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Regulation 201-1

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Environmental Quality

ENVIRONMENTAL GOVERNING STANDARDS (EGS)

***This regulation supersedes USFK Regulation 201-1, dated 18 June 2012.**

FOR THE COMMANDER:

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Summary. This regulation provides specific criteria and management practices for environmental protection on United States Forces Korea (USFK) installations.

Summary of Change. This regulation has been substantially changed. A full review of its contents is required.

Applicability. This regulation applies to USFK installations and facilities directly controlled or directly managed by USFK in the Republic of Korea (ROK). These Environmental Governing Standards (EGS) do not apply to:

- a. Leased, joint use, and similar facilities to the extent that USFK does not control the instrumentality or operation of the facility that would be regulated by this EGS regulation.
- b. Operations of United States (U.S.) military vessels or the operations of U.S. military aircraft. However, this document does apply to support functions for U.S. military vessels and U.S. military

aircraft provided by the USFK Components, including management or disposal of off-loaded waste or material.

c. Off-installation operational deployments, including cases of hostilities, contingency operations in hazardous areas, and when United States Forces are operating as part of a multinational force not under full control of the United States. Such excepted operations and deployments shall be conducted in accordance with applicable international agreements, other Department of Defense Directives (DoDD) and DoD Instructions (DoDI), applicable Service component guidance, and environmental annexes incorporated into operation plans or operation orders.

d. 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 U.S.C. §7158.

e. The determination or conduct of remediation to correct environmental problems caused by USFK's activities, conducted in accordance with DoDI 4715.08, "Remediation of Environmental Contamination Outside the United States" or to meet the requirements of U.S.-ROK bilateral agreements mentioned in the Article III of the SOFA and Memorandum of Special Understanding (MOSU) for Environmental Protection.

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

g. USFK facilities and areas that have only a 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 USFK Components exercise control only on a temporary or intermittent basis.

Forms. USFK Forms are available at <https://8tharmy.korea.army.mil/q1/forms-archives.asp>.

Supplementation. Further supplementation to this regulation is prohibited without prior approval of the USFK Command Engineer (FKEN), Unit #15237, APO AP 96271-5237.

Records Management. Records created as a result of processes prescribed by this regulation must be identified, maintained, and disposed of according to the governing service regulation. Record titles are available on the Army Records Management Information System (ARIMS) website at <https://www.arims.army.mil> and under USFK Regulation 923.1.

Suggested Improvements. The proponent of this regulation is the USFK Command Engineer. Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) to USFK Command Engineer (FKEN), Unit #15237, APO AP 96271-5237.

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Chapter 1

Introduction

1-1. Purpose

The purpose of this regulation is to provide specific criteria and management practices for environmental protection on United States Forces Korea (USFK) installations. This document implements:

- a. Department of Defense Instruction (DoDI) 4715.05, “Environmental Compliance at Installations Outside the United States,” Change 2 dated 31 August 2018.
- b. Department of Defense (DoD) 4715.05-G, “Overseas Environmental Baseline Guidance Document” (OEBGD), Change I, dated 31 August 2018.
- c. Republic of Korea (ROK) standards recommended by the ROK Ministry of Environment that are more stringent than those mentioned in the OEBGD, and bilateral U.S-ROK MOSU on Environmental Protection.

1-2. References

Required publications are listed in appendix A.

1-3. Explanation of Abbreviations and Special Terms

Abbreviations used in this regulation are explained in the glossary. Special terms used in this document are defined in each chapter.

1-4. Conflicts between Environmental Governing Standards and Other Policies and Directives

- a. Each activity and installation will comply with those portions of DoD and their respective service component land-use and environmental policies and directives that apply overseas to the extent that those policies and directives do not directly conflict with Environmental Governing Standards (EGS).
- b. Activities and installations that wish to use conflicting DoD or service component policies or directives in lieu of EGS must follow the waiver provisions set forth in paragraph 1-13.
- c. Service components will notify USFK of any conflicting policies or directives they discover and provide a recommendation for resolution.

1-5. General Definitions and Requirements

- a. For the purpose of this document, unless otherwise indicated, the following definitions apply:
 - (1) Criteria and management practices – Particular substantive provisions of the OEBGD that are used by the Lead Environmental Component (LEC) to develop this regulation.
 - (2) Lead Environmental Component (LEC) – Performs requirements identified by DoDI 4715.05, “Environmental Compliance at Installations Outside the United States.” The USFK Commander is the LEC for Republic of Korea (ROK). The Commander has delegated LEC responsibilities to USFK Command Engineer.

(3) New facility – any facility/building, source or project 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.

(4) Professional Engineer – An individual who, by education, experience or combination of both, meets the basic requirements for a Professional Engineering, 0800 – 0899 Occupational Series, as defined by of the U.S. Office of Personnel Management.

(5) Substantial modification.

(a) The cost of any modification to a facility/building that exceeds \$1 million regardless of funding source.

(b) A conversion of facility use, regardless of cost.

(6) Test Methods and Protocols – Environmental Protection Agency (EPA) test methods and protocols for sampling and analyses will be used unless otherwise specified. Korean standard test methods and protocols can be used for supplemental information and to complete secondary standard's evaluations. Laboratory analyses necessary to implement these EGS shall normally be conducted in a laboratory certified by a U.S. or ROK regulatory authority for the applicable test method.

b. This regulation does 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 this document refers to other DoD Directives and Instructions, it is intended only to coordinate the requirements of those directives as required to implement the policies found in DoDI 4715.05. This document does not change other DoD Directives or Instructions or alter DoD policies.

1-6. Strategy

a. The environmental protection process is dynamic, and officials at all levels are responsible for the frequent review and updating of applicable guidelines for all environmental activities, as directed. It is the policy of USFK to be at the forefront of pollution prevention and environmental compliance and protection. Administrative procedures at all levels of command should be designed to expedite implementation of the most current directives on environmental matters.

b. With few exceptions, the criteria contained in the DoD OEBGD, dated 1 May 2007, have been adopted. These EGS incorporate the more protective standards from relevant U.S. standards and policies and ROK laws and regulations as generally enforced and applied within the ROK, without prejudice to USFK.

1-7. Permits and Licenses

In accordance with the U.S.-ROK Status of Forces Agreement (SOFA), permits, licenses, or other forms of official approvals are not required for DoD activities. Permits, licenses, or other forms of official approvals may, however, be required under ROK law for certain contracted activities specified herein. When required, all such permits, licenses and other forms of official approval shall be obtained by the contractor from the appropriate ROK authorities. DoD Components shall assist contractors when they are applying for a required permit, license or other form of official approval by providing necessary information only."

1-8. Responsibilities

a. The LEC or delegated representative will:

(1) Identify ROK national environmental standards, including those specifically delegated to regional or local governments for implementation, to determine whether ROK national environmental standards should be incorporated into this EGS; and to obtain and maintain copies of applicable ROK environmental documents, standards and regulations.

(2) Ensure this EGS and related environmental standards are consistent with SOFA and other relevant international agreements.

(3) Review the ROK environmental enforcement record and history with respect to enforcement against public and private sector entities, and monitor environmental trends in ROK.

(4) Consult with appropriate ROK officials directly or through the SOFA Environmental Subcommittee on environmental issues as required under the SOFA and the Memorandum of Special Understanding on Environmental Protection (MOSUEP) to coordinate this EGS and to maintain effective cooperation on environmental matters.

(5) Evaluate and determine whether ROK or U.S. environmental standards are the appropriate standards criteria for USFK activities.

(6) Consult with the U.S. Embassy in Seoul, U.S. IndoPacific Command (USINDOPACOM), and other DoD components, including the Defense Logistics Agency (DLA) operating in the ROK, during review of the EGS.

(7) Review and revalidate this EGS IAW DoDI 4715.05 with USFK staff, service components, and other appropriate entities.

(8) Keep USFK components informed of current environmental developments and trends.

b. USFK service components and defense agencies will:

(1) Ensure compliance with the EGS established by USFK.

(2) Ensure their activities and installations allocate the resources required to achieve and maintain compliance with the EGS.

(3) Conduct environmental compliance self-audits.

(4) Program and budget for environmental compliance projects.

(5) Ensure that USFK contracts for services or construction, where performance takes place on an installation, comply with the EGS and are administered to enforce such compliance. Contracts for transfer and delivery of hazardous materials and petroleum products and for the disposal of hazardous waste shall include provisions requiring the contractor to comply with appropriate EGS criteria, Korean regulations and other DoD requirements.

(6) Ensure that host-tenant agreements address compliance with the EGS.

(7) Oversee Installation training programs to ensure compliance with these regulations.

c. Installation/Commanders will:

(1) Comply with the EGS.

(2) Develop and conduct training/education programs to instruct all personnel in the environmental aspect of their jobs. Training/Education programs will be specifically tailored to operations within the ROK.

(3) Establish an Environmental Protection Council or Environmental Quality Control Committee (or equivalent) to provide periodic assessment of the installation's environmental compliance programs and projects.

(4) Incorporate installation environmental compliance auditing into their inspection programs.

1-9. Implementation

The EGS are effective as of the date of this document. USFK will forward the EGS to each major command and defense agency with an installation in the ROK for further distribution to their installations. USFK service components and defense agencies (after coordination with LEC) may issue supplementary criteria that are more protective of the environment than required by the EGS.

1-10. Auditing

Environmental audit programs for USFK facilities and areas will include internal and external environmental audits. Internal self-audits will be conducted at least annually unless an external audit is conducted that year, in which case the internal self-audit is not required for that given year. External compliance audits will be conducted at least once every three years at all major installations.

1-11. Environmental Committees/Boards

a. The Environmental Subcommittee, established pursuant to Article XXVI of the US-ROK SOFA, is responsible for all environmental information exchange and facility and area access for ROK government officials and other entities. The USFK ACoS Engineer is the U.S. Component Chairman of the Environmental Subcommittee.

b. The USFK Environmental Policy Board (EPB) has been established to assist the USFK Commander and subordinate commanders in all phases of environmental policy. The USFK EPB serves as an umbrella organization to oversee related USFK internal subcommittees. The Deputy Chief of Staff, USFK, serves as the Chairman of the USFK EPB.

1-12. Environmental Inquiries and Complaints

Inquiries for environmental information or submission of environmental complaints to USFK personnel shall be referred to the USFK ACoS Engineer. The following are the procedures for responding to environmental inquiries and complaints from ROK authorities and other ROK entities:

a. Report the receipt of an inquiry or complaint through the appropriate chain of command to the USFK ACoS Engineer, as soon as possible, but no later than the end of the next duty day.

b. The activity/installation commander will respond to the complaint originator within 14 calendar days following receipt of a ROK environmental inquiry or complaint, in the process described below.

(1) Draft a response using the standard format (Figure 1-1) below and forward to USFK ACofS Engineer for coordination and approval.

**USFK Standard Letter of Response to Environmental
Complaints/Inquiries**

ORGANIZATION:

ADDRESSEE:

Dear ():

This letter is in response to your inquiry, dated (_____), regarding(_____), at (_____). Issues such as your request for information on (_____) are best handled in accordance with the US-ROK Status of Forces Agreement (SOFA) process. I suggest that you send your request to the ROK component of the Environmental Subcommittee. (Installation commander must contact USFK ACofS for current ROK government agency contact information for inclusion in the response letter).

I have forwarded your letter to the US SOFA Secretariat for information. Should this issue be considered by the US-ROK SOFA Joint Committee, I am confident that the panel of environmental experts from both the US and the ROK components of the Environmental Subcommittee will work to resolve this issue to mutual satisfaction.

Again, thank you for your concern.

Signed by Installation Commander

Figure 1-1. USFK Standard Letter of Response to Environmental Complaints/Inquiries

(2) Provide a corrective action plan if the complaint or inquiry is based on verified non-compliance with the EGS. The draft corrective action plan will describe resource impacts and include a time frame for resolving the environmental situation.

(3) Deliver the USFK approved response to the complaint originator.

c. The USFK ACoS Engineer will coordinate with other appropriate USFK staff offices to promptly respond to the activity/installation commander through appropriate chain of command and notify the Environmental Subcommittee, if appropriate.

1-13. Waivers

a. Military activities and installations may seek temporary waivers and deviations from these EGS until they return back into compliance if compliance would:

- (1) Seriously impact mission and impair operations.
- (2) Adversely affect relations with the ROK.
- (3) Require substantial expenditure of funds not currently available for such purposes.

b. To obtain a waiver or deviation, activity or installation commanders will forward the request through the appropriate chain of command to the Delegated LEC for consideration. The waiver request will:

- (1) Identify the particular standard for which a waiver is requested.
- (2) Describe the extent of relief requested and the period that the waiver will be in effect.
- (3) Describe the anticipated impact of the waiver, if any, on human health and the environment over the period of the waiver.
- (4) Provide justification for the waiver; if complete waiver of the standard is requested, describe why a partial and/or temporary deviation would not be sufficient.
- (5) Provide a timeframe within which the installation will return into compliance.

c. Installation commanders must maintain files of their waiver correspondence and review waiver as needed, or, at a minimum, every 3 years.

d. The LEC will consult with the relevant military departments, defense agencies, USFK staff offices, and U.S. Embassy (Seoul) on all requests. The LEC will maintain a master file of all waivers and deviations granted and requested. Requests for waivers by USFK shall be referred to CDR INDOPACOM.

e. USFK may, consistent with applicable international agreements and other laws, authorize temporary emergency waivers and deviations if the USFK Chief of Staff determines that such waivers are essential to accomplishment of an operational mission.

f. Under exigent circumstances, the LEC may grant temporary waivers or deviations prior to consulting with relevant military departments and defense agencies, U.S. Embassy (Seoul) and CDR INDOPACOM.

g. No waiver of treaty obligations may be granted under this process without prior coordination and approval by all treaty parties.

h. The LEC will review and revalidate waivers as needed, or, at a minimum, every 3 years.

1-14. Recordkeeping Requirements

Unless otherwise specified, all record-keeping requirements, including assessments, inspection records, logs, manifests, notices, forms and formats will be in accordance with DoDM 8910.01 Information Collection Manual: Procedures for Internal Information Collection, Volumes I and II.

Chapter 2 Air Emissions

2-1. Scope

This chapter contains standards for air emissions sources operated by USFK in the ROK. Criteria addressing open burning of Solid Waste (SW) are contained in chapter 7, and criteria addressing “Asbestos” are contained in chapter 15.

2-2. Definitions

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

b. **Cold Cleaning Machine.** Any device or piece of equipment that contains and/or uses liquid solvent into which parts are placed to remove soils 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 parts are classified as cold cleaning machines.

c. **Commercial and Industrial Solid Waste Incinerator (CISWI) Units.** Any enclosed device that combusts commercial and industrial waste using controlled flame combustion without energy recovery and 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. The CISWI unit includes all ash handling systems connected to the bottom ash handling system.

d. **Dust.** Particulate matter that floats, scatters, or descends in the air. The standards for dust reduction are listed in table 2-7.

e. **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.

f. **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.

g. **Gas.** A gaseous substance generated during burning, synthesizing, and analyzing material, or generated by the physical properties of material itself. The permissible standards for gaseous pollutants are listed in table 2-2.

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

i. **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.

j. **Motor Vehicle.** Any commercially available vehicle that is not adapted to military use which 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.

k. **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.

l. **Municipal Solid Waste (MSW).** Any 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, nonmanufacturing activities at industrial facilities, and other similar establishments or facilities. Institutional waste includes materials discarded by schools, hospitals (nonmedical), nonmanufacturing 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).

m. **Offensive Odor.** Unpleasant smell produced from hydrogen sulfide, mercaptans, amines, and other irritating gaseous substances. The permissible standards for offensive odor are listed in table 2-3.

n. **Ozone-Depleting Substances (ODS).** Those substances listed in table 2-4.

o. **Particulate Matter.** Minute solid or liquid particles of material, which are generated by cutting, grading, heaping, reheaping, or any other mechanical treatment or by combustion, synthesis, or decomposition of materials. The permissible standards for particulate pollutants are listed in table 2-5.

p. **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).

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

r. **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.

s. **Pyrolysis.** The endothermic gasification of materials, typically hospital waste and/or medical/infectious waste, using external energy.

t. **Smoke.** Minute particles generated during combustion and mainly composed of free carbon.

u. **Soot.** Particles with the diameter more than 1 micron that are condensed free carbon produced at the time of combustion.

v. **Stack.** Any point in a source covered by criteria contained in paragraph 2-3, Criteria, including: Steam/hot water generating units, incinerators, PCE dry cleaning machines, chromium electroplating and anodizing tanks, or halogenated solvent cleaning machines designed to emit pollutants.

w. **Standard Cubic Meter (sm³).** A cubic meter (~35.3 cubic feet) of air at 1 atmosphere pressure and zero degrees Centigrade (32 degrees Fahrenheit).

x. **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.

y. **Substantially Modified.** Any modification to a facility/building the cost of which exceeds \$1 million regardless of funding source, or a conversion of facility use regardless of cost.

z. **Vapor Cleaning Machine.** A batch or in-line solvent cleaning machine that boils liquid solvent to generate solvent vapor that is used as a part of the cleaning or drying cycle.

aa. **Wood Residue.** Bark, sawdust, slabs, chips, shavings, mill trim, and other wood products derived from wood processing and forest management operations.

2-3. Criteria

a. Open burning of trash and other materials in drums, open areas or burn pits is strictly prohibited at USFK installations.

b. 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.

(1) Air Emission Standards. The following criteria apply to units with a maximum design heat input capacity greater or equal to 10 million Btu/hr:

(a) 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 2-6 at all times, except during periods of startup, shut down, soot blowing, malfunction, or when emergency conditions exist.

(b) For units combusting liquid or solid fossil fuels, fuel sulfur content (weight percent) and higher heating value will be measured and recorded for each new shipment of fuel. Use this data to calculate sulfur dioxide (SO₂) emissions and document compliance with the SO₂ limits using the equation in table 2-6. Alternatively, install a properly calibrated and maintained continuous emissions monitoring system (CEMS) to measure the flue gas for SO₂ and either oxygen (O₂) or carbon dioxide (CO₂).

(2) Air Emissions Monitoring. Steam/hot water generating units subject to opacity or nitrogen oxides (NO_x) standards in table 2-6 must have a properly calibrated and maintained CEMS to measure the flue gas as follows:

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

(b) For fossil-fuel fired units with a maximum design heat input capacity greater than 100 million Btu/hr: NO_x and either O₂ or CO₂.

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

(1) Commercial and Industrial Solid Waste Incinerators (CISWI). All CISWI units must comply with the applicable emission standards in table 2-2, table 2-3, and table 2-5.

(2) Municipal Waste Combustion (MWC) Units. Each MWC unit must comply with the applicable emission standards in table 2-2, table 2-3, and table 2-5.

(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 1 ton 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.

(4) Medical Waste Incinerators (MWI). The following standards apply to all units, except as follows: portable units (field deployable); pyrolysis units; units that burn only pathological, low-level radioactive waste or chemotherapeutic waste; and fixed medical waste incinerators that exist only for contingency purposes and burn only fuel during periodic testing. Refer to chapter 8, "Medical Waste Management," for other requirements pertaining to medical waste management. All MWI must be designed and operated according to the following good combustion practices (GCP):

(a) Unit design: dual chamber.

(b) Minimum temperature in primary chamber: 1400-1600°F.

(c) Minimum temperature in secondary chamber: 1800-2200°F.

(d) Minimum residence time in the secondary chamber: 2 seconds.

(e) Incinerator operators must be trained in accordance with applicable Service requirements.

d. Dry cleaning machines which use Perchloroethylene (PCE), Trichloroethane (TCE), or fluoro solvents and petroleum solvents (PCE/TCE/FS-PS dry cleaning machines). The following requirements apply to all dry cleaning machines. These requirements do not apply to coin-operated machines.

(1) Emissions from PCE/TCE/FS-PS dry cleaning machines installed before 1 October 1994, at installations that have a machine with a rated capacity greater than or equal to 30 kg (66 pounds) in their 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 45°F or less. Dry cleaning machines and control devices must be operated

according to manufacturer recommendations.

(2) All PCE/TCE/FS-PS dry cleaning machines dry cleaning machines 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 45°F or less. Dry cleaning machines and control devices must be operated according to manufacturer recommendations.

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

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

(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.

(3) Option 3: Limit chromium emissions to the maximum allowable mass emission rate (MAMER) calculated using the following equation: $MAMER = ETSA \times K \times 0.015 \text{ mg/dscm}$, 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 (ft²); K = a conversion factor, 425 dscm/(ft²-hr). Option 3 is ONLY applicable to hard chrome electroplating tanks equipped with an enclosing hood and ventilated at no more than half the rate or less than that of an open surface tank with the same surface area.

f. Halogenated Solvent Cleaning Machines. These requirements apply to all solvent cleaning machines that use solvent containing 5 percent or more 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), carbon tetrachloride (CAS No. 56-23-5), chloroform (CAS No. 67-66-3), or any combination of these halogenated solvents.

(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 1-inch water layer or a freeboard ratio of at least 0.75.

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

g. Gas Stations, POL Tank Farms, Dry Cleaning Facilities, and Paint Shops. Operating procedures will be developed for gas stations POL tank farms, dry cleaning facilities, and paint shops with storage capacities $\geq 20 \text{ m}^3$ (5,284 gallons) that will address the following:

(1) Minimization of VOC emissions released to the atmosphere during unloading petroleum products from trucks.

(2) Minimization of VOC emissions with proper installation and maintenance of vent pipes.

h. Units containing an Ozone Depleting Substance (ODS), Hydrofluorocarbons (HFCs), and

PFCs listed in table 2-4. The following criteria apply to direct atmospheric emissions from refrigeration, fire suppression and other equipment.

(1) Refrigerant Recovery/Recycling. All 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 ROK equivalent.

(2) Refrigerant Venting Prohibition. Do not intentionally release any class I or class II ODS, HFC, and PFC refrigerant 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 are not subject to this prohibition.

(3) Refrigerant Leak Monitoring and Repair. Equipment normally containing more than 50 pounds of refrigerant must have leaks repaired under the following conditions.

(a) Commercial Refrigeration Equipment: Commercial refrigeration equipment must have leaks repaired if the appliance is leaking at a rate such that the loss of refrigerant will exceed 35 percent of the total charge during a 12-month period.

(b) Industrial Process Refrigeration Equipment: Industrial process refrigeration equipment must have leaks repaired if the appliance is leaking at a rate such that the loss of refrigerant will exceed 35 percent of the total charge during a 12-month period.

(c) Comfort Cooling Appliances: Comfort cooling appliances not covered by subparagraphs (a) or (b) of this section must have leaks repaired if the appliance is leaking at a rate such that the loss of refrigerant will exceed 15 percent of the total charge during a 12-month period.

(4) ODS Fire Suppression Agent (Halon) Venting Prohibition. Do not intentionally release halons into the environment while testing, maintaining, servicing, repairing, or disposing of halon-containing equipment or during use of equipment for technician training. This venting prohibition does NOT apply to the following halon releases:

(a) 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).

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

(c) 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. When firefighting foams and chemicals are used, it should be noted that use of perfluorooctanic acid (PFOA) and perfluorooctane sulfonate (PFOS) should adhere to the latest DOD and service guidelines for aqueous firefighting foams (AFFF). Any remaining stocks must be disposed of as per standard procedures without causing any environmental damage.

i. Motor vehicles. These criteria apply to DoD-owned motor vehicles and USFK-registered privately owned motor vehicles.

(1) DoD-owned motor vehicle. All vehicles shall be inspected every two years to ensure that no tampering with factory-installed emission control equipment has occurred.

(2) USFK-registered motor vehicle. Inspect upon initial registration and before any change in ownership to ensure that no tampering with factory-installed emission control equipment has occurred.

(3) Motor vehicle emissions will be evaluated upon initial registration, thereafter every 2 years and before any change in ownership in accordance with the environmental standards the vehicle was designed to meet. Vehicles will meet relevant established ROK emission standards.

(4) Motor vehicle fuel will comply with Korean fuel standards established for gasoline, diesel, and LPG for the areas where the fuel will be dispensed.

(5) Use only unleaded gasoline in vehicles that are designed to use unleaded gasoline.

j. Stack Heights. Hg is the good engineering practice stack height necessary to minimize downwash of stack emissions due to aerodynamic influences from nearby structures. Stacks shall be designed and constructed to heights at least equal to the largest Hg calculated from either of the following two criteria:

(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 Hg.

(2) Hg 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 percent 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 also may be considered to be nearby which falls within a distance from the stack of up to no more than 10 times the maximum height (Ht) of the feature, not to exceed 2 miles if such feature achieves a height (Ht) 0.8 km from the stack that is at least 40 percent of the good engineering practice stack height determined by the formula provided in paragraph 2-3j(1) or 26 meters, 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.

k. The following facilities have the potential to emit air pollutants and are of special interest to USFK. Coordination with the LEC is required if an installation is operating or plans to construct one of these facilities.

(1) Metal melting, refining, or heating facilities.

(2) Metal surface treating facilities (i.e., etching).

- (3) Wood-processing and manufacturing facilities (i.e., large plywood manufacturing).
- (4) Petroleum/petroleum-based chemical manufacturing and refining facilities.
- (5) Oil storage facilities associated with refining/manufacturing operations with storage capacities $\geq 10 \text{ m}^3$ (2,642 gallons).

I. Additional Criteria. Additional criteria for gaseous pollutants, particulate pollutants, offensive odors, dust reduction, and volatile organic compounds are provided in the tables that follow.

Table 2-1
List of Air Pollutants

Acetaldehyde	Ethylbenzene
Acrolein	Ethyleneoxide
Acrylonitrile	Fluorides (fluorine)*
Aluminum and its compounds	Formaldehyde
Amines (amine)*	Hydrazine
Ammonia	Hydrogen sulfide
Aniline	Hydrocarbon
Antimony and its compounds	Iron and its compounds
Arsenic and its compounds	Lead and its compounds
Asbestos	Manganese and its compounds
Barium and its compounds	Mercaptans
Benzene	Mercury and its compounds
Benzidine	Nickel and its compounds
Beryllium and its compounds	Nitrogen oxides
Boron and its compounds	Particulate matter
Bromine and its compounds	Phenol and its compounds
1,3-butadiene	Phosphorous and its compounds
Cadmium and its compounds	Polychlorinated biphenyls
Carbon disulfide	Polycyclic aromatic hydrocarbons (PAHs)
Carbon tetrachloride	Propylene oxide
Carbon monoxide	Selenium and its compounds
Chlorine and its compounds	Styrene
Chloroform	Sulfur oxides
Chromium and its compounds	Tellurium and its compounds
Copper and its compounds	Tetrachloroethylene
Cyanides (cyanogen)*	Tin and its compounds
1,2-dichloroethylene	Trichloroethylene
Dichloromethane	Vanadium and its compounds
1,4-diethylene dioxide/ dioxin	Vinyl chloride
Dimethyl and methyl sulfide	Zinc and its compounds
Dimethyl disulfide	

*Korean equivalent name

Table 2-2
Permissible Standards for Gaseous Pollutants

Pollutants	Facilities	Permissible emission standard
Carbon monoxide	Incineration Facilities	
	• Incineration capacity ≥ 2 ton/hour (in case of medical wastes, 200kg/hour)	≤ 50 (12) ppm
	• $200 \text{ kg/hour} \leq \text{Incineration capacity} < 2 \text{ ton/hour}$	≤ 200 (12) ppm
	• Incineration capacity $< 200 \text{ kg/hour}$	≤ 300 (12) ppm
Dioxin (Persistent Organic Pollutant (POP))`	Incineration Facilities (except medical waste facilities)	
	• Incineration capacity ≥ 4 ton/hour	0.1 (12) ng-TEQ/sm ³
	• $2 \text{ ton/hour} \leq \text{Incineration capacity} < 4 \text{ ton/hour}$	1 (12) ng-TEQ/sm ³
	• $0.025 \text{ ton/hour} \leq \text{Incineration capacity} < 2 \text{ ton/hour}$	5 (12) ng-TEQ/sm ³
	Medical Waste Incineration Facilities	
	• Hourly capacity ≥ 4 ton	0.1 (12) ng-TEQ/sm ³
	• $2 \text{ ton} \leq \text{Hourly capacity} < 4 \text{ ton}$	1 (12) ng-TEQ/sm ³
	• $1 \text{ ton} \leq \text{Hourly capacity} < 2 \text{ ton}$	1 (12) ng-TEQ/sm ³
	• $200 \text{ kg} \leq \text{Hourly capacity} < 1 \text{ ton}$	5 (12) ng-TEQ/sm ³
	• $25 \text{ kg} \leq \text{Hourly capacity} < 200 \text{ kg}$	5 (12) ng-TEQ/sm ³
Hydrogen chloride	Incineration Facilities	
	• Incineration capacity ≥ 2 ton/hour (in case of medical wastes, 200kg/hour)	≤ 30 (12) ppm
	• $200 \text{ kg/hour} \leq \text{Incineration capacity} < 2 \text{ ton/hour}$	≤ 40 (12) ppm
	• Incineration capacity $< 200 \text{ kg/hour}$	≤ 50 (12) ppm
Sulfur oxides as SO ₂	General Boiler	
	Facility using liquid fuel (emission $\geq 50,000 \text{ m}^3/\text{hour}$):	
	• Areas required to use low-sulfur oil:	
	• $\leq 1.0 \%$	≤ 270 (4) ppm
	• $\leq 0.5 \%$	≤ 270 (4) ppm
	• $\leq 0.3 \%$	≤ 180 (4) ppm
	• Other areas	≤ 270 (4) ppm
	Facility using liquid fuel (emission $< 50,000 \text{ m}^3/\text{hour}$):	
	• Areas required to use low-sulfur oil:	
	• $\leq 1.0 \%$	≤ 540 (4) ppm
	• $\leq 0.5 \%$	≤ 270 (4) ppm
	• $\leq 0.3 \%$	≤ 180 (4) ppm
	• Other areas	≤ 540 (4) ppm

Table 2-2
Permissible Standards for Gaseous Pollutants - Continued

Pollutants	Facilities	Permissible emission standard
Sulfur oxides as SO ₂ (continued)	Facility using solid fuel (facilities using solid/liquid fuel mixture included):	
	• Solid fuel regulated areas • Facilities using domestic hard coal • Facilities using other solid fuel	≤ 250 (6) ppm ≤ 150 (6) ppm ≤ 150 (6) ppm
	Power Generation	
	• Facilities using liquid fuel • Facilities using solid fuel • Facilities using domestic petroleum cokes • Facilities using other types of solid fuel	≤ 70 (4) ppm ≤ 80 (6) ppm ≤ 270 (6) ppm ≤ 180 (6) ppm
	Incineration facilities	
	• Incineration capacity ≥ 2 ton/hour (in case of medical wastes, 200kg/hour) • 200 kg/hour ≤ Incineration capacity < 2ton/hour • Incineration capacity < 200kg/hour	≤ 30 (12) ppm ≤ 70 (12) ppm ≤ 100 (12) ppm
Nitrogen oxides as NO ₂	General Boiler	
	Boilers using liquid fuel with capacity of:	
	• ≥ 100,000 m³/hour • 10,000 m³/hour < capacity < 100,000 m³/hour • < 10,000 m³/hour	≤ 70 (4) ppm ≤ 200 (4) ppm ≤ 250 (4) ppm
	Boilers using solid fuel	≤ 150 (6) ppm
	Boilers using domestic oil cokes	≤ 200 (6) ppm
	Power Generation	
	Facilities using liquid fuel:	
	• Internal combustion engine: • Gas Turbine • Diesel Engine	≤ 70 (13) ppm ≤ 300 (13) ppm
	• Other power generation facility: • ≥ 100MW • < 100MW	≤ 70 (4) ppm ≤ 70 (4) ppm
	Facilities using solid fuel	≤ 80 (6) ppm
	Facilities using gasoline:	
	• Internal combustion engine • Others	≤ 50 (13) ppm ≤ 50 (4) ppm

Table 2-2
Permissible Standards for Gaseous Pollutants - Continued

Pollutants	Facilities	Permissible emission standard
Nitrogen oxides as NO ₂ (continued)	Incineration facilities	
	• Incineration capacity ≥ 2 ton/hour (in case of medical wastes, 200kg/hour)	≤ 80 (12) ppm
	• 200 kg/hour ≤ Incineration capacity < 2 ton/hour	≤150 (12) ppm
	• Incineration capacity < 200kg/hour	≤150 (12) ppm
Carbon disulfide	Applicable air emission sources*	≤ 30 ppm
Formaldehyde	Applicable air emission sources*	≤ 10 ppm
Hydrogen sulfide	Incineration facilities	
	• Incineration capacity ≥ 2 ton/hour (in case of medical wastes, 200kg/hour)	≤ 2 (12) ppm
	• 200 kg/hour ≤ Incineration capacity < 2 ton/hour	≤2 (12) ppm
	• Incineration capacity < 200kg/hour	≤10 (12) ppm
Fluorides as F	Incineration facilities	
	• Incineration capacity ≥ 2 ton/hour (in case of medical wastes, 200kg/hour)	≤2 (12) ppm
	• 200 kg/hour ≤ Incineration capacity < 2 ton/hour	≤2 (12) ppm
	• Incineration capacity < 200kg/hour	≤3 (12) ppm
Hydrogen cyanide	• Applicable air emission sources*	≤10 ppm
Chlorine	• Incineration facilities	≤10 ppm
Bromine compounds as Br	• Applicable air emission sources*	≤5 ppm
Benzene	• Applicable air emission sources*	≤30 ppm
Phenol compounds	• Applicable air emission sources*	≤10 ppm
Mercury compounds	• Incineration facilities	≤0.1(12) mg/Sm ³
Arsenic compounds	• Incineration facilities	≤0.5(12) ppm

*Air emission testing must be conducted if an air emission source has the potential to emit a listed compound. If analytical results do not indicate the presence of the compound then no further testing will be required unless modifications of the air emissions source or facility processes occur. If analytical results indicate the presence of the compound, then the source must be included in the installation's air emission inventory.

Remarks:

1. () in the permissible emission standard column means standard oxygen density in percentage. (% of O₂).
2. The standard oxygen density standards do not apply to waste gas incineration facilities using direct combustion and catalysts.

