosphorothioic acid, O,[4-[(dime-thylamino)sulfonyl]phenyl]O,O-dimethyl ester	52857		P097	1,000
Phosphorothioic acid, O,O-dimethyl O-(4-nitrophenyl) ester	298000		P071	100
Phosphorothioic acid, 0,0-diethyl 0 pyrazinyl ester	297972		P040	100
Phosphorus	7723140	100		1
Phosphorus oxychloride	10025873	500		1,000
Phosphorous pentachloride	10026138	500		1
Phosphorus pentasulfide (R)	1314803		U189	100

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Phosphorus pentoxide	1314563	10		1
Phosphorus trichloride	7719122	1,000		1,000
Phthalic anhydride	85449		U190	5,000
Physostigmine	57476	100/10,000	P204	1
Phosostigmine, salicylate (1:1)	57647	100/10,000		1
2-Picoline	109068		U191	5,000
Picotoxin	124878	500/10,000		1
Piperidine	110894	1,000		1
Piperidine, 1-nitroso-	100754		U179	10
Pirimifos-ethyl	23505411	1,000		1
Plumbane, tetraethyl-	78002		P110	10
Polychlorinated biphenyls (See PCBs or Aroclor)	1336363			1
Potassium arsenate	7784410			1
Potassium arsenite	10124502	500/10,000		1
Potassium bichromate	7778509			10
Potassium chromate	7789006			10
Potassium cyanide	151508	100	P098	10
Potassium hydroxide	1310583			1,000
Potassium permanganate	7722647			100
Potassium silver cyanide	506616	500	P099	1
Promecarb	2631370	500/10,000		1
Pronamide	23950585		U192	5,000
Propanal, 2-methyl-2-(methylthio)-, O-[(methylamino)carbonyl]oxime	116063		P070	1
1-Propanamine (I,T)	107108		U194	5,000
1-Propanamine, N-propyl-	142847		U110	5,000
1-Propanamine, N-nitroso-N-propyl-	621647		U111	10
Propane, 1,2-dibromo-3-chloro	96128		U066	1
Propane, 2-nitro- (I,T)	79469		U171	10
1,3-Propane sultone	1120714		U193	10
Propane 1,2-dichloro-	78875		U083	1,000
Propanedinitrile	109773		U149	1,000
Propanenitrile	107120		P101	10
Propanenitrile, 3-chloro-	542767		P027	1,000
Propanenitrile, 2-hydroxy-2-methyl-	75865		P069	10
Propane, 2,2'-oxybis[2-chloro-	108601		U027	1,000

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
1,2,3-Propanetnol, trinitrate- (R)	55630		P081	10
1-Propanol, 2,3-dibromo-, phosphate (3:1)	126727		U235	10
1-Propanol, 2-methyl- (I,T)	78831		U140	5,000
2-Propanone (I)	67641		U002	5,000
2-Propanone, 1-bromo-	598312		P017	1,000
Propargite	2312358			10
Propargyl alcohol	107197		P102	1,000
Propargyl bromide	106967	10		1
2-Propenal	107028		P003	1
2-Propenamide	79061		U007	5,000
1-Propene, 1,1,2,3,3,3-hexachloro-	1888717		U243	1,000
1-Propene, 1,3-dichloro-	542756		U084	100
2-Propenenitrile	107131		U009	100
2-Propenenitrile, 2-methyl- (I,T)	126987		U152	1,000
2-Propenoic acid (I)	79107		U008	5,000
2-Prepenoic acid, ethyl ester (I)	140885		U113	1,000
2-Prepenoic acid, 2-methyl-, ethyl ester	97632		U118	1,000
2-Prepenoic acid, 2-methyl-, methyl ester (I,T)	80626		U162	1,000
2-Propen-1-o1	107186		P005	100
Propiolactone, beta-	57578	500		1
Propionaldehyde	123386			1,000
Propionic acid	79094			5,000
Propionic acid, 2-(2,4,5-trichlorophenoxyl)-	93721		U233	100
Propionic anhydride	123626			5,000
Propoxor (Baygon)	114261		U411	100
Propionitrile	107120	500		10
Propionitrile, 3-chloro-	542767	1,000		1,000
Propiophenone, 1, 4-amino phenyl	70699	100/10,000		1
n-Propylamine	107108		U194	5,000
Propyl chloroformate	109615	500		1
Propylene dichloride	78875		U083	1,000
Propylene oxide	75569	10,000		100
1,2-Propylenimine	75558	10,000	P067	1
2-Propyn-1-o1	107197		P102	1,000

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Prothoate	2275185	100/10,000		1
Pyrene	129000	1,000/10,000		5,000
Pyrethrins	121299			1
	121211			
	8003347			
3,6-Pyridazinedione, 1,2-dihydro-	123331		U148	5,000
4-Pyridinamine	504245		P008	1,000
Pyridine	110861		U196	1,000
Pyridine, 2-methyl-	109068		U191	5,000
Pyridine, 2-methyl-5-vinyl-	140761	500		1
Pyridine, 4-amino-	504245	500/10,000		1,000
Pyridine, 4-nitro-, 1-oxide	1124330	500/10,000		1
Pyridine, 3-(1-methyl-2-pyrrolidinyl)-, (S)	54115		P075	100
2,4-(1H,3H)-Pyrimidinedione, 5-[bis(2-chloroethyl)amino]-	66751		U237	10
4(1H)-Pyrimidinone, 2,3-dihydro-6-methyl-2-thioxo-	56042		U164	10
Pyriminil	53558251	100/10,000		1
Pyrrolidine, 1-nitroso-	930552		U180	1
Quinoline	91225			5,000
Quinone (p-Benzoquinone)	106514		U197	10
Quintobenzene	82688		U185	100
Reserpine	50555		U200	5,000
Resorcinol	108463		U201	5,000
Saccharin and salts	81072		U202	100
Salcomine	14167181	500/10,000		1
Sarin	107448	10		1
Safrole	94597		U203	100
Selenious acid	7783008	1,000/10,000	U204	10
Selenious acid, dithallium (1+) salt	12039520		P114	1,000
Selenium ++	7782492			100
Selenium dioxide	7446084		U204	10
Selenium oxychloride	7791233	500		1
Selenium sulfide (R,T)	7488564		U205	10
Selenourea	630104		P103	1,000
Semicarbazide hydrochloride	563417	1,000/10,000		1
L-Serine, diazoacetate (ester)	115026		U015	1