Table 2-3
Permissible Standards for Offensive Odors

Measurement method	Permissible emission standards		
Undiluted Olfactory method	Less than 2 degrees of offensive odor		
Air-diluted Olfactory method	a. at the emission point: dilution ratio ≤ 500 b. at the facility boundary: dilution ratio ≤ 15		
Analytical Instrumentation method	Odor-causing matter	Other regions (ppm)	Industrial (ppm)
	Ammonia	≤ 1	n/a
	Methyl mercaptans	≤ 0.002	n/a
	Hydrogen sulfide	≤ 0.02	n/a
	Dimethyl sulfide	≤ 0.01	n/a
	Dimethyl disulfide	≤ 0.009	n/a
	Trimethyl amines	≤ 0.005	n/a
	Acetaldehyde	≤ 0.05	n/a
	Styrene	≤ 0.4	n/a
	Propionaldehyde	≤ 0.05	≤ 0.1
	Butyraldehyde	≤ 0.029	≤ 0.1
	<i>n</i> -valericaldehyde	≤ 0.009	≤ 0.02
	<i>i</i> - valericaldehyde	≤ 0.003	≤ 0.006

Table 2-4
Class I and II Ozone Depleting Substances

Class I		
Chemical name	Chemical formula	Ozone-depletion potential*
Trichlorofluoroethane (CFC-11)	CFCl_3	1.0
Dichlorodifluoroethane (CFC-12)	CF_2Cl_2	1.0
Chlorotrifluoromethane (CFC-13)	CF_3Cl	1.0
Pentachlorofluoroethane (CFC-111)	C_2FCl_5	1.0
Tetrachlorodifluoroethane (CFC-112)	$\text{C}_2\text{F}_2\text{Cl}_4$	1.0
Trichlorotrifluoroethane (CFC-113)	$\text{C}_2\text{F}_3\text{Cl}_3$	0.8
Dichlorotetrafluoroethane (CFC-114)	$\text{C}_2\text{F}_4\text{Cl}_2$	1.0
Chloropentafluoroethane (CFC-115)	$\text{C}_2\text{F}_5\text{Cl}$	0.6
Heptachlorofluoropropane (CFC-211)	C_3FCl_7	1.0
Hexachlorodifluoropropane (CFC-212)	$\text{C}_3\text{F}_2\text{Cl}_6$	1.0
Pentachlorotrifluoropropane (CFC-213)	$\text{C}_3\text{F}_3\text{Cl}_5$	1.0
Tetrachlorotetrafluoropropane (CFC-214)	$\text{C}_3\text{F}_4\text{Cl}_4$	1.0
Trichloropentafluoropropane (CFC-215)	$\text{C}_3\text{F}_5\text{Cl}_3$	1.0
Dichlorohexafluoropropane (CFC-216)	$\text{C}_3\text{F}_6\text{Cl}_2$	1.0
Chloroheptafluoropropane (CFC-217)	$\text{C}_3\text{F}_7\text{Cl}$	1.0
Bromotrifluoromethane (Halon-1301)	CF_3Br	10.0
Bromochlorodifluoromethane (Halon-1211)	CF_2BrCl	3.0
Dibromotetrafluoroethane (Halon-2402)	$\text{C}_2\text{F}_4\text{Br}_2$	6.0
Carbontetrachloride	CCl_4	1.1
1,1,1-trichloroethane (methylchloroform)	$\text{C}_2\text{H}_3\text{Cl}_3$	0.1
Methylbromide	CH_3BrCl	0.6
Bromochloromethane	CH_2BrCl	0.12
Dibromofluoromethane	CHFBr_2	1.00
Bromodifluoromethane (HBFC-12B1)	CHF_2Br	0.74
Bromofluoromethane	CH_2FBr	0.73
Tetrabromofluoroethane	C_2HFBr_4	0.3 to 0.8
Tribromodifluoroethane	$\text{C}_2\text{HF}_2\text{Br}_3$	0.5 to 1.8
Dibromotrifluoroethane	$\text{C}_2\text{HF}_3\text{Br}_2$	0.4 to 1.6
Bromotetrafluoroethane	$\text{C}_2\text{HF}_4\text{Br}$	0.7 to 1.2
Tribromofluoroethane	$\text{C}_2\text{H}_2\text{FBr}_3$	0.1 to 1.1
Dibromodifluoroethane	$\text{C}_2\text{H}_2\text{F}_2\text{Br}_2$	0.2 to 1.5
Bromotrifluoroethane	$\text{C}_2\text{H}_2\text{F}_3\text{Br}$	0.7 to 1.6
Dibromofluoroethane	$\text{C}_2\text{H}_3\text{FBr}_2$	0.1 to 1.7
Bromodifluoroethane	$\text{C}_2\text{H}_3\text{F}_2\text{Br}$	0.2 to 1.1
Bromofluoroethane	$\text{C}_2\text{H}_4\text{FBr}$	0.07 to 0.1
Hexabromofluoropropane	C_3HFBr_6	0.3 to 1.5

Table 2-4
Class I and II Ozone Depleting Substances - Continued

Class I (continued)		
Chemical name	Chemical formula	Ozone-depletion potential*
Pentabromodifluoropropane	C ₃ HF ₂ Br ₅	0.2 to 1.9
Tetrabromotrifluoropropane	C ₃ HF ₃ Br ₄	0.3 to 1.8
Tribromotetrafluoropropane	C ₃ HF ₄ Br ₃	0.5 to 2.2
Dibromopentafluoropropane	C ₃ HF ₅ Br ₂	0.9 to 2.0
Bromohexafluoropropane	C ₃ HF ₆ Br	0.7 to 3.3
Pentabromofluoropropane	C ₃ H ₂ FBr ₅	0.1 to 1.9
Tetrabromodifluoropropane	C ₃ H ₂ F ₂ Br ₄	0.2 to 2.1
Tribromotrifluoropropane	C ₃ H ₂ F ₃ Br ₃	0.2 to 5.6
Dibromotetrafluoropropane	C ₃ H ₂ F ₄ Br ₂	0.3 to 7.5
Bromopentafluoropropane	C ₃ H ₂ F ₅ Br	0.9 to 14
Tetrabromofluoropropane	C ₃ H ₃ FBr ₄	0.08 to 1.9
Tribromodifluoropropane	C ₃ H ₃ F ₂ Br ₃	0.1 to 3.1
Dibromotrifluoropropane	C ₃ H ₃ F ₃ Br ₂	0.1 to 2.5
Bromotetrafluoropropane	C ₃ H ₃ F ₄ Br	0.3 to 4.4
Tribromofluoropropane	C ₃ H ₄ FBr ₃	0.03 to 0.3
Dibromodifluoropropane	C ₃ H ₄ F ₂ Br ₂	0.1 to 1.0
Bromotrifluoropropane	C ₃ H ₄ F ₃ Br	0.07 to 0.8
Dibromofluoropropane	C ₃ H ₅ FBr ₂	0.04 to 0.4
Bromodifluoropropane	C ₃ H ₅ F ₂ Br	0.07 to 0.8
Bromofluoropropane	C ₃ H ₆ FBr	0.02 to 0.7
Class II		
Dichlorofluoromethane (HCFC-21)	CHFCI ₂	0.04
Chlorofluoromethane (HCFC-22)	CHF ₂ Cl	0.055
Chlorofluoroethane (HCFC-31)	CH ₂ FCI	0.02
Tetrachlorofluoroethane (HCFC-121)	C ₂ HFCl ₄	0.01 to 0.04
Trichlorodifluoroethane (HCFC-122)	C ₂ HF ₂ Cl ₃	0.02 to 0.08
Dichlorotrifluoroethane (HCFC-123)	C ₂ HF ₃ Cl ₂	0.02 to 0.06
Dichlorotrifluoroethane (HCFC-123)	CHCl ₂ CF ₃	0.02
Dichlorotrifluoroethane (HCFC-124)	C ₂ HF ₄ Cl	0.02 to 0.04
Dichlorotrifluoroethane (HCFC-124)	CHFCICF ₃	0.022
Trichlorofluoroethane (HCFC-131)	C ₂ H ₂ F ₂ Cl ₂	0.007 to 0.05
Dichlorodifluoroethane (HCFC-132)	C ₂ H ₂ F ₂ Cl ₂	0.008 to 0.05

Table 2-4
Class I and II Ozone Depleting Substances - Continued

Class II (continued)		
Chemical name	Chemical formula	Ozone-depletion potential*
Chlorotrifluoroethane (HCFC-133)	C ₂ H ₂ F ₃ Cl	0.02 to 0.06
Dichlorofluoroethane (HCFC - 141)	C ₂ H ₃ FCl ₂	0.005 to 0.07
Dichlorofluoroethane (HCFC-141b)	CH ₃ CFCl ₂	0.11
Chlorodifluoroethane (HCFC – 142)	C ₂ H ₃ F ₂ Cl	0.008 to 0.07
Chlorodifluoroethane (HCFC-142b)	CH ₃ CF ₂ Cl	0.065
Chlorofluoroethane (HCFC – 151)	C ₂ H ₄ FCI	0.003 to 0.005
Hexachlorofluoropropane (HCFC-221)	C ₃ HFCl ₆	0.015 to 0.07
Pentachlorodifluoropropane (HCFC-222)	C ₃ HF ₂ Cl ₅	0.01 to 0.09
Tetrachlorotrifluoropropane (HCFC-223)	C ₃ HF ₃ Cl ₄	0.01 to 0.08
Trichlorotetrafluoropropane (HCFC-224)	C ₃ HF ₄ Cl ₃	0.01 to 0.09
Dichloropentafluoropropane (HCFC-225)	C ₃ HF ₅ Cl ₂	0.02 to 0.07
Dichloropentafluoropropane (HCFC – 225ca)	CF ₃ CF ₂ CHCl ₂	0.025
Dichloropentafluoropropane (HCFC – 225cb)	CF ₂ ClCF ₂ CHClF	0.033
Monochlorohexafluoropropane (HCFC-226)	C ₃ HF ₆ Cl	0.02 to 0.1
Pentachlorofluoropropane (HCFC-231)	C ₃ H ₂ FCI ₅	0.05 to 0.09
Tetrachlorodifluoropropane (HCFC-232)	C ₃ H ₂ F ₂ Cl ₄	0.008 to 0.1
Trichlorotrifluoropropane (HCFC-233)	C ₃ H ₂ F ₃ Cl ₃	0.007 to 0.23
Dichlorotetrafluoropropane (HCFC-234)	C ₃ H ₂ F ₄ Cl ₂	0.01 to 0.28
Monochloropentafluoropropane(HCFC-235)	C ₃ H ₂ F ₅ Cl	0.03 to 0.52
Tetrachlorofluoropropane (HCFC-241)	C ₃ H ₃ FCI ₄	0.004 to 0.09
Trichlorodifluoropropane (HCFC-242)	C ₃ H ₃ F ₂ Cl ₃	0.005 to 0.13
Dichlorotrifluoropropane (HCFC-243)	C ₃ H ₃ F ₃ Cl ₂	0.007 to 0.12
Monochlorotetrafluoropropane (HCFC-244)	C ₃ H ₃ F ₄ Cl	0.009 to 0.14
Monochlorotetrafluoropropane (HCFC-251)	C ₃ H ₄ FCI ₃	0.001 to 0.01
Dichlorodifluoropropane (HCFC-252)	C ₃ H ₄ F ₂ Cl ₂	0.005 to 0.04
Monochlorotrifluoropropane (HCFC-253)	C ₃ H ₄ F ₃ Cl	0.003 to 0.03
Dichlorofluoropropane (HCFC-261)	C ₃ H ₅ FCI ₂	0.002 to 0.02
Monochlorodifluoropropane (HCFC-262)	C ₃ H ₅ F ₂ Cl	0.002 to 0.02
Monochlorofluoropropane (HCFC-271)	C ₃ H ₆ FCI	0.001 to 0.03

*Ozone Depletion Potential (ODP) is a non-dimensional number indicating the degree of harmfulness of a chemical to ozone. CFC-11 is given the reference value of 1. If ODP is greater than 1, it indicates that the specific chemical is more harmful to ozone than CFC-11.

NOTES:

1. All isomers of the above chemicals are ODS (except isomers of 1,1,1-trichloroethane [also known as methyl chloroform] such as 1,1,2-trichloroethane).
2. The highest number shall be applied when ODPs are indicated in a range.
3. Installations developing a Pollution Prevention Plan will consider using ODS compounds that have a lower ozone depletion potential.

Table 2-5
Permissible Standards for Particulate Pollutants

Pollutants	Facilities	Permissible emission standard
Dust	General Boiler	
	Facilities using liquid fuel with emission volume:	
	• $\geq 200,000 \text{ m}^3/\text{hour}$	$\leq 20 \text{ (4) mg/sm}^3$
	• $30,000 \text{ m}^3/\text{hour} \leq \text{emission volume} < 200,000 \text{ m}^3/\text{hour}$	$\leq 50 \text{ (4) mg/sm}^3$
	• $6,000 \text{ m}^3/\text{hour} \leq \text{emission volume} < 30,000 \text{ m}^3/\text{hour}$	$\leq 80 \text{ (4) mg/sm}^3$
	• $\leq 6,000 \text{ m}^3/\text{hour}$	$\leq 100 \text{ (4) mg/sm}^3$
	Facilities using solid fuel (or mixture of solid and liquid fuels) with emission volume:	
	• $\geq 30,000 \text{ m}^3/\text{hour}$	$\leq 30 \text{ (6) mg/sm}^3$
	• $6,000 \text{ m}^3/\text{hour} \leq \text{emission volume} < 30,000 \text{ m}^3/\text{hour}$	$\leq 40 \text{ (6) mg/sm}^3$
	• $\leq 6,000 \text{ m}^3/\text{hour}$	$\leq 80 \text{ (4) mg/sm}^3$
	Power Generation	
	Facilities using liquid fuel with capacity:	
	• $\geq 100 \text{ MW}$	$\leq 20 \text{ (4) mg/sm}^3$
	• $< 100 \text{ MW}$	$\leq 20 \text{ (4) mg/sm}^3$
	Internal combustion engine	$\leq 40 \text{ (13) mg/sm}^3$
	Facilities using solid fuel (or mixture of solid and liquid fuels) with capacity:	
	• $\geq 500 \text{ MW}$	$\leq 20 \text{ (6) mg/sm}^3$
	• $< 500 \text{ MW}$	$\leq 30 \text{ (6) mg/sm}^3$
Cadmium Compounds	Incineration Facilities	
	• Incineration capacity $\geq 2 \text{ ton/hour}$ (in case of medical wastes, 200kg/hour)	$\leq 30 \text{ (12) ppm}$
	• $200 \text{ kg/hour} \leq \text{Incineration capacity} < 2 \text{ ton/hour}$	$\leq 80 \text{ (12) mg/sm}^3$
	• Incineration capacity $< 200\text{kg/hour}$	$\leq 100 \text{ (12) mg/sm}^3$
	• Incineration capacity $\geq 2 \text{ ton/hour}$ (in case of medical wastes, 200kg/hour)	$\leq 0.02 \text{ (12) mg/sm}^3$
	• $200 \text{ kg/hour} \leq \text{Incineration capacity} < 2 \text{ ton/hour}$	$\leq 0.1 \text{ (12) mg/sm}^3$
	• Incineration capacity $< 200\text{kg/hour}$	$\leq 0.2 \text{ (12) mg/sm}^3$

Table 2-5
Permissible Standards for Particulate Pollutants - Continued

Pollutants	Facilities	Permissible emission standard
Lead compounds as Pb	Incineration facilities	
	Incineration capacity $\geq$ 2 ton/hour (in case of medical wastes, 200kg/hour)	$\leq$ 0.02 (12) mg/sm ³
	200 kg/hour $\leq$ Incineration capacity < 2 ton/hour	$\leq$ 1.6 (12) mg/sm ³
	Incineration capacity < 200kg/hour	$\leq$ 5 mg/Sm ³
Chromium compounds as Cr	Incineration facilities	$\leq$ 0.5 (12) mg/sm ³
Copper compounds as Cu	Applicable air emission sources*	$\leq$ 10 mg/sm ³
Nickel and nickel compounds	Applicable air emission sources*	$\leq$ 20 mg/sm ³
Zinc compounds as Zn	Applicable air emission sources*	$\leq$ 10 mg/sm ³
Flying dust	Applicable air emission sources*	$\leq$ 0.5 mg/sm ³
Smoke	Applicable air emission sources*	$\leq$ level 2 in Ringelmann smoke chart

NOTES:

*Air emission testing must be conducted if an air emission source has the potential to emit a given compound. If analytical results do not indicate the presence of the compound then no further testing will be required unless modifications of the air emissions source occur. If analytical results indicate the presence of the compound, then the source must be included in the installation's air emission inventory.

Remarks:

- () in the permissible emission standard column means standard oxygen density in percentage.
- The emission volume of general boilers is determined by the boiler capacity. The volume of an emergency boiler installed as a back-up boiler is not counted.
- Standard oxygen density is not applied for the following:
 - Facilities using direct combustion or catalysts under the category of waste gas incineration facilities.
 - Facilities using pure oxygen instead of air.

Table 2-6**Emission Standards for Steam Generating Units**

Fuel Type	Maximum Design Heat Input Capacity						
	10 – 100 million BTU/hr			Size >100 million BTU/hr			
	PM	Opacity ^b	SO ₂ ^c	PM	Opacity ^b	SO ₂ ^c	NO _x ^d
Gaseous	N/A	N/A	N/A	N/A	N/A	N/A	0.20
Gaseous - Coal	N/A	N/A	N/A	N/A	N/A	N/A	0.50
Liquid Fossil Fuel	N/A	20%	0.50 ^e	0.10	20%	0.80	0.30
Solid Fossil Fuel	0.10	20%	1.20	0.10	20%	1.20	0.70
Other Solid Fuel ^f	0.30	20%	N/A	0.20	20%	N/A	N/A

NOTES:

N/A = Not applicable.

1. Standards apply to units constructed or substantially modified after 1 October 1994. Standards do not apply during periods of startup, shutdown, malfunction, soot blowing, or when emergency conditions exist. Unless specified otherwise, emission standards are in lb/million BTU.

2. The opacity standards do not apply to units < 30 million BTU/hr. The 20% standard applies to the average opacity over a six-minute period. A 30% opacity value is allowed for one six-minute period per hour.

3. SO₂ is best controlled and compliance documented by limiting fuel sulfur content. SO₂ emissions (lb/ million BTU) = 0.02 x sulfur content of fuel (%) / heat content of fuel (HHV, million BTU/lb fuel) [e.g., for fuel oil with 0.5% sulfur, SO₂ = 0.02 x 0.5 / 0.019 = 0.53 lb/million BTU].

4. Emission limitation for NO_x is based on a 30-day rolling average. NO_x standard does not apply when a fossil fuel containing at least 25% by weight of coal refuse is burned in combination with gaseous, liquid, or other solid fossil fuel.

5. Instead of 0.5 lb/ million BTU of SO₂, fuel oil combustion units may comply with a 0.5% average fuel sulfur content limit (weight percent) which is statistically equivalent to 0.5 lb/million BTU.

6. Other solid fuels include wood or waste-derived fuels.

Table 2-7
Best Management Practices for Dust Reduction

No.	Discharge process	Standards for installation & necessary measures
1	Field storage (when powdery material is stored in the field)	a. Field stored material shall be covered by anti-dust cover. b. Anti-dust cover wall of 1/3 of field storage height shall be installed and anti-dust net (screen) of 1.25 times the height of storage shall be installed. For construction site, landscaping site, and demolition site, the boundary shall be guarded with anti-dust wall of 1.8m or more. When two or more sites are adjacent to each other, the inner boundary does not need a wall. c. Field stored material shall have water content of 7-10% and sprinkler shall be installed to maintain the water content. (For iron scrap site, this does not apply) d. When the same measures equivalent to or better than a – c are taken, those measures may substitute a – c.
2	Loading/unloading criteria for potential dust-generating activities, such as those involving soil, coal, and concrete/cement	a. Install portable dust booth or spraying dust booth to control flying dust produced during the work processes (limited to coal manufacturing industry, iron/steel industry, and grain transportation industry). b. Install and use fixed or portable water sprays (spraying radius ≥ 5 m and water pressure ≥ 3 kg/cm²) to control flying dust (grain processing and loading facilities are excluded). c. Stop working when wind velocity ≥ 8 m/sec (~18 miles per hour). d. If current actions are more effective than a - c, then implementation of a - c is exempted.
3	Transportation [cement, coal, soil, feeds, grain, scrap iron are limited to a, b, f, g and wood is limited to g and h]	a. Cover the loaded materials. b. Loaded materials shall not extend above 5 cm (~2 inches) below the top of the truck bed. c. If 10 or more residences are located within 500 meters of the road, pavement, temporary pavement or appropriate covering (with water spray application) shall be provided on the unpaved roads within the 1 km radius. d. One of the following will be made available: (1) Automatic wheel washer (2) Automatic wheel washer with a water containment basin with the following specifications: (a) Area of basin: ≥ 1.2 times area of the truck (b) Depth of basin: ≥ 20 cm (~8 inches) (c) Length of basin: ≥ 2 times of truck length (d) Equipment to assure continuous water flow within the basin e. Install side water sprinkler IAW the following criteria: (1) Water sprinkler should reach bottom of wheels to lower portion of truck bed. (2) Length: ≥ 1.5 times of truck length (3) Pressure of water spray: 3 kg/cm²

Table 2-7**Best Management Practices for Dust Reduction - Continued**

No.	Discharge process	Standards for installation & necessary measures
3	Transportation [cement, coal, soil, feeds, grain, scrap iron are limited to a, b, f, g and wood is limited to g and h]	f. Truck sides and wheels must be washed before exiting site. g. Speed limits within work site shall not exceed 20 km/hr to prevent excessive dust. h. The work site shall be sprayed at least once a day while there is traffic.
4	Conveyance	a. Outdoor conveyance equipment shall be covered and sealed to prevent the release of dust. b. Appropriate dust booths shall be installed at the entrance, exit, falling points, and ventilation areas. c. Water spray or other dust control measures shall be available using non-mechanical devices. d. If current actions more effective than a through c are being practiced, then implementation of a through c is exempted.
5	Outdoor cutting	a. It is recommended that iron scrap cutting be conducted indoors. b. Partitions will be installed for dust control when outdoor cutting is necessary. c. Stop working when wind velocity ≥ 8 m/sec (~18 miles per hour); for ship industries, stop working when wind velocity ≥ 10 m/sec (~22 miles per hour). d. If current actions more effective than a through c are being practiced, then implementation of a through c is exempted.
6	Outdoor media blasting	a. Media blasting will be conducted indoors if the length of an object is less than 15 cm (~6 inches). b. Install partitions for dust control. c. Use portable dust booths if conducting outdoor media blasting. If dust booths are not feasible, media blasting area will be cleaned with vacuum truck. d. Blasting media, dust, and debris will be contained to prevent dust. e. Stop working when wind velocity ≥ 8 m/sec (~18 miles per hour); for ship industries, stop working when wind velocity ≥ 10 m/sec (~22 miles per hour). f. If current actions more effective than a through e are being practiced, then implementation of a through e is exempted.
7	Outdoor grinding	a. Use portable dust booths if conducting outdoor grinding. If dust booths are not feasible, grinding area will be cleaned with vacuum truck. b. Use portable dust net or panels higher than grinding table when outdoor grinding is performed within 40 m (~120 feet) of the property boundary. c. Grinding media, dust, and debris will be contained to prevent dust. d. Stop working when wind velocity ≥ 8 m/sec (~18 miles per hour); for ship industries, stop working when wind velocity ≥ 10 m/sec (~22 miles per hour). e. If current actions more effective than a through e are being practiced, then implementation of a through e is exempted.

Table 2-7**Best Management Practices for Dust Reduction - Continued**

No.	Discharge process	Standards for installation & necessary measures
8	Other processes (i.e., building construction sites, earthwork sites, building demolition)	a. The following shall be implemented at building construction sites: (1) Install dust control panels at the work site when dust generation is anticipated (i.e., activities such as floor cleaning, wall grinding, cutting, spray painting, etc.). (2) Install dust control panels to contain dust within the work site. Special precautions should be considered when applying fire-retardant materials to steel construction beams and when grinding/polishing uneven concrete surfaces. (3) Clean floors at all times to minimize dust. b. Install dust control panels when spray painting at building construction or groundworking sites. c. Install dust control panels, dust control walls, and wetting of materials during building demolition activities. d. All major construction must have a dust control plan which shall be preapproved by the Garrison's Environmental Office. If current actions are more effective than a through c, then implementation of a through c is exempted.

Chapter 3

Drinking Water

3-1. Scope

This chapter contains criteria for providing potable water.

3-2. Definitions

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

b. **Appropriate DoD Medical Authority.** The medical professional designated by the in-theater component commander to be responsible for resolving medical issues as necessary to provide safe drinking water at the component's installations. If issues are unresolved, the USFK Command Surgeon shall be consulted as the ultimate Medical Authority.

c. **Concentration-Time (CT).** The product of residual disinfectant concentration, C, in mg/L determined before or at the first customer, and the corresponding disinfectant contact time, T, in minutes. CT values appear in tables 3-11-1.1 to 3-11-1.6, and tables 3-11-2 through 3-11-9.

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

e. **Diatomaceous Earth Filtration.** A water treatment process of passing water through a precoat of diatomaceous earth deposited on 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.

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

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

h. **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.

i. **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.

j. **Haloacetic Acids (HAA5).** Sum of mass concentrations in milligrams per liter (mg/l) of five haloacetic acid compounds = Sum of monochloroacetic acid (MCAA), dichloroacetic acid (DCAA), trichloroacetic acid (TCAA), monobromoacetic acid (MBAA) and dibromoacetic acid (DBAA), rounded to two significant figures after addition.

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

l. **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.

m. **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.

n. **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.

o. **Nephelometric Turbidity Units (NTU).** The intensity of light at a specified wavelength scattered or attenuated by suspended particles or absorbed at a method-specified angle, usually 90 degrees, from the path of the incident light compared to a synthetic chemically prepared standard.

p. **Non-Public Water System (NPWS).** A system that does not meet the definition of a public water system; for example, a well serving a building with less than 25 people.

q. **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.

r. **Point-of-Use (POU) Treatment Device.** A treatment device applied to a tap to reduce contaminants in drinking water flowing from that tap.

s. **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.

t. **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 out 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":

(1) **Community Water System (CWS).** A public water system having at least 15 service connections used by year-round residents, or which regularly serves at least 25 year-round residents.

(2) **Non-Community Water System (NCWS).** A PWS that is not a community water system. A NCWS is either a non-transient, non-community water system or a transient, non-community water system.

(a) **Non-transient non-community water system (NTNCWS).** A public water system 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.

(b) **Transient non-community water system (TNCWS).** A public, non-community water system that provides water at least six months per year. Examples include but are not limited to gas stations, motels, and campgrounds that have their own water sources.

u. **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.

v. **Slow Sand Filtration.** Water treatment process where raw water passes through a bed of sand at a low velocity (typically 1.3 ft/hr), resulting in particulate removal by physical and biological mechanisms.

w. **Total Trihalomethanes (TTHM).** The sum of the concentration in mg/L of chloroform, bromoform, dibromochloromethane, and bromodichloromethane.

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

y. **USFK Water System.** A public water system or non-public water system located on or servicing a USFK installation.

z. **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

a. USFK water systems, regardless of whether they produce or purchase water, will:

- (1) Maintain a map/drawing of the complete potable water system.
- (2) Update the potable water system master plan at least every five years.
- (3) Protect all water supply aquifers (groundwater) and surface water sources from contamination by suitable placement and construction of wells, suitable placement of any new intakes (heading) to all water treatment facilities, proper siting and maintenance of septic systems and on-site treatment units, and appropriate land use management on USFK installations.
- (4) Groundwater wells will be installed and constructed IAW service component well head protection programs, to include the following, as appropriate:
 - (a) Use a well head seal made of impermeable and erosion-resistant materials, such as concrete or synthetic resin.
 - (b) For dug wells, the length, width (in case of circular shape, the inner diameter), and height of the upper protective cover must each be at least 100 cm (~40 inches), or at least 50 cm (~20 inches) for wells with capacity of less than 30 tons/day. The upper part shall be installed at least 30 cm (~12 inches) above ground level. This does not apply to drilled wells (wells closed at the top to prevent introduction of pollutants). Well casings should extend at least 3 m (~9 feet) in depth. For borings advanced below the depth of bedrock, the casing shall be installed below the depth of bedrock.
 - (c) The thickness of exterior grouting for casing shall be a minimum of 5 cm (~2 inches). Fill with bentonite or similar impermeable material to grade.
 - (d) The well head seal shall be designed to prevent pollutant or surface water contamination of the well.
 - (e) The ground surface gradient within a 1m (~3 feet) radius of the well shall be maintained at 10° or higher, sloping away from the well.
 - (f) Completely remove pollutants, debris, and rainwater introduced during well installation and sterilize water before use.
- (5) Conduct sanitary surveys of the water systems, including review of required water quality analyses, at least once every 3 years for systems using surface water or GWUDISW, and every 5 years for systems using groundwater, or over shorter intervals as warranted. Off-installation surveys will be coordinated with ROK authorities.
- (6) Provide proper treatment for all potable water sources. Surface water supplies, including GWUDISW, must conform to the surface water treatment requirements set forth in table 3-1. Groundwater extracted for use as potable water, at a minimum, must be disinfected.
- (7) Maintain a continuous positive pressure of at least 137.9 kilopascals (20 pounds per square inch (psi)) in the water distribution system.
- (8) Perform water distribution system operation and maintenance practices consisting of:

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

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

(c) An effective annual water main flushing program.

(d) Proper operation and maintenance of storage tanks and reservoirs.

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

(9) Establish an effective cross-connection control and backflow prevention program.

(10) Manage underground injection on USFK 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.

(11) Develop and update as necessary an emergency contingency plan to ensure the provision of potable water despite interruptions from natural disasters and service interruptions. As needed to meet potable water source requirements, an installation commander shall request access to municipal potable water supplies through the LEC. At a minimum, the emergency contingency plan will include plans, procedures, and identification of equipment that can be implemented or utilized in the event of an intentional or unintentional disruption as follows:

(a) Identification of key personnel.

(b) Procedures to restore service.

(c) Procedures to isolate damaged lines.

(d) Identification of alternative water supplies.

(e) Installation public notification procedures.

(12) 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.

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

(14) 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.

(15) Conduct vulnerability assessments, which would include, but are not limited to, a review of:

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

(b) Use, storage, or handling of various chemicals.

(c) Operation and maintenance of the water storage, treatment, and distribution systems.

b. USFK water systems, regardless of whether they produce or purchase water, will complete independent testing, to ensure conformance with the following:

(1) Total coliform bacteria requirements:

(a) 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 respect to the total coliform-related MCL. The MCL is no more than 5% samples positive for total coliforms per month for a system examining 40 or more samples a month, and no more than one sample positive for total coliforms per month when a system analyzes less than 40 samples per month.

(b) Each system must develop a written, site-specific monitoring plan and collect routine samples according to table 3-2, "Total Coliform Monitoring Frequency."

(c) Systems with initial samples testing positive for total coliforms will collect repeat samples as soon as possible, preferably the same day. A system that collects more than one routine sample per month must collect no fewer than three repeat samples for each total coliform-positive sample found. For each sample testing positive, a repeat sample must be collected at the same tap as the original sample, and one sample each must be collected at upstream and downstream sample points that are within 5 service connections of the original service connection. Any additional repeat sampling that may be required will be performed according to appropriate DoD medical authority guidance. Monitoring will continue until total coliforms are no longer detected.

(d) 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 coliforms positive sample if fecal or *E. coli* is assumed to be present.

(e) Any fecal coliform-positive repeat sample or *E. coli*-positive repeat sample, or any total coliform-positive repeat sample following a fecal coliform-positive or *E. coli*-positive routine sample constitutes a violation of the MCL for total coliforms. If a system has exceeded this MCL, the installation will complete the notification in paragraph 3-3c no later than the end of the next business day that an acute risk to public health may exist. The installation will complete notification to the USFK Command Surgeon as soon as possible, but in no case later than the end of the same day that the command responsible for operating the PWS is notified of the result. The installation public will be notified as soon as possible, but no later than 72 hours after the installation command is notified.

(2) Inorganic chemical requirements.

(a) USFK installations responsible for a PWS will ensure that the inorganic chemicals in water distributed to consumers do not exceed the limitations set out in table 3-3.

(b) Systems will be monitored for inorganic chemicals at the frequency set in table 3-4, “Inorganic Monitoring Requirements.”

(c) 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 the average exceeds the MCL, the system is out of compliance.

(d) If a system is out of compliance, the installation will complete the notification in paragraph 3-3c as soon as possible. If the nitrate, nitrite, or total nitrate/nitrite MCL is exceeded, then this is considered an acute health risk, and the installation will complete notification to:

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

- The installation public, as soon as possible, but not later than 72 hours after the PWS is notified of the test result.

(e) If the installation is monitoring due to a waiver approved by the LEC in accordance with Chapter 1-13 of this EGS, it will immediately increase monitoring IAW table 3-4 until authorities determine the system is back in compliance.

(f) The MCL for arsenic applies to CWS and NTNCWS.

(3) Fluoride requirements.

(a) USFK installations responsible for a PWS will ensure that the fluoride content of drinking water does not exceed the MCL of 4.0 mg/L stated in table 3-3, “Inorganic Chemical MCLs.”

(b) Systems will be monitored for fluoride by collecting one treated water sample at the entry point to the distribution system annually 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.”

(c) If any sample exceeds the MCL, the installation will complete the notification in paragraph 3-3c as soon as possible, but in no case later than 14 days after the violation.

(4) Lead and copper requirements.

(a) An installation responsible for a CWS or a NTNCWS will ensure that the system complies with action levels (distinguished from the MCL) of 0.015 mg/L for lead and 1.0 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 percent of all sampled taps.

(b) Affected USFK systems will conduct monitoring in accordance with table 3-6. 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, "Monitoring Requirements for Lead and Copper Water Quality Parameters."

(c) If an action level is exceeded, the installation will collect additional water quality samples specified in table 3-6. Optimal corrosion control treatment will be pursued. If action levels are exceeded after implementation of applicable corrosion control and source water substitution or 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 ROK) within 60 days and will complete the notification in paragraph 3-3 c as soon as possible, but in no case later than 14 days after the violation.

(5) Synthetic organics requirements.

(a) USFK installation responsible for a CWS or a 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, that system is out of compliance if a single sample exceeds the MCL.

(b) Systems will be monitored for synthetic organic chemicals according to the schedule stated in table 3-8, "Synthetic Organic Chemical Monitoring Requirements."

(c) If a system is out of compliance, the installation will completed the notification in Paragraph 3-3 c as soon as possible, but in no case later than 14 days after the violation. The installation will immediately begin quarterly monitoring if the level of any contaminant is detected at its detection limit as noted in table 3-8, and will continue until the installation commander determines the system is back in compliance, and any necessary remedial measures are implemented.

(6) Disinfectant/Disinfection By-Product (DDBP) requirements.

(a) USFK installations responsible for a CWS or a 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 ensure that the following MCLs and maximum residual disinfectant levels (MRDL) are not exceeded in drinking water. A system is out of compliance when the annual running average of all sample sites exceeds the MCL. Installations will:

- Ensure that the MCL of 0.08 mg/L for total trihalomethanes (TTHM), the MCL of 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 not exceeded in drinking water.

- Ensure that the 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 not exceeded 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 caused by circumstances such as distribution line breaks, storm runoff events, source water contamination, or cross-connections.

(b) Such systems that add a disinfectant will monitor TTHM and HAA5 in accordance with table 3-9, "Disinfectant/Disinfection By products Monitoring Requirements." Additional DDBP monitoring for systems that utilize chlorine dioxide, chloramines, or ozone is included in table 3-9.

(c) 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, exceeds 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, the installation will complete the notification in paragraph 3-3c as soon as possible, but in no case later than 14 days after the violation, and undertake remedial measures.

(d) 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 will ensure that protection from microbial pathogens is not compromised.

(7) Radionuclide Requirements.

(a) USFK installations responsible for a CWS will test the system for conformance with applicable radionuclide limits presented in table 3-10, "Radionuclide MCLs and Monitoring Requirements."

(b) Systems will perform radionuclide monitoring as stated in table 3-10 Notes, "Monitoring Requirements".

(c) If the average annual MCL for gross alpha activity for radium is exceeded, the installation will complete the notification in paragraph 3-3c as soon as possible, but in no case later than 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 occur monthly. If any gross beta MCL is exceeded, the major radioactive components will be identified.

(8) Surface water treatment requirements. All USFK water systems that use surface water sources or GWUDISW will meet the surface water treatment requirements delineated in table 3-1. 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 will ensure that protection from microbial pathogens is not compromised.

(9) Turbidity requirements. USFK PWS filtered waters will be tested for turbidity in accordance with table 3-1. If the turbidity exceeds the MCL as listed in table 3-1, or if the turbidity exceeds 1 NTU for drinking water and 0.5 NTU for filtered tap water, the installation will complete the notification in paragraph 3-3c as soon as possible, but in no case later than 14 days after the violation and will undertake remedial action.

(10) Secondary drinking water requirements. The secondary drinking water requirements cover contaminants that affect the taste, odor, or appearance of drinking water. The secondary MCLs are shown in table 3-12, Monitoring of the secondary contaminants is not required, but the results of routine testing can be useful to the plant operation.

(11) Non-public water system requirements. USFK NPWSs will be monitored at a minimum for total coliforms and disinfectant residuals at least quarterly.

(12) Alternative water supplies. Alternative water sources include POE/POU treatment

devices and bottled water supplies. An installation commander, in consultation with the installation medical authority, may approve the use of an alternative water source. The use of appropriated funds to purchase bottled water is authorized only if necessary to maintain a supply of drinking water in the workplace or government-furnished living quarters, and no other potable water is reasonably available without charge at a lower cost. All requests to use bottled water as an alternative water source will receive a legal review from the installation command's legal advisor.

(13) Filter Backwash Requirements. To prevent microbes and other contaminants from passing through and into finished drinking water, USFK installations with a PWS 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 systems that:

- (a) Use surface water or GWUDISW.
- (b) Use direct or conventional filtration processes.
- (c) Recycle spent filter backwash water, sludge thickener supernatant, or liquids from dewatering processes.

c. Notification requirements. When a USFK water system is out of compliance as set forth in the preceding criteria, the Installation Commander shall notify the appropriate USFK medical authority, LEC, and installation personnel (U.S. and ROK), after consultation with the USFK service component commander and the appropriate service medical authority. Copies of the notification will be provided to the LEC, USFK's Environmental Officer, the Office of the Judge Advocate, and the USFK Public Affairs Office. The notice will provide a clear and readily understandable explanation of the violation, any potential adverse health effects, the population at risk, the steps that the system is taking to correct the violation, the necessity for seeking alternative water supply, if any, and any preventive measures the consumer should take until the violation is corrected. The LEC will coordinate notification of ROK authorities in cases where off-installation populations are at risk.

d. Personnel qualification requirements. Personnel engaged or employed in operation and maintenance of water treatment facilities must successfully complete an effective training program with appropriate certification every three years. Associated lab personnel must complete an appropriate training program every three years.

Table 3-1
Surface Water Treatment Requirements

1. Unfiltered Systems

- a. Systems that use unfiltered surface water or GWUDISW will analyze the raw water for total coliforms or fecal coliforms at least weekly and for turbidity at least daily for a minimum of one year. The monitoring must continue as long as the unfiltered system is in operation. If the total coliforms and/or fecal coliforms exceed 100/100 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 of water immediately prior to the first or only point of disinfectant application exceeds 1 Nephelometric Turbidity Units (NTU).
- b. Disinfection must achieve at least 99.9 percent (4-log) inactivation of *Giardia lamblia* cysts and 99.99 percent inactivation of viruses by meeting applicable CT values, as shown in Tables 3-11-1.1 through 3-11-1.6.
- c. Disinfection systems must have redundant components to ensure uninterrupted disinfection during operational periods.
- d. Disinfectant residual monitoring at the entry point to the distribution system is required at least once every 4 hours that the system is in operation. Disinfectant residual measurements in the distribution system will be made weekly or at the same times as total coliforms are sampled, whichever is more frequent.
- e. Disinfectant residual in water entering the distribution system must be maintained at a minimum of 0.2 mg/L.
- f. If disinfectant residuals in the distribution system are undetected in more than 5 percent of monthly samples for two consecutive months, appropriate filtration must be implemented.
- g. Water in a distribution system with a heterotrophic bacteria concentration less than or equal to 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.

2. Filtered Systems

- a. Filtered water systems will provide a combination of disinfection and filtration that achieves a total of 99.9 percent (3-log) removal of *Giardia lamblia* cysts and 99.99 percent (4-log) removal of viruses.
 - b. The turbidity of filtered water will be monitored at least once every 4 hours that the system is in operation.
 - c. The turbidity of filtered water for direct and conventional filtration systems will not exceed 0.3 NTU in 95 percent of the analyses in a month, with a maximum of 1 NTU.
 - d. Disinfection must provide the remaining log-removal of *Giardia lamblia* cysts and viruses not obtained by the filtration technology applied.*
 - e. Disinfection residual maintenance and monitoring requirements are the same as those for unfiltered systems.
-

Table 3-1
Surface Water Treatment Requirements -Continued

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
-

NOTE:

*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 typically removes 2.0-log *Giardia*/ 2.0-log viruses. Less log-removal may be assumed if treatment is not properly applied, according to commonly accepted industry standards.