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Silane, (4-aminobutyl)diethoxymethyl-	3037727	1,000		1
Silver ++	7440224			1,000
Silver cyanide	506649		P104	1
Silver nitrate	7761888			1
Silvex (2,4,5-TP)	93721		U233	100
Sodium	7440235			10
Sodium arsenate	7631892	1,000/10,000		1
Sodium arsenite	7784465	500/10,000		1
Sodium azide	26628228	500	P105	1,000
Sodium bichromate	10588019			10
Sodium bifluoride	1333831			100
Sodium bisulfite	7631905			5,000
Sodium cacodylate	124652	100/10,000		1
Sodium chromate	7775113			10
Sodium cyanide	143339	100	P106	10
Sodium dodecylbenzenesulfonate	25155300			1,000
Sodium fluoride	7681494			1,000
Sodium fluoroacetate	62748	10/10,000		10
Sodium hydrosulfide	16721805			5,000
Sodium hydroxide	1310732			1,000
Sodium hypochlorite	7681529			100
	10022705			
Sodium methylate	124414			1,000
Sodium nitrite	7632000			100
Sodium prentachlorophenate	131522	100/10,000		1
Sodium phosphate, dibasic	7558794			5,000
	10039324			
	10140655			
Sodium phosphate, tribasic	7601549			5,000
	7758294			
	7785844			
	10101890			
	10124568			
	10361894			
Sodium selenate	13410010	100/10,000		1
Sodium selenite	10102188	100/10,000		100
	7782823			

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Sodium tellurite	10102202	500/10,000		1
Stannane, acetoxytriphenyl	900958	500/10,000		1
Streptozotocin	18883664		U206	1
Strontium chromate	7789062			10
Strychnidin-10-one	57249		P108	10
Strychnidin-10-one, 2,3-dimethoxy-	357573		P018	100
Strychnine, & salts	572494	100/10,000	P108	10
Strychnine sulfate	60413	100/10,000		1
Styrene	100425			1,000
Styrene oxide	96093			100
Sulfotep	3689245	500		100
Sulfoxide, 3-chloropropyl octyl	3569571	500		1
Sulfur monochloride	12771083			1,000
Sulfur dioxide	7446095	500		1
Sulfur phosphide (R)	1314803		U189	100
Sulfur tetrafluoride	7783600	100		1
Sulfur trioxide	7446119	100		1
Sulfuric acid	7664939	1,000		1,000
	8014957			
Sulfuric acid, dithallium (1+) salt	7446186		P115	100
	10031591			
Sulfuric acid, dimethyl ester	77781		U103	100
Tabun	77816	10		1
2,4,5-T acid	93765		U232	1,000
2,4,5-T amines	2008460			5,000
	1319728			
	3813147			
	6369966			
	6369977			
Tellurium	13494809	500/10,000		1
Tellurium hexafluoride	7783804	100		1
2,4,5-T esters	93798			1,000
	1928478			
	2545597			
	25168154			
	61792072			
2,4,5-T salts	13560991			1,000
2,4,5-T	93765		U232	1,000

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
TDE (Dichloro diphenyl dichloroethane)	72548		U060	1
TEPP (Tetraethyl ester diphosphoric acid)	107493	100		10
Terbufos	13071799	100		1
1,2,4,5-Tetrachlorobenzene	95943		U207	5,000
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	1746016			1
1,1,1,2-Tetrachloroethane	630206		U208	100
1,1,2,2-Tetrachloroethane	79345		U209	100
Tetrachloroethene	127184		U210	100
Tetrachloroethylene	127184		U210	100
2,3,4,6-Tetrachlorophenol	58902		U212	10
Tetraethyl lead	78002	100	P110	10
Tetraethyl pyrophosphate	107493		P111	10
Tetraethyldithiopyrophosphate	3689245		P109	100
Tetraethyltin	597648	100		1
Tetramethyllead	75741	100		1
Tetrahydrofuran (I)	109999		U213	1,000
Tetranitromethane (R)	509148	500	P112	10
Tetraphosphoric acid, hexaethyl ester	757584		P062	100
Thallic oxide	1314325		P113	100
Thallium ++	7440280			1,000
Thallium acetate	563688		U214	100
Thallium carbonate	6533739		U215	100
Thallium chloride	7791120		U216	100
Thallium nitrate	10102451		U217	100
Thallium oxide	1314325		P113	100
Thallium selenite	12039520		P114	1,000
Thallium sulfate	7446186	100/10,000	P115	100
	10031591			
Thallous carbonate (Thallium (I) carbonate)	6533739	100/10,000	U215	100
Thallous chloride (Thallium (I) chloride)	7791120	100/10,000	U216	100
Thallous malonate (Thallium (I) malonate)	2757188	100/10,000		1
Thallous sulfate (Thallium (I) sulfate)	7446186	100/10,000	P115	100

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Thioacetamide	62555		U218	10
Thiocarbazide	2231574	1,000/10,000		1
Thiodiphosphoric acid, tetraethyl ester	3689245		P109	100
Thiofanox	39196184	100/10,000	P045	100
Thioimidodicarbonic diamide [(H2N)C(S)] 2NH	541537		P049	100
Thiomethanol (I,T)	74931		U153	100
Thionazin	297972	500		100
Thioperoxydicarbonic diamide [(H2N)C(S)] 2S2, tetra-methyl-	137268		U244	10
Thiophenol	108985	500	P104	100
Thiosemicarbazide	79196	100/10,000	P116	100
Thiourea	62566		U219	10
Thiourea, (2-chlorophenyl)-	5344821	100/10,000	P026	100
Thiourea, (2-methylphenyl)-	614788	500/10,000		1
Thiourea, 1-naphthalenyl-	86884		P072	100
Thiourea, phenyl-	103855		P093	100
Thiram	137268		U244	10
Titanium tetrachloride	7550450	100		1,000
Toluene	108883		U220	1,000
Toluenediamine	95807		U221	10
	496720			
	823405			
	25376458			
Toluene diisocyanate (R,T)	584849	500	U223	100
	91087	100		100
	26471625			
o-Toluidine	95534		U328	100
p-Toluidine	106490		U353	100
o-Toluidine hydrochloride	636215		U222	100
Toxaphene	8001352		P123	1
2,4,5-TP acid	93721		U233	100
2,4,5-TP acid esters	32534955			100
1H-1,2,4-Triazol-3-amine	61825		U011	10
Trans-1,4-dichlorobutene	110576	500		1
Triamiphos	1031476	500/10,000		1
Triazofos	24017478	500		1
Trichloroacetyl chloride	76028	500		1

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Trichlorfon	52686			100
1,2,4-Trichlorobenzene	120821			100
1,1,1-Trichloroethane	71556		U226	1,000
1,1,2-Trichloroethane	79005		U227	100
Trichloroethene	79016		U228	100
Trichloroethylene	79016		U228	100
Trichloroethylsilane	115219	500		1
Trichloronate	327980	500		1
Trichloromethanesulfenyl chloride	594423		P118	100
Trichloromonofluoromethane	75694		U121	5,000
Trichlorophenol	21567822			10
2,3,4-Trichlorophenol	15950660			
2,3,5-Trichlorophenol	933788			
2,3,6-Trichlorophenol	933755			
2,4,5-Trichlorophenol	95954		U230	10
2,4,6-Trichlorophenol	88062		U231	10
3,4,5-Trichlorophenol	609198			
Trichlorophenylsilane	98135	500		1
Trichloro(chloromethyl)silane	1558254	100		1
Trichloro(dichlorophenyl)silane	27137855	500		1
Triethanolamine dodecylbenzene-sulfonate	27323417			1,000
Triethoxysilane	998301	500		1
Trifluralin	1582098			10
Triethylamine	121448			5,000
Trimethylamine	75503			100
Trimethylchlorsilane	75774	1,000		1
2,2,4-Trimethylpentane	540841			1,000
Trimethylolpropane phosphite	824113	100/10,000		1
Trimethyiltin chloride	1066451	500/10,000		1
1,3,5-Trinitrobenzene (R,T)	99354		U234	10
1,3,5-Trioxane, 2,4,6-trimethyl-	123637		U182	1,000
Triphenyltin chloride	639587	500/10,000		1
Tris(2-chloroethyl)amine	555771	100		1
Tris(2,3-dibromopropyl) phosphate	126727		U235	10
Trypan blue	72571		U236	10
Unlisted Hazardous Wastes Characteristic of **Ignitability**	NA		D001	100

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Unlisted Hazardous Wastes Characteristic of **Corrosivity**	NA		D002	100
Unlisted Hazardous Wastes Characteristic of **Reactivity**	NA		D003	100
Unlisted Hazardous Wastes Characteristic of **Toxicity**				

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Arsenic			D004	1
Barium			D005	1,000
Benzene			D018	10
Cadmium			D006	10
Carbon Tetrachloride			D019	10
Chlordane			D020	1
Chlorobenzene			D021	100
Chloroform			D022	10
Chromium			D007	10
o-Cresol			D023	100
m-Cresol			D024	100
p-Cresol			D025	100
Cresol			D026	100
2,4-D (Dichlorophenoxyacetic acid)			D016	100
1,4-Dichlorobenzene			D027	100
1,2-Dichloroethane			D028	100
1,1-Dichloroethylene			D029	100
2,4-Dinitrotoluene			D030	10
Endrin			D012	1
Heptachlor (and epoxide)			D031	1
Hexachlorobenzene			D032	10
Hexachlorobutadiene			D033	1
Hexachloroethane			D034	100
Lead			D008	10
Lindane			D013	1
Mercury			D009	1
Methoxychlor			D014	1
Methyl ethyl ketone			D035	5,000
Nitrobenzene			D036	1,000
Pentachlorophenol			D037	10
Pyridine			D038	1,000
Selenium			D010	10
Silver			D011	1
Tetrachloroethylene			D039	100
Toxaphene			D015	1
Trichloroethylene			D040	100
2,4,5 Trichlorophenol			D041	10