Table 3-2
Table Coliform Monitoring Frequency

Population Served			Minimum Routine Samples / Month ²
25	to	1,000 ¹	1
1,001	to	2,500	2
2,501	to	3,300	3
3,301	to	4,100	4
4,101	to	4,900	5
4,901	to	5,800	6
5,801	to	6,700	7
6,701	to	7,600	8
7,601	to	8,500	9
8,501	to	12,900	10
12,901	to	17,200	15
17,201	to	21,500	20
21,501	to	25,000	25
25,001	to	33,000	30
33,001	to	41,000	40
41,001	to	50,000	50

NOTES:

1. A non-community water system using groundwater (except GWUDISW) and serving 1,000 or fewer people may monitor once in each calendar quarter during which the system provides water, provided a sanitary survey conducted within the last five years shows the system is supplied solely by a protected groundwater source and free of sanitary defects.
2. Minimum Number of Routine Samples per Month: Systems serving fewer than 4,900 people, and which use groundwater (except GWUDISW) 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 (Both I & II together/stringent will be considered as MCLs)

Contaminant	MCL I (OEBGD Required)	MCL II (ROK Required)
Ammonia Nitrogen	Not applicable (n/a)	0.5 mg/L
Antimony ¹	0.006 mg/L	n/a
Arsenic ¹	0.010 mg/L	n/a
Asbestos ¹	7 million fibers/L (>10 µm)	n/a
Barium ¹	2.0 mg/L	n/a
Beryllium ¹	0.004 mg/L	n/a
Boron	n/a	1.0 mg/L
Cadmium ¹	0.005 mg/L	n/a
Chromium ¹	0.1 mg/L	0.05 mg/L
Cyanide (as free Cyanide) ¹	0.2 mg/L	0.01 mg/L Cyanogen
Fluoride ²	4.0 mg/L	1.5 mg/L
Mercury ¹	0.002 mg/L	0.001 mg/L
Nickel ¹	0.1 mg/L	n/a
Lead		0.01 mg/L
Nitrate ³	10 mg/L (as N)	n/a
Nitrite ³	1 mg/L (as N)	n/a
Total Nitrite and Nitrate ³	10 mg/L (as N)	n/a
Selenium ¹	0.05 mg/L	0.01 mg/L
Sodium ⁴	n/a	n/a
Thallium ¹	0.002 mg/L	n/a

NOTES:

1. MCLs apply to CWS and NTNCWS.
2. MCLs apply to CWS, NTNCWS, and TNCWS systems.
3. Fluoride also has a secondary MCL at 2.0 mg/L. The primary MCL applies only to CWS. See criteria 3-3b(3) for additional requirements.
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	Waivers
Antimony	1 sample / 3yr	1 sample / 1yr	> MCL	---
Arsenic	1 sample / 3yr	1 sample / 1yr	> MCL	---
Asbestos	1 sample / 9yr	1 sample / 9yr	> MCL	Yes ³
Barium	1 sample / 3yr	1 sample / 1yr	> MCL	---
Beryllium	1 sample / 3yr	1 sample / 1yr	> MCL	---
Cadmium	1 sample / 3yr	1 sample / 1yr	> MCL	---
Chromium	1 sample / 3yr	1 sample / 1yr	> MCL	---
Corrosively	Once	Once	---	---
Cyanide	1 sample / 3 yr	1 sample / 1yr	> MCL	---
Fluoride	1 sample / 3 yr	1 sample / 1yr	> MCL	---
Mercury	1 sample / 3 yr	1 sample / 1yr	> MCL	---
Nickel	1 sample / 3 yr	1 sample / 1yr	> MCL	---
Total Nitrate/Nitrite	1 sample / 1yr	Quarterly ⁵	> 50% Nitrite MCL	---
Nitrate	1 sample / 1yr ⁵	Quarterly	> 50% MCL ⁴	Yes ⁶
Nitrite	1 sample / 1yr ⁵	Quarterly	> 50% MCL ⁴	Yes ⁷
Selenium	1 sample / 3yr	1 sample / 1yr	> MCL	---
Sodium	1 sample / 3yr	1 sample / 1yr	---	---
Thallium	1 sample / 3yr	1 sample / 1yr	> MCL	---

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 monitoring requires a minimum of one sample per quarter. 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. The need for analysis will be determined based on a sanitary survey conducted by the PWS.
4. Increased quarterly monitoring shall be undertaken for nitrate and nitrite if a sample is >50% of the MCL.
5. Any sampling point with an analytical value greater than or equal to 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.
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.

Table 3-5
Recommended Fluoride Concentrations at Different Temperatures

Annual Average of Max. 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

System size	Monitoring type	No. of Sites for Initial Monitoring ^{1,2,8}	No. of Sites for Follow-up Monitoring ^{1,2,3,9}	No. of Sites for Reduced Monitoring ^{4,10}	No. of Sites for Ultimate Reduced Monitoring ¹¹
Population served		Two consecutive 6 month sampling periods	Two consecutive 6 month sampling periods	Annually for 3 years	Every 3 years
10,001 - 100,000	Cold Water Tap (1st Draw)	60	60	30	NA ⁷
	POE ⁵	1	1	1	NA ⁷
	WQPs ⁶	10	10	7	NA ⁷
3,301-10,000	Cold Water Tap (1st Draw)	40	40	20	20
	POE ⁵	None	1	1	1
	WQPs ⁶	None	3	3	3
501 - 3,300	Cold Water Tap (1st Draw)	20	20	10	10
	POE ⁵	None	1	1	1
	WQPs ⁶	None	2	2	2

Table 3-6
Monitoring Requirements for Lead and Copper Water Quality Parameters - Continued

101 - 500	Cold Water Tap (1st Draw)	10	10	5	5
	POE ⁵	None	1	1	1
	WQPs ⁶	None	1	1	1
< 100	Cold Water Tap (1st Draw)	5	5	5	5
	POE	None	1	1	1
	WQPs ⁶	None	1	1	1

NOTES:

- Two consecutive six-month monitoring periods.
- Sampling sites shall be based on a hierarchical approach. For CWS, priority will be given to single-family residences that contain copper pipe with lead solder installed after 1982, contain lead pipes, or are served by lead service lines; then, structures, including multifamily residences, with the foregoing characteristics; and finally, residences and structures with copper pipe with lead solder installed before 1983. For NTNC systems, 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.
- Follow-up monitoring is performed if a system exceeds the lead or copper action level during any monitoring event.
- Annually for lead and copper if action levels are met during each of two consecutive six-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 sampling will be conducted during the months of June, July, August, and September.
- POE: Point of entry into the water distribution system.
- 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. Water Quality Parameter samples (WQPs) 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.
- Ultimate Reduced Monitoring does not apply to systems serving populations of 10,001 or greater.
- Initial Lead and Copper Monitoring: Two consecutive six-month monitoring periods for first-draw samples for lead and copper.
- Follow-up Lead and Copper Monitoring: Two consecutive six-month monitoring periods for water systems that do not comply with the lead or copper action levels. Monitoring will consist of lead/copper tap samples and water quality parameters (WQPs). This sampling cycle will continue until the system demonstrates compliance with both of the lead and copper action levels.
- Reduced Lead and Copper Monitoring: The reduction of both the number of samples and the frequency of monitoring required for those water systems that have demonstrated consistent compliance with the lead and copper action levels during 2 consecutive 6-month monitoring periods. An installation commander must obtain approval for reduced monitoring by submitting a request, in writing, to the LEC. The LEC is responsible for determining if a water system qualifies for reduced monitoring. Reduced lead monitoring will consist of lead/copper tap samples and WQPs. This monitoring will be conducted annually for three consecutive years during the months of June, July, August, or September.
- Ultimate Re Reduced Lead Monitoring: The lowest reduction in monitoring frequency allowed for systems that demonstrate compliance with the lead and copper action levels during all 3 consecutive annual sampling events conducted under the reduced monitoring schedule. Monitoring will consist of lead/copper tap samples and WQPs. Monitoring will be conducted once every 3 years during the months of June, July, August, or September.

Table 3-7
Synthetic Organic Chemical MCLs

Contaminant	MCL-I (OEGBD) mg/L	MCL-II (ROK Recommended), mg/L	Detection Limit, mg/L
Pesticides/PCBs			
Alachlor	0.002	Not applicable (n/a)	0.0002
Aldicarb	0.003	n/a	0.0005
Aldicarb sulfone	0.003	n/a	0.0008
Aldicarb sulfoxide	0.004	n/a	0.0005
Atrazine	0.003	n/a	0.0001
Benzo[a]pyrene	0.0002	n/a	0.00002
Carbofuran	0.04	n/a	0.0009
Carbaryl	n/a	0.07 mg/L	
Chlordane	0.002	n/a	0.0002
Dalapon	0.2	n/a	0.0002
2,4-D	0.07	n/a	0.0001
1,2-Dibromo-3-chloropropane (DBCP)	0.0002	n/a	0.00002
Di(2-ethylhexyl) adipate	0.4	n/a	0.0006
Di(2-ethylhexyl) phthalate	0.006	n/a	0.0006
Diazinon	n/a	0.02 mg/L	
Dinoseb	0.007	n/a	0.0002
1,4-Dioxin		0.05 mg/L	
Diquat	0.02	n/a	0.0004
Endrin	0.002	n/a	0.00002
Endothall	0.1	n/a	0.009
Ethylene dibromide (EDB)	0.00005	n/a	0.00001
Fenitrothion	n/a	0.04 mg/L	
Glyphosate	0.7	n/a	0.006
Heptachlor	0.0004	n/a	0.00004
Heptachlorepoxyde	0.0002	n/a	0.00002
Hexachlorobenzene	0.001	n/a	0.0001

Table 3-7
Synthetic Organic Chemical MCLs - Continued

Contaminant	MCL-I (OEBGD) mg/L	MCL-II (ROK Recommended), mg/L	Detection Limit, mg/L
Pesticides/PCBs - Continued			
Hexachlorocyclopentadiene	0.05	n/a	0.0001
Lindane	0.0002	n/a	0.00002
Methoxychlor	0.04	Not applicable (n/a)	0.0001
Oxamyl (Vydate)	0.2	n/a	0.002
Parathion	n/a	0.06	
PCBs (as decachlorobiphenyls)	0.0005	n/a	0.0001
Pentachlorophenol	0.001	n/a	0.00004
Phenol	n/a	0.005 mg/L	
Picloram	0.5	n/a	0.0001
Simazine	0.004	n/a	0.00007
2,3,7,8-TCDD (Dioxin)	3×10^{-8}	n/a	5×10^{-9}
Toxaphene	0.003	n/a	0.001
2,4,5-TP (Silvex)	0.05	n/a	0.0002
Volatile Organic Chemicals			
Benzene	0.005	n/a	0.0005
Carbon tetrachloride	0.005	0.002	0.0005
o-Dichlorobenzene	0.6	n/a	0.0005
cis-1,2-Dichloroethylene	0.07	n/a	0.0005
trans-1,2-Dichloroethylene	0.1	n/a	0.0005
1,1-Dichloroethylene	0.007	n/a	0.0005
1,1,1-Trichloroethane	0.20	n/a	0.0005
1,1,1-Trichloroethene	n/a	0.10	
1,2-Dichloroethane	0.005	(n/a)	0.0005
Dichloromethane	0.005	n/a	0.0005
1,1,2-Trichloroethane	0.005	n/a	0.0005
1,2,4-Trichlorobenzene	0.07	n/a	0.0005
1,2-Dichloropropane	0.005	n/a	0.0005

Table 3-7
Synthetic Organic Chemical MCLs - Continued

Contaminant	MCL-I (OEBGD) mg/L	MCL-II (ROK Recommended), mg/L	Detection Limit, mg/L
Volatile Organic Chemicals - Continued			
Ethylbenzene	0.7	0.3	0.0005
Monochlorobenzene	0.1	n/a	0.0005
para-Dichlorobenzene	0.075	n/a	0.0005
Styrene	0.1	n/a	0.0005
Tetrachloroethylene	0.005	n/a	0.0005
Trichloroethylene	0.005	n/a	0.0005
Toluene	1.0	0.7	0.0005
Vinyl chloride	0.002	n/a	0.0005
Xylene (total)	10	0.5	0.0005
Other Organic Chemicals			
Acrylamide	0.05% dosed at 1 ppm ¹		
Epihydrochlorin	Treatment technique 0.01% dosed at 20 ppm ¹		

NOTES:

*Use current USEPA test methods. 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	Waivers
	Groundwater	Surface water		
VOCs	Quarterly	Quarterly	≥ 0.0005 mg/L	Yes ^{3,4}
Pesticides / PCBs	4 Quarterly samples/3yrs 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.
2. Increased monitoring will be conducted quarterly. For groundwater systems, a minimum of 2 quarterly samples are required, and for surface water systems, a minimum of 4 quarterly samples are required before a system can reduce monitoring annually. Following SOC detection and increased monitoring, installation may request that the LEC approve reduced monitoring if the water system is reliably and consistently below the MCL.
3. Repeat sampling frequency may be reduced to annually after one year of no detection and every three years after three rounds of no detection.
4. Monitoring frequency may be reduced, if warranted, based on a sanitary survey by the PWS.
5. Detection limits noted in table 3-7, 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 serving greater than 3,300 people reduce to minimum of 2 quarterly samples in one year during each repeat compliance period or systems serving less than 3,301 people reduce to 1 sample every 3 years.

Remark:

*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 LEC or appropriate DoD medical authority requests a confirmation sample, in which case compliance is based upon the average of the original and confirmation sample. A system is out of compliance if any contaminant exceeds the MCL. If four consecutive quarters of sampling results are not available, and after receipt of written approval from the LEC, an installation may substitute 6 quarters of sampling results collected during the past two years to determine compliance.

Table 3-9
Disinfectant/Disinfection By products Monitoring Requirements

Source Water Type	Population Served by system	Analyte and Frequency of Samples	Number of Samples
SW or GWUDISW	10,000 or more	TTHM & HAA5- Quarterly ^{1,2}	^{1,2,3} 4
SW or GWUDISW	500 to 9,999	TTHM & HAA5- Quarterly ⁴	^{5,6} 1
SW or GWUDISW	499 or less	TTHM & HAA5- Yearly	^{7,8} 1
Groundwater (GW)	10,000 or more	TTHM & HAA5- Quarterly ⁹	^{10,11} 1
Groundwater (GW)	9,999 or less	TTHM & HAA5- Yearly ¹²	^{13,14} 1
		Chlorite-Daily and 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 USFK 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.

Table 3-9**Disinfectant/Disinfection Byproducts Monitoring Requirements - Continued**

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.
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 HAA5 concentration exceeds the MCL, 0.060 mg/L.
9. For TTHM and HAA5, a USFK 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 HAA5 the MCL, 0.060 mg/L.
12. For TTHM and HAA5, a USFK 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 HAA5 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.
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Table 3-9**Disinfectant/Disinfection Byproducts Monitoring Requirements - Continued**

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 less than 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. 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.
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 an exceedance 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 less than 2.0 mg/L for two consecutive years, or less than 1.0 mg/L for one year, may reduce TOC and alkalinity to one paired sample per plant per quarter.
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Table 3-10
Radionuclide MCLs and Monitoring Requirements

MCLs Contaminant	MCL, pCi/L
Gross Alpha ¹	15
Combined Radium-226 and 228	5
Uranium	30 µg/L
Gross Beta ²	50 (4 mrem/yr)
Strontium-90	8
Tritium	20,000

NOTES:

***Monitoring Requirements.** All CWSs using ground water, surface water, or systems using both ground and surface water or ocean water (for desalination) must sample at every entry point 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 four (4) years. Testing will be conducted using an annual composite of four (4) consecutive quarterly samples or the average of four samples obtained at quarterly intervals at a representative point in the distribution system. If the average annual concentration is less than half the maximum contaminant level, analysis of a single sample may be substituted for the quarterly sampling procedure. A gross alpha particle activity measurement may be substituted for radium-226 and radium-228 provided that the measured gross alpha particle activity does not exceed 5 pCi/L. Where radium-228 may be present in drinking water, radium-226 and/or -228 analyses should be performed when the gross alpha particle activity is > 2 pCi/L. 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.

1. Gross alpha activity includes radium-226, but excludes radon and uranium.

2. Monitoring for gross beta is only required for surface water systems serving a population over 100,000. Gross beta activity refers to the sum of beta particle and photon activity from manmade radionuclides. If gross beta exceeds the MCL, i.e., equivalence to a dose of 4 millirem/year, the concentrations of the individual components (Strontium-90 and Tritium) must be determined. See 40 CFR 141.26(b) (reference (g)) for additional information.

Table 3-11-1.1

CT Values for Inactivation of *Giardia* Cysts by Free Chlorine at 0.5°C or Lower [Log Inactivations]*

Chlorine Conc. (mg/L)**	pH 6 or less						pH 6.5						pH 7.0						pH 7.5					
	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 or less	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 Conc. (mg/L)	pH 8 or less						pH 8.5						pH 9.0											
	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 or less	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, **Concentration (mg/L)

Table 3-11-1.2

CT Values for Inactivation of Giardia Cysts by Free Chlorine at 5°C [Log Inactivations]*

Chlorine Conc. (mg/L)**	pH 6 or less						pH 6.5						pH 7.0						pH 7.5					
	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 or less	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 Conc. (mg/L)	pH 8 or less						pH 8.5						pH 9.0											
	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 or less	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, **Concentration (mg/L)

Table 3-11-1.3

CT Values for Inactivation of Giardia Cysts by Free Chlorine at 10°C [Log Inactivations]*

Chlorine Conc. (mg/L)**	pH 6 or less						pH 6.5						pH 7.0						pH 7.5					
	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 or less	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 Conc. (mg/L)	pH 8 or less						pH 8.5						pH 9.0											
	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 or less	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, **Concentration (mg/L)

Table 3-11-1.4

CT Values for Inactivation of *Giardia* Cysts by Free Chlorine at 15°C [Log Inactivations]*

Chlorine Conc. (mg/L)**	pH 6 or less						pH 6.5						pH 7.0						pH 7.5					
	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 or less	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 Conc. (mg/L)	pH 8 or less						pH 8.5						pH 9.0											
	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 or less	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, **Concentration (mg/L)

Table 3-11-1.5

CT Values for Inactivation of *Giardia* Cysts by Free Chlorine at 20°C [Log Inactivations]*

Chlorine Conc. (mg/L)**	pH 6 or less						pH 6.5						pH 7.0						pH 7.5					
	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 or less	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 Conc. (mg/L)	pH 8 or less						pH 8.5						pH 9.0											
	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 or less	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, **Concentration (mg/L)

Table 3-11-1.6

CT Values for Inactivation of *Giardia* Cysts by Free Chlorine at 25°C [Log Inactivations]*

Chlorine Conc. (mg/L)**	pH 6 or less						pH 6.5						pH 7.0						pH 7.5					
	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 or less	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 Conc. (mg/L)	pH 8 or less						pH 8.5						pH 9.0											
	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 or less	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, **Concentration (mg/L)

Table 3-11-2
CT Values for Inactivation of Viruses by Free Chlorine

Temperature (°C)	2.0 pH		3.0 pH		4.0 pH	
	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 3-11-3
CT Values for Inactivation of Giardia Cysts by Chlorine Dioxide

Inactivation	Temperature (°C)					
	1 or less	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 3-11-4
CT Values for Inactivation of Viruses by Free Chlorine Dioxide pH 6-9

Removal	Temperature (°C)					
	1 or less	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 3-11-5
CT Values for Inactivation of Giardia Cysts by Ozone

Inactivation	Temperature (°C)					
	1 or less	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 3-11-6
CT Values for Inactivation of Viruses by Free Ozone

Inactivation	Temperature (°C)					
	1 or less	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 3-11-7
CT Values for Inactivation of Giardia Cysts by Chloramine pH 6-9

Inactivation	Temperature (°C)					
	1 or less	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 3-11-8
CT Values for Inactivation of Viruses by Chloramine

Inactivation	Temperature (°C)					
	1 or less	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 3-11-9
CT Values for Inactivation of Viruses by UV

Log Inactivation	
2.0	3.0
21	36

Table 3-12
Secondary MCLs

Contaminant	Secondary MCLs
Aluminum	0.05 - 0.2 mg/L
Chloride	250 mg/L
Color	5 color units
Corrosivity	Noncorrosive
Foaming Agents	0.5 mg/L
Hardness (CaCO ₃)	300 mg/L; Drinking water: 500 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor number
Potassium Permanganate	10 mg/L
pH	6.5 to 8.5
Silver	0.1 mg/L
Sulfate	200 mg/L
Total Dissolved Solids	500 mg/L
Zinc	3 mg/L
Copper	1 mg/L

Chapter 4 Wastewater

4-1. Scope

This chapter contains criteria to control and regulate discharges of wastewaters 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

- a. **Best Management Practices (BMPs).** Practical practices and procedures that will minimize or eliminate the possibility of pollution being introduced into waters of the ROK.
- b. **Biochemical Oxygen Demand (BOD₅).** 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).
- c. **Carbonaceous BOD₅ (CBOD₅).** The five-day measure of the pollutant parameter, carbonaceous biochemical oxygen demand. This test can substitute for the BOD₅ testing, which suppresses the nitrification reaction/component in the BOD₅ test.
- d. **Chemical Oxygen Demand (COD).** A measure of the oxygen-consuming capacity of organic matter, chemical oxygen demand.
- e. **Conventional Pollutants.** BOD₅, total suspended solids (TSS), oil and grease, fecal coliforms, and pH.
- f. **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.
- g. **Direct Discharge.** Any "discharge of pollutants" other than an indirect discharge.
- h. **Discharge of a Pollutant.** Any addition of any pollutant or combination of pollutants to waters of ROK from any "point source."
- i. **Domestic Sewage.** Used water and solids from residences.
- j. **Domestic Wastewater Treatment System (DWTS).** Any USFK or ROK facility designed to treat wastewater before its discharge to waters of the ROK and in which the majority of such wastewater is made up of domestic sewage.
- k. **Effluent.** Wastewater or other liquid-raw, partially or completely treated-flowing from a facility, basin, treatment process, or treatment plant.
- l. **Effluent Limitation.** Any restriction imposed by these EGS on quantities, discharge rates, and concentrations of pollutants that are ultimately discharged from point sources into waters of the ROK.

m. **Existing Source.** A source that discharges pollutants to waters of the ROK, that was in operation, or under construction, prior to 1 October 1994.

n. **Grab Sample.** A single sample taken from a specific point and time.

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

p. **Industrial Activities Associated with Storm Water.** Activities that may contribute pollutants to storm water runoff or drainage during wet weather events (See table 4-8, “Best Management Practices”).

q. **Industrial Wastewater.** Wastewater discharged either directly or indirectly from factories, processing facilities or other facilities listed in table 4-6, “Industrial Wastewater Sources.”

r. **Industrial Wastewater Treatment System (IWTS).** Any USFK facility, other than a DWTS, designed to treat process wastewater before its discharge to waters of the ROK.

s. **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.

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

u. **New source.** A source built or significantly modified on or after 1 October 1994 that directly or indirectly discharges pollutants to the wastewater system.

v. **pH.** An abbreviation of the French term “pouvoir hydrogene”, literally “hydrogen power.” It expresses the intensity of acid or alkaline conditions of water. Mathematically, it is the negative log to the base ten of the hydrogen ion concentration. In water, the pH values range from 0 (very acidic) to 14 (very alkaline).

w. **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.

x. **Pollutant.** Includes, but is not limited to, the following: dredged spoil; solid waste; incinerator residue; filter backwash; sewage; garbage; sewage sludge; munitions; chemical wastes; biological materials; radioactive materials; heat; wrecked or discarded equipment; rock; sand; cellar dirt; and industrial, municipal, and agricultural waste discharged into water.

y. **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.

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

aa. **Significantly Increased.** Increase of more than 10% in average daily flow based upon either the design capacity or recorded flows for calendar year, whichever is greater.

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

cc. **Substantial Modification.** Any modification to a facility of which the cost exceeds \$1,000,000 regardless of funding source, or a conversion of facility use regardless of cost.

dd. **Surface Water.** All water which is open to the atmosphere and which is subject to direct surface run-off.

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

ff. **Total Toxic Organics (TTO).** The summation of all quantifiable values greater than 0.01 mg/L for the toxic organics in table 4-9, "Components of Total Toxic Organics".

gg. **Waters of ROK.** Surface waters, including the territorial seas, recognized under customary international law, including:

(1) All waters that are currently used, were used in the past, or may be susceptible to use in commerce.

(2) Waters that are or could be used for recreation or other purposes.

(3) Waters from which fish or shellfish are or could be taken and sold.

(4) Waters that are used or could be used for industrial purposes by industries.

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

(6) Tributaries of waters identified in subparagraphs 4-2gg(1) through (5) of this definition.

Note. Domestic and industrial wastewater treatment systems, including treatment ponds or lagoons designed to meet the requirements of this chapter, are not waters of the ROK. This exclusion only applies to manmade bodies of water that were neither original waters of the ROK nor resulted from impoundment of waters of the ROK.

4-3. Criteria

a. Effluent limitations for direct dischargers of conventional pollutants, total nitrogen, and total phosphorus. The following effluent limitations shall apply to new and existing sources:

(1) For locations with 50 m³/day (13,200 gallons/day) or more flow rate:

(a) BOD₅ and TSS: 10 mg/L.

(b) Total Nitrogen (T-N): 20 mg/L.

(c) Total Phosphorous (T-P): 2 mg/L.

(d) Total Coliform Bacteria: 3,000 number/ml.

- (e) pH: 6.0 – 9.0.
- (2) For locations with less than 50 m³/day flow rate:
 - (a) For Class I locations: BOD5 and TSS: 10 mg/L, pH: 6.0 – 9.0.
 - (b) For Class II – V locations: BOD5 and TSS: 20 mg/L, pH: 6.0 – 9.0.
- (3) For golf courses.
 - (a) With no accommodation facilities: BOD5 and TSS, 10 mg/L.
 - (b) With accommodation facilities: BOD5 and TSS, 5 mg/L.
- (4) For septic tank servicing 11 or more people per day.
 - (a) Class I locations: BOD5 removal rate: 65% or greater with discharge concentration rate: g/L.
 - (b) Class II – V locations: BOD5 removal rate 50% or greater.
 - (c) Class I - V locations: TSS removal rate 50% or greater, with discharge to leach field less than 250 mg/L.
- (5) For coastal, estuarine and marine facilities the BOD5 limitation is 50 mg/L.

b. Monitoring. Monitoring requirements apply to all regulated facilities. The monitoring frequency (including both sampling and analysis) given in table 4-5, "Monitoring Requirements", includes all parameters which are regulated in paragraph 4-3a. Samples should be collected at the point of discharge prior to any mixing with the receiving water. CBOD5 may be substituted for BOD5. CBOD5 limit, if substituted for the parameter BOD5, should be at least 5 mg/L less than each numerical limit for the BOD5 limit. The CBOD5 test procedure suppresses the nitrification component in the BOD5 test procedure, thereby reducing the value or effects and lowering the oxygen demand.

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

- (1) The effluent, concentration, or other measurement specified for each regulated parameter.
- (2) The daily volume of effluent discharge from each point source.
- (3) Test procedures for the analysis of pollutants.
- (4) The date, exact place and time of sampling and/or measurements.
- (5) The person who performed the sampling and/or measurements.
- (6) The date of analysis.

d. Septic Tanks. Effluent monitoring is not required provided that an appropriately maintained septic tank is installed prior to connection to a domestic wastewater treatment system.

(1) Testing of effluent BOD5 and TSS:

- (a) Septic tanks servicing 5 and TSS:ople: once every 6 months.
- (b) Septic tanks servicing 1,000 to 2,000 people: annually.
- (c) Septic tanks servicing less than 1,000 people: testing not required.
- (d) Test results must be maintained for 3 years.

(2) The tanks must be cleaned at least annually.

(3) Effluent from septic tanks used daily by 500 people or more must be chlorinated.

e. Effluent limitations for industrial indirect dischargers. The following effluent limits will apply to all discharges of pollutants to DWTSS and associated collection systems from process wastewater.

(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.

(2) Ignitability and explosivity.

(a) The discharge of wastewater with a closed cup flashpoint of less than 60 degrees Celsius (140 degrees Fahrenheit) is prohibited.

(b) The discharge of wastes with any of the following characteristics is prohibited:

- A liquid solution that contains more than 24% alcohol by volume and has a flash point less than 60 degrees Celsius (140 degrees Fahrenheit).
- A non-liquid that under standard temperature and pressure can cause a fire through friction.
- An ignitable compressed gas.
- An oxidizer, such as peroxide.

(3) Reactivity and fume toxicity. The discharge of any of the following wastes is prohibited:

(a) Wastes that are normally unstable and readily undergo violent changes without detonating.

(b) Wastes that react violently with water.

(c) Wastes that form explosive mixtures with water or form toxic gases or fumes when mixed with water.

(d) Cyanide or sulfide waste that can generate potentially harmful toxic fumes, gases,

or vapors.

(e) Waste capable of detonation or explosive decomposition or reaction at standard temperature and pressure.

(f) Wastes that contain explosives regulated by Chapter 5, "Hazardous Material."

(g) Wastes which produce any toxic fumes, vapors, or gases with the potential to cause safety problems or harm to workers.

(4) Corrosivity. It is prohibited to discharge pollutants that have the potential to be structurally corrosive to the DWTS. Specifically, no discharge of wastewater below a pH of 5.0 or above a pH of 9.0 is allowed, unless the DWTS is specifically designed to handle that type of wastewater.

(5) Oil and grease. The direct discharge of the following oils, which can pass through or cause interference to the DWTS, is prohibited: petroleum oil, non-biodegradable cutting oil, and products of mineral oil origin.

(6) Spills and batch discharges (slugs). 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:

(a) Description of discharge practices, including non-routine batch discharges.

(b) Description of stored chemicals.

(c) 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.

(d) 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.

(e) Proper procedures for building containment structures or equipment.

(f) Necessary measures to control toxic organic pollutants and solvents.

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

(7) Trucked and hauled waste. The discharge of trucked and hauled waste into the DWTS, except at locations and under conditions specified by the DWTS operator, is prohibited.

(8) 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).

f. Effluent limitations for specific industrial dischargers. In addition to requirements in paragraph 4-3e, industrial wastewater sources listed in table 4-6 must comply with discharge requirements identified in table 4-7. Effluent limitations for electroplating.

(1) In addition to requirements in paragraphs 4-3e and f, 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:

(a) 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.

(b) 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.

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

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

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

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

(g) 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.

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

Table 4-1
Electroplating Discharge Standards (1)

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	---

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

Table 4-2
Electroplating Discharge Standards (2)

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
Chromium	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	--

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

Table 4-3
Electroplating Discharge Standards (3)

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

(2) Monitoring. Monitoring of specific industrial dischargers (including both sampling and analysis) will be accomplished quarterly and will include all parameters which are specified in the section 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 total toxic organics (TTO) may not be required if the commanding officer determines that no discharge of concentrated toxic organics into the wastewaters has occurred, and the facility has implemented a TTO management plan. (See table 4-5, 'Monitoring Requirements')

g. Storm Water Management.

(1) Develop and implement storm water pollution prevention plans (SWPPP) for activities listed in table 4-8, "Best Management Practices". Update the SWPPP annually.

(2) Employee Training. Personnel who handle hazardous substances or perform activities that could contribute pollution to wet weather events should be trained in appropriate Best Management Practices. Such training should stress SWPPP principles and awareness of possible pollution sources, including non-traditional sources such as sediment, nitrates, pesticides and fertilizers.

(3) Storm drains shall not be used for discharging any other wastewater or liquids other than storm water and natural surface water.

h. 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.

i. Sludge Disposal. All sludges produced during the treatment of wastewater will be disposed of under Chapter 6, "Hazardous Waste and Designated Waste," or chapter 7, "Solid Waste," as appropriate.

j. Complaint system. Each installation shall implement a system, which involves the LEC, as appropriate, for investigating water pollution complaints from individuals or ROK water pollution control authorities. Chapter 1, paragraph 1-12, "Environmental Inquiries and Complaints," of this regulation describes USFK procedures for responding to ROK inquiries and complaints.

k. Personnel qualification requirements. Personnel engaged or employed in operation and maintenance of wastewater treatment facilities must successfully complete an effective training program with appropriate certification every three years. Associated lab personnel must complete an appropriate training program every three years.

l. Laboratory analysis. Korean standard methods of analysis will be used to determine compliance with this chapter. Internal sampling to monitor equipment functions or evaluate wastewater system performance can be completed using US EPA, Korean or other methods.

m. A domestic garbage disposal unit (grinder) should not be installed and used on USFK installations or leased facilities, unless the installation or facility operates a wastewater treatment facility. If the installation's wastewater treatment facility is closed and wastewater treatment is conducted off SOFA-granted land, then domestic garbage disposal units will be removed prior to wastewater treatment facility closure. Units installed prior to 1 November 2004 may continue to be used, but will not be replaced.

n. Sediment control at construction sites. Sediment control measures must be implemented at construction sites and engineering controls shall be put in place to prevent runoff into the storm drains. All construction which involves soil excavation shall have a sediment control plan which is pre-approved in advance from the Garrison DPW's Environmental Office.

Table 4-4**Existing Sources – Classification of ROK Receiving Waters Relevant to USFK Installations**

USFK INSTALLATION **	STREAM/RIVER (Discharge to)	CLASS ***
Camp Casey	Shinchon	IV
Camp Hovey	Shinchon	IV
Camp Castle	Shinchon	IV
H-220 Heliport	Shinchon	IV
MPRC	Imjin River (downstream)	II
Warrior Base	Imjin River (downstream)	II
NNSC Compound	Imjin River (downstream)	II
Camp Stanley	Chungryangchon (upstream)	II
K-16	Songnam City Sewer*	NC
Yongsan Garrison	Seoul City Sewer*	NC
CP Tango	Seoul City Sewer*	NC
DRMO APO	Yang Sa Chon	II
Camp Humphreys	Anseong Chon	II
Camp Carroll Camp Henry Camp	Nakdong River (Kamchon Kumho River)	I
Walker Camp George	Taegu City Sewer*	NC
Pusan Storage Area Pier #8	Taegu City Sewer*	NC
	Taegu City Sewer*	NC
	Pusan City Sewer*	NC
	Pusan City Sewer*	NC
Osan Air Base	Chinwichon (downstream)	III
Kunsan Air Base	Kum River (downstream)	III
Taegu Air Base	Kumho River	III
Kwangju Air Base	Hwangryong River	II
Kimhae Air Base	Nakdong River (downstream)	III
Suwon Air Base	Suwon City Sewer*	NC
Chinhae Navy Base	Chinhae Bay	IV
Camp Mujuk	No Receiving Stream	NC

NOTES:

* NC: No class.

** Most remote sites and training areas are not included.

*** Classification of the receiving water. Use in conjunction with Paragraph 4-3a.

Table 4-5**Monitoring Requirements**

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

**Table 4-6
Industrial Wastewater Sources**

No.	Standard industry	Remarks
1	Coal and mining	Facility mining less than 8,000 ton/month excluded.
2	Metal mining (processing facility for mined materials)	Facility for 103 uranium and thorium included.
3	Non-metal mineral mining	Mining not exclusively classified are included. Mining facility for fuels, sand (mining and processing) not discharging wastewater are excluded.
4	Slaughter, meat, fish processing, storage, and treatment	Any facility slaughtering and producing refrigerated or frozen meat. Slaughtering facility for domestic animals, birds, whale, and game included. Processing on the boat and facility categorized as other water pollution sources excluded.
5	Fruit and vegetable processing, storage, and treatment	Facility for simple water-cleaning and salting (only for transportation and storage) excluded.
6	Animal and vegetable fat production	
7	Dairy and ice-cream production	Facility for egg cleaning excluded.
8	Processed grain manufacturing	
9	Starch and sugars production	
10	Animal feed production	
11	Sugar production	
12	Artificial flavor and food additives production	
13	Other food production	Tofu and similar food, bread, grain powder snacks, noodle and similar food, cocoa and sugar snacks, coffee, tea, instant soup mix, ginseng products, health supplement, and food production not specifically categorized are included. Noodles and similar food cooked on-site are excluded. Bakery and mills occupying less than 100 m3 in the category of —bread and grain powder snacks” are excluded.
14	Alcohol (ethanol) production and brewing	Manufacturing facilities for hard liquor, synthetic liquor, brewed alcohol, malt and beer included.
15	Non-alcoholic beverage and ice manufacturing	
16	Tobacco manufacturing	
17	Threading and spinning	Fabric weaving included.
18	Cloth dying and processing	
19	Other fabric Manufacturing	
20	Leather and fur processing and products manufacturing	Processing of raw fur and leather included.