Table AP1.T4. List of Hazardous Waste/Substances/Materials
(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
2,4,5-TP			D017	100
Vinyl chloride			D043	1
Uracil mustard	66751		U237	10
Uranyl acetate	541093			100
Uranyl nitrate	10102064			100
	36478769			
Urea, N-ethyl-N-nitroso	759739		U176	1
Urea, N-methyl-N-nitroso	684935		U177	1
Urethane (Carbamic acid ethyl ester)	51796		U238	100
Valinomycin	2001958	1,000/10,000		1
Vanadic acid, ammonium salt	7803556		P119	1,000
Vanadic oxide V_20_5	1314621		P120	1,000
Vanadic pentoxide	1314621		P120	1,000
Vanadium pentoxide	1314621	100/10,000		1,000
Vanadyl sulfate	27774136			1,000
Vinyl chloride	75014		U043	1
Vinyl acetate	108054			5,000
Vinyl acetate monomer	108054	1,000		5,000
Vinylamine, N-methyl-N-nitroso-	4549400		P084	10
Vinyl bromide	593602			100
Vinylidene chloride	75354		U078	100
Warfarin, & salts, when present at concentrations greater than 0.3%	81812	500/10,000	P001	100
Warfarin sodium	129066	100/10,000		100
Xylene (mixed)	1330207		U239	100
m-Benzene, dimethyl	108383			1,000
o-Benzene, dimethyl	95476			1,000
p-Benzene, dimethyl	106423			100
Xylenol	1300716			1,000
Xylylene dichloride	28347139	100/10,000		1
Yohimban-16-carboxylic acid, 11,17 dimethoxy-18-[(3,4,5-trimethoxy-benzoyl)oxy]-, methyl ester (3-beta, 16-beta,17-alpha,18-beta,20-alpha)-	50555		U200	5,000
Zinc ++	7440666			1,000
Zinc acetate	557346			1,000

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(All notes appear at the end of the table.)

Hazardous Waste/Substance/Material	**CAS No.[1]**	**Threshold Planning Quantity (Pounds)[2]**	**USEPA HW No. [3]**	**RQ (Pounds)[4]**
Zinc ammonium chloride	52628258			1,000
	14639975			
	14639986			
Zinc borate	1332076			1,000
Zinc bromide	7699458			1,000
Zinc carbonate	3486359			1,000
Zinc chloride	7646857			1,000
Zinc cyanide	557211		P121	10
Zinc, dichloro(4,4-dimethyl-5((((methyl-amino)carbonyl)oxy)imino)pentaenitrile)-,(t-4)-	58270089	100/10,000		1
Zinc fluoride	7783495			1,000
Zinc formate	557415			1,000
Zinc hydrosulfite	7779864			1,000
Zinc nitrate	7779886			1,000
Zinc phenosulfonate	127822			5,000
Zinc phosphide	1314847	500	P122	100
Zinc phosphide Zn_3P_2, when present at concentrations greater than 10%	1314847		P122	100
Zinc silicofluoride	16871719			5,000
Zinc sulfate	7733020			1,000
Zirconium nitrate	13746899			5,000
Zirconium potassium fluoride	16923958			1,000
Zirconium sulfate	14644612			5,000
Zirconium tetrachloride	10026116			5,000

F001			**F001**	**10**
The following spent halogenated solvents used in degreasing; all spent solvent mixtures/blends used in degreasing containing, before use, a total of 10 percent or more (by volume) of one or more of the above halogenated solvents or those solvents listed in F002, F004, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.				
(a) Tetrachloroethylene	127184		U210	100
(b) Trichloroethylene	79016		U228	100
(c) Methylene chloride	75092		U080	1,000
(d) 1,1,1-Trichloroethane	71556		U226	1,000
(e) Carbon tetrachloride	56235		U211	10
(f) Chlorinated fluorocarbons	NA			5,000
F002			**F002**	**10**
The following spent halogenated solvents: all spent solvent mixtures/blends containing, before use, a total of 10 percent or more (by volume) of one or more of the above halogenated solvents or those listed in F001, F004, or F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.				
(a) Tetrachloroethylene	127184		U210	100
(b) Methylene chloride	75092		U080	1,000
(c) Trichloroethylene	79016		U228	100
(d) 1,1,1-Trichloroethane	71556		U226	1,000
(e) Chlorobenzene	108907		U037	100
(f) 1,1,2-Trichloro-1,2,2 trifluoroethane	76131			5,000
(g) o-Dischlorobenzene	95501		U070	100
(h) Trichlorofluoromethane	75694		U121	5,000
(i) 1,1,2-Trichloroethane	79005		U227	100
F003			**F003**	**100**
The following spent non-halogenated solvents and the still bottoms from the recovery of these solvents:				
(a) Xylene	1330207			1,000
(b) Acetone	67641			5,000
(c) Ethyl acetate	141786			5,000
(d) Ethylbenzene	100414			1,000
(e) Ethyl ether	60297			100
(f) Methyl isobutyl ketone	108101			5,000
(g) n-Butyl alcohol	71363			5,000
(h) Cyclohexanone	108941			5,000
(i) Methanol	67561			5,000
F004			**F004**	**100**
The following spent non-halogenated solvents and the still bottoms from the recovery of these solvents:				
(a) Cresols/Cresylic acid	1319773		U052	100
(b) Nitrobenzene	98953		U169	1,000

F005		**F005**	**100**
The following spent non-halogenated solvents and the still bottoms from the recovery of these solvents:			
(a) Toluene	108883	U220	1,000
(b) Methyl ethyl ketone	78933	U159	5,000
(c) Carbon disulfide	75150	P022	100
(d) Isobutanol	78831	U140	5,000
(e) Pyndine	110861	U196	1,000
F006		**F006**	**10**
Wastewater treatment sludges from electroplating operations except from the following processes: (1) sulfuric acid anodizing of aluminum, (2) tin plating on carbon steel, (3) zinc plating (segregated basis) on carbon steel, (4) aluminum or zinc-aluminum plating on carbon steel, (5) cleaning/stripping associated with tin, zinc and aluminum plating on carbon steel, and (6) chemical etching and milling of aluminum.			
F007		**F007**	**10**
Spent cyanide plating bath solutions from electroplating operations.			
F008		**F008**	**10**
Plating bath residues from the bottom of plating baths from electroplating operations where cyanides are used in the process.			
F009		**F009**	**10**
Spent stripping and cleaning bath solutions from electroplating operations where cyanides are used in the process.			
F010		**F010**	**10**
Quenching bath residues from oil baths from metal heat treating operations where cyanides are used in the process.			
F011		**F011**	**10**
Spent cyanide solution from salt bath pot cleaning from metal heat treating operations.			
F012		**F012**	**10**
Quenching wastewater treatment sludges from metal heat treating operations where cyanides are used in the process.			
F019		**F019**	**10**
Wastewater treatment sludges from the chemical conversion coating of aluminum except from zirconium phosphating in aluminum can washing when such phosphating is an exclusive coating process.			
F020		**F020**	**1**
Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tri-or-tetrachlorophenol, or of intermediates used to produce their pesticide derivatives. (This listing does not include wastes from the production of hexachlorophene from highly purified 2,4,5-trichlorophenol.)			
F021		**F021**	**1**
Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of pentachlorophenol, or of intermediates used to produce its derivatives.			

F022	**F022**	**1**
Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tetra-, penta-, or hexachlorobenzenes under alkaline conditions.		
F023	**F023**	**1**
Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production of materials on equipment previously used for the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tri- and tetrachlorophenols. (This listing does not include wastes from equipment used only for the production or use of hexa-chlorophene from highly purified, 2,4,5-tri-chlorophenol.)		
F024	**F024**	**1**
Wastes, including but not limited to distillation residues, heavy ends, tars, and reactor cleanout wastes, from the production of chlorinated aliphatic hydrocarbons, having carbon content from one to five, utilizing free radical catalyzed processes. (This listing does not include light ends, spent filters and filter aids, spent dessicants(sic), wastewater, wastewater treatment sludges, spent catalysts, and wastes listed in Section 261.32.)		
F025	**F025**	**1**
Condensed light ends, spent filters and filter aids, and spent desiccant wastes from the production of certain chlorinated aliphatic hydrocarbons, by free radical catalyzed processes. These chlorinated aliphatic hydrocarbons are those having carbon chain lengths ranging from one to and including five, with varying amounts and positions of chlorine substitution.		
F026	**F026**	**1**
Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production of materials on equipment previously used for the manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tetra-penta-, or hexachlorobenzene under alkaline conditions.		
F027	**F027**	**1**
Discarded unused formulations containing tri-, tetra-, or pentachlorophenol or discarded unused formulations containing compounds derived from these chlorophenols. (This listing does not include formulations containing hexachlorophene synthesized from prepurified 2,4,5-tri-chlorophenol as the sole component.)		
F028	**K028**	**1**
Residues resulting from the incineration or thermal treatment of soil contaminated with EPA Hazardous Waste Numbers F020, F021, F022, F023, F026, and F027.		
F032	**F032**	**1**
Wastewaters (except those that have not come into contact with process contaminants), process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that currently use or have previously used clorophenolic formulations (except potentially cross-contaminated wastes that have had the F032 waste code deleted in accordance with 261.35 of this chapter or potentially cross-contaminated wastes that are otherwise currently regulated as hazardous wastes (i.e., F034 or F035), and where the generator does not resume or initiate use of chlorophenolic formulations). This listing does not include K001 bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote and/or pentachlorophenol.		

F034	**F034**	**1**
Wastewaters (except those that have not come into contact with process contaminants), process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that use creosote formulations. This listing does not include K001 bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote and/or pentachlorophenol.		
F035	**F035**	**1**
Wastewaters (except those that have not come into contact with process contaminants), process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that use inorganic preservatives containing arsenic or chromium. This listing does not include K001 bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote and/or pentachlorophenol.		
F037	**F037**	**1**
Petroleum refinery primary oil/water/solids separation sludge--any sludge generated from the gravitational separation of oil/water/solids during the storage or treatment of process wastewaters and oily cooling wastewaters from petroleum refineries. Such sludges include, but are not limited to, those generated in: oil/water/solids separators; tanks and impoundment; ditches and other conveyances; sumps; and stormwater units receiving dry weather flow. Sludge generated in stormwater units that do not receive dry weather flow, sludges generated from non-contact once-through cooling waters segregated for treatment from other process or oily cooling waters, sludges generated in aggressive biological treatment units as defined in 261.31(b)(2) (including sludges generated in one or more additional units after wastewaters have been treated in aggressive biological treatment unites) and K051 wastes are not included in this listing.		
F038	**F038**	**1**
Petroleum refinery secondary (emulsified) oil/water/solids separation sludge--any sludge and/or float generated from the physical and/or chemical separation of oil/water/solids in process wastewaters from petroleum refineries. Such wastes include, but are not limited to, all sludges and floats generated in: induced air flotation (IAF) units, tanks and impoundments, and all sludges generated in DAF units. Sludges generated in stormwater units that do not receive dry weather flow, sludges generated from once-through non-contact cooling waters segregated from treatment from other process or oil cooling wastes, sludges and floats generated in aggressive biological treatment units as defined in 261.31(b) (2) (including sludges and floats generated in one or more additional units after wastewaters have been treated in aggressive biological treatment units) and F037, K048, and K051 wastes are not included in this listing.		
K001	**K001**	**1**
Bottom sediment sludge from the treatment of wastewaters from wood preserving processes that use creosote and/or pentachlorophenol.		
K002	**K002**	**10**
Wastewater treatment sludge from the production of chrome yellow and orange pigments.		
K003	**K003**	**10**
Wastewater treatment sludge from the production of molyodate orange pigments.		
K004	**K004**	**10**
Wastewater treatment sludge from the production of zinc yellow pigments.		
K005	**K005**	**10**
Wastewater treatment sludge from the production of chrome green pigments.		
K006	**K006**	**10**
Wastewater treatment sludge from the production of chrome oxide green pigments (anhydrous and hydrated).		