Table 4-6
Industrial Wastewater Sources – Continued

No.	Standard industry	Remarks
21	Shoes manufacturing	
22	Wood and wood products manufacturing	Manufacturing of furniture and cork is included.
23	Pulp, paper, and paper products manufacturing	
24	Printing, photo processing, and recording media copying	Processing facilities for dental X-ray and microfilms and facilities categorized as "other water-pollution sources" are excluded.
25	Corks and related products manufacturing	
26	Refined petroleum manufacturing	Oil storage, distillation, inversion, refining, manufacturing of lubricant and grease, refining of oil not specifically categorized and reprocessing facilities for oil refining byproducts are included. Oil storage includes oil refining and tanks. Gas recovery, desalination, desulfurization, stripping, stabilization, reforming, cracking, alkylation, polymerization included.
27	Basic petroleum chemical manufacturing	Manufacturing facilities for ethylene, propylene, butylenes, butadiene, cyclopentadiene, isoprene, aromatic hydrocarbon, cyclohexane, acetylene, petroleum chemicals not specifically categorized, basic chemicals are included.
28	Coal chemicals manufacturing	
29	Natural resin and wood chemicals manufacturing	
30	Other basic organic chemicals manufacturing	
31	Basic inorganic chemicals manufacturing	Manufacturing facilities for sulfuric acid, nitric acid, hydrogen chloride, lime stone, alkali, synthesizing ammonia and induced chemicals, inorganic dyeing agent, metal oxidant, salt, phosphoric acid, non-metallic oxidant, sulfide, halogen compounds, basic inorganic chemicals not specifically categorized are included.
32	Industrial gas manufacturing	Gas manufacturing facility included.
33	Synthetic dyeing conditioner and other coloring agents manufacturing	Botanic dyeing extract manufacturing facility included.
34	Fertilizer and nitrogen compounds manufacturing	
35	Synthetic rubber manufacturing	Manufacturing regenerated fiber and its derivatives is included.
36	Synthetic resin and other plastic materials manufacturing	Manufacturing regenerated fiber and its derivatives is included.
37	Medicine manufacturing	Medical chemicals and herb medicines manufacturing is included.
38	Pesticide and other agricultural chemicals manufacturing	

Table 4-6
Industrial Wastewater Sources – Continued

No.	Standard industry	Remarks
39	Paint, printing ink and similar products manufacturing	
40	Surfactant, toothpaste, soap and other detergent manufacturing	
41	Cosmetics manufacturing	
42	Surface polishing agent and indoor fragrance manufacturing	Wax is included.
43	Non-photosensitive recording media, photo chemicals and photo sensitizer manufacturing	Electric card is included.
44	Refined and table salt manufacturing	
45	Aromatic oil and related products manufacturing	
46	Glue and gelatin manufacturing	
47	Gunpowder and fireworks products manufacturing	
48	Manufacturing of chemicals not specifically categorized	
49	Chemical fiber manufacturing	
50	Rubber and plastic products manufacturing	
51	Glass and glass products manufacturing	
52	Porcelain and other ceramics manufacturing	
53	Cement, lime, plaster and related products manufacturing	Concrete mixer trucks are included. A facility with only a vapor curing process is excluded.
54	Other non-metallic mineral products manufacturing	Stone products, non-metal not specifically categorized are included.
55	Basic iron and steel manufacturing	Iron, steel, hot rolling, cold rolling, extruded or drawn products, steel wire, steel pipe, steel rolling and cast-iron pipe manufacturing is included.
56	Alloy iron manufacturing	
57	Smelting or refining non-ferrous metal and manufacturing alloy	Smelting or refining copper, aluminum, lead, zinc, and non-ferrous metal is included.
58	Rolling, drawing or extruding copper	
59	Rolling, drawing or extruding aluminum	
60	Rolling, drawing or extruding other non-ferrous metal	
61	Other primary non-ferrous metal industry	
62	Metal casting industry	

Table 4-6
Industrial Wastewater Sources – Continued

No.	Standard industry	Remarks
63	Assembled metal products (if not otherwise classified)	
64	Insulated wire or cable manufacturing	
65	Storage battery and primary battery manufacturing	
66	Light bulb and lighting fixtures manufacturing	
67	Semiconductor or other electric parts manufacturing	
68	Broadcasting receiver and other image or sound manufacturing	
69	Other products manufacturing	
70	Power plants	
71	Water supply facilities	
72	Bottled water manufacturing	
73	Marine products merchandising ($\geq 700 \text{ m}^2$)	
74	Hospitals (the number of beds is larger than the standard number of beds for general hospital)	
75	Wastewater storage in the wastewater treatment facility and wastewater from the waste treatment facility	
76	Laundry (volume $\geq 2 \text{ m}^3/\text{hr}$, water consumption $\geq 1 \text{ m}^3/\text{hr}$)	Facility not discharging specific water contaminants is not included.
77	Washing and condensing industrial waste gas and dust ($\geq 0.01 \text{ m}^3/\text{hr}$)	Public wastewater treatment facility, livestock night soil treatment plant, private wastewater treatment facility and terminal wastewater treatment facility are excluded.
78	Industrial water purification facility ($\geq 100 \text{ m}^3/\text{d}$)	Facility with only physical treatment units are excluded. Swimming pool units are excluded.
79	Scientific labs ($\geq 100 \text{ m}^3/\text{d}$)	Labs associated with public wastewater treatment plant, livestock night soil treatment plant, private wastewater treatment facility, terminal wastewater treatment facility, elementary and middle schools are excluded.
80	Plating	Facility where the main process is plating.
81	Vehicle repairing and washing	Repair and washing facilities for vehicles and heavy construction machinery, train and aircraft included. Temporary dust cleaning at construction site is excluded.

NOTES:

1. Printing, automatic photo processing, X-ray, production for precious metals and jewelry facilities are categorized as industrial wastewater producing facilities.

Table 4-6
Industrial Wastewater Sources – Continued

2. Among the industrial wastewater-producing facilities, the facility producing specific water contaminants must be registered and licensed, and must not discharge specific water contaminants to public water bodies. Those specific water contaminants must be treated by the facility producing specific water contaminants or by a licensed wastewater treatment contractor. Specific water contaminants are defined as water contaminants that might cause direct or indirect adverse effects on human health or wealth, or growth of animal and plants and include the following:

- a. Copper and copper compounds.
- b. Lead and lead compounds.
- c. Arsenic and arsenic compounds.
- d. Mercury and mercury compounds.
- e. Cyan compounds.
- f. Organic phosphorus compounds.
- g. Hexavalent chromium compounds.
- h. Cadmium and cadmium compounds.
- i. Tetrachloroethylene.
- j. Trichloroethylene.
- k. Phenol.
- l. PCBs.
- m. Selenium and selenium compounds.
- n. Benzene.
- o. Carbon tetrachloride.
- p. Dichloromethane.
- q. 1, 1-dichloroethylene.
- r. 1, 2-dichloroethane.
- s. Chloroform.
- t. 1,4-dioxane.
- u. Bis(2-ethylhexyl)phthalate.
- v. Vinyl chloride.
- w. Acrylonitrile.
- x. Bromoform.

Table 4-7
Industrial Wastewater Effluent (Maximum Daily Discharge) Limitations

Pollutant Category	ROK Receiving Waters and Wastewater Systems	
	Class I	Class II – V and Special Areas Wastewater Systems
pH	5.8 - 8.6	5.8 - 8.6
Normal hexane extracts:		
Mineral oil (mg/L)	1 or less	5 or less
Animal/vegetable oil (mg/L)	5 or less	30 or less
Phenol (mg/L)	1 or less	3 or less
Cyanide (mg/L)	0.2 or less	1 or less
Chromium (mg/L)	0.5 or less	2 or less
Soluble iron (mg/L)	2 or less	10 or less
Zinc (mg/L)	1 or less	5 or less
Copper (mg/L)	0.5 or less	3 or less
Cadmium (mg/L)	0.02 or less	0.1 or less
Mercury (mg/L)	0.001 or less (undetectable)	0.005 or less
Organic phosphorous (mg/L)	0.2 or less	1 or less
Arsenic (mg/L)	0.1 or less	0.5 or less

Table 4-7
Industrial Wastewater Effluent (Maximum Daily Discharge) Limitations – Continued

Pollutant Category	ROK Receiving Waters and Wastewater Systems	
	Class I	Class II – V and Special Areas Wastewater Systems
Lead (mg/L)	0.2 or less	1 or less
Hexavalent chromium (mg/L)	0.1 or less	0.5 or less
Soluble manganese (mg/L)	2 or less	10 or less
Fluorine (mg/L)	3 or less	15 or less
PCB (mg/L)	0.001 or less (undetectable)	0.003 or less
Coliform bacteria (numbers/mL)	100 or less	3,000 or less
Total suspended solids (mg/L)	30-40 ²	30-120 ²
Temperature (°C)	40 or less	40 or less
Total nitrogen (mg/L)	30 or less	60 or less
Total phosphorous (mg/L)	4 or less	8 or less
Trichlorethylene (mg/L)	0.06 or less	0.3 or less
Tetrachloroethylene (mg/L)	0.02 or less	0.1 or less
Alkyl benzene sulfonate (mg/L)	3 or less	5 or less
Dioxin (pg-TEQ/L)	10 or less	10 or less

NOTES:

- The receiving water classifications are identified in table 4-4, and are defined as follows:
 - Class I (clean area): water bodies that should be maintained to conserve excellent (Ia) level of water quality.
 - Class II (Area A): water bodies that should be maintained to conserve good (Ib) to slightly good (II) level of water quality.
 - Class III-V (Area B): water bodies that should be maintained to conserve average (III), slightly bad (IV), or bad (V) level of water quality.
 - Special area: areas designated as integrated wastewater treatment district and agricultural industrial area.
- Total Suspended Solids limits:
 - 30 mg/L for Class I with more than 2,000 m³/day flowrate.
 - 40 mg/L for Class I with 2,000 m³/day or less flowrate.
 - 60 mg/L for Class II with more than 2,000 m³/day flow rate.
 - 80 mg/L for Class II with 2,000 m³/day or less flowrate.
 - 120 mg/L for Class III-V with 2,000m³/day or less flow rate.
 - 30 mg/L for Special Areas with more than 2,000 m³/day flowrate.
 - 30 mg/L for Special Areas with 2,000 m³/day or less flowrate.
- Sampling and will be performed annually for all parameters in table 4-7.
- Sampling shall be performed by taking grab samples at the point of discharge prior to any mixing with the receiving water or wastewater system.
- Effluent standards for sewage treatment plants are applied for facilities discharging wastewater into public water bodies (not connected to sewer system), and facilities discharging wastewater into public water bodies without the installation of specific discharge systems.
- Standards special areas are applied for factories located in specific areas.

Table 4-8
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	Wash aircraft and vehicles in designated areas. Capture wash water and send to wastewater treatment plant. Do not discharge into storm drains. Treat wash water with oil water separator before discharge into wastewater treatment plant. Do not discharge into storm drains.
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.
Dewatering operation at construction sites	Separate solids and treat with oil water separator.

Table 4-9
Components of Total Toxic Organics (TTO)

Volatil 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

Table 4-9
Components of Total Toxic Organics (TTO) – Continued

Base/Neutral Extractable Organics - Continued	
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 Extractable Organics	
2-Chlorophenol	2,4,6-Trichlorophenol
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
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	

Chapter 5

Hazardous Material

5-1. Scope

This chapter contains criteria for the storage, handling, transportation, and disposition of hazardous materials used by USFK and its contractors. It does not cover solid or hazardous waste, underground storage tanks, petroleum storage, and related spill contingency and emergency response requirements. These matters are covered under other chapters. This regulation does not cover munitions.

5-2. Definitions

a. **Gaseous Toxic Chemical.** Toxic chemicals that are hazardous to human health or environment and that are gaseous at normal pressure and room temperature. See table 5-2.

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

- (1) Identification/name of hazardous chemicals.
- (2) Appropriate hazard warnings.
- (3) The name and address of the manufacturer, importer or other responsible party; and which is prepared in accordance with DoDI 6050.05, "DoD Hazard Communication (HAZCOM) Program."

c. **Hazardous Material.** Any material that is capable of posing an unreasonable risk to health, safety, or environment if improperly handled, stored, issued, transported, labeled, or disposed, because it displays any of the characteristics listed in table 5-1, "Typical Hazardous Material Characteristics," or the material is listed in appendix B, table B-4, "List of Hazardous Materials/Substances/Wastes." Exclusive military munitions are excluded.

d. **Hazardous Materials Information Resource System (HMIRS).** A Department of Defense (DoD) automated system developed and maintained by the Defense Logistics Agency. HMIRS is the central repository for Material Safety Data Sheets (SDS) for the United States Government military services and civil agencies. The HMIRS is used by DoD IAW DoDI 6050.05, "DoD Hazard Communication (HAZCOM) Program." The web address for HMIRS is <http://www.dlis.dla.mil/hmirs/>.

e. **Hazardous Material Shipment.** Any movement of hazardous material in a USFK land vehicle or a vehicle used under USFK contract either from an installation to a final destination off the same 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.

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

5-3. Criteria

a. Storage and handling of hazardous materials will adhere to 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 Air Organization Rules or DoD Component guidance including Air Force Interservice Manual (AFIM) 24-204, Army Technical Order (ATO) 38-250, NAVSUP 505, MCO P4030.19E, and DLAI 4145.3, Defense Contract Management Agency D1, Ch3.4 (HM24), "Preparing Hazardous Materials for Military Air Shipments."

b. 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 as far as practical away from catch basins and floor/storm drains.

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

(1) The shipment is accompanied throughout by shipping papers that clearly describe the quantity and identity of the material and that include an SDS.

(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.

(3) All drivers are trained on spill control and emergency notification procedures. For any hazardous material categorized on the basis of appendix B-1, the shipping papers and briefing for the driver include identification of the material in terms of the nine United Nations (UN) Hazard Classes."

(4) The transport vehicles are subjected to a walk-around inspection by the driver before and after the hazardous material is loaded.

(5) Vehicles transporting hazardous materials are equipped with an appropriate spill response kit. Labels meeting the requirements of DoDI 6050.05, "DoD Hazard Communication (HAZCOM) Program," must be affixed to every container or package of hazardous materials that are listed in appendix B. All labels must convey information about the characteristics of the material using standard international pictograph, language and symbols.

d. Each installation will maintain a master listing of all storage locations for hazardous materials, as well as an inventory of all hazardous materials contained therein. This requirement includes temporary or short-term storage on the installation, such as with construction projects.

e. Safety Data Sheets (SDS). Each SDS shall be in English and Korean and shall contain at least the following information:

(1) The identity used on the label.

(a) If the hazardous chemical is a single substance, it's chemical and common name and Chemical Abstract Service (CAS) Number.

(b) 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 which contribute to these known hazards, and the common name(s) of the mixture itself.

(c) If the hazardous chemical is a mixture that has not been tested as a whole:

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

- The chemical and common name(s) of all ingredients that have been determined to be health hazards, and which comprise less than 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.

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

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

(3) The physical hazards of the hazardous chemical, including the potential for fire, explosion, and reactivity.

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

(6) The appropriate occupational exposure limit recommended by the chemical manufacturer, importer, or employer preparing the SDS, where available.

(7) Whether the hazardous chemical has been found to be a potential carcinogen.

(8) Any generally applicable precautions for safe handling and use which are known to the chemical manufacturer, importer or employer preparing the SDS, including appropriate hygienic practices, protective measures during repair and maintenance of contaminated equipment, and procedures for clean-up of spills and leaks.

(9) Any generally applicable control measures which are known to the chemical manufacturer, importer or employer preparing the material safety data sheet, such as appropriate engineering controls, work practices, or personal protective equipment (PPE).

(10) Emergency and first aid procedures.

(11) The date of preparation or last revision of the material safety data sheet.

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

f. Each work center will maintain a file of SDS and Korean language summaries for each hazardous material procured, stored or used at the work center. SDS that are not contained in HMIRS and those SDS prepared for locally purchased items should be incorporated into HMIRS following procedures on the HMIRS web site. A file of SDS information not contained in HMIRS should be maintained on site.

g. All hazardous materials on USFK installations will have a Hazardous Chemical Warning Label IAW DoDI 6050.05, "Department of Defense Hazard Communication (HAZCOM) Program," (or ROK equivalent) and have SDS information either available or in HMIRS IAW DoD component instructions. These requirements apply throughout the life cycle of these materials.

h. USFK 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.

i. All excess hazardous material will be processed through the Defense Logistics Agency Disposition Services (DLA DS) in accordance with the procedures in DoDM 4160.21, Volume 1, Defense Materiel Disposition: Disposal Guidance and Procedures. The DLA DS will donate, transfer, or sell hazardous material only to environmentally responsible parties. This paragraph is not intended to prohibit the transfer of usable hazardous material between USFK activities participating in a regional or local pharmacy or exchange program.

j. All personnel who use, handle or store hazardous materials will be trained in accordance with DoDI 6050.05 and their component instructions.

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

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 which 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 ROK 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 greater than 1.0 volt or less than -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.

Table 5-2
Permissible Standards for Gaseous Toxic Chemicals

Threshold Limit Value (a) (ppm)	Regulated Quantity (kg/day or m ³ /day)	Gases
$a \leq 1$	2.5 or 0.25	Phosgene, Phosphine, Formaldehyde, cyanogen chloride
$1 < a \leq 10$	25 or 2.5	Hydrogen cyanide, Hydrogen Iodine, Hydrogen fluoride, Hydrogen bromine, Methyl bromine, Hydrogen chloride,
$10 < a \leq 100$	250 or 25	Ammonia
$100 < a \leq 200$	500 or 50	Methane chloride

Chapter 6

Hazardous Waste and Designated Waste

6-1. Scope

This chapter contains criteria for a comprehensive management program to ensure that HW/DW are identified, stored, transported, treated, disposed and recycled in an environmentally sound manner. This program provides a tracking system for management of HW/DW from generation to ultimate disposal.

6-2. Definitions

a. **Acute Hazardous Waste.** Those wastes listed in table B-4, "List of Hazardous Wastes/Substances/Materials" with a United States (U.S.) Environmental Protection Agency (EPA) waste number with the "P" designator, or those wastes in table B-4 with hazard code "H".

b. **Designated Waste (DW).** Synonymous with the term "hazardous waste." USFK hazardous wastes will be identified as designated waste upon leaving the installation boundary for disposal at a ROK waste disposal facility.

c. **Disposal.** The discharge, deposit, injection, dumping, spilling, leaking, or placing of any hazardous/designated 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.

d. **DOD Activity Account Code (DODAAC).** The unique code that identifies a unit, activity or organization that has the authority to requisition and/or receive material. .

e. **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.

f. **Hazardous Constituent.** A chemical compound that is listed by name in table B-4 or possesses the characteristics described in appendix B-1.

g. **Hazardous Waste (HW).** Synonymous with the term DW. A discarded material that may be solid, semi-solid, liquid, or contained gas and either exhibits a characteristic of a HW defined in appendix B-1, or is listed as a HW in tables B-1 through B-4. Excluded from this definition are domestic sewage sludge, household wastes, and medical wastes.

h. **Hazardous Waste Accumulation Point (HWAP).** A shop, site, or other work center where HW are accumulated until removed to a Hazardous Waste Storage Area (HWSA) or shipped for treatment or disposal. A HWAP may be used to accumulate no more than 208 liters (55 gallons) of HW, or 0.95 liter (one 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.

i. **Hazardous Waste/Designated Waste Disposal Facility.** A facility on a USFK installation where HW, or off of a USFK installation where DW, is landfilled, incinerated, destroyed, neutralized, cement solidified, or intermediately treated for such disposal.

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

k. **Hazardous Waste Generation.** Any act or process that produces HW as defined in this regulation.

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

m. **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 HW.

n. **Hazardous Waste Storage Area (HWSA).** One or more locations on a USFK installation where HW is collected prior to shipment for treatment or disposal. An HWSA may store more than 55 gallons of a HW stream and more than one quart (0.95 liter) of an acute hazardous waste stream.

o. **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.

p. **Incinerator.** Any furnace used in the process of burning HW 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.

q. **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.

r. **Persistent Organic Pollutant (POP).** Organic compounds that are resistant to environmental degradation, such as dioxin, and that threaten people and ecosystems due to toxicity, persistence, bio-accumulation, and long-distance migration.

s. **POP Waste.** Wastes, ash, sludge, waste oil, waste acids, and waste alkali solutions containing POPs and/or materials no longer needed for daily or industrial activities.

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

u. **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 HW. Used oil mixed with hazardous waste is a HW and will be managed as such.

v. **USFK Hazardous Waste Generator.** In USFK, a generator is considered to be the installation or activity on an installation that produces a HW.

w. **Unique Identification Number.** A number assigned to generators of HW to identify the generator and used to assist in tracking the waste from point of generation to ultimate disposal.

6-3. Criteria

a. Installations will develop a HW Management Plan IAW service component guidance and the requirements of this chapter.

b. USFK HW generators.

(1) HW determination. 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. A HW Profile Sheet (HWPS) will be used to identify each HW stream. 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 HW being handled at the storage area.

(2) Waste characterization. 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 waste characterization for off-installation disposal shall be IAW Korean test methods and protocols. U.S. EPA standard tests may be used as a supplemental characterization method for off-installation disposal.

(3) Each generator will use a DODAAC number for all record-keeping, reports, and manifests for HW.

(4) Pre-transport requirements.

(a) Transportation. Dry materials shall be covered for dust control. Liquids shall be contained to prevent leakage or discharge.

- When transporting HW via commercial transportation on ROK public roads and highways, HW generators will prepare off-installation HW shipments in compliance with applicable

ROK transportation regulations. Requirements may include placarding, marking, containerization, and labeling. HW/DW designated for international transport will be prepared in accordance with applicable international regulations. In the absence of ROK regulations, international standards will be used.

- When transporting HW/DW via military vehicle on ROK public roads and highways, generators will ensure compliance with Service regulations for the transport of hazardous materials and applicable ROK transportation laws and regulations.

(b) Manifesting. All HW/DW leaving the installation for disposal will be identified as DW and will be accompanied by a manifest to ensure a complete audit trail from point of origin to ultimate disposal that will include the information listed below. ROK forms will be used when applicable; otherwise, DD Form 1348-1A, "Issue Release/Receipt Document," or DD Form 1348-2, "Issue Release/Receipt Document with Address Label," will be used. This manifest should include:

- Generator's name, address, and telephone number.
- DODAAC Number.
- Transporter's name, address, and telephone number.
- Destination name, address, and telephone number.
- Description of waste.
- Total quantity of waste.
- Date of shipment.
- Date of receipt.

(c) Generators will maintain an audit trail of HW/DW from the point of generation to disposal as a designated waste. Generators using DLA DS will obtain a signed copy of the manifest from the initial DLA DS recipient of the waste, at which time DLA DS will assume responsibility. A generator, as provided in a host-tenant agreement, that uses the HW management and/or disposal program of a USFK component that has a DODAAC 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/DW outside of the DLA DS system will develop their own manifest tracking system to provide an audit trail from point of generation to ultimate disposal. If ROK manifest forms are used, completed forms will be returned to the generator with the corresponding certificates of disposal, and if applicable, the government contracting officer's representative.

c. Hazardous waste accumulation points (HWAP).

(1) A HWAP is defined in paragraph 6-2h above. 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.

(2) A HWAP will comply with the storage limits in paragraph 6-2h above. When these

limits have been reached, the generator will move the HW to a HWSA or ship it off-site for treatment or disposal within the next five working days. To avoid delays, prompt arrangements and submission of all appropriate turn-in documents to initiate the removal (e.g., DD Form 1348-1A) to appropriate authorities responsible for removing the HW (e.g., DLA DS) shall be made. Wastes intended to be recycled or used for energy recovery (for example, used oil or antifreeze) are exempt from the 208 liter (55 gallons)/0.95 liter (one quart) volume accumulation limits, but must be transported off-site to a final destination facility within one year from the date of arriving at the HWAP.

(3) All criteria of paragraph 6-3e of this chapter, "Use and Management of Containers," apply to HWAPs, with the exception of 6-3e(2)(e) (weekly inspections).

(4) The following provisions of paragraph 6-3f of this chapter, "Record-keeping Requirements," apply to HWAPs: subparagraphs 6-3f(1) (Turn-in documents), 6-3f(5) (Manifests) and 6-3f(6) (Waste Analysis/Characterization Records).

(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 subparagraph 6-3k of this chapter.

d. Hazardous Waste Storage Areas (HWSA).

(1) Each installation shall give a listing (including site maps) to on-installation emergency authorities (e.g., fire prevention department) and to the appropriate USFK service component. The listing shall include information on types and quantities of HW generated or stored.

(2) 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, Control and Reporting Plan must address the risk.

(3) Design and Operation of HWSA. The 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. HW should not be stored longer than one year in a HWSA.

(4) Waste Analysis and Verification.

(a) 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 and verification testing of both on-site and off-site hazardous/designated waste. The plan should include: parameters for testing and rationale for choosing them, frequency of analysis, test methods, and sampling methods. Waste Analysis Plans will use Korean testing procedures for HW/DW to be disposed off installation.

(b) Maintenance of Waste Analysis File. The HWSA must have, and keep on file, a hazardous waste profile sheet (HWPS) for each waste stream that is stored at each HWSA.

(c) 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:

- Inspect the waste to ensure it matches the description provided.
- Ensure that no waste is accepted for storage unless a HWPS is provided, or is available and properly referenced.
- Request a new HWPS from the generator if there is reason to believe that the process generating the waste has changed.
- Analyze waste shipments in accordance with the waste analysis plan to determine whether it matches the waste description on the accompanying manifest and documents.
- Reject shipments that do not match the accompanying waste descriptions unless the generator provides an accurate description.

(5) Security.

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

(b) Security System Design. An acceptable security system for a HWSA consists of either:

- A 24-hour surveillance system (e.g., television monitoring or surveillance by guard or other designated personnel) that continuously monitors and controls entry into the HWSA.
- An artificial or natural barrier (e.g., a securely locked building dedicated for HW storage, a fence in good repair, or a fence combined with a cliff) that completely surrounds the HW storage area, combined with a means to control entrance at all times (e.g., an attendant, television monitors, locked gate, or controlled roadway access).

(c) Required Signs. Signs with the legends "Danger Unauthorized Personnel Keep Out," and "No Smoking" must be posted at each entrance to the hazardous waste storage area, and at other locations, in sufficient numbers to be seen from any approach to the HWSA. The legend must be written in English and Korean, and must be legible from a distance of at least 25 feet. Existing signs with a legend other than "Danger Unauthorized Personnel Keep Out," may be used if the legend on the sign is written in both English and Korean and indicates that only authorized personnel are allowed to enter the HW storage area, and that entry to it can be dangerous.

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

(7) Access to Communications or Alarm System.

(a) 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.

(b) 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.

(8) Required Equipment. All HWSAs must be equipped with the following:

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

(b) 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.

(c) 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.

(d) Water at adequate volume and pressure to supply water hose streams, foam producing equipment, automatic sprinklers, or water spray systems (except at facilities where all wastes approved for storage therein are incompatible with water).

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

(f) 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.

(9) General Inspection Requirements.

(a) 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.

(b) 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.

(c) 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, eroding dike, etc.).

(d) Frequency of Inspections. Minimum frequencies for inspecting containers and container storage areas are found in subparagraph 6-3e(2)(e). Minimum frequencies for inspecting tank systems are found in subparagraph 6-3h(5)(b). 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.

(e) Remedy of Problems Revealed by an Inspection. When a problem is revealed by an inspection, the installation must remedy any deterioration or malfunction of equipment or structures on a schedule that 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.

(f) Maintenance of Inspection Records. The installation must record inspections in an inspection log or summary, and keep these 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.

(10) Personnel Training. Personnel assigned HWSA duty must successfully complete an appropriate HW training program in accordance with the training requirements in subparagraph 6-3k.

(11) Storage Practices.

(a) Compatible Storage. The storage of ignitable, reactive, or incompatible wastes must be handled so that it does not threaten human health or the environment. Dangers resulting from improper storage of incompatible wastes include generation of extreme heat, fire, explosion, and generation of toxic gases.

(b) 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 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 Korean. Water reactive waste cannot be stored in the same area as flammable and combustible liquid.

(12) Closure and Closure Plans:

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

(b) Closure Plan. Closure plans are required before opening a new HWSA. Each existing HWSA is required to maintain 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 HW, steps to be taken to remove or decontaminate all waste residues, and an estimate of the expected date for closure.

e. Use and Management of Containers.

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

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

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

(2) Management of Containers.

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

(b) A container holding HW must not be opened, handled, or stored in a manner that may rupture the container or cause it to leak.

(c) Containers of flammable liquids must be grounded when transferring flammable liquids from one container to the other and at other times whenever practical.

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

(e) Areas where containers are stored must be inspected weekly for leaking containers, for deterioration of containers and the containment system caused by corrosion or other factors, and for any defects in the secondary containment systems. Releases discovered will be immediately cleaned up IAW Chapter 18. Secondary containment will be emptied of retained storm water at least weekly and more frequently during periods of greater precipitation.

(3) Containment. Container storage areas must have a secondary containment system meeting the following:

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

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

(c) Storage areas that store containers holding only wastes that do not contain free liquids need not have a containment system as described in paragraph 6-3e(3), 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.

(d) 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. As a best management practice, container storage secondary containment systems should have dedicated containment for compatible wastes.

(4) 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.

(5) Special Requirements for Incompatible Wastes.

- (a) Incompatible wastes and materials must not be placed in the same container.
- (b) HW must not be placed in an unwashed container that previously held an incompatible waste or material.
- (c) A storage container holding a 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.

f. Record-keeping Requirements.

(1) Turn-in documents, e.g., DD Form 1348-1(A) or manifests, must be maintained for at least three years.

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

- (a) Name/address of generator.
- (b) Description and hazard class of the HW.
- (c) Number and types of containers.
- (d) Quantity of HW.
- (e) Date stored.
- (f) Storage location.
- (g) Disposition data, to include: dates received, sealed and transported and transporter used.

(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.

(4) Inspection Logs. Records of inspections should be maintained for a minimum period of three years.

(5) Manifests. Manifests of incoming and outgoing HW will be retained for three years.

(6) Waste Analysis/Characterization Records. These records will be retained for three years after closure of the HWSA.

g. Spill Prevention, Control and Reporting Plan.

(1) Each installation will have a Spill Prevention, Control and Reporting 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."

(2) Copies of Spill Prevention, Control and Reporting Plan. A current copy of the installation contingency plan must be:

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

(b) Submitted to all police departments, fire departments, hospitals, and emergency response teams identified in the plan, and which the plan relies upon to provide emergency services. Plans should be available in both English and Korean.

h. 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 (USTs) containing POLs and hazardous substances.

(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 6-3h(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 also exempted from the requirements in subparagraph 6-3h(4). HW storage tanks will be included in the installation's Storage Container Management Plan required in chapter 9.

(2) LEC approval is required for existing tank systems that do not have secondary containment meeting the requirements of subparagraph 6-3h(4). Installations must determine annually whether the tank system is leaking or is fit for use.

(3) Design and Installation of New Tank Systems or Components. Managers of HWSAs installing new tank systems or components must obtain a written assessment, reviewed and certified by a professional engineer, attesting that the tank system has sufficient structural integrity and is acceptable for the storing and treating of 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.

(4) Containment and Detection of Releases. In order to prevent the release of HW or hazardous constituents to the environment, secondary containment that meets the requirements of this subparagraph must be:

(a) Provided for all new tank systems or components, prior to their being put into service.

(b) Provided for those existing tank systems when the tank system annual leak test detects leakage.

(c) Provided for tank systems that store or treat HW.

(d) 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.

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

(5) General Operating Requirements.

(a) HW 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. The installation must inspect and log at least once each operating day:

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

(b) 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 six 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) 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 which is unfit for use, must be removed from service immediately and repaired or closed. Installations must satisfy the following requirements:

(a) 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.

(b) Containment of visible releases to the environment. The installation must immediately conduct an inspection of the release and, based upon that inspection:

- Prevent further migration of the leak or spill to soils or surface water.
- Remove and properly dispose of any contamination of the soil or surface water.
- Remove free product to the maximum extent possible.
- Continue monitoring and mitigating for any additional fire and safety hazards posed by vapors or free products in subsurface structures.

(c) Make required notifications and reports in accordance with Chapter 18, "Spill

Prevention and Response Planning.”

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

i. Standards for the Management of Used Oil.

(1) Used Oil Burned for Energy Recovery. Used oil burned for energy recovery must not exceed 4,000 ppm total halogens. Used oil fuel may be burned only in the following devices:

(a) Industrial furnaces.

(b) Boilers that are identified as follows:

- 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.

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

- Used oil-fired space heaters provided that:

- The heater burns only used oil that a USFK installation generates.

- The heater is designed to have a maximum capacity of not more than 0.5 million BTU per hour.

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

(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.

j. Standards for the Management of Lead-Acid Batteries.

(1) Lead-acid batteries will be managed as hazardous material when:

(a) They will be regenerated for reuse or their component materials will be recycled.

(b) They are either intact or the acid has been properly drained.

(2) Lead-acid batteries will be managed as hazardous waste when:

(a) They are not being recycled.

(b) They are cracked and not properly drained, although their components may still be recycled.

k. Hazardous Waste Training.

(1) Application. Personnel and their supervisors that 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 must work under direct supervision until they have completed appropriate training. Additional guidance is contained in DoDI 6050.05, "DoD Hazardous Communication Program."

(2) Refresher Training. All personnel performing hazardous waste duties must successfully complete annual refresher HW training.

(3) Training Contents and Requirements. The training program must:

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

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

(c) 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.

(d) Address the following areas in particular for personnel whose duties include HW handling and management:

- Emergency procedures (response to fire/explosion/spills; use of communications/alarm systems; body and equipment clean up).
- Drum/container handling/storage; safe use of HW equipment; proper sampling procedures.
- Employee Protection. Personal Protective Equipment (PPE), safety and health hazards, hazard communication, worker exposure.
- Record-keeping. Record-keeping, security, inspections, contingency plans, storage requirements, and transportation requirements.

(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.

I. HW/DW Disposal.

(1) USFK HW destined for disposal at a ROK disposal facility will be identified as DW upon leaving the installation. DW include the following:

(a) HW included in table B-4, "Hazardous Materials/Substances/Waste."

(b) Industrial waste (slag, casting sand and waste sand-blasting media, particulates from air emissions equipment, incineration ash, fire-resistant material, unglazed pottery pieces, waste treated by stabilization or solidification, spent catalyst, and waste absorbent/adsorbent) and industrial sludge with a water content less than 95% or solid content more than 5% that contain the following substances in excess of concentrations identified in tables B-1 and B-2:

- Lead or its compounds.
- Copper or its compounds.
- Arsenic or its compounds.
- Mercury or its compounds.
- Cadmium or its compounds.
- Hexavalent chromium or its compounds.
- Cyanide compounds.
- Organic phosphorus compounds.
- Tetrachloroethylene.
- Trichloroethylene.

(c) Waste polymer (resin and rubber) from the manufacturing process.

(d) Other regulated wastes.

- Non edible, non-PCB waste oil with oil content of 5% or more.
- Waste asbestos. (Regulated in Chapter 15, “Asbestos”)
- Infectious medical wastes. (Regulated in Chapter 8, “Medical Waste Management”)
- PCB-containing waste (Regulated in Chapter 14, “Polychlorinated Biphenyls”):
 - Liquid waste with PCB content ≥ 2 mg/l.
 - Waste other than liquid waste with a PCB content > 0.003 mg/L in an extraction liquid.

(2) All USFK HW/DW should normally be disposed of through the DLA DS. A decision not to use the DLA DS for HW/DW disposal may be made for best accomplishment of the installation mission, but such decision shall be approved in writing by the Component Commander, in coordination with DLA DS, 411th Contracting Support Brigade, and the LEC. All such installation contracts and disposal criteria must be at least as protective as criteria used by DLA DS. DW must be treated at a facility specifically designed for DW treatment, except for liquid wastes with 85% or higher moisture content or 15% or less solid content, such as acid or alkali, treated at a waste water treatment plant through direct discharge, only if the treatment is acknowledged by the waste water treatment plant.

(3) USFK components must ensure that wastes generated by USFK operations that are considered designated under ROK law are not disposed of in the ROK unless the disposal is

conducted in accordance with the environmental governing standards and the following:

(a) When HW/DW cannot be disposed of in accordance with these EGS within the ROK, the hazardous/designated waste will be either 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 the environmental governing standards applicable to the country of disposal, if any exist. Trans-shipment of HW/DS to another country other than the United States for disposal must be approved by, at a minimum, the Deputy Under Secretary of Defense for Installations and Environment (DUSD (I&E)).

(b) The determination of whether particular USFK-generated HW/DS may be disposed of in the ROK will be made by the LEC, in coordination with the unified combatant commander, Director of Defense Logistics Agency (DLA), or other relevant USFK Components, and the Chief of the U.S. Diplomatic Mission.

(4) Disposal Procedures.

(a) The determination of whether HW/DW may be disposed of in a ROK facility must include consideration of whether the means of treatment and/or containment technologies employed in the ROK program, as enacted and enforced, effectively mitigate the hazards of such waste to human health and the environment, meet all ROK regulatory requirements, and must consider whether the ROK program includes:

- An effective system for tracking the movement of DW to its ultimate destination.
- An effective system for granting authorization or permission to those engaged in the collection, transportation, storage, treatment, and disposal of DW.
- Appropriate standards and limitations on the methods that may be used to treat and dispose of DW.
- Standards designed to minimize the possibility of fire, explosion, or any unplanned release or migration of DW or its constituents to air, soil, surface, or groundwater.

(b) The LEC must also be satisfied, either through reliance on the ROK regulatory system and/or provisions in the disposal contracts, that:

- All persons and facilities in the waste management process have demonstrated the appropriate level of training and reliability.
- Effective inspections, monitoring, and record-keeping will take place.

(5) Specific standards for DW.

(a) Waste synthetic polymer.

- Waste thermo-hardening synthetic resin shall be shredded or cut to the size of 15 cm or less in diameter, or melted, and then disposed of in a managed landfill.
- Waste non thermo-hardening synthetic resin and waste synthetic rubber shall be

disposed of by incineration.

(b) Waste paint and waste lacquer: Waste paint and waste lacquer shall be disposed by high-temperature incineration, or processed to remove recyclable substances, such as organic solvents, followed by disposal of the residue by high-temperature incineration.

(6) ROK facilities that either store, treat, or dispose USFK-generated DW must be evaluated and approved by the ROK as being in compliance with their regulatory requirements. This evaluation and approval may consist of having a valid permit or ROK equivalent for the HW that will be handled.

(7) HW will be recycled or reused to the maximum extent practical. Safe and environmentally acceptable methods will be used to identify, store, prevent leakage, and disposal of HW in a manner to minimize risks to health and the environment.

(8) Land disposal requirements for HW. Installations may operate an existing landfill, initiate a new landfill, or expand an existing waste landfill in USFK. The use of HW landfills requires adequate justification approved by the LEC. Justification will be submitted to the LEC through the Service Component Commander for approval. HW 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. HW may be land-disposed only in facilities meeting the following criteria:

(a) The land disposal facility has a liner and leachate collection system. The liner will be of natural or man-made materials and restricts 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.

(b) 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.

(c) The requirements of subparagraphs 6-3l(8)(a) or 6-3l(8)(b), 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 6-3l(8)(a).

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

(a) Incinerators used to dispose DW must be licensed or permitted by the competent ROK authority and approved by the LEC. On-installation HW incinerators, and boilers or industrial furnaces for any recycling purposes require LEC approval. This license, permit, or approval must comply with the criteria listed in subparagraph 6-3l(9)(b).

(b) Incineration of HW/DW 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) so as to effectively destroy hazardous constituents and control harmful emissions.

- A valid ROK permit or license and LEC's permission will be sufficient to ensure the incinerator is appropriately designed and operated so as to effectively destroy hazardous constituents and control harmful emissions.

- USFK approval for incineration of HW will require an incinerator to achieve the standards set forth in either of the subparagraphs below.

- 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.

- The incinerator has demonstrated, as a condition for obtaining a license, permit, or LEC 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 ROK authority or the LEC to conclude that the incinerator will effectively destroy the principal organic hazardous constituents of each waste to be burned.

(10) Treatment Technologies: The following treatment technologies may be used to reduce the volume or hazardous characteristics of wastes. Wastes that are categorized as HW on the basis of appendix B-1 and which, after treatment as described herein no longer exhibit any hazardous characteristic, may be disposed as solid waste. Treatment residues of wastes categorized as hazardous under any other section of appendix B will continue to be managed as HW under the criteria of this document, including those for disposal. The treatment technologies listed below are provided as baseline treatment/disposal technologies for use in determining suitability of Korean disposal alternatives. These technologies should not be implemented without consultation with LEC.

(a) Organics.

- Incineration in accordance with the requirements of subparagraph 6-3l(9)(b).

- 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.

- Biodegradation. Wastes are degraded by microbial action. Such units will be operated under aerobic or anaerobic conditions so that the concentration 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.

- 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.

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

(b) **Heavy Metals.**

- **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 render the metals immobile in a landfill environment.

- **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.

(c) **Reactives.** Any treatment that changes the chemical or physical composition of a material such that it no longer exhibits the characteristic for reactivity defined in appendix B-1d.

(d) **Corrosives.** Corrosive wastes, as defined in appendix B-1c, 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.

(e) **Batteries.** Mercury, nickel-cadmium, lithium, and lead-acid batteries will be regenerated for reuse if possible, or turned in to DLA DS for recycling or disposal. If proper facilities and equipment exist, lead-acid batteries can be drained and the acid separately turned in to DLA DS as a HW.

(11) 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 accordance with subparagraphs 6-3l(9) and 6-3l(10).

Chapter 7 Solid Waste

7-1. Scope

This Chapter contains criteria to ensure that solid wastes (SW) 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 SW 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 4715.23, "Integrated Recycling and Solid Waste Management," and service SW management manuals. The criteria in this chapter deal with general SW. Criteria for specific types of SW that require special precautions are located in Chapter 6, "Hazardous Waste and Designated Waste", Chapter 8, "Medical Waste Management", Chapter 11, "Pesticides", and Chapter 14, "Polychlorinated Biphenyls (PCBs)".

7-2. Definitions

a. **Bulk Waste.** Large items of SW 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 SW collection, processing or disposal methods.

b. **Carry-out Collection.** Collection of SW from a storage area proximate to the dwelling unit(s) or establishment where generated.

c. **Collection.** The act of consolidating SW (or materials which have been separated for the purpose of recycling) from various locations.

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

e. **Commercial SW.** All types of SW generated by stores, offices, restaurants, warehouses, and other non-manufacturing activities, excluding residential and industrial wastes.

f. **Compactor Collection Vehicle.** A vehicle with an enclosed body containing mechanical devices that conveys SW into the main compartment of the body and compresses it into a smaller volume of greater density.

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

h. **Cover Material.** Material that is used to provide cover to compacted SW at a land disposal site.

i. **Curb Collection.** Collection of SW placed adjacent to a street.

j. **Daily Cover.** Soil that is spread and compacted or synthetic material that is placed on the top and side slopes of compacted SW at least at the end of each operating day in order to control vectors, fire, moisture, odors, 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.

k. **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.

l. **Food Waste.** The organic residues generated by the handling, storage, sale, preparation, cooking, and serving of foods.

m. **Generation.** The act or process of producing SW.

n. **Hazardous/Designated Wastes.** Refer to Chapter 6, "Hazardous Waste and Designated Waste."

o. **Industrial SW.** The SW generated by industrial processes and manufacturing.

p. **Institutional SW.** SW generated by educational, health care, correctional, and other institutional facilities.

q. **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.

r. **Lower Explosive Limit.** The lowest percent by volume of a mixture of explosive gases in

air that will propagate a flame at 25 degrees Celsius and atmospheric pressure.

s. **Municipal SW (MSW).** Normally, residential and commercial SW generated within a community, including yard waste (See also definition in Chapter 2, “Air Emissions”).

t. **Municipal Solid Waste Landfill Unit (MSWLF).** 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. A MSWLF unit also may receive other types of wastes, such as commercial SW and industrial waste.

u. **Open Burning.** Burning of SW in the open, such as in an open dump.

v. **Open Dump.** A land disposal site at which SW 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.

w. **Residential SW.** The wastes generated by normal household activities, including, but not limited to, food wastes, rubbish, ashes, and bulky wastes.

x. **Rubbish.** A general term for SW, excluding food wastes and ashes, taken from residences, commercial establishments and institutions.

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

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

aa. **Scavenging.** The uncontrolled and unauthorized removal of materials at any point in the SW management system.

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

cc. **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.

dd. **Solid Waste (SW).** 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.

ee. **Solid Waste Storage Container.** A receptacle used for the temporary storage of SW while awaiting collection.

ff. **Stationary Compactor.** A powered machine that is designed to compact SW or recyclable materials, and that remains stationary when in operation.

gg. **Storage.** The interim containment of SW after generation and prior to collection for ultimate recovery or disposal.

hh. **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.

ii. **Transfer Station.** A site at which SW is concentrated for transport to a processing facility or land disposal site. A transfer station may be fixed or mobile.

jj. **Vector.** A carrier that is capable of transmitting a pathogen from one organism to another.

kk. **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

a. USFK SW will be treated, stored, and disposed of in facilities that have been evaluated against paragraphs 7-3l, o and p of this chapter. These evaluated facilities will be used to the maximum extent practical.

b. Installations will cooperate with ROK officials, to the extent possible, in the SW management process. Contractors responsible for transporting and disposing USFK generated SW at disposal facilities outside the installation shall meet all ROK license and permit requirements. Permit and information requests from ROK officials will be considered IAW paragraphs 1-7 and 1-12 of this regulation.

c. Installations will develop and implement a SW management strategy to reduce SW disposal. This strategy could include recycling, composting and waste minimization efforts. Planning and execution of construction, renovation, and demolition projects should maximize the reuse and recycling of excess materials generated by the projects, subject to the criteria in this regulation and other appropriate guidance.

d. All SWs 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 to avoid spillage.

e. 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 SW and water in and around the bulky items. Bulky wastes will be screened for the presence of hazardous constituents and ozone depleting substances as defined in Chapter 2, "Air Emissions," or hazardous constituents as defined in Chapter 6, "Hazardous Waste and Designated Waste." Readily detachable or removable HW will be segregated and disposed of IAW Chapters 6, 14, and 15 of this regulation.

f. In the design of all buildings or other facilities that are constructed, modified, or leased after the effective date of these guidelines, there will be provisions for storage IAW these guidelines that will accommodate the volume of SW anticipated. Storage areas will be easily cleaned and maintained, and will allow for safe, efficient collection.

g. 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. Storage containers should have functional lids.

h. Containers should be stored on a firm, level, well drained surface that is large enough to accommodate all of the containers and which is maintained in a clean, spillage-free condition.

i. Recycling programs will be instituted on USFK installations in accordance with the policies in DoDI 4715.23 and the policies of each service component.

j. Installations will not initiate a new landfill, expand an existing waste landfill, or continue use of an existing landfill. If there is a compelling reason for land disposal, a justification of the unique circumstances requiring a new landfill, an expanded landfill, or continued use of an existing landfill, will be submitted to the LEC for approval through the in-theater Component Commander for consideration.

k. New MSWLF units will be designed and operated in a manner that incorporates the following broad factors:

(1) Location restrictions in regard to airport safety (i.e., bird hazards), floodplains, wetlands, aquifers, seismic zones, and unstable areas.

(2) Procedures for excluding HW.

(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.

(4) Inspection program.

(5) Liner and leachate collection system designed consistent with location to prevent groundwater contamination that would adversely affect human health.

(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.

l. Installations operating LEC-approved MSWLF units will:

(1) Use standard sanitary landfill techniques of spreading and compacting SW and placing daily cover over disposed SW at the end of each operating day.

(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.

(3) Implement a program to detect and prevent the disposal of hazardous/designated wastes, infectious wastes, PCB wastes, and wastes determined unsuitable for the specific MSWLF unit.

(4) Investigate options for composting of MSW as an alternative to landfilling or treatment prior to landfilling.

(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.

(6) Develop procedures for dealing with yard waste and construction debris that keep it out of MSWLF units to the maximum extent possible (e.g., composting, recycling).

(7) Operate the MSWLF unit in a manner to protect the health and safety of personnel associated with the operation.

(8) Maintain conditions that are unfavorable for the harboring, feeding and breeding of disease vectors.

(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.

(10) Operate in an aesthetically acceptable manner.

(11) Operate in a manner to protect aquifers.

(12) Control public access to landfill facilities.

(13) Prohibit the disposal of bulk or non-containerized liquids, if possible.

(14) Maintain records on the preceding criteria.

m. During closure and post-closure operations of landfills that may have been operated in the past, installations will:

(1) Install a final cover system that is designed to minimize infiltration and erosion.

(2) Ensure that the infiltration layer includes a minimum of 46 cm (18 inches) of earthen material, geotextiles, or combination thereof, that have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present, or a permeability no greater than 0.00005 cm/sec, whichever is less.

(3) Ensure that the final layer consists of a minimum of 21 cm (8 inches) of earth material that is capable of sustaining native plant growth.

(4) If possible, revegetate the final cap with native plants that are compatible with the landfill design, including the liner.

(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. Post-closure period will be a minimum of five (5) years.

n. Open burning is a prohibited method of SW disposal. Where burning is the method, incinerators meeting air quality requirements in chapter 2, "Air Emissions" will be used.

o. A composting facility that is located on a USFK installation and that processes more than 5,000 tons of sludge annually from a domestic wastewater treatment plant (see chapter 4, "Wastewater") will comply with the following criteria:

(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.

(2) Access to the facility must be controlled. All access points must be secured when the facility is not in operation. Composting facilities must be paved and care shall be taken to prevent scattering.

(3) 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.

(4) 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.

(5) The temperature and retention time for the material being composted must be monitored and recorded.

(6) 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 polychlorinated biphenyls (PCBs).

(7) Compost must be produced by a process to further reduce pathogens. Two such acceptable methods are:

(a) Windrowing, which consists of an unconfined composting process involving periodic aeration and mixing such that aerobic conditions are maintained during the composting process.

(b) 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 degrees Celsius. A stabilization period of at least seven days must follow the decomposition period.

p. Classification and use of compost from USFK Composting Facilities. Compost produced at a composting facility that is located on a USFK installation and that processes more than 5,000 tons of sludge from a domestic wastewater treatment plant or more of USFK sludge annually (See chapter 4, Wastewater), must be classified as "Class A" or "Class B" based on the guidelines criteria below. Class B compost shall be subject to certain use restrictions. Compost intended for use on non-SOFA granted property (not on USFK installations) will comply with all requirements (allowable average contaminant concentrations (AACC-Is) and AACC-IIs) identified in this paragraph.

(1) Class A compost must be stored until the compost is matured, i.e., 60 percent 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. AACCs (Risk standards for heavy metals in organic fertilizer, and by-product fertilizer among the fertilizers categorized as general fertilizer; and raw materials) in milligrams per kilogram on a dry weight basis are:

Table 7-1
AACCs in mg/kg on a Dry Weight Basis

Contaminant	AACC-I (mg/kg)	AACC-II (mg/kg)
(a) PCB	1	n/a
(b) Cadmium		5
(c) Chromium		300
(d) Copper		300
(e) Lead		150
(f) Mercury		2
(g) Nickel		50
(h) Zinc		900

(2) Class B compost consists of any compost generated that fails to meet Class A standards.

(3) Compost distribution and end use.

(a) Class A compost may be distributed for unrestricted use, including agricultural applications.

(b) Class B compost may not be distributed for agricultural applications.

q. Specific standards for construction waste.

(1) General standards.

(a) HW/DW shall be removed from building prior to demolition and separated from construction wastes.

(b) Construction wastes must be segregated for recycling whenever possible.

(c) Combustible wastes, such as wood materials, that cannot be recycled, must be incinerated at a facility operated in compliance with this regulation or disposed of off installation IAW Korean law.

(d) Construction wastes must be crushed to a diameter equal to or less than 50 cm (~20 inches); synthetic resins that are difficult to incinerate must be crushed and cut down to diameter equal to or less than 15 cm (~6 inches) to minimize landfill space. Moisture content of construction sludge must be less than 85% through dewatering and drying before it is disposed of in a landfill.

(2) Collection and transportation.

(a) Trucks used to collect and haul construction wastes must be labeled on each side

with a clearly written, recognized label providing the transporter name and phone number. The label must be no smaller than 100 cm (~40 inches) wide by 50 cm (~20 inches) tall.

(b) Construction and non-construction wastes cannot be mixed or loaded together.

(3) Storage.

(a) Construction wastes must not be stored for more than 90 days. However, generated construction wastes with a total weight of less than 8 tons (50 tons for concrete and asphalt concrete produced during road construction) can be stored for a longer period of time.

(b) Construction wastes will be removed from the construction site upon completion of the project.

(c) The construction waste treatment contractor must affix a sign to each storage waste collection area, as follows:

Table 7-2
Construction Wastes Storage Label

Type of construction wastes	Total storage weight (ton)
Area of the storage space (m ²)	Allowable storage weight (ton)
Storage period	Personnel in charge
Storage cautions	
Shipping destination	

NOTES:

1. Types of construction wastes must be indicated as one of "regulated construction wastes," "recyclable construction wastes," "incineration construction wastes," or "landfill construction wastes."
2. The sign must be easily visible.
3. Size of sign (width 60 cm [~24 inches] × height 40 cm [16 inches]).
4. Sign must be white, with letters and lines in black.

r. Prohibition of open dumping. No one shall dump any waste at other than waste collection or disposal points.

s. Food waste management.

(1) Installation Commanders will not landfill unprocessed food waste from dining facilities serving 100 or more customers daily on USFK installations.

(2) Collection and storage of food waste. Food waste is collected and transported by a vehicle within a container to prevent offensive odor or leakage of liquids. The vehicles and containers shall be washed or sterilized as needed so that they do not constitute a nuisance and to retard the harborage, feeding, and breeding of vectors.

(3) Food waste will be processed using one of the following methods:

(a) Off installation disposal through contract IAW Korean law.

(b) On installation disposal.

- Incineration with residuals disposed of in an LEC-approved landfill.
- Composting with moisture content of less than 40%.
- Converting to animal feed with a moisture content of less than 40%.

(4) Heating packs included in military rations that are eaten at the community dining areas shall not be disposed off with the food waste. They must be collected separately and disposed off according to the disposal requirements of their contents

Chapter 8 Medical Waste Management

8-1. Scope

This chapter contains criteria for the management of medical waste at USFK 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 HW/DW. It does not apply to what would otherwise be household waste.

8-2. Definitions

a. **Infectious Agent.** Any organism (such as a virus or a 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.

b. **Infectious Hazardous Waste.** Mixtures of infectious medical waste and HW/DW such as fluids from a parasitology laboratory.

c. **Infectious Medical Waste/Harmful Medical Waste.** Waste generated in the diagnosis, treatment, research, or immunization of human beings and animals which is capable of causing disease in humans and may pose a risk to either individuals or community health if not managed properly. Medical waste produced by medical, dental and veterinary treatment facilities which 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. Include the following classes:

(1) Microbiological waste, including used test tubes and gloves, in addition to cultures, culture media, and stocks of etiologic agents which, due to their species, type, virulence, or concentration are known to cause disease in humans.

(2) Biological and chemical waste, including vaccines, chemotherapy medicine, and trace wastes.

(3) Pathology waste, including human and animal 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 infected animals are also included.

(4) Human and animal blood and blood products (including serum, plasma, and other blood components), items contaminated with liquid or semi-liquid blood or blood products including blood

bags and waste from hemodialysis, intravenous injection kit containing blood, body fluids, secretion or excrements, 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.

(5) Potentially infectious materials. Synonymous with the term "General Medical Waste" includes human and animal body fluids such as semen, vaginal secretions, cerebrospinal fluid, pericardial fluid, pleural fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, pus, 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. Items saturated with human or animal blood, pus, discharge, or secretions, such as absorbent cotton, bandage, gauze, disposable diaper, and sanitary napkins are considered potentially infectious materials.

(6) 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, dental needles, acupuncture needles, stitching needles and disposable needles, scalpel blades, Pasteur pipettes, specimen slides, cover slips, glass petri plates, and broken glass potentially contaminated with infectious waste. It also includes the following unused, discarded sharps that were intended to be used: hypodermic needles, suture needles, syringes, and scalpel blades.

(7) Infectious waste from isolation rooms. Synonymous with the term "Quarantine Medical Waste" generated while providing medical care to individuals isolated to protect others from infectious disease, but only including those items that were contaminated or likely to be contaminated with infectious agents or pathogens, including excretion exudates and discarded materials contaminated with blood.

d. **Noninfectious Medical Waste.** SW created that does not require special management because it has been determined to be incapable of causing disease in humans or that has been treated to render it noninfectious.

e. **Solid Waste.** Any SW as defined in chapter 7, "Solid Waste."

f. **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.

8-3. Criteria

a. Infectious medical waste will be separated, if practical, from other SW at the point of origin.

b. Mixtures of infectious medical wastes and HW/DW will be handled as infectious hazardous waste under DoDM 4160.21 and are the responsibility of the generating DoD Component. Priority will be given to the hazard that presents the greatest risk. DLA DS have no responsibility for this type of property until it is rendered noninfectious as determined by the appropriate DoD medical authority.

c. Pharmaceutical waste: If possible, bulk pharmacy items shall be recycled to manufacturer prior to expiration. Used pharmaceuticals and packaging will be segregated according to waste class (radioactive medical waste, infectious medical waste, etc.) and disposed of accordingly.

Expired controlled pharmaceuticals will be incinerated and documented in accordance with service directives.

d. Mixtures of other SW and infectious medical waste will be handled as infectious medical waste.

e. Radioactive medical waste will be managed in accordance with service directives.

f. 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.

g. 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 Korean, and will include markings that identifies the generator, date of generation, and the contents.

h. Sharps will only be discarded into rigid receptacles. Needles shall not be clipped, cut, bent or recapped before disposal.

i. Infectious medical waste will be transported and stored to minimize human exposure, and will not be placed in chutes or dumbwaiters.

j. Infectious medical waste will not be compacted.

k. All anatomical pathology waste (i.e., large body parts) must be placed in containers lined with plastic bags that comply with paragraph 8-3f, 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.

l. Blood, blood products and other liquid infectious wastes Blood, blood products and other liquid infectious wastes must be placed in containers lined with plastic bags that comply with paragraph 8-3f, 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. Suction waste from operating rooms may be disposed of in two ways. First is using a close system medical waste sterilizing system where the pretreated waste is then drained into the waste water system. Second is using a canister and agent which converts the liquid waste to solid. Once waste is solidified, the canister is then disposed in the normal regulated medical waste bags.

m. Suction canister waste from operating rooms may be decanted into a clinical sink if the sink is connected to a wastewater treatment plant and no pre-treatment is required. Pre-treatment is required when suction canister waste is known to be contaminated with infectious agents or pathogens. If pre-treatment is required, the methods contained in table 8-4, "On-Installation Treatment and Disposal Methods for Infectious Medical Waste," will be employed prior to discharge to the sewer system. The suction canisters may also be sealed into leak-proof containers and incinerated.

n. All personnel handling infectious medical waste will wear appropriate protective apparel or equipment such as gloves, coveralls, mask, goggles, etc. sufficient to prevent the risk of exposure to infectious agents or pathogens.

o. If infectious medical waste will be managed during storage as follows:

(1) Infectious medical waste will be maintained in a nonputrescent state, using refrigeration as necessary.

(2) Infectious medical waste with multiple hazards (i.e., infectious HW, or infectious radioactive waste) will be segregated from the general infectious waste when additional or alternative treatment is required.

(3) Infectious medical waste must not be stored more than 30 days, unless storage is required due to a contingency such as a natural disaster, temporarily closed facility, or an uncontrollable event. In such cases, infectious medical waste should be stored in a refrigerated unit or facility.

p. Storage sites must be:

(1) Specifically designated.

(2) Constructed to prevent entry of insects, rodents and other pests.

(3) Prevent access by unauthorized personnel.

(4) Marked on the outside with the universal biohazard symbol and the word "BIOHAZARD" in both English and Korean.

(5) Structured to prevent any leakage from infiltrating into the ground.

(6) Constructed to prevent discharge of offensive odor.

(7) Disinfected once a week at a minimum with a facility approved disinfectant.

q. Bags and receptacles containing infectious medical waste must be placed into rigid or semi-rigid, leak-proof containers before being transported off-site.

r. On-installation disposal of infectious medical waste must be in accordance with table 8-4, and the conditions that follow prior to disposal.

(1) Sterilizers must maintain the temperature at 121°C (250° F) for at least 30 minutes at 15 psi.

(2) The effectiveness of sterilizers must be checked at least weekly using *Bacillus stearo thermophilus* spore strips or an equivalent biological performance test.

(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."

(4) Ash or residue from the incineration of infectious medical waste must be assessed for classification as HW in accordance with the criteria in chapter 6, "Hazardous Waste and Designated Waste." Ash that is determined to be HW 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."

(5) Chemical disinfection must be conducted using procedures and compounds approved

by the appropriate DoD medical authority for use on any pathogen or infectious agent suspected to be present in the waste. Chemical disinfection is not permitted as a means of on-installation treatment of bulk blood/blood products and suction canister waste known to be contaminated with infectious agents and pathogens.

s. Off-installation disposal of medical waste. USFK infectious medical waste destined for disposal at a ROK disposal facility will be identified as Harmful Medical Waste, General Medical Waste, or Quarantine Medical Waste, as appropriate, upon leaving the installation.

(1) Collection and Transportation.

(a) Medical wastes must be put into medical waste containers and sealed to be collected and transported by an appropriate U.S. government vehicle or a contract vehicle. The medical waste produced on an island not connected to the mainland must be sealed and marked and placed into sealed refrigerated containers.

(b) The contract vehicle shall be equipped as follows:

- Medical waste trucks must be equipped with cooling devices to maintain temperature at 4°C (39.2°F). The cooling device must be turned on while transporting medical wastes.
- Box trucks will be used to transport medical wastes to prevent scattering, spillage or odors.
- The interior surface of the truck's container holding area must be water-resistant and anti-corrosive so it can be decontaminated easily. The truck must also carry a thermometer, chemicals and equipment required for sterilization.
- The truck's container holding area must be chemically sterilized. It must be disinfected weekly, or immediately after spills of medical waste in the holding area.
- Medical waste trucks must be colored in white.
- A medical waste placard, company name, and phone number must be placed on each side of the truck container. A medical waste placard must be placed at the back of each container. Size of the placard must be minimum 100 cm (~40 inches) wide and 50 cm (~20 inches) long (minimum 50 cm (~40 inches) for both width and height for the sign on the back). The placard and the letters must be in green.

(2) Preparation for off-installation disposal.

(a) The medical waste must be stored in appropriately identified medical waste disposal containers. The containers in use must be managed to prevent spills. The inner bag and the external container must be sealed when filled. If the collected medical waste is to be treated using the same method at one treatment facility, medical waste of the same characteristics and physical state can be sealed and stored together.

Table 8-1
The Medical Waste Marking Color

Medical Waste Type	Color
--------------------	-------

Human placenta recycling*	Green
Quarantine medical wastes	Red
Harmful medical wastes	Yellow
General medical wastes	Bags/Black, Boxes Yellow

*Human placenta recycling is not practiced by DoD medical facilities in Korea; therefore, Korean placenta recycling environmental regulations have not been incorporated into this chapter. Prior coordination with the LEC is needed before a DoD Medical Facility chooses to recycle placentas, rather than disposing of placentas as an infectious medical waste.

(b) The medical waste container for off-installation disposal must be as follows.

- The medical waste container must be an approved bag or box.
- The medical waste containers must not be recycled.

(c) Capacity and dimensions of box-type waste containers are listed in the table below. Depending on the types and volume of medical wastes, the size can be adjusted within a 20% range.

Table 8-2
Capacity and Dimensions of Synthetic Waste Containers

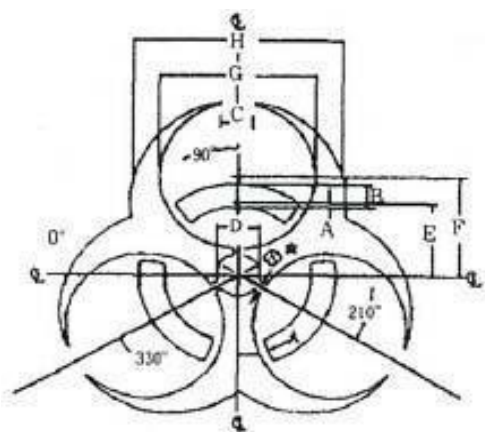
Synthetic resin containe		
Capacity (l)	Size of the box (mm)*	Size of the cylinder (mm)*
0.5	80 × 80 × 105	Φ 90 × 10
1	95 × 95 × 130	Φ 105 × 135
2	120 × 120 × 160	Φ 130 × 170
5	165 × 165 × 225	Φ 176 × 230
10	215 × 215 × 290	Φ 220 × 295
20	270 × 270 × 370	Φ 276 × 375
30	310 × 310 × 410	Φ 320 × 410
50	360 × 360 × 500	Φ 380 × 510
70	400 × 400 × 550	Φ 430 × 560
100	450 × 450 × 620	Φ 500 × 600

*Box: length×width×depth, Cylinder: diameter×depth

(d) The medical waste symbol and the caution label must be placed on the surface of the receptacle.



Figure 8-1. Medical Wastes Symbol



A	B	C	D	E	F	G	H
1	3.5	4	6	11	15	21	30

Figure 8-2. Drawing Guidelines (Length ratios are indicated in the table)

(e) The label will be in Korean and will contain the following information in the format described below.

**Table 8-3
Caution Label**

Handle with special caution because contagious wastes may be in the container.			
Generator		Type, characteristics and state	
Collection starting date (dd/mmm/yyyy)			
Collector			
Remarks: The first day medical waste was placed into the container must be marked in the cell "collection starting date".			

(3) Treatment.

(a) Medical waste treatment and disposal contractors shall be licensed in

accordance with applicable Korean laws.

(b) Medical waste must be treated at facilities specifically designed for the treatment of medical waste. However, in remote islands, according to the municipal ordinance declared by the competent local government, medical waste can be incinerated at the daily waste incineration facility within the island or at a neighboring island.

(c) Medical waste must be incinerated or sterilized and pulverized. Quarantine medical waste and harmful medical waste must be incinerated.

(d) Medical waste receptacles cannot be emptied before they are put into the incinerator or the facility for sterilization and pulverization. The waste in the receptacles must be put in as a whole.

(e) During the sterilization and pulverization processes, waste must be pulverized until the original shape of wastes cannot be recognized to prevent from waste recycling.

(f) If sterilization and pulverization residues are judged not to be sufficiently sterilized, the residues must be treated again.

(g) Residues from sterilization and pulverization must be incinerated.

(h) Residues from incineration must be landfilled.

t. Installations will develop contingency plans for treatment or disposal of infectious medical waste in the event the primary means become inoperable.

u. Spills of infectious medical waste will be cleaned up as soon as possible in accordance with the following:

(1) Response personnel must comply with subparagraph 8-3m.

(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.

(3) Surfaces contacted by infectious medical waste must be washed with soap and water and chemically decontaminated in accordance with paragraph 8-3q(5).

v. Installations will keep records of the following information concerning infectious medical waste for at least three years after the date of disposal:

(1) Type of waste.

(2) Amount of waste (volume or weight).

(3) Treatment, if any, including date of treatment.

(4) Disposition, including date of disposition, and if the waste is transferred to ROK facilities, and receipts acknowledging paragraphs 8-3r(1) – 8-3r(3) for each transfer.

Table 8-4
On-Installation Treatment and Disposal Methods for Infectious Medical Waste

Type of Medical Waste	Method of Treatment	Method of Disposal
Microbiological	Steam sterilization ¹	Municipal Solid Waste Landfill (MSWLF) ²
	Chemical disinfection	MSWLF
	Incineration	MSWLF
Pathological	Incineration ³	MSWLF
	Cremation ³	Burial
	Chemical sterilization ⁴	Domestic Wastewater Treatment Plant (DWTP) ⁵
	Steam sterilization ⁴	DWTP
Bulk blood and suction container waste	Steam sterilization ⁶	DWTP
	Chemical disinfection	DWTP
	Incineration ⁶	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, "Solid Waste," for criteria for SW 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, "Wastewater," for criteria on 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 (USTs) containing POL products or hazardous materials 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

a. **Aboveground Storage Container.** POL storage containers, exempt from UST criteria, which 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.

b. **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 9-2g below.

c. **Loading/ Unloading Racks.** Locations where tanker trucks/rail cars are loaded and unloaded by pipes, pumps, and loading arms.

d. **Loading/ Unloading Areas.** Any location where POL is authorized to be loaded or unloaded to or from a POL storage container.

e. **Pipeline Facility.** Includes new and existing pipes, pipeline rights of way, auxiliary equipment (e.g., valves, manifolds, etc.), and buildings or other facilities used in the transportation of POL.

f. **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.

g. **POL Facility.** An installation with; aggregate aboveground storage container capacity (excluding below ground storage containers) of 5,000 liters (1,320 gallons) or greater; UST storage of greater than 159,000 liters (42,000 gallons); or a pipeline facility as identified in subparagraph 9-2e.

h. **POL Storage Container.** POL containers with capacities GREATER than 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.

i. **Recognized Industry Standards.** Those standards adopted by independent professional organizations, including, but not limited to, ASTM International, American National Standards Institute, American Petroleum Institute, National Association of Corrosion Engineers, National Fire Protection Association and Underwriters Laboratories.

9-3. Criteria

a. All installations will develop and maintain a Storage Container Management Plan. The Storage Container Management Plan required in this chapter can be combined with the Underground Storage Tank Management Plan required in Chapter 19, "Underground Storage Tanks." At a minimum, the Storage Container Management Plan will include the following:

- (1) An inventory of all aboveground storage containers.
- (2) For each aboveground storage container, the following information will be recorded:
 - (a) Size.
 - (b) Location.
 - (c) Contents.
 - (d) Construction materials (i.e., steel, fiberglass).

- (e) Type of leak detection used.
 - (f) Type of corrosion protection.
 - (g) Type of inventory control system used.
 - (h) Installation Date(s).
 - (i) Removal date(s) (if applicable).
- (3) The following documentation will be maintained:
- (a) Inventory control records.
 - (b) Maintenance, repair, and upgrade records.
 - (c) Monitoring/integrity testing results for the previous 5 years.
 - (d) Copies of performance claims provided by leak detection manufacturers.
 - (e) Original manufacturer's written instructions/manuals/warranties regarding aboveground storage containers and all applicable appurtenances.
 - (f) USFK notifications.
 - (g) Written procedures for:
 - Monthly monitoring.
 - Response to warning alarms.
 - Inventory control.

b. General POL storage container criteria. All POL above ground and below ground storage container systems must meet the following requirements:

(1) 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, with interstitial monitoring. Below ground storage *containers will use* a leak barrier with a leak detection pipe and basin. The LEC may waive this secondary containment criterion for below ground storage containers.

(2) Maximum permeability for containment areas will be 10^{-7} cm/sec.

(3) Drainage of storm water from diked areas will be controlled by a valve that is locked closed when not in active use. Storm water will be inspected for petroleum sheen before being drained from diked areas. If a petroleum sheen is present, the storm water must be collected with sorbent material prior to drainage, or treated using an oil-water separator. Disposal of sorbent

material exhibiting the hazardous characteristics in appendix B will be IAW Chapter 6, "Hazardous Waste and Designated Waste."

(4) All aboveground valves, piping, and appurtenances associated with POL storage containers shall be annually inspected IAW recognized industry standards.

(5) Underground piping associated with POL storage containers shall be tested for integrity and leaks at the time of installation, modification, construction, relocation, or replacement. New underground piping must be protected against corrosion IAW recognized industry standards.

(6) POL storage containers shall be designed or modernized IAW good engineering practice to prevent unintentional discharges by use of overflow prevention devices.

(7) Completely and partially underground metallic POL Storage Containers must be protected from corrosion IAW recognized industry standards.

(8) POL storage container systems will use one of the following leak detection methods:

- (a) Automatic tank gauging that meets industry standards.
- (b) Vapor monitoring.
- (c) Groundwater monitoring.
- (d) Interstitial monitoring.

c. Leak detection systems will be maintained and evaluated IAW manufacturer's written instructions. Container systems using secondary containment as part of the required leak detection method will, at least annually, be evaluated to verify integrity of the secondary containment. Container systems lacking secondary containment will require annual soil testing to a depth of 1.5 meters (~4 feet) below the section of the system that is not equipped with secondary containment. If contamination is identified, provisions of DoDI 4715.08 will apply.

d. Additional Storage Container Wastes Criteria. POL container cleaning wastes frequently have hazardous characteristics (as defined in appendix B-1). Such wastes must be handled and disposed of according to the requirements of Chapter 6, "Hazardous Waste and Designated Waste." POL container wastes and handling procedures include:

(1) POL container cleaning wastes (sludge and wash waters) must be disposed of in accordance with the criteria of Chapter 6, "Hazardous Waste and Designated Waste," unless sampling and testing determine that the waste does not exhibit HW characteristics defined in appendix B-1.

(2) POL container bottom waters, which are periodically drained from storage tanks, must be collected and disposed of IAW Chapter 6, "Hazardous Waste and Designated Waste," unless sampling and testing confirm they do not have hazardous characteristics. If they do not have HW characteristics, they will be handled IAW the criteria in Chapter 4, "Wastewater."

e. General POL pipeline provisions for testing and maintenance. All pipeline facilities carrying POL must be tested and maintained IAW recognized industry standards. This includes, but is not limited to, the following requirements:

(1) Each pipeline operator handling POL will prepare and follow a procedural manual for operations, maintenance and emergencies.

(2) Each new pipeline system and piping in each feature where pipe has been replaced or relocated must be hydrostatically tested IAW recognized industry standards, without leakage before being placed in service.

f. General POL pipeline construction. All new pipeline facilities will be designed and constructed to meet recognized industry construction standards.

g. The following pertains to Loading/Unloading Racks and Areas:

(1) 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.

(2) 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.

(3) 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.

(4) Provide appropriate containment and/or diversionary structures (dikes, berms, culverts, spill diversion ponds, etc.) or equipment (sorbent materials, weirs, booms, other barriers, etc.) at loading/unloading areas to prevent a discharge of POL that reasonably could be expected to cause a sheen on waters of the ROK defined in Chapter 4, "Wastewater."

h. Additional requirements for non-temporary vehicle fueling stations. Dispensing pumps must be located on a concrete-paved surface to allow convenient access. The area must be sloped to contain leaks or spills and bermed to contain potential spills.

i. 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.

Chapter 10

Noise (Reserved)

10-1. Scope

10-2. Definitions

10-3. Criteria

Chapter 11

Pesticides

11-1. 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 Designated Waste."

11-2. Definitions

a. **Certified Pesticide Applicators.** Personnel who apply pesticides or supervise the use of pesticides, and who have been formally certified in accordance with the DoDM 4150.07, Volume 1, DoD Pest Management Program Elements and Implementation: Structure and Operation (which accepts ROK certification in appropriate circumstances).

b. **Integrated Pest Management (IPM).** A planned program, incorporating continuous monitoring, education, recordkeeping, 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.

c. **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 well being of humans or animals; attack real property, supplies, equipment or vegetation; or are otherwise undesirable.

d. **Pest Management Consultant (PMC).** 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.

e. **Pesticide.** Any substance or mixture of substances, including biological control agents, that may prevent, destroy, repel, or mitigate pests.

f. **Pesticide Waste.** Materials subject to pesticide disposal restrictions including:

(1) Any pesticide that has been identified by the pest management consultant as cancelled under U.S. or ROK authority.

(2) Any pesticide that does not meet specifications, is contaminated, has been improperly mixed, or is otherwise unusable, whether concentrated or diluted.

(3) Any material used to clean up a pesticide spill. 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 SW.

(4) Any containers, equipment, or material contaminated with pesticides. Empty pesticide containers that have been triple rinsed are NOT considered HW, and can be disposed of as normal

SW.

g. **Registered Pesticide.** A pesticide that has been registered and approved for sale or use within the United States or the ROK.

11-3. Criteria

a. 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." Individual services shall establish the required level of record-keeping and reporting via their PMCs.

b. Installations will implement and maintain a current pest management plan that includes pest management/control measures based upon appropriate surveillance data for all installation and satellite site activities. The plan will be written in English, and Korean translation will be provided to Pest Control Shop Korean supervisors and workers. This written plan will include IPM procedures for preventing pest problems in order to minimize the use of pesticides. The plan must be reviewed, updated if needed, and approved in writing by the appropriate pest management consultant annually.

c. All pesticide applications will be made by certified pesticide applicators, with the following exceptions:

(1) New USFK 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.

(2) Arthropod skin and clothing repellents.