K007	**K007**	**10**
Wastewater treatment sludge from the production of iron blue pigments.		
K008	**K008**	**10**
Oven residue from the production of chrome oxide green pigments.		
K009	**K009**	**10**
Distillation bottoms from the production of acetaldehyde from ethylene.		
K010	**K010**	**10**
Distillation side cuts from the production of acetaldehyde from ethylene.		
K011	**K011**	**10**
Bottom stream from the wastewater stripper in the production of acrylonitrile.		
K013	**K013**	**10**
Bottom stream from the acetonitrile column in the production of acrylonitrile.		
K014	**K014**	**5,000**
Bottoms from the acetonitrile purification column in the production of acrylonitrile.		
K015	**K015**	**10**
Still bottoms from the distillation of benzyl chloride.		
K016	**K016**	**1**
Heavy ends or distillation residues from the production of carbon tetrachloride.		
K017	**K017**	**10**
Heavy ends (still bottoms) from the purification column in the production of epi-chlorohydrin.		
K018	**K018**	**1**
Heavy ends from the fractionation column in ethyl chloride production.		
K019	**K019**	**1**
Heavy ends from the distillation of ethylene dichloride in ethylene dichloride production.		
K020	**K020**	**1**
Heavy ends from the distillation of vinyl chloride in vinyl chloride monomer production.		
K021	**K021**	**10**
Aqueous spent antimony catalyst waste from fluoromethanes production.		
K022	**K022**	**1**
Distillation bottom tars from the production of phenol/acetone from cumene.		
K023	**K023**	**5,000**
Distillation light ends from the production of ophthalic anhydride from naphthalene.		
K024	**K024**	**5,000**
Distillation bottoms from the production of phthalic anhydride from naphthalene.		
K025	**K025**	**10**
Distillation bottoms from the production of nitrobenzene by the nitration of benzene.		
K026	**K026**	**1,000**
Stripping still tails from the production of methyl ethyl pyridines.		
K027	**K027**	**10**
Centrifuge and distillation residues from toluene diisocyanate production.		
K028	**K028**	**1**
Spent catalyst from the hydrochlorinator reactor in the production of 1,1,1-trichloroethane.		
K029	**K029**	**1**
Waste from the product steam stripper in the production of 1,1,1-trichloroethane.		

K030	**K030**	**1**
Column bottoms or heavy ends from the combined production of trichloroethylene and perchloroethylene.		
K031	**K031**	**1**
By-product salts generated in the production of MSMA and cacodylic acid.		
K032	**K032**	**10**
Wastewater treatment sludge from the production of chlordane.		
K033	**K033**	**10**
Wastewater and scrub water from the chlorination of cyclopentadiene in the production of chlordane.		
K034	**K034**	**10**
Filter solids from the filtration of hexachlorocyclopentadiene in the production of chlordane.		
K035	**K035**	**1**
Wastewater treatment sludges generated in the production of creosote.		
K036	**K036**	**1**
Still bottoms from toluene reclamation distillation in the production of disulfoton.		
K037	**K037**	**1**
Wastewater treatment sludges from the production of disulfoton.		
K038	**K038**	**10**
Wastewater from the washing and stripping of phorate production.		
K039	**K039**	**10**
Filter cake from the filtration of diethylphosphorodithioic acid in the production of phorate.		
K040	**K040**	**10**
Wastewater treatment sludge from the production of phorate.		
K041	**K041**	**1**
Wastewater treatment sludge from the production of toxaphene.		
K042	**K042**	**10**
Heavy ends or distillation residues from the distillation of tetrachlorobenzene in the production of 2,4,5-T.		
K043	**K043**	**10**
2,6-Dichlorophenol waste from the production of 2,4-D.		
K044	**K044**	**10**
Wastewater treatment sludges from the manufacturing and processing of explosives.		
K045	**K045**	**10**
Spent carbon from the treatment of wastewater containing explosives.		
K046	**K046**	**10**
Wastewater treatment sludges from the manufacturing, formulation and loading of lead-based initiating compounds.		
K047	**K047**	**10**
Pink/red water from TNT operations.		
K048	**K048**	**10**
Dissolved air flotation (DAF) float from the petroleum refining industry.		
K049	**K049**	**10**
Slop oil emulsion solids from the petroleum refining industry.		

K050 Heat exchanger bundle cleaning sludge from the petroleum refining industry.	**K050**	**10**
K051 API separator sludge from the petroleum refining industry.	**K051**	**10**
K052 Tank bottoms (leaded) from the petroleum refining industry.	**K052**	**10**
K060 Ammonia still lime sludge from coking operations.	**K060**	**1**
K061 Emission control dust/sludge from the primary production of steel in electric furnaces.	**K061**	**10**
K062 Spent pickle liquor generated by steel finishing operations of facilities within the iron and steel industry (SIC Codes 331 and 332).	**K062**	**10**
K064 Acid plant blowdown slurry/sludge resulting from thickening of blowdown slurry from primary copper production.	**K064**	**10**
K065 Surface impoundment solids contained in and dredged from surface impoundments at primary lead smelting facilities.	**K065**	**10**
K066 Sludge from treatment of process wastewater and/or acid plant blowdown from primary zinc production.	**K066**	**10**
K069 Emission control dust/sludge from secondary lead smelting.	**K069**	**10**
K071 Brine purification muds from the mercury cell process in chlorine production, where separately prepurified brine is not used.	**K071**	**1**
K073 Chlorinated hydrocarbon waste from the purification step of the diaphragm cell process using graphite anodes in chlorine production.	**K073**	**10**
K083 Distillation bottoms from aniline extraction.	**K083**	**100**
K084 Wastewater treatment sludges generated during the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds.	**K084**	**1**
K085 Distillation or fractionation column bottoms from the production of chlorobenzenes.	**K085**	**10**
K086 Solvent washes and sludges, caustic washes and sludges, or water washes and sludges from cleaning tubs and equipment used in the formulation of ink from pigments, driers, soaps, and stabilizers containing chromium and lead.	**K086**	**10**
K087 Decanter tank tar sludge from coking operations.	**K087**	**100**
K088 Spent potliners from primary aluminum reduction.	**K088**	**10**