(3) Pesticides applied as part of an installation's self-help program.

d. All pesticide applicators will be included in a medical surveillance program to monitor the health and safety of persons occupationally exposed to pesticides.

e. 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.

f. Installations will only use registered pesticides approved in writing by the appropriate pest management consultant. This may be documented as part of the approval of the PMC.

g. Pesticides will be included in the installation spill contingency plan (See Chapter 18, "Spill Prevention and Response Planning").

h. Pest management facilities, including mixing and storage areas, will comply with the standard SOPs for such facilities prepared by the installations as per their Service's requirements.

i. All pesticide applications will be IAW guidance provided 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 Korean nationals will be using the pesticides, the

precautionary messages and use instructions will be in English and Korean.

j. Material Safety Data Sheets (SDS) and labels for all pesticides will be available at the storage and holding facility.

k. Pesticide storage areas will contain a readily visible current inventory of all items in storage, including items awaiting disposal, and shall be inspected monthly and shall be secured to prevent unauthorized access.

l. 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 in paragraph 11-3m.

m. The generator of pesticide wastes will determine if waste is considered hazardous or not in accordance with Chapter 6 of this regulation.

(1) Pesticide waste determined to be HW will be disposed of in accordance with the criteria for HW disposal in Chapter 6.

(2) Pesticide waste that is determined not to be a HW will be disposed of in accordance with the label instructions, through DLA DS, as a SW. Pesticide containers shall be crushed or the top and bottom portions shall be removed to prevent reuse.

n. All contracts involving pesticide application, in whole or in part, must be approved in writing by respective PMC prior to solicitation.

11-4. Use of Pesticides not Included in Armed Forces Pest Management Board Standard List

PMCs wanting to use locally-purchased pest management chemicals that are not included in the Armed Forces Pest Management Board (AFPMB) Standard Pesticides List, (which can be obtained from their web site at www.AFPMB.org.) will ensure that:

a. The pest management chemical and its application do not contravene AFPMB guidance and standards.

b. The pest management chemical is registered and approved for use in ROK.

c. Pesticides will not be used for trees, shrubs, or grass on golf courses, unless approved by the PMC.

d. The following restrictions are adhered to:

(1) Standards of handling restrictions for the use of highly toxic pesticides related to agricultural production.

(a) Use of the pesticides will be restricted only to the applicable crops.

(b) The pesticides can only be used by farmers who have taken a special training course on safe use of pesticides provided by the director of the regional agriculture technology center or a training course on safe use of pesticides provided by the manager of pesticide retailers.

(2) Standards of handling restrictions for the use of fish toxic pesticides.

(a) Fish Toxic Classes I, II, IIs and III.

- Pesticides generally used in rice paddies are prohibited in an area if there is a potential for the sprayed pesticide to flow directly into fisheries, reservoirs, water intakes, or the sea by wind and rain.

- Pesticides generally used for gardening (other than farming) are prohibited in an area if there is a potential for the sprayed pesticide to reach fisheries, reservoirs, water intakes, or sea by wind or rain.

(b) Fish toxic class IV. The pesticide may be commonly used; however, it will not be sprayed by aircraft on rice paddies located in the ROK-designated water quality protection areas.

(3) Standards of handling restrictions for the use of water-polluting pesticide.

(a) The pesticide will not be used in rice paddies.

(b) The pesticide will not be used in ROK-designated water quality protection areas.

(4) Standards of handling restrictions on the products of special concern to prevent agrochemical poisoning or accidents. Aerial restrictions on non-selective herbicide; Use of non-selective herbicide is prohibited if the potential exists for the herbicide to flow into a water intake.

Chapter 12

Historic and Cultural Resources

12-1. Scope

This Chapter contains criteria for required plans and programs needed to ensure proper protection and management of cultural resources, including historic and prehistoric properties under USFK control, and properties on the World Heritage List or on the ROK's list of Historical and Cultural Properties. The purpose is to preserve and protect buildings, structures, sites, and objects of historical, architectural, archaeological, or cultural value on USFK-controlled property and in maneuver rights areas. Specifically, this Chapter advises on the restrictions or prohibitions of certain actions and procedures for conservation of specified cultural properties, and excavation of buried cultural properties, etc.

12-2. Definitions

a. **Action.** All activities or programs of any kind authorized, funded, or carried out, in whole or in part, on USFK-controlled installations.

b. **Adverse Effect.** Changes that diminish the quality or significant value of historic or cultural resources.

c. **Archeological Resources.** 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 materials, or any portion of any of the foregoing items.

d. **Buried Cultural Property.** A cultural property that was buried or discovered under the

land, on the sea-bottom or at a construction site.

e. **Cultural mitigation.** Specific steps designed to lessen the adverse effects of a USFK action on a cultural or archeological resource, including.

- (1) Limiting the magnitude of the action.
- (2) Relocating the action in whole or in part.
- (3) Repairing, rehabilitating, or restoring the affected resources and affected property.
- (4) Recovering and recording data from cultural properties that may be destroyed or substantially altered.

f. **Cultural properties.** This refers to the following list:

(1) Tangible cultural properties: Buildings, classical books, calligraphic ancient documents, painting, sculptures, industrial art objects, etc., and other tangible cultural products which possess high historic or artistic value and other archeological specimens which belong to categories above.

(2) Monuments:

(a) Historic sites, such as temple sites, shell-mound, ancient tombs, palace sites, ruins of fortress, pottery and kiln remains, strata containing remains, etc., and other sites of historical remains which possess historical, artistic or scientific value.

(b) Scenic places which possess high artistic or scenic values.

(c) Animals (including the places of habitat, breeding, and migration), plants (including habitat), minerals, caves, geological features, biological products and special natural phenomena which have historical, scenic and scientific value. Additional requirements for the management of animal monuments are located in Chapter 13.

(3) Folklore materials: Manners and customs relating to the food, clothing and shelter (settlement), religious and annual events and clothing, utensils or houses used therefore.

g. **Designated and Registered Cultural Properties.**

(1) Designated cultural and natural heritage: Cultural and natural heritage properties and materials designated by the by the Administrator of the Cultural Heritage Administration; Special Metropolitan or Metropolitan Mayors/ Do Governors.

(2) Registered cultural heritage: Cultural heritage properties and materials registered by the Administrator of the Cultural Heritage Administration which are not designated under subparagraph 12-2g(1).

h. **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.

i. **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 Korean traditional culture and history. The ROK's list of historical and cultural properties on real estate granted for exclusive use of the United States armed forces in Korea are listed at paragraph 12-3k.

j. **Inventory.** To determine the location of cultural resources that may have world, national or local significance.

k. **Material remains.** Physical evidence of human habitation, occupation, use, or activity, including the site, loci, or context in which such evidence is situated including:

- (1) Surface or subsurface structures.
- (2) Surface or subsurface artifact concentrations or scatters.
- (3) Whole or fragmentary tools, implements, containers, weapons, clothing, and ornaments.
- (4) By-products, waste products, or debris resulting from manufacture or use.
- (5) Organic waste.
- (6) Human remains.
- (7) Rock carvings, rock paintings, and intaglios.
- (8) Rock shelters and caves.
- (9) All portions of shipwrecks.
- (10) Any portion or piece of any of the foregoing.

l. **National Treasure.** Tangible cultural properties on USFK installations are chosen from among the "Treasures" by the ROK Cultural Heritage Administration after consultation with the Cultural Properties Protection Subcommittee. National treasures are rare and of great human cultural value.

m. **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.

n. **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.

o. **Treasure.** Especially important tangible cultural properties on USFK installations are

designated by the ROK Cultural Heritage Administration after consultation with the Cultural Properties Protection Subcommittee.

12-3. Criteria

a. Installation Commanders shall consider the effect of any planned action on any properties or places listed in paragraphs 12-3b and 12-3k, for the purposes of avoiding or mitigating any adverse effects.

b. Installations shall have access to the World Heritage List and the ROK list of historic and cultural properties as further described in paragraph 12-3k.

c. 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 accomplished through in-house training, contracted support, or through consultation with other agencies. Government personnel directing such functions must have training in historic or cultural resource management.

d. Installations shall, after coordinating with the Cultural Properties Protection Subcommittee, 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.

e. Installations shall, after consultation with the Cultural Properties Protection Subcommittee, and if financially and otherwise practical:

(1) Inventory historic, cultural, and archeological resources in areas under USFK control. An inventory shall be developed from a records search, visual survey, cultural resources identified in paragraphs 12-3b and 12-3k and cultural resource surveys.

(2) Develop a plan for the protection and preservation of historic, cultural, and archeological resources identified on the installation inventory and for mitigation of any adverse effects.

(3) Establish measures sufficient to protect known historic, cultural and archeological resources until appropriate mitigation or preservation can be completed.

(4) Establish procedures to consider ROK Government concerns and requests by working through the Environmental Executive Agent.

f. Based on guidance from the SOFA Cultural Properties Protection Subcommittee, installations will establish measures to properly protect historic, cultural, or archeological properties. Areas known to contain buried or submerged historic properties shall not be excavated or disturbed without a specific plan that has been reviewed and approved by the LEC and the Installation Commander and coordinated with the SOFA Cultural Properties Protection Subcommittee. This requirement applies to graves which have been identified as historically, archaeologically or culturally significant. Graves which have not been identified as historically, archaeologically or culturally significant will be handled in accordance with real estate policy published in paragraph 6-8, USFK Regulation 405-7.

g. Based on guidance from the SOFA Cultural Properties Protection Subcommittee, installations will establish measures to prevent personnel from damaging, disturbing or removing

archeological resources and designated natural heritage items listed in paragraph 12-3b. No one shall remove from the installation any cultural or archeological property, such as designated and registered cultural heritage items, resources identified in paragraph 12-3b and resources identified in the installation's cultural resource management plan, except with the written permission of the SOFA Cultural Properties Protection Subcommittee. Any such requests will be processed through the Installation Commander and LEC to the SOFA Cultural Properties Protection Subcommittee for approval.

h. Installation commanders shall ensure that planning for major actions includes consideration of possible effects on historic, cultural, archeological resources, items identified in paragraphs 12-3b of this Chapter, and resources identified in the installation's cultural resources management plan.

i. If potential historic, cultural, or archeological resources not previously inventoried are discovered in the course of a USFK action conducted inside or outside of an installation, 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 SOFA Cultural Properties Protection Subcommittee.

j. Contracts involving potential discovery and disturbance of subsurface cultural or historic materials shall have an "inadvertent find clause." The contract should define procedures for securing the site and immediate notice of installation point of contact.

k. Installations will be able to access the USFK facilities and areas cultural properties list provided by the Cultural Heritage Administration, which is recognized and approved by the SOFA Cultural Properties Protection Subcommittee. An installation specific digitized list of the mostly recently identified cultural properties can be found at <http://www.cha.go.kr>.

Chapter 13

Natural Resources and Endangered Species

13-1. 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 and fauna) declared endangered or threatened by either United States or ROK government. The ROK government designates protection areas where the preservation of natural ecosystems is specifically required and imposes restrictions on collecting, or importing and exporting endangered or specified wild animals or plants. USFK Regulation 405-7, "Facilities and Areas (Real Estate) Policies and Procedures in Korea," provides additional information regarding forest management.

13-2. Definitions

a. **Action.** All activities or programs of any kind authorized, funded, or carried out, in whole or in part, by USFK installations.

b. **Adverse Effect.** Changes that diminish the quality or significant value of natural resources. For biological resources, adverse effects include impacts to overall population diversity, abundance and fitness.

c. **Conservation.** Planned management, use and protection; continued benefit for present and future generations; and prevention of exploitation, destruction and/or neglect of natural

resources.

d. **Endangered or Threatened Species.** Any species of flora or fauna, listed in table 13-1, "Endangered Wild Animals and Plants." This also includes any species of flora or fauna listed on an equivalent ROK-protected species list.

e. **ROK-Designated Natural Monument Species.** Any species of flora or fauna listed in table 13-2, "ROK Species Designated as Natural Monuments," or otherwise designated by the ROK.

f. **Management Plan.** A document describing natural resources, their quantity, condition, and actions to ensure conservation and good stewardship.

g. **Ecosystem and Landscape Conservation Areas.** Refers to areas, listed in table 13-3, "Ecosystem and Landscape Conservation Areas," of this section, which fall under one of following areas.

(1) An area that is worthy of scientific research since it keeps the originality of natural ecosystems or has abundant natural resources.

(2) An area that requires preservation for scientific research or natural scenery since its topographic or geological features are unique.

(3) An area that is worthy of preservation, where endangered species or Korean native species grow.

(4) An area that represents diverse ecosystems or a sample of a diverse ecosystem.

(5) An area that requires special protection of other natural ecosystems.

h. **Natural Resources.** All living and inanimate materials supplied by nature that are of aesthetic, ecological, educational, historical, recreational, scientific or other value.

i. **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.

j. **Significant Land or Water Areas.** A land or water area outside the cantonment that is normally at least 500 acres in size; smaller areas may be included if they have natural resources that are especially vulnerable to disturbance.

k. **Wetland Protected Areas.** A designated wetland that is worthy of protection and conservation due to its authorized values of water supply & quality, aesthetics, and biodiversity maintenance (refer to table 13-4): A wetland should be considered a "Wetland Protected Area" if any of the following criteria are met:

(1) A wetland that is natural or near-natural with high biodiversity.

(2) A wetland that supports rare, endangered or threatened species.

(3) A wetland that contains unique landscapic, geomorphic or geological values.

13-3. Criteria

a. Installations that have land and water areas shall take reasonable steps to protect and enhance known endangered or threatened species and ROK-designated Natural Monument species and their habitat.

b. Installations shall maintain, or have access to, current lists of table 13-1, "Endangered Wild Animals and Plants" and table 13-2, "ROK Species Designated as Natural Monuments."

c. Installations with significant land or water areas shall develop Integrated Natural Resources Management Plans.

d. Installation Commanders shall report the initial discovery of any endangered, threatened, or ROK-designated natural monument species to the LEC and the observation shall be recorded in the INRMP for proper management. In turn, the LEC shall notify the ROK authorities through the SOFA Environmental Subcommittee.

e. Installations having natural resources management plans shall, after coordination with the USFK installation commander or similar appropriate ROK authorities, and if financially and otherwise practical, and in such a way that there is no net loss of mission capability:

(1) Conduct a survey to determine the presence of any threatened or endangered species or ROK-protected species, or support ROK surveys.

(2) Implement natural resources management plans.

f. Installations shall maintain grounds to meet designated mission use and ensure harmony with the natural landscape and/or the adjacent ROK facilities where practical.

g. 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, ROK-designated natural monument species, wetlands, soil stabilization). This may be accomplished through in-house training, contract, or consultation with another agency. Government personnel directing such functions must have training in natural resources management.

h. Installations shall place emphasis on the maintenance and protection of habitats favorable to the reproduction and survival of indigenous plants, fish and wildlife (flora and fauna).

i. 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), and complement the Bird Aircraft Strike Hazard program where applicable.

j. Installations shall utilize protective vegetative cover or other standard soil erosion/sediment control practices to control dust, stabilize sites and avoid silting of streams.

k. No one is permitted to capture, collect, transplant, export, process, distribute, or store specified wild species, except in specially permitted cases.

Table 13-1
Endangered Wild Animals and Plants

Scientific Name		Korean Common Name	English Common Name or Description from Scientific Name
1. Mammals			
A. Endangered Wildlife Mammals Class I			
1	<i>Canis lupus coreanus</i>	Nuk-dae	Asiatic or Chinese Wolf
2	<i>Cervus nippon hortulorum</i>	Dae-ryuk-sa-sum	Dybowsky's Sika Deer
3	<i>Zalophus californianus japonica</i>	Ba-da-sa-ja	Japanese Sea Lion
4	<i>Ursus thibetanus ussuricus</i>	Ban-dal-ga-sum-gom	Manchurian Black Bear
5	<i>Myotis formosus chofukusei</i>	Bul-gun-bak-jui	Korean Orange Whiskered Bat, Golden-winged Myotis, or Jobokseong Bat
6	<i>Moschus moschiferus parvipes</i>	Sa-hyang-no-roo	Korean musk Deer
7	<i>Naemorhedus caudatus</i>	San-yang	Chinese or Long-tailed Goral
8	<i>Lutra lutra</i>	Soo-dal	Eurasian river Otter
9	<i>Lynx lynx</i>	Shi-ra-so-nee	Eurasian Lynx
10	<i>Vulpes vulpus peculiosa</i>	Yo-woo	Fox
11	<i>Panthera pardus orientalis</i>	Pyo-bum	Leopard
12	<i>Panthera tigris altaica</i>	Ho-rang-ee	Tiger
1. Mammals			
B. Endangered Wildlife Mammals Class II			
1	<i>Martes flavigula</i>	Dam-bee	Yellow-throated Marten
2	<i>Mustela nivalis</i>	Moo-san-jok-jae-bee	Weasel
3	<i>Callorhinus ursinus</i>	Mool-gae	Northern Fur Seal

Table 13-1
Endangered Wild Animals and Plants - Continued

Scientific Name		Korean Common Name	English Common Name or Description from Scientific Name
4	<i>Phoca largha</i>	Mool-bum	Spotted Seal
5	<i>Phoca spp.</i>	Mool-bum spp.	Seal spp.
6	<i>Prionailurus bengalensis</i>	Sark	Leopard Cat
7	<i>Murina ussuriensis</i>	Ja-gun-gwan-ko-bak-jee	Ussuri Tube-nosed bat
8	<i>Eumetopias jubatus</i>	Kun-ba-da-sa-ja	Steller Sea Lion
9	<i>Plecotus auritus</i>	To-kee-baak-jee	Long-eared Bat
10	<i>Pteromys volans aluco</i>	Ha-nul-da-ram-jee	Korean Small Flying Squirrel

2. Birds

A. Endangered Wildlife Birds Class I

1	<i>Aquila chrysaetos</i>	Gum-dok-soo-ree	Golden Eagle
2	<i>Eurynorhynchus pygmeus</i>	Nup-jok-boo-ree-do-yo	Spoon-billed Sandpiper
3	<i>Egretta eulophotes</i>	No-rang-boo-ree-bak-ro	Chinese Egret
4	<i>Platalea leucorodia</i>	No-rang-boo-ree-jo-awe-sae	Spoonbill
5	<i>Grus japonensis</i>	Doo-roo-me	Manchurian (or Japanese) Crane
6	<i>Falco peregrinus</i>	Mae	Peregrine Falcon
7	<i>Platalea minor</i>	Jo-awe-sae	Black-faced Spoonbill
8	<i>Haliaeetus pelagicus</i>	Cham-soo-ree	Steller's Sea Eagle
9	<i>Tringa guttifer</i>	Chong-da-ri-do-yo-sa-chon	Nordmann's Sandpiper
10	<i>Dryocopus javensis</i>	Knok-sae	White-billed Woodpecker
11	<i>Cygnus olor</i>	Huk-go-nee	Mute Swan
12	<i>Ciconia boyciana</i>	Hwang-sae	Oriental White Stork
13	<i>Haliaeetus albicilla</i>	Hin-ko-ri-soo-ree	White-tailed Sea Eagle

2. Birds

B. Endangered Wildlife Birds Class II

1	<i>Anas formosa</i>	Ga-chang-o-ree	Baikal Teal
2	<i>Circus aeruginosus</i>	Gae-goo-ree-mae	Marsh Harrier
3	<i>Anser cygnoides</i>	Gae-ree	Swan Goose
4	<i>Larus saundersi</i>	Gum-un-mo-ree-gal-mae-kee	Saunders's Gull
5	<i>Haematopus ostralegus</i>	Gum-un-mo-ree-mool-tae-sae	Oystercatcher
6	<i>Grus grus</i>	Gum-un-mok-doo-roo-me	Crane
7	<i>Cygnus columbianus</i>	Go-nee	Bewick's Swan
8	<i>Strix uralensis</i>	Gwyn-jom-bak-ee-ol-pae-me	Ural Owl
9	<i>Dryocopus martius</i>	Ka-mak-tak-da-goo-ree	Great Black Woodpecker
10	<i>Otis tarda</i>	Nu-shee	Great Bustard
11	<i>Aegypius monachus</i>	Dok-soo-ree	Cinereous Vulture

Table 13-1
Endangered Wild Animals and Plants - Continued

Scientific Name		Korean Common Name	English Common Name or Description from Scientific Name
12	<i>Gallicrex cinerea</i>	Tum-boo-kee	Watercock
13	<i>Buteo buteo</i>	Mal-tong-ga-ree	Buzzard
14	<i>Ciconia nigra</i>	Muk-hwang-sae	Black Stork
15	<i>Pandion haliaetus</i>	Mool-soo-ree	Osprey
16	<i>Pernis ptilorhynchus</i>	Bol-mae	Oriental Honey-Buzzard
17	<i>Aythya baeri</i>	Bul-gun-ga-sum-hin-jook-jee	Baer's Pochard
18	<i>Gorsachius goesagi</i>	Bul-gun-hae-o-ra-kee	Japanese Night Heron
19	<i>Falco amurensis</i>	Bee-dool-kee-jo-rong-ee	Red-footed Falcon
20	<i>Synthliboramphus wumizusume</i>	Pul-sae-o-ree	Japanese Murrelet
21	<i>Galerida cristata</i>	Pul-jong-da-ree	Crested Lark
22	<i>Terpsiphone atrocaudata</i>	Sam-gwang-jo	Japanese Paradise Flycatcher
23	<i>Falco subbuteo</i>	Sae-hul-li-kee	Hobby
24	<i>Milvus migrans</i>	Sol-gae	Black-eared Kite
25	<i>Falco columbarius</i>	Sae-hwang-jo-rong-ee	Merlin
26	<i>Bubo bubo</i>	Soo-ri-boo-ong-ee	Eagle Owl
27	<i>Grus leucogeranus</i>	Siberia hin-doo-roo-me	Siberian Crane
28	<i>Circus melanoleucos</i>	Alak-gae-goo-ree-mae	Pied Harrier
29	<i>Numenius madagascariensis</i>	Alak-ko-ri-ma-do-yo	Australian Curlew
30	<i>Strix aluco</i>	Ol-pae-me	Tawny Owl
31	<i>Grus vipio</i>	Jae-doo-roo-me	White-napped Crane
32	<i>Circus cyaneus</i>	Jat-bit-gae-goo-ri-mae	Hen Harrier
33	<i>Larus relictus</i>	Jok-ho-gal-mae-kee	Relict Gull
34	<i>Accipiter gularis</i>	Jo-rong-ee	Japanese Sparrow Hawk
35	<i>Accipiter gentilis</i>	Cham-mae	Goshawk
36	<i>Cygnus cygnus</i>	Kun-go-nee	Whooper Swan
37	<i>Anser fabalis</i>	Kun-kee-ro-kee	Bean Goose
38	<i>Ixobrychus eurhythmus</i>	Kun-dumble-hae-o-ra-kee	Schrenck's Bittern
39	<i>Buteo hemilasius</i>	Kun-mal-tong-ga-ree	Upland Buzzard
40	<i>Buteo lagopus</i>	Tul-bal-mal-tong-ga-ree	Rough-legged Buzzard
41	<i>Pitta nympha</i>	Pal-sak-jo	Fairy Pitta
42	<i>Aquila clanga</i>	Hang-ra-mo-ri-dok-soo-ree	Greater Spotted Eagle
43	<i>Mergus squamatus</i>	Ho-sa-bee-o-ree	Chinese Merganser
44	<i>Branta bernicla</i>	Huk-kee-ro-kee	Brent Goose
45	<i>Grus monacha</i>	Huk-doo-roo-me	Hooded Crane
46	<i>Charadrius placidus</i>	Hin-mok-mool-tae-sae	Long-billed Ringed Plover
47	<i>Anser erythropus</i>	Hin-ee-ma-kee-ro-kee	Lesser White-fronted Goose
48	<i>Aquila heliaca</i>	Hin-jook-jee-soo-ree	Imperial Eagle

Table 13-1
Endangered Wild Animals and Plants - Continued

Scientific Name		Korean Common Name	English Common Name or Description from Scientific Name
3. Amphibians and Reptiles			
A. Endangered Wildlife Amphibians and Reptiles Class I			
1	<i>Elaphe schrenckii</i>	Goo-rong-ee	Russian Rat Snake
3. Amphibians and Reptiles			
B. Endangered Wildlife Amphibians and Reptiles Class II			
1	<i>Rana plancyi</i>	Gum-gae-goo-ree	Eastern Golden Frog
2	<i>Chinemys reevesii</i>	Nam-saeng-ee	Reeve's Turtle
3	<i>Kaloula borealis</i>	Mang-kong-ee	Korean Narrow-mouthed Frog
4	<i>Sibynophis collaris</i>	Be-ba-ree-baem	Many-tooth Snake
5	<i>Eremias argus</i>	Pyo-bum-jang-jee-baem	Tiger Lizard
4. Fish			
A. Endangered Wildlife Fish Class I			
1	<i>Pseudopungtungia nigra</i>	Gam-dol-go-kee	Black Shinner
2	<i>Pseudobagrus brevicorpus</i>	Ko-chee-dong-ja-gae	Korean Stumpy Bullhead
3	<i>Cobitis choii</i>	Me-ho-jong-gae	Miho Spine Loach
4	<i>Koreocobitis naktongensis</i>	Olook-sae--sae-ko-me-koo-ree	White-nosed Loach
5	<i>Liobagrus obesus</i>	Tong-sa-ree	Bull-head Torrent Catfish
6	<i>Gobiobotia naktongensis</i>	Hin-soo-ma-ja	Hin-soo-ma-ja
4. Fish			
B. Endangered Wildlife Fish Class II			
1	<i>Pseudopungtungia tenuicorpa</i>	Ga-nun-dol-go-kee	Silver/black fish
2	<i>Pungitius sinensis</i>	Ga-shi-go-kee	Amur Stickleback
3	<i>Gobiobotia macrocephala</i>	Koo-goo-ree	Yellow/black fish
4	<i>Lethenteron reissneri</i>	Da-mook-jang-o	Sand Lamprey
5	<i>Gobiobotia brevibarba</i>	Dol-sang-o	Yellow/black fish
6	<i>Cottus poecilopus</i>	Dook-joong-gae	Alpine Bullhead
7	<i>Microphysogobio koreensis</i>	Mo-rae-joo-sa	Silver fish w/ black spots
8	<i>Acheilognathus signifer</i>	Mook-nob-ja-roo	Korean Gudgeon
9	<i>Acheilognathus somjinensis</i>	Yim-sil-nob-ja-roo	Korean Bitterling
10	<i>Pungitius kaibarae</i>	Jan-ga-shi-go-kee	Ninespine Stickleback
11	<i>Lethenteron japonicum</i>	Chil-sung-jang-o	Lamprey
12	<i>Cottus hangionensis</i>	Han-dook-joong-gae	Scorpion Fish
13	<i>Saurogobia dabryi</i> Bleeker	Du-u-jaeng-i	Asian Gudgeon
14	<i>Iksookimia pumila</i>	Bu-an-jong-gae	Buan Spine Loach
15	<i>Coreoperca kawamebari</i>	Kkuk-juh-gi	Japanese Aucha Perch
16	<i>Niwaella brevifasciata</i>	Jom-su-su-chi	Dwarf Spine Loach

Table 13-1
Endangered Wild Animals and Plants - Continued

Scientific Name	Korean Common Name	English Common Name or Description from Scientific Name
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5. Insects

A. Endangered Wildlife Insects Class I

1	<i>Metopodontus blanchardi</i>	Doo-jom-ba-kee-sa-sum-bol-lae	Chinese Stag Beetle
2	<i>Hipparchia autonoe</i>	San-gool-took-na-bee	Esper Butterfly
3	<i>Aporia crataegi</i>	Sang-jae-na-bee	Black-veined White
4	<i>Polyphylla laticollis manchurica</i>	Soo-yom-poong-dang-ee	Garden Chafer
5	<i>Callipogon relictus</i>	Jang-soo-ha-nul-so	Korean Relict Long-horned Beetle

5. Insects

B. Endangered Wildlife Insects Class II

1	<i>Challia fletcheri</i>	Go-ryo-jib-gae-bol-lae	Earwig
2	<i>Protantigius superans</i>	Guipon-san-boo-on-na-bee	Butterfly
3	<i>Nannophya pygmaea</i>	Ko-ma-jam-ja-ree	Scarlet Dwarf
4	<i>Cicindela anchoralis</i>	Dot-moo-nee-guil-ap-ja-bee	Beetle
5	<i>Acoptolabrus mirabilissimus</i>	Mot-cho-rong-bak-tak-jong-bol-lae	Beetle
6	<i>Lethocerus deyrolli</i>	Mool-jang-goon	Giant Water Bug
7	<i>Parnassius bremeri</i>	Bool-gun-jom-mo-shi-na-bee	Red-spotted Apollo Butterfly
8	<i>Chrysochroa fulgidissima</i>	Bee-dan-bol-lae	Jewel Beetle
9	<i>Gymnopleurus mopsus</i>	So-tong-goo-ree	Dung Beetle
10	<i>Cigaritis takanonis</i>	Saang-ko-ri-boo-jon-na-bee	Butterfly
11	<i>Copris tripartitus</i>	Ae-kee-pool-so-tong-goo-ree	Dung Beetle
12	<i>Argynnis nerippe</i>	Wang-un-jom-pyo-bum-na-bee	Silver-spotted Leopard Butterfly
13	<i>Psacothoea hilaris</i>	Wool-do-ha-nul-so	Yellow-spotted Longhorn Beetle
14	<i>Cicindela hybrida nitida</i>	Joo-hong-guil-ap-jab-ee	Beetle
15	<i>Osmoderma opicum</i>	Kun-ja-sak-ho-rang-kkot-moo-jee	Silver/black beetle

6. Invertebrate

A. Endangered Wildlife Invertebrate Class I

1	<i>Cristaria plicata</i>	Gui-ee-pal-dae-ching-ee	Leech
2	<i>Charonia saulia</i>	Na-pal-go-doong	Saul's Triton
3	<i>Pseudohelice subquadrata</i>	Nam-bang-bang-gae	Grey Shore Crab
4	<i>Lamprotula coreana</i>	Dud-ruk-jo-gae	Mussel
5	<i>Gammarus zeongogensis</i>	Kal-sae-o-ri-yop-sae-woo	Amphipod

Table 13-1
Endangered Wild Animals and Plants - Continued

Scientific Name		Korean Common Name	English Common Name or Description from Scientific Name
6. Invertebrate			
B. Endangered Wildlife Invertebrate Class II			
1	<i>Chasmagnathus convexus</i>	Get-gae	Mud-flat Crab
2	<i>Dendronephthya suensoni</i>	Gum-bul-gun-soo-ji-mand-ra-me	Soft coral
3	<i>Clithon retropictus</i>	Kee-soo-gal-go-doong	Brackish Water Snail
4	<i>Triops longicaudatus</i>	Gwyn-ko-ri-too-goo-sae-woo	Longtail Tadpole Shrimp
5	<i>Plumarella spinosa</i>	Git-san-ho	Coral
6	<i>Ellobium chinense</i>	Dae-choo-gui-go-doong	Snail
7	<i>Euplexaura crassa</i>	Doon-han-jin-chong-san-ho	Coral
8	<i>Plexauroides reticulata</i>	Mang-sang-map-si-san-ho	Coral
9	<i>Dendronephthya castanea</i>	Bam-soo-jee-mand-ra-me	Soft coral
10	<i>Verrucella stellata</i>	Byol-hok-san-ho	Lichen
11	<i>Sesarmopsintermedius</i>	Bul-gun-bal-mal-tong-gae	Crab
12	<i>Ophiacantha linea</i>	Sum-chim-gaw-mi-bool-ga-sa-ri	Invertebrate
13	<i>Dendronephthya mollis</i>	Yon-soo-ji-mand-ra-me	Soft coral
14	<i>Dendrophyllia cribrata</i>	Yu-chak-na-mu-dol-san-ho	Coral
15	<i>Nacospatangus alta</i>	Ui-yom-tong-sung-gae	Sea Urchin
16	<i>Dendronephthya putteri</i>	Ja-sack-soo-ji-mand-ra-me	Soft coral
17	<i>Dendrophyllia ijimai</i>	Jan-ga-ji-na-moo-dol-san-ho	Coral
18	<i>Scelidotoma vadososinuata hoonsooi</i>	Jang-soo-sot-got-jo-gae	Invertebrate
19	<i>Tubastraea coccinea</i>	Jin-hong-na-pal-dol-san-ho	Coral
20	<i>Plumarella adhaerans</i>	Chak-saeng-git-san-ho	Sea fan/sea whip
21	<i>Koreanohadra koreana</i>	Cham-dal-paeng-ee	Invertebrate
22	<i>Plexauroides complexa</i>	Chuk-map-si-san-ho	Coral
23	<i>Antipathes japonica</i>	Hae-song	Coral
24	<i>Dendronephthya alba</i>	Hin-soo-ji-mand-ra-me	Soft coral
7. Land Plants			
A. Endangered Wildlife Land Plants Class I			
1	<i>Cypripedium japonicum</i>	Gwang-run-yo- gang-kkot	Lady's Slipper
2	<i>Sedirea japonica</i>	Na-do-poong-ran	Orchid
3	<i>Euchresta japonica</i>	Man-nyon-kong	Evergreen shrub
4	<i>Cotoneaster wilsonii</i>	Sum-gae-ya-gwang-na-mu	Low dense shrub
5	<i>Diapensia lapponica</i> var. <i>obovata</i>	Am-mae	Pincushion Plant
6	<i>Cymbidium lancifolium</i>	Jook-bag-ran	Orchid
7	<i>Neofinetia falcata</i>	Poong-ran	Orchid
8	<i>Cymbidium kanran</i>	Han-ran	Orchid

Table 13-1
Endangered Wild Animals and Plants - Continued

Scientific Name		Korean Common Name	English Common Name or Description from Scientific Name
7. Land Plants			
B. Endangered Wildlife Land Plants Class II			
1	<i>Euryale ferox</i>	Ga-shi-yon-kkot	Fox Nut
2	<i>Eleutherococcus senticosus</i>	Ga-shi-o-gal-pi-na-moo	Siberian Ginseng
3	<i>Quercus gilva</i>	Gae-ga-shi-na-moo	Red Oak
4	<i>Echinosophora koreensis</i>	Gae-nu-sam	Solbi Tree
5	<i>Astilboides tabularis</i>	Gae-byong-poong	Shieldleaf Rodgersia
6	<i>Paliurus ramosissimus</i>	Get-dae-choo	Tree
7	<i>Trientalis europaea subsp. arctica</i>	Kee-seng-kkot	Green leaf plant with white flowers
8	<i>Jeffersonia dubia</i>	Kang-kang-ee-pool	Twin Flower
9	<i>Drosera peltata var. nipponica</i>	Kun-kun-ee-gui-gae	Flowering plant
10	<i>Kirengeshoma koreana</i>	Na-do-sung-ma	Yellow waxbells
11	<i>Rhododendron aureum</i>	No-rang-man-byong-cho	Small flowering shrub
12	<i>Iris odaesanensis</i>	No-rang-moo-ni-boot-kkot	White/yellow flower
13	<i>Iris koreana</i>	No-rang-boot-kkot	Dwarf yellow iris
14	<i>Aster altaicus var. uchiyamae</i>	Dan-yang-sook- boo-jaeng-ee	Flowering plant
15	<i>Iris dichotoma</i>	Dae-chong-boo- chae	Purple iris fan
16	<i>Cymbidium macrorhizum</i>	Dae-hong-ran	Orchid
17	<i>Cicuta virosa</i>	Dok-mee-na-ree	Northern Water Hemlock
18	<i>Hylotelephium ussuriense</i>	Dung-gun-yip-kong-ui-bi-rum	Round leaf stonecrop
19	<i>Berchemia berchemiaefolia</i>	Mang-gae-na-moo	Buckthorn Tree
20	<i>Ranunculus trichophyllus var. kazusensis</i>	Mae-hwa-ma-rum	Diamond shaped plum demersum
21	<i>Lasianthus japonicus</i>	Moo-joo-na-moo	Muji Tree
22	<i>Isoetes japonica</i>	Mool-boo-choo	Quillwort
23	<i>Abeliophyllum distichum</i>	Mee-sun-na-moo	Korean Abelia
24	<i>Osmanthus insularis</i>	Bag-dal-mok-saw	Evergreen
25	<i>Aconitum coreanum</i>	Bag-boo-ja	Korean aconite
26	<i>Veillabium yakushimensis var. nakaianum</i>	Bag-woon-ran	Orchid
27	<i>Paeonia obovata</i>	San-jak-yak	Obovata Peony
28	<i>Saururus chinensis</i>	Sam-bag-cho	Chinese Lizard's Tail
29	<i>Viola raddeana</i>	Sun-jae-bi-kkot	Perennial herb
30	<i>Bupleurum latissimum</i>	Sum-shi-ho	Small flowering plant
31	<i>Scrophularia takesimensis</i>	Sum-hyon-sam	Small flowering plant
32	<i>Aconitum austrokoreense</i>	Sae-pool-too-goo- kkot	Purple flowering plant
33	<i>Lilium cernuum</i>	Sol-na-ri	Nodding Lily
34	<i>Psilotum nudum</i>	Sol-yip-ran	Orchid

Table 13-1
Endangered Wild Animals and Plants - Continued

	Scientific Name	Korean Common Name	English Common Name or Description from Scientific Name
35	<i>Leontopodium coreanum</i>	Som-da-ri	Whisk Fern
36	<i>Brasenia schreberi</i>	Soon-chae	Water Shield
37	<i>Milletia japonica</i>	Ae-kee-dung	Vine
38	<i>Thalictrum coreanum</i>	Yon-nip-kkong-ui-da-ri	China Meadow Rue
39	<i>Viola websteri</i>	Wang-jae-bee-kkot	Yellow/white flowering plant
40	<i>Cyrtosia septentrio</i>	U-rum-nan-cho	Eureum Orchid
41	<i>Utricularia yakusimensis</i>	Ja-joo-tang-gui-gae	Aquatic water plant
42	<i>Smilacina bicolor</i>	Ja-joo-som-dae	Green leafy plant
43	<i>Mankyua chejuense</i>	Jeju-go-sa-ri-sam	Fern
44	<i>Menyanthes trifoliata</i>	Jo-rum-na-mool	Buckbean
45	<i>Sarcandra glabra</i>	Jook-jol-cho	Decrotive evergreen shrubbery
46	<i>Cleisostoma scolopendrifolium</i>	Jee-nae-bal-lan	Orchid
47	<i>Lycoris chinensis</i> var. <i>sinuolata</i>	Jin-no-rang-sang-sa-hwa	Yellow wildflower
48	<i>Polygonatum stenophyllum</i>	Chung-chung-doong-gul-lae	Dung-tiered bridle
49	<i>Trillium tschonoskii</i>	Kun-yol-lyong-cho	Three-leaf circular plant
50	<i>Cypripedium guttatum</i>	Tul-bok-joo-mo-ni-ran	Orchid
51	<i>Asplenium antiquum</i>	Pa-cho-il-yop	Spleenwort
52	<i>Leontice microrrhyncha</i>	Han-gae-ryong-pool	Yellow flowering plant
53	<i>Arctous alpines</i> var. <i>japonicus</i>	Hong-wol-gyul	Red Manzanita, Red Bearberry
54	<i>Hibiscus hamabo</i>	Hwang-gun	Flowering shrub
55	<i>Astragalus membranaceus</i>	Hwang-kee	Yellow Leader
56	<i>Corylopsis gotoana</i> var. <i>coreana</i>	Hearee	Yellow flowering tree

8. Macroalgae (Sea Plants)

A. Endangered Wildlife Macroalgae (See Plants) Class II

1	<i>Coccophora langsdorfii</i>	Sam-na-moo-mal	Flowering sea plant
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Table 13-2
ROK Species Designated as Natural Monuments

Monument Designation No.	Korean Name	English Name (Scientific Name)	Classification*
197	Knok-sae	White-billed Woodpecker (<i>dryocopus javensis horsfield</i>)	Bird I-10
198	Tao-kee	Japanese Crested Ibis (Nipponia Nippon temminck)	
199	Hwang-sae	Oriental White Stork (<i>Ciconia boyciana</i>)	Bird I-12
200	Muk-hwang-sae	Black Stork (<i>Ciconia ciconia linne</i>)	Bird II-14
201	Back-jo group	Bewick's Wooper and Mute Swan (<i>Cygnus bewickii</i> varrell and <i>C. olor</i> Gmelin)	
201-1	Go-nee	Bewick's Swan (<i>Cygnus columbianus</i>)	Bird II-7
201-2	Kun-go-nee	Whooper Swan (<i>Cygnus Cygnus</i>)	Bird II-36
201-3	Huk-go-nee	Mute Swan (<i>Cygnus olor</i> Gmelin)	Bird I-11
202	Doo-roo-me	Manchurian Crane (<i>Grus japonensis</i>)	Bird I-5
203	Jae-doo-roo-me	White-napped Crane (<i>Grus vipio</i>)	Bird II-31
204	Pal-sak-jo		Fairy Pitta (<i>Pitta nympha</i>)
205	Jo-awe-sae group	Black-faced Spoonbill and Spoonbill (<i>Platalea minor</i> and <i>Platalea leucorodia</i>)	
205-1	Jo-awe-sae	Black-faced Spoonbill (<i>Platalea minor</i>)	Bird I-7
205-2	No-rang-boo-ree-jo-awe-sae	Spoonbill (<i>Platalea leucorodia</i>)	Bird I-4
206	Nu-shee	Great Bustard (<i>Otis tarda</i>)	Bird II-10
215	Huk-bee-dool-kee	Japanese Wood Pigeon (<i>Columba janthina</i> Temminck)	
228	Huk-doo-roo-me	Hooded Crane (<i>Grus monacha</i>)	Bird II-45
242	Ka-mak-tak-da-goo-ree	Great Black Woodpecker (<i>Dryocopus martius</i>)	Bird II-9
243	Soo-ree group	Cinereous Vultures, Golden Eagle, Steller's Sea Eagle, and White-tailed Sea Eagle (<i>Aegypius monachus</i> , <i>Aquila chrysaeros</i> , <i>Haliaeetus pelagicus</i> , and <i>Haliaeetus albichilla</i>)	
243-1	Dok-soo-ree	Black Vulture (<i>Aegypius monachus</i>)	
243-2	Gum-dok-soo-ree	Golden Eagle (<i>Aquila chrysaetos</i>)	Bird I-1
243-3	Cham-soo-ree	Steller's Sea Eagle (<i>Haliaeetus pelagicus</i>)	Bird I-8
243-4	Hin-ko-ri-soo-ree	White-tailed Sea Eagle (<i>Haliaeetus albicilla</i>)	Bird I-13
323	Mae group	Goshawk, Chinese Goshawk, Eurasian Sparrow Hawk, Marsh Harrier, and Kestrel (<i>Accipiter gentilis</i> , <i>Accipiter soloensis</i> , <i>Accipiter nisus</i> , <i>Circus aeruginosus</i> , and <i>Falco tinnunculus</i>)	

Table 13-2
ROK Species Designated as Natural Monuments - Continued

Monument Designation No.	Korean Name	English Name (Scientific Name)	Classification*
323-1	Cham-mae	Goshawk (<i>Accipiter gentilis</i>)	Bird II-35
323-2	Bul-gun-bae-sae-mae	Chinese Goshawk (<i>Accipiter soloensis</i>)	
323-3	Gae-goo-ree-mae	Marsh Harrier (<i>Circus aeruginosus</i>)	Bird II-2
323-4	Sae-mae	Eurasian Sparrowhawk (<i>Accipiter nisus</i>)	
323-5	Alak-gae-goo-ree-mae	Pied Harrier (<i>Circus melanoleucus</i>)	Bird II-28
323-6	Jat-bit-gae-goo-ree-mae	Hen Harrier (<i>Circus cyaneus</i>)	Bird II-32
323-7	Mae	Peregrine Falcon (<i>Falco 151eregrines</i>)	Bird I-6
323-8	Hwang-jo-rong-ee	Kestrel (<i>Falco tinnunculus</i>)	
324	Ol-pae-me and Boo-ong-ee group	Tawny Owl, Eurasian Scops Owl, Eagle Owl, Brown Hawk Owl, Long-eared Owl, Short-eared Owl, Eurasian Scops Owl, and Collared Owl (<i>Strix aluco</i> Linne, <i>Otus scops</i> , <i>Bubo bubo</i> , <i>Ninox scutulata</i> , <i>Asio flammeus</i> , <i>Asio otus</i> , <i>Otus lempiji</i> , and <i>Otus scops</i>)	
324-1	Ol-pae-me	Tawny Owl (<i>Strix aluco</i>)	Bird II-30
324-2	Soo-ri-boo-ong-ee	Eagle Owl (<i>Bubo bubo</i>)	Bird II-26
324-3	Sol-boo-ong-ee	Brown Hawk Owl (<i>Ninox scutulata</i>)	
324-4	Soe-boo-ong-ee	Short-eared Owl (<i>Asio flammeus</i>)	
324-5	Chick-boo-ong-ee	Long-eared Owl (<i>Asio otus</i>)	
324-6	So-chok-sae	Eurasian Scops Owl (<i>Otus scops</i>)	
324-7	Kun-so-chok-sae	Collared Scops (<i>Otus lempiji</i>)	
325	Kee-ro-kee group	Swan Goose and Brent Goose (<i>Anser cygnoid</i> and <i>Branta bernicla</i>)	
325-1	Gae-ree	Swan Goose (<i>Anser cygnoides</i>)	Bird II-3
325-2	Huk-kee-ro-kee	Brent Goose (<i>Branta bernicla</i>)	Bird II-44
326	Gum-un-mo-ree-mool-tae-sae	Oystercatcher (<i>Haematopus ostralegus</i>)	Bird II-5
327	Won-ang	Mandarin Ducks (<i>Aix galericulata linne</i>)	
361	No-rang-boo-ree-bak-ro	Chinese Egret (<i>Egretta eulophotes</i>)	Bird I-3
446	Tum-boo-kee	Watercock (<i>Gallicrex cinerea</i>)	Bird II-12
447	Doo-kyon	Lesser Cuckoo (<i>Cuculus poliocephalus</i>)	
448	Ho-sa-bee-o-ree	Chinese Merganse (<i>Mergus squamatus</i>)	Bird II-43
449	Ho-sa-do-yo	Painted Snipe (<i>Rostratula benghalensis</i>)	
450	Pal-sae-o-ree	Japanese Murrelet (<i>Synthliboramphus wumizusume</i>)	Bird II-20
216	Sa-hyang-no-roo	Korean Musk Deer (<i>Moschus moschiferus paryipes</i>)	Ma I-6
217	San-yang	Chinese or Long-tailed Goral (<i>Naemorhedus caudatus</i>)	Ma I-7

Table 13-2
ROK Species Designated as Natural Monuments - Continued

Monument Designation No.	Korean Name	English Name (Scientific Name)	Classification*
328	Ha-nul-da-ram-jee	Korean Small Flying Squirrel (<i>Pteromys volans aluco</i>)	Ma II-10
329	Ban-dal-ga-sum-gom	Manchurian Black Bear (<i>Ursus thibetanus ussuricus</i>)	Ma I-4
330	Soo-dal	Eurasian River Otter (<i>Lutra lutra</i>)	Ma I-8
452	Bul-gun-bak-jui	Korean Orange Whiskered Bat, Golden-winged Myotis or Jobokseng Bat (<i>Myotis formosus chofukusei</i>)	Ma I-5
258	Moo-tae-jang-awe	(<i>Anguilla mauritiana</i>)	
259	O-rum-chee	Cyprinid Fish (<i>Ganopropspterus myloden</i>)	
454	Me-ho-jong-gae	Miho Spine Loach (<i>Iksookimia choii</i>)	Fish I-3
455	Ko-chee-dong-ja-gae	Korean Stumpy Bullhead (<i>Pseudobagrus brevicorpus</i>)	Fish I-2
218	Jang-soo-ha-nul-so	Korean Relict Long-horned Beetle (<i>Callipogon relictus</i>)	Ins I-5
458	San-gool-took-na-bee	Esper Butterfly (<i>Metopodontus blanchardi</i>)	Ins I-2
453	Nam-saeng-ee	Reeve's Turtle (<i>Chinemys reevesii</i>)	AR II-2
456	Hae-song	(<i>Antipathes japonica</i>)	Inv II-23
457	Gwyn-ga-ji-hae-song	Gwyn-ga-ji-hae-song (<i>Antipathes lata</i>)	

Table 13-3
Ecosystem and Landscape Conservation Areas

Name	Location	Area (km ²)	Features	Designation Date
Nine Areas Designated by the Ministry Of Environment (241.613) km²				
Hasidong-Anin Sand Dune	Areas at Hasidong-ri, Gangneung-si, Gangwon-do	0.234	Excellent topography	Dec. 17, 2008
Mt. Jiri	Areas in Pia-gol Toji- myon and Shimwon gorge Sandong-myon Gurae-gun Jonnam	20.20	Climax forest (<i>Abies Koreana</i> forest, etc.)	Oct. 28, 2005
Mt. Unmoon	Areas at Unmoon-myon, Cheongdo-gun, Kyungbuk	26.395	Excellent scenery; habitat for rare wildlife species	Sep. 9, 2010
Geogum-do mt. Jeokdae	Areas at Geumsan-myon, Goheung-gun, Jeonnam	8.365	Habitat for rare wildlife species	Jan. 7, 2011
Otters habitat at the Sum-jin River	Areas at Toji-myon, Gan-jon-myon, and Moon-chuk-myonGu-rae-gun Jonnam	1.83	Habitat for otters	Dec. 1, 2001
<i>Myotis formosus chofukusei</i> habitat on Mt. Gosa-bong	Areas at Dae-dong- myon Ham-pyong-gun Jonnam	8.78	Habitat for <i>Myotis formosus chofukusei</i> (Endangered wildlife mammals Class II)	May 1, 2002
Basin of the Dong River	Areas at Yong-wol-up Yong-wol-gun in Kang- won; and Jong-sun-up and Shin-dong-up, and Mi-tan-myon Pyong-Chang-gun Gang-won	72.85	Excellent topography and scenery Habitat for rare wildlife species	Aug. 9, 2002
Basin of the Wang-pee-chon	Areas at Gunnam- myon, and Saw-myon Ul-jin-gun Gyong-buk	102.838	Excellent topography and scenery Habitat for rare wildlife species	Oct. 14, 2005
So-hwang sand dune	Areas at Dok-san-ree, and So-hwang-ree Ung-chon-up Boryong Choong-nam	0.12	Costal sand dune	Oct. 28, 2005
Four Areas Designated by the Ministry of Land, Transport and Maritime Affairs (70.37 km²)				
Sea areas of Shin-doo-ree Sand Dune	Areas at Shin-doo-ree Won-buk-myon Tae-an-gun Choong-nam	0.64	Various vegetation	Oct. 9, 2002

Table 13-3
Ecosystem and Landscape Conservation Areas - Continued

Name	Location	Area (km ²)	Features	Designation Date
Moon Island and sea areas	Areas of Bomok-do, To-pyong-dong, So-gui-dong, Bub-hwan-dong, and Kang-jong-dong So-gui-po Jeju	13.68	Various seaweed communities and the only coral community in Korea	Nov. 5, 2002
Oryuk Island and sea areas around it	936 to 941 and its adjacent sea areas Yongho-2-dong Nam-gu Busan	0.35	Uninhabited rock island Protection of biota on vertical rocks	Dec. 31, 2003
Sea areas around Dae-ee-jak-do	Sea areas E-jak-ree and Sung-bong-ree Ong-jin-gun Incheon	55.7	Exceptional natural scenery Habitats for marine species	Dec. 31, 2003

22 Areas Designated by the Governors and Mayors (50.327 km²)

The Han River Bam Island	84-4 Yo-ui-do-dong Young-dung-po-gu and 314 Dang-in-dong Ma-po-gu Seoul	0.241	Habitats for migration birds	Aug. 10, 1999
Natural wetland at Dun-chon-dong	211 Dun-chon-dong Gang-dong-gu Seoul	0.0025	Natural wetland	Mar. 6, 2000 Dec. 5, 2002
Wetland at Bang-ee-dong	Areas of 539-2 Bang-ee-dong Song-pa-gu Seoul	0.059	Wetland	Apr. 15, 2002 Nov. 24, 2005
Tan-chon	Soo-so-dong Gang-nam-gu and Ga-rak-dong Song-pa-gu Seoul	1.405	Habitats for migration birds	Apr. 15, 2002
Wetland at Jin-kwan-nae-dong	Areas at 78 Jin-kwan-nae-dong Un-pyong-gu Seoul	0.017	Natural wetland	Dec. 30, 2002
Wetland at Am-sa-dong	Area at 624-1 Gang-dong-gu Seoul	0.103	Riparian wetland	Dec. 30, 2002
Terrace land on the Han River at Go-duk-dong	Area at 396 Gang-dong-gu Seoul	0.320	Various native species	Oct. 20, 2004
Mt. Chong-gae Won-taw-gol	Areas at San 4-15 Won-ji-dong So-cho-gu Seoul	0.146	Deciduous broad-leaved trees, such as White Oak	Oct. 20, 2004
Hun-in-rung Ro-ri-na-moo	Areas at San 13-1 Nae-gok-dong So-cho-gu Seoul	0.057	Various native species	Nov. 24, 2005

Table 13-3
Ecosystem and Landscape Conservation Areas - Continued

Name	Location	Area (km ²)	Features	Designation Date
Mt. Nam-san	Areas at San 5-6 Ye-jang-dong Joong-gu Seoul	0.705	Communities of Mongolian Oak	Jul. 27, 2006
Mt. Bool-am San-you-dae	Areas at San 223-1 Gong-nung-dong No-won-gu Seoul	0.204	Communities of <i>Carpinus laxiflora</i>	Jul. 27, 2006
Backyard of Chang-duk Palace	Areas at 2-71 Wa-ryong-dong Jong-ro-gu Seoul	0.440	Communities of White Oak	Jul. 27, 2006
Gum-dae-bong Mt. Dae-duk	Tae-bak, Sam-chok-gun, and Jong-sun-gun Gang-won	4.20	Intensive habitats for rare species	Apr. 26, 1993
Mt. Bak-woon	Ok-ryong-myon, Jin- sang-myon, and Da- ap-myon Jonnam	9.74	Spectacular view and virgin forest	Apr. 26, 1993
Upstream areas of Jo- jong stream at Mt. Yong-ji and Mt. Chong- gae	Ga-pyong-gun and Po- chon-gun Gyong-gi	21.84	Rare insects A wide range of biota	Sep. 1, 1993
Go-ran-cho habitats in Go-jae	San 144-3 Duk-gok-ree Ha-chong-myon Go-jae Kyong-nam	0.002	Rich habitats for <i>Crypsinus hastatus</i>	Oct. 2, 1995
Bongsan Pabbaenamoo Forest	Areas at Sinsa-dong, Gangnam-gu, Seoul	0.073	Communities of <i>Sorbus alnifolia</i>	Dec. 27, 2007
Mt. Inwang scenery	Areas at Hongje-dong, Seodaemoon-gu, Seoul	0.258	Excellent scenery	Dec. 27, 2007
Seongnaecheon downstream	Areas at Bangee-dong, Songpa-gu, Seoul	0.7	Urban natural river	Nov. 26, 2009
Mt. Gwanak	Areas at Sinrim-dong, Gwanak-gu, Seoul	7.482	Boxwood habitat	Nov. 26, 2009
Baeksasil Valley	Areas at Booam-dong, Jongro-gu, Seoul	1.326	Rich in biodiversity	Nov. 26, 2009
Taehwa River	Downstream Areas of Taehwa River at Ulsan	0.983	Habitats for migration birds	Dec. 24, 2008

Table 13-4
Wetland Protected Areas

Name	Location	Area (km ²)	Key Features	Designate Date
18 Areas Designated by the Ministry Of Environment (117.126km²)				
Nak Dong Estuary	Saha-gu & Gangseo- gu, Busan Metropolitan City	37.718	Migratory birds resting site	Aug. 9,1999
Yongneup of Mt. Daeam	Injae-gun, Gangwon province	1.360	Moor with peat deposits under cold temperature	Aug. 9,1999
Upo wetland	Changryeong-gun, Gyeongnam province	8.540	Largest inland wetland in the country	Aug. 9,1999
Moojaechi-neup	Ulsan Metropolitan City, Gyeongnam province	0.184	Mountainous wetland with high biodiversity	Aug. 9,1999
Mulyeongri oreum	Namwon, Jeju special self-governing province	0.309	Wetland in volcanic catchment	Dec. 5,2000
Hwaum-neup	Yangsan, Gyeongnam province	0.124	Mountainous wetland	Feb. 1,2002
Du-woong wetland	Daejeon, Choongnam province	0.067	Oxbow lake and Marsh of Shinduri dune with rare wildlife species	Nov. 1,2002
High Moor of Mt. Shin-bul	Yangsan, Gyeongnam province	0.308	Mountainous wetland with rare species	Feb. 20,2004
Damyang wetland	Damyang-gun & Gwangju City (Jeonnam province)	0.981	Riverine wetland with extensive areas of bamboo population	July. 8, 2004.
Jangdo island High Moore	Shinan-gun, Jeonnam province	0.090	Mountainous wetland in an ocean island	Aug. 31, 2004
Han estuary	Gangwha, Gyeonggi province	6,067	Large expanses of estuary	Apr. 17, 2006
Sajapyeong of Mt. Jaeyak	Milyang, Gyeongnam province	0.580	Thick peat deposits	Dec. 28, 2006
1100 Altitude Wetland	Jeju and Seogwipo cities, Jeju Special self- governing province	0.126	High mountainous wetland with rare species	Oct. 1, 2009
Muljangori oreum	Bongaedong, Jeju Special Self-governing province	0.610	Wetland in volcanic catchment	Dec. 1,2009

Table 13-4
Wetland Protected Areas - Continued

Name	Location	Area (km ²)	Key Features	Designate Date
Dongbaekdongsan	Jocheon, Jeju Special Self-governing province	0.590	Contribution to groundwater recharge	Nov. 1, 2010
Ungok wetland	Gochang-Myeon, Jeonbuk province	1.797	High biodiversity	Mar. 14, 2011
Gonggumjee	Sangju city, Gyeongbuk province	0.264	Rice paddy of natural & folk	Jun. 29, 2011
Hanbando wetland	Yeongwol-myeon, Gangwon province	2.81	Riverine wetland with high biodiversity	Jan. 13, 2012

10 Areas Designated by the Ministry of Land, Transport and Maritime Affairs (212.140km²)

Muan Tidal Flat	Muan-gun, Jeonnam province	42.000	High biodiversity, Geologic values	Dec.28, 2001
Jindo Tidal Flat	Jindo-gun, Jeonnam province	1.440	Picturesque landscape, high biodiversity, Migratory birds resting site	Dec.28, 2002
Suncheon Bay	Suncheon city, Jeonnam province	28.000	Hooded crane resting site, Picturesque landscape	Dec.31, 2003
Boseong- Bulgyo Tidal Flat	Boseong-gun, Jeonnam province	10.300	Affluent marine resources	Dec.31, 2003
Woongjin-Jangbongdo Tidal Flat	Woongjin-gun, Incheon	68.400	A resting site of rare migratory birds species, High biodiversity	Dec. 31, 2003
Julpo Bay Tidal Flat	Buan-myeon, Jeonbuk province	4.900	A resting site of rare migratory birds species, High biodiversity	Dec. 15, 2006
Gochang Tidal Flat	Gochang-gun, Jeonbuk province	10.400	Large expanses of tidal flats, Beautiful landscape, Municipal water source	Dec. 31, 2007
Seocheon Tidal Flat	Seocheon-gun, Jeonnam province	15.300	Habitat of Eurasian Oystercatcher, Beautiful Landscape	Feb. 1, 2008
Jungdo Tidal Flat	Shian-gun, Jeonnam province	31.300	Habitat of birds of internationally importance	Jan. 29, 2010

Table 13-4
Wetland Protected Areas - Continued

Name	Location	Area (km ²)	Key Features	Designate Date
Bongam Tidal Flat	Bongam, Changwon city	0.1	Wetland near urban settlement, Habitat of rare , endangered and threatened species	Dec. 16,2006
3 Areas Designated by the Governors and Mayors (6.634km²)				
Dalsung Riverine Wetland	Dalseo-gu, Daegu Metropolitan City	0.178	Migratory birds resting site, affluent aquatic plants (inland wetland)	May. 25, 007
Choodong Wetland	Choodong, Daejeon Metropolitan City	0.346	Habitat of rare species (inland wetland)	Dec. 26, 008
Songdo Tidal Flat	Songdo, Incheon Metropolitan City	6.110	On a Route of East Asian-Australasian Flyway (coastal wetland)	Dec. 31, 009

Chapter 14

Polychlorinated Biphenyls

14-1. 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 (PCBs). 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.

14-2. Definitions

- a. **Capacitor.** A device for accumulating and holding a charge of electricity and consisting of conducting surfaces separated by a dielectric.
- b. **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.
- c. **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.
- d. **Mark.** The descriptive name, instructions, cautions, or other information applied to PCBs and PCB items, or other objects subject to this regulation.
- e. **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.

f. **Non-PCB.** Any manufactured item, component, article, equipment, or waste, including, but not limited to, transformers, capacitors, circuit breakers, reclosers, voltage regulators, switches, electromagnets, and cable, that contains less than 2 ppm PCB.

g. **PCB-Containing.** Any manufactured item, component, article, equipment, or waste, including, but not limited to, transformers, capacitors, circuit breakers, reclosers, voltage regulators, switches, electromagnets, and cable that contains greater than or equal to 2 ppm PCB.

h. **PCB Article.** Any manufactured article, other than a PCB container, that contains PCBs and whose surface has been in direct contact with PCBs. This includes capacitors, transformers, electric motors, pumps, and pipes.

i. **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.

j. **PCB Container.** Any package, can, bottle, bag, barrel, drum, tank, or other device that contains PCBs or PCB articles, and whose surface has been in direct contact with PCBs.

k. **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

l. **PCB Item.** Any PCB article, PCB article container, PCB container, or PCB equipment that deliberately or unintentionally contains a material that has or has as a part of it any PCB, or PCBs at a concentration of 2 ppm or greater.

m. **PCB Large High Voltage Capacitor.** A capacitor that contains 1.36 kg (3 lbs) or more of dielectric fluid, which operates at 2,000 volts (alternating current (AC) or direct current (DC)) or above, and that contains or has as a part of it any PCB, or PCBs at a concentration of 2 ppm or greater.

n. **PCB Large Low Voltage Capacitor.** A capacitor that contains 1.36 kg (3 lbs) or more of dielectric fluid, which operates below 2,000 volts (AC or DC), and that contains or has as a part of it any PCB, or PCBs at a concentration of 2 ppm or greater.

o. **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.

p. **Substantial Contact Area.** An area that is subject to public access on a routine basis or where substantial dermal contact by employees could occur.

q. **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.

r. **PCB-Containing Waste:**

(1) Liquid substances containing equal to or more than 2 mg/l (2 ppm) PCBs.

- (2) Non-liquid substances containing equal to or more than 0.003 mg/L (0.003 ppm) PCBs.

14-3. Criteria

a. General.

(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.

(2) Spills and other incidents involving materials containing PCBs at a concentration of 2 ppm or greater will be responded to immediately upon discovery. The spill will be cleaned up IAW the following:

(a) Surfaces that are located in substantial contact areas will be cleaned to 10 micrograms (μg) per 100 square centimeters (cm^2).

(b) Surfaces in all other contact areas will be cleaned to 100 μg per 100 cm^2 .

(c) Contaminated soil located in restricted access areas will be removed until the soil tests no higher than 1 ppm PCBs and 0 will be backfilled with clean soil containing less than 1 ppm PCBs. Restricted access areas in which PCB spills have been cleaned up, but some residual concentration remains, 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.

(d) Contaminated soil located in unrestricted access areas will be removed to a minimum depth of 10 inches or until the soil tests no higher than 1 ppm PCBs, whichever is deeper, and will be backfilled with clean soil containing a concentration of less than 1 ppm of PCBs.

(3) All PCB Transformers, PCB Large High Voltage Capacitors, PCB Containers, and certain PCB items containing PCB concentrations of 2 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 the Korean language. 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. In addition, the following PCB items must be marked at the time of item removal from use if not already marked: PCB Large Low Voltage Capacitors and equipment containing a PCB Transformer or PCB Large High Voltage Capacitor.

(4) Each installation having PCB items will maintain a written inventory that includes a current list by type of all marked and unmarked PCB-containing items in use, along with the location of the PCB item, the volume of fluid contained within the unit (with laboratory test results indicating concentration of PCBs), and the status of the unit (i.e., placed into storage for disposal, date of disposal). Inventory records should be maintained for at least 3 years after disposal of the last item on the list.

- (5) PCBs are designated hazardous wastes. Disposal of PCB items will only be through

the servicing DLA DS in accordance with DoDM 4160.21 and paragraph 14-3d, "Disposal," of this document.

(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.

(7) 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 collected and containerized.

(8) All transformers and electrical equipment locally procured, regardless of source, shall be certified to be accompanied by manufacturer's certification that PCBs were not used in the manufacture of the item or that equipment contains less than 2 ppm at the time of shipment.

(9) Transformers containing 50 ppm or greater PCB were phased out and replaced with new non-PCB transformers as of 1 January 2005.

(10) Transformers and other equipment containing 2 ppm or greater PCB shall be phased out by 30 September 2015.

(11) Transformer fluids containing 2 ppm or greater PCB shall not be used in any application including servicing of existing transformers and other electrical system components. When dielectric fluid containing PCB concentrations ≥ 2 ppm is disposed of, it will be regarded as PCB-containing fluid.

b. Other PCB items.

(1) Electromagnets, switches, and voltage regulators that may contain PCBs at any concentration are serviced as follows:

(a) The PCB-containing electrical equipment will only be serviced with dielectric fluid containing less than 2 ppm PCB.

(b) Servicing any electromagnet, switch, or voltage regulator with a PCB concentration of 500 ppm or greater which requires the removal and rework of the internal components is prohibited.

(c) The PCBs removed during servicing will be captured and either:

- Reused as dielectric fluid (if less than 2 ppm).
- Disposed of properly.

(d) The 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.

(e) Dielectric fluids containing 500 ppm or greater will not be used as dielectric fluid in any electromagnet, switch, or voltage regulator classified as PCB-containing electrical equipment.

(2) Capacitors and condensers containing PCBs at any concentration must be managed as

follows:

(a) Use and storage for reuse of PCB-containing large high-voltage capacitors and PCB-containing large low-voltage capacitors which pose an exposure risk to food or feed is prohibited.

(b) Use of PCB-containing large high-voltage and PCB-containing 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 shall not have public access and shall have an adequate roof, walls, and floor to contain any release of PCBs.

(3) Fluorescent light ballasts with no labels or markings indicating that it is a non-PCB unit will be classified as PCB-containing.

(4) Any PCB item removed from service will be marked with the date it is removed from service.

c. Storage.

(1) The PCBs and PCB items at concentrations 2 ppm or greater that are to be stored before disposal will be stored in a facility that will assure the containment of PCBs, including:

(a) Roofs and walls of storage buildings that exclude rainfall. A containment berm, at least 6 inches high, sufficient to contain twice the internal volume of the largest PCB article or 25 percent of the total internal volume of all PCB articles or containers stored, whichever is greater.

(b) Drains, valves, floor drains, expansion joints, sewer lines or other openings constructed to prevent any release from the bermed area.

(c) Continuous, smooth and impervious flooring and containment berm material.

(d) To the maximum extent possible, a new PCB storage area will be located to minimize risk of release due to seismic activity, floods, or other natural events. For facilities located where there is a high probability of such events, the Spill Prevention, Control and Reporting Plan will address the risk.

(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:

(a) Non-leaking PCB items, marked to indicate whether it is a PCB article or PCB equipment.

(b) 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.

(c) The PCB containers in which non-liquid PCBs have been placed.

(d) The PCB containers in which PCBs at a concentration between 2-499 ppm have been placed and whose containers are marked to indicate less than 500 ppm PCB.

(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 facility requirements of subparagraph 14-3c(1), if they are inspected weekly.

(4) All other PCB storage areas will be inspected at least monthly.

(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.

d. Disposal.

(1) Installations that generate waste containing 2 ppm or greater PCBs will maintain an audit trail for the wastes at least as stringent as that required under the criteria in Chapter 6, "Hazardous Waste and Designated Waste".

(2) Disposal of PCB items will be through the servicing DLA DS IAW DoDM 4160.21.

(3) Disposal of PCBs off of SOFA-granted land will be completed using a contractor that has all applicable licenses and permits IAW ROK law.

(4) Retrogrades of PCBs DoD-generated PCBs manufactured in the U.S. will be returned to the Continental United States (CONUS) for delivery to a permitted disposal facility if ROK or third country disposal is not possible, is prohibited or will not be managed in an environmentally sound manner. Ensure that all PCB items and equipment are marked in accordance with criteria in subparagraph 14-3a(3). PCBs manufactured outside the U.S. will be disposed of in accordance with subparagraph 14-3d(2).

e. Elimination of PCB products.

(1) Installations shall minimize the use of PCBs and PCB items without degrading mission performance.

(2) Installations shall not purchase or otherwise take control of PCBs or PCB items for use.

(3) All procurement of transformers or any other equipment containing dielectric or hydraulic fluid shall be accompanied by manufacturer's certification that PCBs were not used in the manufacture of the item, or that the equipment contains no detectable PCBs at the time of shipment.

(4) Such newly procured transformers and equipment shall have permanent labels affixed stating they are PCB free (no detectable PCBs).

Chapter 15

Asbestos

15-1. Scope

This chapter contains criteria to control and abate threats to human health and the environment from asbestos, and describes proper management of asbestos during removal and disposal. Asbestos management and training activities will be conducted in accordance with standards set forth in the Asbestos Hazard Emergency Response Act (AHERA), Title 40, Code of Federal Regulations (CFR), Part 763, Subpart E, "Asbestos-Containing Materials in Schools". Policy requirements for a Comprehensive Occupational Health and Safety program policy are not covered in this chapter. To protect personnel from asbestos exposure, refer to DoDI 6055.01, "DoD Safety and Health (SOH) Program", and DoDI 6055.05, "Occupational and Environmental Health (OEH)", and concomitant service instructions.

15-2. Definitions

a. **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.

b. **Asbestos.** Generic term used to describe six distinctive varieties of fibrous mineral silicates, including chrysotile, amosite, crocidolite, tremolite, anthophyllite, and actinolite. Also includes any of these materials that have been chemically treated and/or altered.

c. **Asbestos-Containing Material (ACM).** Any material containing more than one percent asbestos by weight.

d. **Asbestos-Containing Waste Material (ACWM).** As applied to demolition and renovation operations, ACWM includes, regardless of its phase (i.e., liquid, solid).

(1) All friable asbestos waste.

(2) Category I non-friable ACM that has become friable (e.g., dust collected in dust collectors and debris produced from cutting, grinding, or shaping of asbestos products), or is in poor condition.

(3) Category II non-friable ACM that becomes crumbled, pulverized, or reduced to powder by forces that acted on the material during the course of demolition or renovation operations.

(4) Materials contaminated with asbestos, including disposal equipment, floor vinyl sheets, respirators, and protective clothing, etc. Wastes generated during building demolition are classified as HW/DW if $\geq 1\%$ of asbestos is present, regardless of its phase (liquid, solid, or else).

e. **Category I Non-Friable ACM.** Asbestos-containing packings, mastic, gaskets, resilient floor covering and asphalt roofing products in accordance with the Asbestos National Emission Standard for Hazardous Air Pollutants (NESHAP). Category I non-friable ACM is not subject to regulation unless:

(1) It has been subjected to sanding, grinding, cutting, or abrading.

(2) It becomes friable, or (c) is in poor condition.

f **Category II Non-Friable ACM.** Any non-friable asbestos-containing material not designated as Category I, in accordance with the Asbestos NESHAP, that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure. Some examples of Category II non-friable ACM are cementitious asbestos board (transite), acoustical ceiling tiles, flex connectors, expansion joints, caulking material, and textured paint.

g. **Composited Sample.** Multiple layers of a single core sample are composited for analysis. A composite sample does NOT combine multiple individual samples to obtain a single result.

h. **Friable Asbestos.** Any material containing more than one percent asbestos that, when dry, can be crumbled, pulverized or reduced to powder by hand pressure.

i. **Joint Compound.** The material used to fill nail holes, cracks, and small spaces between sections of wallboard.

j. **Multi-Layered Interior Wall System.** A system that contains multiple layers of material, any or all of which may be ACM.

k. **Non-Friable Asbestos.** A material containing more than one percent asbestos as determined using Polarized Light Microscopy (PLM) that when dry cannot be crumbled, pulverized, or reduced to powder by hand pressure.

l. **Regulated Asbestos-Containing Material (RACM).** Includes:

- (1) Friable asbestos material.
- (2) Category I non-friable ACM that has become friable or has been/will be subjected to sanding, grinding, cutting or abrading.
- (3) Category II non-friable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder in the course of demolition or renovation operations.

15-3. Criteria

a. Installations will appoint, in writing, an asbestos program manager to serve as the single point of contact for all asbestos-related activities.

b. Installations will prepare and implement an asbestos management plan. Service components may elect to standardize and publish procedures that may be used as a common component for the asbestos management plans of multiple installations. At a minimum, the plan will include the following:

- (1) An ACM inventory, conducted by sample and analysis or visual determination.
- (2) A notification and education program to inform 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.
- (3) Regular ACM surveillance to note, assess, and document any changes in the ACM's condition.

- (4) Work control/permit systems to control activities that might disturb ACM.
 - (5) Operations and maintenance (O&M) work practices to avoid or minimize fiber release during activities affecting ACM.
 - (6) Record-keeping to document O&M activities related to asbestos identification management and abatement.
 - (7) Training for the asbestos program manager, as well as custodial and maintenance staff.
 - (8) Procedures to assess and prioritize identified hazards for abatement.
 - (9) Procedures to prevent the use of ACM in new construction.
 - (10) Medical surveillance and respiratory protection programs required to support all USFK personnel involved in asbestos-related activities, IAW 29 CFR 1926.1101(h). Contractors are responsible for the health and safety of their personnel IAW applicable regulatory standards.
- c. Prior to the 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).
 - d. Prior to the 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.
 - e. Installations will remove friable ACM when the ACM poses a threat to release airborne asbestos fibers and cannot be reliably repaired or isolated.
 - f. Prior to disturbing or demolishing any part of a facility, all regulated ACM will be removed.
 - g. If in-house abatement is performed, installations will, as a minimum:
 - (1) Prior to removal, train all workers involved in the removal.
 - (2) Establish monitoring programs during asbestos removal operations to document exposure levels.
 - (3) Ensure that all workers involved in the removal use properly fitted respiratory protection and personal protection equipment.
 - (4) Use engineering controls and work practices to contain and control asbestos fiber releases for all asbestos removal that has the potential to release airborne asbestos fibers greater than the permissible discharge limit (PDL) of 0.01 fibers/cc.
 - h. Waste asbestos shall be collected and transported in double-layered, high-density, waterproof bags or air-tight containers after sufficient water has been sprayed to prevent scattering, and the cargo should be covered during transportation. In storage, waste asbestos shall be humidified and double wrapped with sacks, sealed in a sturdy container, or solidified with cement or synthetic polymer compounds, or by similar methods, so as not to be scattered during storage. Containers shall be labeled in both English and Korean as follows:
"DANGER - CONTAINS ASBESTOS FIBERS - AVOID CREATING DUST - CANCER AND LUNG

DISEASE HAZARD." Storage of asbestos waste shall not exceed 60 days. Permanent records documenting the disposal action and site shall be maintained.

i. When disposing of ACWM, material shall be adequately wetted, sealed in a leak-proof container, and properly disposed of through a licensed DW disposal contractor IAW applicable ROK regulations as follows:

(1) Dust, debris, or materials that may easily be crushed by palm pressure shall be solidified or melted at high temperature.