K090	**K090**	**10**
Emission control dust or sludge from ferrochromiumsilicon production.		
K091	**K091**	**10**
Emission control dust or sludge from ferrochromium production.		
K093	**K093**	**5,000**
Distillation light ends from the production of phthalic anhydride from ortho-xylene.		
K094	**K094**	**5,000**
Distillation bottoms from the production of phthalic anhydride from ortho-xylene.		
K095	**K095**	**100**
Distillation bottoms from the production of 1,1,1-trichloroethane.		
K096	**K096**	**100**
Heavy ends from the heavy ends column from the production of 1,1,1-trichloroethane.		
K097	**K097**	**1**
Vacuum stripper discharge from the chlordane chlorinator in the production of chlordane.		
K098	**K098**	**1**
Untreated process wastewater from the production of toxaphene.		
K099	**K099**	**10**
Untreated wastewater from the production of 2,4-D.		
K100	**K100**	**10**
Waste leaching solution from acid leaching of emission control dust/sludge from secondary lead smelting.		
K101	**K101**	**1**
Distillation tar residues from the distillation of aniline-based compounds in the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds.		
K102	**K102**	**1**
Residue from the use of activated carbon for decolorization in the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds.		
K103	**K103**	**100**
Process residues from aniline extraction from the production of aniline.		
K104	**K104**	**10**
Combined wastewater streams generated from nitrobenzene/aniline production.		
K105	**K105**	**10**
Separated aqueous stream from the reactor product washing step in the production of chlorobenzenes.		
K106	**K106**	**1**
Wastewater treatment sludge from the mercury cell process in chlorine production.		
K107	**K107**	**10**
Column bottoms from product separation from the production of 1,1-dimethylhydrazine (UDMH) from carboxylic acid hydrazines.		
K108	**K108**	**10**
Condensed column overheads from product separation and condensed reactor vent gases from the production of 1,1-dimethylhydrazine (UDMH) from carboxylic acid hydrazides.		
K109	**K109**	**10**
Spent filter cartridges from product purification from the production of 1.1-dimethylhydrazine (UDMH) from carboxylic acid hydrazides.		

K110	**K110**	**10**
Condensed column overheads from intermediate separation from the production of 1,1-dimethylhydrazine (UDMH) from carboxylic acid hydrazides.		
K111	**K111**	**10**
Product washwaters from the production of dinitrotoluene via nitration of toluene.		
K112	**K112**	**10**
Reaction by-product water from the drying column in the production of toluenediamine via hydrogenation of dinitrotoluene.		
K113	**K113**	**10**
Condensed liquid light ends from the purification of toluenediamine in the production of toluenediamine via hydrogenation of dinitrotoluene.		
K114	**K114**	**10**
Vicinals from the purification of toluenediamine in the production of toluenediamine via hydrogenation of dinitrotoluene.		
K115	**K115**	**10**
Heavy ends from the purification of toluenediamine in the production of toluenediamine via hydrogenation of dinitrotoluene.		
K116	**K116**	**10**
Organic condensate from the solvent recovery column in the production of toluene disocyanate via phosgenation of toluenediamine.		
K117	**K117**	**1**
Wastewater from the reaction vent gas scrubber in the production of ethylene bromide via bromination of ethene.		
K118	**K118**	**1**
Spent absorbent solids from purification of ethylene dibromide in the production of ethylene dibromide.		
K123	**K123**	**10**
Process wastewater (including supernates, filtrates, and washwaters) from the production of ethylenebisdithiocarbamic acid and its salts.		
K124	**K124**	**10**
Reactor vent scrubber water from the production of ethylene- bisdithiocarbamic acid and its salts.		
K125	**K125**	**10**
Filtration, evaporation, and centrifugation solids from the production of ethylenebisdithiocarbamic acid and its salts.		
K126	**K126**	**10**
Baghouse dust and floor sweepings in milling and packaging operations from the production or formulation of ethylene-bisdithiocarbamic acid and its salts.		
K131	**K131**	**100**
Wastewater from the reactor and spent sulfuric acid from the acid dryer in the production of methyl bromide.		
K132	**K132**	**1,000**
Spent absorbent and wastewater solids from the production of methyl bromide.		
K136	**K136**	**1**
Still bottoms from the purification of ethylene dibromide in the production of ethylene dibromide via bromination of ethene.		

K141	**K141**	**1**
Process residues from the recovery of coal tar, including but not limited to, tar collecting sump residues from the production of coke or coal or the recovery of coke by-products produced from coal. This listing does not include K087 (decanter tank tar sludge from coking operations).		
K142	**K142**	**1**
Tar storage tank residues from the production of coke or from the recovery of coke by-products produced from coal.		
K143	**K143**	**1**
Process residues from the recovery of light oil, including, but not limited to, those generated in stills, decanters, and wash oil recovery units from the recovery of coke by-products produced from coal.		
K144	**K144**	**1**
Wastewater treatment sludges from light oil refining, including, but not limited to, intercepting or contamination sump sludges from the recovery of coke by-products produced from coal.		
K145	**K145**	**1**
Residues from naphthalene collection and recovery operations from the recovery of coke by-products produced from coal.		
K147	**K147**	**1**
Tar storage tank residues from coal tar refining.		
K148	**K148**	**1**
Residues from coal tar distillation, including, but not limited to, still bottoms.		
K149	**K149**	10
Distillation bottoms from the production of alpha- (or methyl-) chlorinated toluenes, ring-chlorinated toluenes, benzoyl chlorides, and compounds with mixtures of these functional groups. [This waste does not include still bottoms from the distillation of benzyl chloride.]		
K150	**K150**	10
Organic residuals, excluding spent carbon adsorbent, from the spent chlorine gas and hydrochloric acid recovery processes associated with the production of alpha- (or methyl-) chlorinated toluenes, ring-chlorinated toluenes, benzoyl chlorides, and compounds with mixtures of these functional groups.		
K151	**K151**	10
Wastewater treatment sludges, excluding neutralization and biological sludges, generated during the treatment of wastewaters from the production of alpha- (or methyl-) chlorinated toluenes, ring-chlorinated toluenes, benzoyl chlorides, and compounds with mixtures of these functional groups.		
K157	**K157**	++
Wastewaters (including scrubber waters, condenser waters, washwaters, and separation waters) from the production of carbamates and carbamoyl oximes. (This listing does not include sludges derived from the treatment of these wastewaters.)		
K158	**K158**	++
Bag house dusts and filter/separation solids from the production of carbamates and carbamoyl oximes.		
K159	**K159**	++
Organics from the treatment of thiocarbamate wastes.		
K160	**K160**	++
Solids (including filter wastes, separation solids, and spent catalysts) from the production of thio-carbamates and solids from the treatment of thiocarbamate wastes.		

K161	**K161** ++
Purification solids (including filtration, evaporation, and centrifugation solids), bag house dust, and floor sweepings from the production of dithiocarbamate acids and their salts. (This listing does not include K125 or K126.)	

Notes:
1 Chemical Abstract Service (CAS) Registry Number.
2 USEPA Hazardous Waste Number.
3 Reportable quantity release that requires notification. (See Chapter 18, "Spill Prevention and Response Planning").
4 Includes mono- and di-ethers of ethylene glycol, diethylene glycol, and triethylene glycol R-(OCH2CH2)n-OR'. Where: n = 1, 2, or 3; R = alkyl C7 or less; or R = phenyl or alkyl substituted phenyl; R' = H or alkyl C7 or less; or OR' consisting of carboxylic acid ester, sulfate, phosphate, nitrate, or sulfonate.
++ No reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is equal to or exceeds 100 micrometers (0.004 inches).
+++ The reportable quantity (RQ) for asbestos is limited to friable forms only.
# Indicates that the RQ is subject to change when the assessment of potential carcinogenicity is completed.
The statutory RQ for this hazardous substance may be adjusted in a future rulemaking; until then the statutory RQ applies.
1* Indicates that the 1-pound RQ is a statutory RQ.
** Indicates that no RQ is being assigned to the generic or broad class.
(1+) Indicates that the statutory source for designation of this hazardous substance under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is Clean Water Act (CWA) Section 311(b)(4).
(2+) Indicates that the statutory source for designation of this hazardous substance under CERCLA is CWA section 30711(a)(4).
(3+) Indicates that the statutory source for designation of this hazardous substance under CERCLA is CAA section 112.
(4+) Indicates that the statutory source for designation of this hazardous substance under CERCLA is Resource Conservation and Recovery Act, Section 3001.

A2. APPENDIX 2

DETERMINATION OF WORST CASE DISCHARGE PLANNING VOLUME

A2.1. This Appendix provides criteria to determine, on an installation-specific basis, the extent of a worst-case discharge (WCD).

A2.2. This Appendix provides criteria to determine the volume of oil or hazardous substance to be used in planning for a WCD. Installations should calculate both WCD volumes that apply to the installation's design and operation and use the larger volume as the WCD planning volume.

A2.3. For installations transferring oil to and from vessels with tank capacities of 10,500 gallons (250 barrels) or more, the WCD planning volume is calculated as follows:

A2.3.1. Where applicable, the loss of the entire capacity of all in-line and break out tank(s) needed for the continuous operation of the pipelines used for the purposes of handling or transporting oil, in bulk, to or from a vessel regardless of the presence of secondary containment; plus

A2.3.2. The discharge from all piping carrying oil between the marine transfer manifold and the valve or manifold adjacent to the POL storage container. The discharge from each pipe is calculated as follows: The maximum time to discover the release from the pipe in hours, plus the maximum time to shut down flow from the pipe in hours (based on historic discharge data or the best estimate in the absence of historic discharge data for the installation) multiplied by the maximum flow rate expressed in gallons per hour (based on the maximum relief valve setting or maximum system pressure when relief valves are not provided) plus the total line drainage volume expressed in gallons for the pipe between the marine transfer manifold and the valve or manifold adjacent to the POL storage container.

AP2.4. For installations with POL Storage Containers:

A2.4.1. Single POL Storage Container Facilities. For facilities containing only one aboveground oil or hazardous substance storage container, the WCD planning volume equals the capacity of the oil or hazardous substance storage container. If adequate secondary containment (sufficiently large to contain the capacity of the above ground oil or hazardous substance storage container plus sufficient freeboard to allow for precipitation) exists for the oil storage container, multiply the capacity of the container by 0.8.

A2.4.2. Multiple POL Storage Container Facilities

A2.4.2.1. Facilities having no secondary containment. If none of the above ground storage containers at the facility have adequate secondary containment, the worst case planning volume equals the total above ground oil and hazardous substance storage capacity at the facility.

A2.4.2.2. Facilities having complete secondary containment. If every above ground storage container at the facility has adequate secondary containment, the WCD planning volume

equals the capacity of the largest single above ground oil or hazardous substance storage container.

A2.4.2.3. Facilities having partial secondary containment. If some, but not all above ground storage containers at the facility have adequate secondary containment, the WCD planning volume equals the sum of:

A2.4.2.3.1. The total capacity of the above ground oil and hazardous substance storage container that lacks adequate secondary containment; plus

A2.4.2.3.2. The capacity of the largest single above ground oil or hazardous substance storage container that has adequate secondary containment.

A2.4.3. For purposes of this Appendix, the term "adequate secondary containment" means an impervious containment system such as a dike, berm, containment curb, drainage system or other device that will prevent the escape of spilled material into the surrounding soil.