(2) Solidified wastes considered to produce no airborne dust shall be packed in polyethylene or high density waterproof bags and disposed at a DW landfill.

(3) Vinyl sheets used for asbestos removal, protection masks, respirators, protection gear, etc. shall be packed in double-layered high density water-proof bags to be disposed at a designated HW/DW landfill, melted at high temperature, or solidified.

j. For demolition projects, all ACM will be removed prior to demolition. During the demolition process, if the ACM material is combined with the rest of the demolition debris, all of the mixed material will be managed and disposed of as ACM.

k. For renovation projects, all ACM will be removed from project debris and managed and disposed of as ACM. During the renovation process, if the removed ACM material is combined with the other debris, all of the mixed material will be managed and disposed of as ACM.

l. DOD schools will comply with applicable requirements 15 U.S.C. 2643(l) and implementing regulations in 40 CFR Part 763, Subpart E, and "Asbestos-Containing Materials in Schools."

m. Sampling of multi-layered interior wall systems:

(1) For multi-layered interior wall systems, including joint compound and skim coats, discrete layers from one sample location are combined to produce a composite analytical result. If the composite result is less than or equal to one percent, then the sampled material is not classified as ACM, and no further analysis is required. If the composite result is greater than one percent, then the sampled material is considered to be ACM.

(2) For multi-layered interior wall systems not including joint compound, the material is classified as ACM if asbestos content is greater than one percent. If no asbestos is detected in the composite sample, then the material is classified as non-ACM. However, if the analysis detects asbestos up to one percent, then each layer of the sample must be analyzed individually. If any one layer contains greater than one percent asbestos, then that layer is classified as ACM. If it is infeasible or impossible to separate the layers, then the entire sample is considered to be ACM. As an alternative to the standard PLM method, and if available, composite samples may be gravimetrically analyzed to derive the percentage of asbestos by weight.

n. Exterior Textured Paint. ACM exterior textured paint is considered Category II non-friable ACM. For renovation projects, routine abatement and disposal procedures shall be followed when the impact of renovation activities may result in the release of significant levels of airborne asbestos fibers.

o. Training. All USFK personnel engaged in asbestos-related activities, including, but not limited to, the program manager, management planner, abatement project monitor, inspector,

worker, project designer, supervisor, and operations and maintenance personnel, shall maintain US EPA AHERA accreditation commensurate with their asbestos-related duties and responsibilities. Completion of the appropriate class(es) and refresher training is required for USFK personnel maintaining accreditation. Contractors are responsible for the health, safety, and training of their personnel IAW applicable regulatory standards.

Chapter 16

Radon (Reserved)

16-1. Scope

16-2. Definitions

16-3. Criteria

Chapter 17

Lead Based Paint

17-1. 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:

- a. DoDI 6055.01, "DoD Occupational Safety and Health Program".
- b. DoDI 6055.05, "Industrial Hygiene and Occupational Health".
- c. Concomitant service instructions.

17-2. Definitions

a. **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.

b. **Accessible Surface.** An interior or exterior surface painted with lead-based paint that is accessible for a young child to mouth or chew.

c. **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.

d. **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 day's 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.

e. **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 exists in a facility in which children under the age of 6 frequent.

f. **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.

g. **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 of 15-19 µg/dl in two tests taken at least 3 months apart.

h. **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.

i. **Enclosure.** The use of rigid, durable construction materials that are mechanically fastened to the substrate in order 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.

j. **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.

k. **Friction Surface.** An interior or exterior surface that is subject to abrasion or friction, including but not limited to, window, floor, and stair surfaces.

l. **Hazard Reduction.** Measures designed to reduce or eliminate human exposure to lead-based paint hazards through methods including interim controls or abatement or a combination of the two.

m. **Impact Surface.** An interior or exterior surface that is subject to damage by repeated sudden force, such as certain parts of door frames.

n. **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.

o. **Lead-Based Paint.** Paint or other surface coatings that contain lead equal to or exceeding 1.0 milligram per square centimeter, or 0.5 percent by weight or 5,000 parts per million (ppm) by weight.

p. **Lead-Based Paint Hazard.** Any condition in child-occupied facilities and military family housing that causes exposure to lead from lead-contaminated dust, lead-contaminated soil, or lead-contaminated paint that is deteriorated or present in accessible surfaces, friction surfaces, or impact surfaces, and that would result in adverse human health effects. More specifically, a lead-based paint hazard is any of the following:

(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 subparagraph 17-2r.

(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).

(3) Any chewable lead-based painted surface on which there is evidence of teeth marks.

(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.

q. **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.

r. **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 µg/ft² on floors; 250 µg/ft² on interior window sills, based on wipe samples

s. **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 200 ppm (µg/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.

t. **Permanent.** An expected design life of at least 20 years.

u. **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.

v. **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.

w. **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.

x. **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 is 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.

17-3. Criteria

a. Installations will:

(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. Table 17-1 provides examples of where lead hazards may be present.

Table 17-1
Potential Lead Hazard Areas

Interior	Floors	Entryways	Cabinets
	Window Wells	Heavy Traffic Areas	
	Window Sills	Stairways	
Exterior	Walls	Drip Line	
	Entrances	Play Areas	
Common Areas	Mailroom	Laundry Room	Playroom
	Community Room	Entrances	

(2) Manage identified lead-based paint hazards through interim controls or abatement.

(3) Identify lead-based paint hazards in child-occupied facilities and military family housing using any or all of the following methods:

(a) Lead-based paint risk assessment screen. If screen identifies dust-lead levels $>25 \mu\text{g}/\text{ft}^2$ for floors, $125 \mu\text{g}/\text{ft}^2$ for interior window sills, a lead-based paint risk assessment should be performed.

(b) Lead-based paint risk assessments.

(c) Routine facility inspection for fire and safety.

(d) Occupant, facility manager, and worker reports of deteriorated paint.

(e) Results of childhood blood lead screening or reports of children identified to have elevated blood lead levels.

(f) Lead-based paint reevaluations.

(g) Review of construction, painting, and maintenance histories.

(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.

(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.

(6) Ensure that all personnel involved in lead-based activities, including paint inspection, risk assessment, specification or design, supervision, and abatement, are properly trained. The following training for the specified types of personnel is considered proper training. Refresher training is required every three years to continue to be considered properly trained.

(a) **Lead Abatement Worker.** This training, typically two days long, is designed for the

lead abatement and lead risk reduction worker. The course covers current abatement issues affecting the worker.

(b) **Lead Risk Assessor.** Certified Lead Inspector Technicians are eligible for the Risk Assessor training. This training is typically two days long. After completing the course the student will be able to determine the presence, or absence, of lead-based paint hazards and recommend options for lead hazard control.

(c) **Maintenance and Repainting Supervisor.** This training, typically two days long, is designed for those who will supervise work activities that may disturb lead-based paint by home improvement contractors and others in affected properties. Detailed hands-on activities allow students the opportunity to become comfortable with performing risk reduction procedures.

(d) **Lead Inspector Technician.** This training is typically 3 days in length. Students learn the sampling protocols for XRFs, paint chips, dust, and soil. Hands-on activities include XRF operation, paint chip sampling, dust wipe sampling, soil sampling, substrate corrections and random sampling in multi-family units.

(e) **Lead Abatement Supervision.** This course, typically four days in length, is for personnel who directly supervise lead abatement operations, lead risk reduction operations and accredited lead paint abatement workers.

(7) Ensure that personnel subject to exposure to lead at or above the action level on any day or subject to exposure to lead compounds receive Lead Awareness Training. This training, typically one hour long, is for all personnel who are subject to exposure to lead at or above the action level on any day or who are subject to exposure to lead compounds which may cause skin or eye irritation. Annual refresher training is required.

(8) Dispose of lead-contaminated waste that meets the definition of a HW in accordance with paragraph 6-2g of Chapter 6, "Hazardous Waste and Designated Waste."

b. Maintenance Operations: Properly trained personnel should only perform maintenance operations, including repainting (see paragraph 17-3d). Proper cleaning practices involving special cleaning with high efficiency particulate air filter (HEPA) vacuums and TSP wash or an equivalent cleaning solution should be performed. Maintenance operations should be evaluated for:

(1) Building or housing code violations.

(2) Paint conditions.

c. Renovation or modernization of older facilities is an excellent time to either abate the lead hazards on a property or to perform risk reductions of LBP hazards.

d. Repaint facilities with LBP at a minimum of every 5 years. More frequent repainting should be performed if the paint appears in poor condition. The following precautions should be taken when repainting LBP:

(1) Use a lead-specific cleaner or deglossing agent to prepare the surface.

(2) Alternately, surface preparation can be performed by wet sanding/wet scraping.

(3) HEPA vacuuming with trisodium phosphate (TSP) wash or equivalent should be

performed following any repainting.

e. The following are permissible methods of abating lead hazards in residential facilities.

- (1) Replacement.
- (2) Off-site chemical stripping.
- (3) Heat gun.
- (4) On-site chemical stripping.
- (5) Sander with HEPA vacuum.
- (6) Wet scraping.
- (7) Encapsulation with approved materials.
- (8) Reversal.
- (9) Vacuum-blasting (exterior only)
- (10) Contained hydro-blasting (exterior only).

f. The following are not permissible methods of abating lead hazards in residential facilities.

- (1) Open flame burning.
- (2) Dry sanding.
- (3) Open abrasive blasting.
- (4) Uncontained hydro-blasting.
- (5) Methylene chloride for interior use.
- (6) Dry scraping.

g. The following are permissible methods of abating lead hazards in nonresidential facilities (including structural steel projects).

- (1) Abrasive blasting with dust recovery and filtration system.
- (2) Mechanical chipping with dust collection system.
- (3) Needle gun with HEPA vacuum.
- (4) Demolition methods.

Chapter 18

Spill Prevention and Response Planning

18-1. Scope

This chapter contains criteria to plan for, prevent, control and report spills of POL and hazardous substances. It is USFK policy to prevent spills of these substances due to USFK 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 4715.08.

18-2. Definitions

a. **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, or 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.

b. **Decontamination Wastes.** Waste materials generated during the decontamination of personnel and equipment used during spill response, including, but not limited to, purging water, rinsing water, plastic containers, rags, gloves, and other personal protective equipment.

c. **Environmental Point of Contact.** Individual responsible for notification of the LEC and local officials, when appropriate, of reportable spills of POL and hazardous substances.

d. **Facility Incident Commander (FIC).** (Previously known as the Installation On-scene Coordinator (IOSC). The official who coordinates and directs USFK control and cleanup efforts at the scene of a POL or hazardous substance spill due to USFK activities on or near the installation. This official is designated by the installation commander.

e. **Facility Response Team (FRT).** (Previously known as the Installation Response Team (IRT). A team performing emergency functions as defined and directed by the FIC.

f. **Hazardous substance.** Any substance having the potential to do serious harm to human health or the environment if spilled or released in a reportable quantity. A list of these substances and the corresponding reportable quantity is contained in table B-4, "List of Hazardous Materials/Substances/Waste," appendix B. Hazardous substances do not include:

(1) Petroleum, including crude POL or any fraction thereof, that is not otherwise specifically listed or designated as a hazardous substance above.

(2) Natural gas, natural gas liquids, liquefied natural gas, or synthetic gas usable for fuel (or mixtures of natural gas and such synthetic gas).

g. **Initial Response.** Actions needed to evaluate health and safety risks, contain a spill, and determine the need for additional assistance, as necessary.

h. **Obviously Contaminated Soil.** A level of contamination easily observed or recognized without the aid of instruments or analytical procedures.

i. **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.

j. **POL.** Refined petroleum, oils, and lubricants including, but not limited to, petroleum, fuel, lubricant oils, synthetic oils, mineral oils, and POL mixed with wastes other than dredged spoil.

k. **Significant spill.** An uncontained release to the land or water in excess of any of the following quantities:

(1) For HW or hazardous substance identified as a result of inclusion in table B-4, "Listed Hazardous Materials/Substances/Wastes," any quantity in excess of the reportable quantity listed in that table;

(2) For POL or liquid or semi-liquid hazardous material, HW, or hazardous substance, in excess of 400 liters (110 gallons).

(3) For other solid hazardous material, in excess of 225 Kg (500 pounds).

(4) For combinations of POL and liquid, semi-liquid and solid hazardous materials, HW or hazardous substance, in excess of 340 Kg (750 pounds).

(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.

l. **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 at appendix C, "Determination of Worst Case Discharge Planning Volume."

18-3. Criteria

a. Spill Prevention, Control and Reporting Plan. All USFK installations will prepare, maintain and implement a Spill Prevention, Control and Reporting 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.

(1) Update and Certification.

(a) The plan will be developed before a facility becomes operational and updated at least every five years or:

- Within 6 months of any significant changes to operations.
- When there have been two significant spills in any 12-month period.
- When there has been a spill of 1,000 gallons or greater.

(b) The plan shall be certified by a professional engineer ensuring that the plan considers applicable industry standards for spill prevention and environmental protection, and that the plan is prepared in accordance with good engineering practice and is adequate for the facility.

The plan will be reviewed and approved by the Installation Commander.

(c) Non-administrative changes to the plan require recertification and approval.

(2) Spill Prevention Section. The prevention section of the plan will, at a minimum, contain the following:

(a) Name, title, responsibilities, duties and telephone number of the designated FIC and an alternate.

(b) General information on the installation including name, type or function, location and address, charts of drainage patterns, drains, catch basins, oil water separators, wash racks, sewer lines, designated water protection areas, maps showing locations of facilities described in paragraph 18-3a(2)(c) below, critical water resources, land uses and possible migration pathways.

(c) An inventory of storage, handling and transfer sites that could produce a significant spill. For each listing, using maps as appropriate, include a prediction of the direction and rate of flow, and total quantity of POL or hazardous substance that might be spilled as a result of a major failure.

(d) An inventory of all POL and hazardous substances at storage, handling and transfer facilities described in paragraph 18-3a(2)(c).

(e) Procedures for the periodic integrity testing of all aboveground storage containers, including visual inspection and where deemed appropriate, another form of nondestructive testing.

(f) Procedures for periodic inspection for all aboveground valves, piping, and appurtenances associated with POL storage containers, in accordance with Chapter 9, "Petroleum, Oil, and Lubricants," subparagraph 9-3b(4).

(g) 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.

(h) Means to contact emergency services. The plan will include a telephone number or other means to contact the appropriate emergency services provider (e.g., installation fire department) on a 24-hour basis.

(i) 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, HW, POL, underground storage tanks, pesticides and PCBs provide specific criteria for containment structure requirements.

(j) 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 a professional engineer. Each determination will be reviewed and approved by the Installation Commander. Waivers are required for containers without secondary containment IAW chapter 1, paragraph 1-13, "Waivers."

(k) 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.

(l) 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 HW or fires), and a designated meeting place.

(m) A description of deficiencies in spill prevention and control measures at each facility 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.

(n) Written procedures for:

- Operations to preclude spills of POL and hazardous substances.
- Inspections.
- Record-keeping requirements.

(o) Site-specific procedures should be maintained at each site on the facility where significant spills could occur.

(3) Spill Control Section. The spill control section of the plan (which may be considered a contingency plan) will identify resources for cleaning up spills at installations and activities, and providing assistance to other agencies when requested. At a minimum, this section of the plan will contain:

(a) Provisions specifying the responsibilities, duties, procedures and resources to be used to contain and clean up spills.

(b) A description of initial response actions that should be taken when a spill is first discovered.

(c) The responsibilities, composition, and training requirements of the FRT.

(d) 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.

(e) Procedures for FRT alert and response to include provisions for:

- Access to a reliable communications system for timely notification of a POL spill or hazardous substance spill.
- Public affairs involvement.

(f) 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 and the LEC, 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.

(g) The plan will provide for the notification of the FIC, installation commander, and local authorities in the event of hazard to human health or environment.

(h) Assignment of responsibilities for making the necessary notifications including notification to the emergency services providers. The environmental point of contact will be responsible for contacting the local ROK environmental point of contact when the FIC determines off-installation citizens could be exposed to an imminent and substantial endangerment.

(i) Surveillance procedures for early detection of POL and hazardous substance spills.

(j) A prioritized list of various critical water and natural resources that will be protected in the event of a spill.

(k) Other resources addressed in prearranged agreements, including mutual aid agreement with ROK Fire Departments, that are available to the installation to clean up or reclaim a large spill due to USFK activities, if such spill exceeds the response capability of the installation.

(l) 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.

(m) 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.

(n) A description of general health, safety and fire prevention precautions for spill cleanup actions.

(o) A public affairs section that describes the procedures, responsibilities, and methods for releasing information in the event of a spill.

(4) Reporting Section. The reporting section of the plan will address the following:

(a) Record-keeping when emergency procedures are invoked.

(b) Any significant spill will be reported to the FIC immediately. Immediate actions will be taken to eliminate the source and contain the spill.

(c) The FIC will immediately notify the appropriate In-Theater Component Commander and/or Defense Agency and the LEC. LEC notification of spill may be completed by phone, with follow-up email within 24 hours. The FIC will submit a follow-up written report to the appropriate In-Theater Component Commander and/or Defense Agency and the LEC, when:

- The spill occurs outside a USFK installation.
- The spill occurs inside a USFK installation and cannot be contained within the installation boundaries.
- The spill occurs inside a USFK installation and cannot be contained within any required berm or secondary containment (i.e., any quantity outside of secondary containment).

- A surface or groundwater resource has been polluted.
- A significant spill occurs.
- The FIC has determined that the spill is significant.

(d) In the event that a significant spill occurs inside a USFK installation and cannot be contained within the installation boundaries or threatens a ROK drinking water resource, the appropriate in-theater component commander and/or Defense Agency, LEC, and ROK environmental point of contact will be notified immediately. If practical, coordination with the LEC will be completed prior to the ROK environmental point of contact notification.

(e) In the event that a significant spill occurs outside of a USFK installation:

- The unit that was the source of the release will take immediate action to safely stop the source of the spill/leakage, contain the spill/leakage, and conduct initial response and cleanup within the limits of their capabilities. They will also notify the local fire department and emergency services to obtain necessary assistance.

- The person in charge at the scene will immediately notify the appropriate In-Theater Component Commander and/or Defense Agency and the LEC through the chain of command.

- The USFK response to off-post spills/damages will be limited to notification actions, spill control, collection of standing product, and fire prevention.

b. Training. Installations will provide necessary training and spill response drills to ensure the effectiveness of personnel and equipment.

c. Annual Exercise. An annual exercise of installation spill response actions will be conducted at one of the sites identified in the plan. Every third year, a worst case discharge scenario exercise will be conducted.

(1) An actual spill response action can be used to fulfill the annual training requirement if the installation's Environmental Protection Committee (or equal) certifies the following:

(a) The actual spill action met the training objectives of the installation's contemplated annual spill response exercise.

(b) The actual spill site was not the same type of site (fuel dispensing station, POL storage area, heating oil transfer site, or aboveground storage tank without secondary containment) as the previous year's annual spill response exercise.

(c) All key individuals and organizations identified in the installation's spill response plan were involved in the actual response action.

(d) An after action review of the actual response action is conducted and used to improve the installation's spill response plan.

(2) A copy of the installation's Environmental Protection Committee (or equal) certification must be forwarded to the LEC, through the Component Command, with the installation maintaining

the original certification along with the annual training exercise records.

d. **Response Completion.** After completion of the initial response, spill response will continue until any remaining free product and/or obviously contaminated soil is appropriately removed and managed. Further action will be governed by DoDI 4715.08.

Chapter 19

Underground Storage Tanks (USTs)

19-1. Scope

This chapter contains criteria to control and abate pollution resulting from POL products and hazardous materials stored in USTs. Standards for USTs containing hazardous waste are covered in Chapter 6, "Hazardous Waste and Designated Waste." Criteria for aboveground and below-ground POL storage containers are addressed in Chapter 9, "Petroleum, Oil, and Lubricants."

19-2. Definitions

a. **Deferred UST.** A deferred UST is an underground storage system that fits into one of the following categories:

(1) A hydrant fuel distribution system.

(2) A field-constructed tank.

b. **Hazardous material.** Any material defined as a hazardous material in Chapter 5, "Hazardous Material." The term does not include:

(1) Petroleum, including crude POL or any fraction thereof, that is not otherwise specifically listed or designated as a hazardous material above.

(2) Natural gas, natural gas liquids, liquefied natural gas, or synthetic gas usable for fuel (or mixtures of natural gas and such synthetic gas).

c. **Hazardous material UST.** A UST that contains a hazardous material (but not including HW as defined in Chapter 6) or any mixture of such hazardous materials, and petroleum, and which is not a petroleum UST.

d. **POL.** Refined petroleum, oils and lubricants.

e. **Recognized industry standards.** Those standards adopted by independent professional organizations, including, but not limited to, ASTM International, American National Standards Institute, American Petroleum Institute, National Association of Corrosion Engineers, National Fire Protection Association and Underwriters Laboratories.

f. **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 water table.

g. **Underground storage tank (UST).** Any tank, including underground piping connected thereto, having a storage volume greater than 416 liters (110 gallons) that is used to contain POL

products or hazardous materials, and the volume of which, including the volume of connected pipes, is 10 percent or more beneath the surface of the ground, but does not include:

- (1) Septic tanks.
- (2) Storm water or wastewater collection systems.
- (3) Flow through process tanks.
- (4) Surface impoundments, pits, ponds or lagoons.
- (5) Field constructed tanks.
- (6) Hydrant fueling systems.
- (7) 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.
- (8) UST containing *de minimis* concentrations of regulated substances, except where paragraph 19-3b(12) is applicable.
- (9) Emergency spill or overflow containment UST systems that are expeditiously emptied after use.

19-3. Criteria

a. All installations will develop and maintain an Underground Storage Tank Management Plan. The Underground Storage Tank Management Plan required in this chapter can be combined with the Aboveground Storage Container Management Plan required in chapter 9, "Petroleum, Oil, and Lubricants." At a minimum, the Underground Storage Tank Management Plan will include the following:

- (1) An inventory of all underground storage tanks.
- (2) For each underground storage tank, the following information will be recorded:
 - (a) Size.
 - (b) Location.
 - (c) Contents.
 - (d) Construction materials (i.e., steel, fiberglass).
 - (e) Type of leak detection used.
 - (f) Type of corrosion protection.
 - (g) Type of inventory control system used.
 - (h) Installation date(s).

- (i) Removal date(s) (if applicable).
- (3) The following documentation will be maintained:
 - (a) Inventory control records.
 - (b) Maintenance, repair, and upgrade records.
 - (c) Monitoring/tank tightness test results for the previous 5 years.
 - (d) Copies of performance claims provided by leak detection manufacturers.
 - (e) Original manufacturer's written instructions/manuals/warranties regarding underground storage tanks and all applicable appurtenances.
 - (f) USFK notifications.
 - (g) Written procedures for:
 - Monthly monitoring.
 - Response to warning alarms.
 - Inventory control.
- b. POL USTs. All petroleum UST systems will be properly installed, protected from corrosion, provided with spill/overflow prevention and incorporate leak detection as described below.
 - (1) Corrosion protection. Tanks and piping must be provided with corrosion protection unless constructed of fiberglass or other non-corrodible material. The corrosion protection system must be certified by a competent authority.
 - (2) Spill/overflow protection. USTs will be provided with spill and overflow prevention equipment, except where transfers are made in the amounts of 95 liters (25 gallons) or less. Where spill and overflow 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:
 - (a) Automatic shut-off device (set at 95% of tank capacity).
 - (b) High level alarm (set at 90% of tank capacity).
 - (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 one percent 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.
 - (4) UST systems will use one of the following leak detection methods:
 - (a) Automatic tank gauging.
 - (b) Vapor monitoring.

- (c) Groundwater monitoring.
 - (d) Interstitial monitoring.
- (5) Leak detection systems will be evaluated IAW manufacturer's written instructions.
- (a) UST systems using secondary containment as part of the required leak detection.
 - (b) UST systems or parts of systems using leak detection methods other than secondary containment will require annual soil testing at 4 locations within the UST excavation. Soils tested shall be approximately 1.5 meters (~4 feet) below the deepest part of the UST. Underground pipelines will be tested at 10 meter (~30 feet) increments at a depth of 1.5 meters (~4 feet) below the line. If contamination is identified, provisions of DoDI 4715.08 and USFK Reg 200-1 will apply.
- (6) All pressurized UST piping must be equipped with automatic line leak detectors and utilize either an annual tightness test or monthly monitoring.
- (7) Suction piping will either have a line tightness test conducted every three years or use monthly monitoring.
- (8) POL tank construction. Whenever feasible, POL USTs will be replaced with aboveground tanks.
- (9) POL USTs and piping will be properly closed if not needed or be upgraded or replaced.
- (10) 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 U.S. industry standards and inventoried monthly to determine system tightness.
- (11) All verified leaking USTs or UST piping will be immediately emptied and removed from service. If the UST is still required, it will be repaired or replaced. 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 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 4715.08. 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.
- (12) 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 system wastes must be sampled and tested in accordance with subparagraph 9-3d, "Additional Storage Container Wastes Criteria."
- (13) When the product stored in a UST is changed, the UST must be emptied and cleaned by removing all liquid and accumulated sludge prior to the introduction of the new product.
- (14) 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:

- (a) Vent lines must be left open and functioning.
- (b) All other lines, pumps, manways, and ancillary equipment must be secured and capped.
- c. UST Record-keeping. 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.
- d. Hazardous material USTs.
 - (1) All hazardous material USTs and piping must meet the same design and construction standards and management criteria as required for petroleum USTs and piping, and, in addition, must be provided with secondary containment for both tank and piping. Secondary containment for piping can be met by using double-walled piping but all tanks must have secondary containment which are inspected at least every month and after every inclement weather conditions to assure the containment area is properly maintained and valves are closed after draining the water.
 - (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.
 - (3) Hazardous material USTs and piping that do not incorporate the criteria contained in subparagraph 19-3d(1) shall be immediately removed from service and upgraded or replaced as necessary.
- e. 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.

Appendix A

References

Air Force Joint Manual 24-204, Army Technical Order 38-250, Naval Supply Publication 505, Marine Corps Order P4030.19E, and Defense Logistics Agency Manual 4145.3, Preparing Hazardous Materials for Military Air Shipments.

Code of Federal Regulations 1926.1101(h), Title 29, Asbestos.

Code of Federal Regulations, Part 141.26(b), Title 40, Monitoring Frequency for Radioactivity in Community Water Systems.

Code of Federal Regulations, Part 763, Title 40, Asbestos-Containing Materials in Schools.

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.

DoDM 4150.07, Volume 1, DoD Pest Management Program Elements and Implementation: Structure and Operation.

DoDM 4160.21, Volume 1, Defense Materiel Disposition: Disposal Guidance and Procedures.

DoD 4715.05-G, Overseas Environmental Baseline Guidance Document (OEBGD).

DoDM 8910.01, Volume 1, DoD Information Collections Manual: Procedures For DoD Internal Information Collections.

DoDI 4715.23, Integrated Recycling and Solid Waste Management.

DoDI 4715.05, Environmental Compliance at Installations Outside the United States.

DoDI 4715.08, Remediation of Environmental Contamination Outside the United States.

DoDI 6050.05, DoD Hazard Communication (HAZCOM) Program.

DoDI 6055.01, DoD Safety and Occupational Health (SOH) Program.

DoDI 6055.05, Occupational and Environmental Health (OEH).

Executive Order 12114, Environmental Effects Abroad of Major Federal Actions.

Executive Order 12344, Naval Nuclear Propulsion Program.

Military Handbook 1028/8A, Design of Pest Management Facilities.

Naval Facility Manual of Operation-213, Air Force Regulation 91-8, and Army Technical Manual 5-634, Solid Waste Management.

United States Code, Section 2643 of title 15.

United States Code, Section 7158 of title 42.

USFK Reg 10-10, Joint Committee and Subcommittees under the USA – ROK SOFA.

USFK Reg 200-1, United States Forces Korea Remediation Regulation.

Appendix B

Characteristics of Hazardous Wastes and Lists of Hazardous Wastes and Hazardous materials

B-1. Characteristics of Hazardous Waste

a. General.

- (1) A SW is a discarded material that may be solid, semi-solid, liquid, or that contained gas.
- (2) A SW becomes a HW when it exhibits a characteristic of a HW or is listed as a hazardous waste in this appendix. A HW or any mixture of a SW and a HW that is listed solely because it exhibits one or more characteristics of ignitability, corrosivity, or reactivity, is not a HW if the waste no longer exhibits any characteristic of HW.
- (3) Each HW is identified by a USEPA HW Number (HW#). The HW# must be used in complying with the notification, recordkeeping, and reporting requirements.

b. Characteristic of Ignitability.

- (1) A SW exhibits the characteristic of ignitability if a representative sample of the waste has any of the following properties:
 - (a) 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.
 - (b) 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.
 - (c) It is an ignitable compressed gas as determined by appropriate test methods or USEPA.
 - (d) It is an oxidizer.
- (2) A SW that exhibits the characteristic of ignitability has the USEPA HW# D001.

c. Characteristic of Corrosivity.

- (1) A SW exhibits the characteristic of corrosivity if a representative sample of the waste has either of the following properties:
 - (a) 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.
 - (b) It is a liquid and corrodes steel (SAE 1020) at a rate greater than 6.35 mm (0.250inch) 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 SW, Physical/Chemical Methods".

(2) A SW that exhibits the characteristic of corrosivity has the USEPA HW# D002.

d. Characteristic of Reactivity.

(1) A SW exhibits the characteristic of reactivity if a representative sample of the waste has any of the following properties:

(a) It is normally unstable and readily undergoes violent change without detonating.

(b) It reacts violently with water.

(c) It forms potentially explosive mixtures with water.

(d) 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.

(e) 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.

(f) It is capable of detonation or explosive reaction if it is subjected to a strong initiating source or if heated under confinement.

(g) It is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure.

(h) It is a forbidden explosive.

(2) A SW that exhibits the characteristic of toxicity has the USEPA HW# D003.

e. Toxicity Characteristic.

(1) A SW 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 B-1, "Maximum Concentration of Contaminants for the Toxicity Characteristic," or section B-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.

(2) A SW that exhibits the characteristic of toxicity has the USEPA HW# specified in table B-1 or section B-2, which corresponds to the toxic contaminant causing it to be hazardous.

B-2. Lists of Hazardous Wastes

a. General.

(1) A SW is a HW if it is listed in this section.

(2) The basis for listing the classes or types of wastes listed employed one or more of the following Hazard Codes:

- (a) Ignitable Waste (I).
- (b) Corrosive Waste (C).
- (c) Reactive Waste (R).
- (d) Toxicity Characteristic Waste (E).
- (e) Acute Hazardous Waste (H).
- (f) Toxic Waste (T).

(3) Each HW listed in section B-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.

b. HW from Non-Specific Sources. The SW in table B-3, "Listed Hazardous Wastes from Non-Specific Sources," are listed HW from non-specific sources. These HW are designated with an "F."

c. HW from Specific Sources. The SWs listed in table B-4, annotated "K" as the first character of the USEPA Hazardous Waste No. column, are listed HW from specific sources.

d. Discarded Commercial Chemical Products, Off-Speculation Species, Container Residues, and Spill Residue. 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.

(1) Any commercial chemical product, or manufacturing chemical intermediate having the generic name listed in table B-4, annotated "P" or "U" as the first character in the USEPA HW#.

(2) Any off-specification commercial chemical product or manufacturing chemical intermediate which, if it met specifications, would have the generic name listed in table B-4, annotated "P" or "U" as the first character in the USEPA HW#.

(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 B-4, 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 HW. 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.)

(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 B-4, 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 B-4, 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 B-4, annotated "P" or "U" as the first character in the USEPA HW#. Where a manufacturing process waste is deemed to be a HW because.)

(5) The commercial chemical products, manufacturing chemical intermediates or off-specification commercial chemical products or manufacturing chemical intermediates referred to in table B-4, annotated "P" as the first character in the USEPA HW# are hereby identified as acute HW (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 B-4, annotated "P" as the first character in the USEPA HW#.

(6) The commercial chemical products, manufacturing chemical intermediates, or off-specification commercial chemical products referred to in table B-4, subparagraphs B-2d(1) through B-2d(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 B-1
Maximum Concentration of Contaminants for the Toxicity Characteristic

Contaminant	CAS No. ¹	Regulatory Level (mg/L)
Arsenic	7440-38-2	1.5
Barium	7440-39-3	100.0
Cadmium	7440-43-2	0.3
Chromium (hexavalent)	7440-47-3	1.5
Copper	7440-50-8	3.0
Cyanide	57-12-5	1.0
2,4-D	94-75-7	10.0
Endrin	72-20-8	0.02
Lead	7439-92-1	3.0
Lindane	58-89-9	0.4
Mercury	7439-97-6	0.005
Methoxychlor	72-43-5	10.0
Phosphorous (organic)	7723-14-0	1.0
Selenium	7782-49-2	1.0
Silver	7440-22-4	5.0
Toxaphene	8001-35-2	0.5
2,4,5-TP (Silvex)	93-72-1	1.0

NOTE:

1. Chemical Abstracts Service number

Table B-2
Maximum Concentration of Contaminants for Non-Wastewater

Contaminant	CAS No. ¹	Regulatory Level (mg/kg)
Benzene	71-43-2	0.5
Carbon tetrachloride	56-23-5	0.5
Chlordane	57-74-9	0.03
Chlorobenzene	108-90-7	100.0
Chloroform	67-66-3	6.0
o-Cresol	95-48-7	200.0
m-Cresol	108-39-4	200.0
p-Cresol	106-44-5	200.0
Cresol		200.0
1,4-Dichlorobenzene	106-46-7	7.5
1,2-Dichloroethane	107-06-2	0.5
1,1-Dichloroethylene	75-35-4	0.7
2,4-Dinitrotoluene	121-14-2	0.13
Heptachlor (and its epoxide)	76-44-8	0.008
Hexachlorobenzene	118-74-1	0.13
Hexachlorobutadiene	87-68-3	0.5
Hexachloroethane	67-72-1	3.0
Methyl Ethyl Ketone	78-93-3	200.0
Nitrobenzene	98-95-3	2.0
Pentachlorophenol	87-86-5	100.0
Pyridine	110-86-1	5.0
Tetrachloroethylene	127-18-4	0.1
Trichloroethylene	79-01-6	0.3
2,4,5-Trichlorophenol	95-95-4	400.0
2,4,6-Trichlorophenol	88-06-2	2.0
Vinyl Chloride	75-01-4	0.2

NOTE:

1. Chemical Abstracts Service number

Table B-3
Listed Hazardous Wastes from Non-Specific Sources

US EPA 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 B-3**Listed Hazardous Wastes from Non-Specific Sources - Continued**

US EPA 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)
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 B-3**Listed Hazardous Wastes from Non-Specific Sources - Continued**

US EPA 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 HW (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 B-3**Listed Hazardous Wastes from Non-Specific Sources - Continued**

US EPA 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 B-4**List of Hazardous Materials/Substances/Waste (All notes appear at the end of the table.)**

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
(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
(2-Hydroxyethyl) ammonium mercapto- acetate	126-97-6	25			
(E)-N-[(6-Chloro-3-pyridyl)methyl]-N-cyano-N- methylacetamide	135410-20-7				
(Epoxyethyl)benzene	96-09-3	0.1			
[1,6-Bis(2,3-epoxypropoxy)naphthalene	27610-48-6	1			
[1,1'-Biphenyl]-4,4'-diol polymer with (chloromethyl) oxirane	71296-97-4				
[Methyl alcohol	67-56-1				
[Mixture of 3a,4,4a,5,8,8a,9,9a-Octahydro-4,9:5,8-dimethano-1H-benz[f]indene and 4,4a, 4b,5,8,8a,9,9a-Octahydro-1,4:5,8-dimethano-1H-fluorene (35184-08-8)	7158-25-0 35184-08-8	25			
1,1-Dichloro-1-nitroethane	594-72-9	1			
1,1'-minodi(octamethylene)diguanidinium tris(dodecylbenzenesulfonate)	99257-43-9				
1,2-Dibromo-3-chloropropane		0			
1,2-Dibromoethane	106-93-4	5			
1,2-Dibromoethane	106-93-4	50			
1,2-Dichloroethane	107-06-2	0.1			
1,3-Di-2-propenyl-2-(2-propenyloxy)benzene, epoxidized		1			
1,3-Dichloro-2-propanol	96-23-1				
1,3-Dichloropropene	542-75-6				
1,3-Dihydro-1,3-dioxo-2H-isoindole-2-hexaneperoic acid	128275-31-0	25			
1,4-Dichloro-3-buten-2-one	69711-44-0	1			
1-[2-[Ethyl[4-[4-[ethyl(2-pyridinoethyl)amino]-2-methylphenylazo]benzoylamino]phenylazo]-3-methylphenyl]amino]ethyl]pyridiniumdichloride	163831-67-2				

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
1 4-(2-Chloroethyl)morpholine hydrochloride	3647- 69-6				
1-Bromo-2-chloroeth-ane	107-04-0				
1-Chloro-2-nitro- benzene	88-73-3	25			
1-Chloro-2-nitropro- pane	2425-66-3	1			
1-Cyclohexyl-1 H-pyrrole-2,5-dione	1631-25-0	1			
1-Methylpropylamine	13952-84-6	10			
1-(o-Chlorophenyl)thiourea	5344821			P026	100
1,1,2,2-Tetrabromoethane	79-27-6				
1,1-(p-Tolylimino) dipropan-2-ol	38668-48-3	25			
1,1'-(1,3-Phenylenedi carbonyl) bis(methyl aziridine)	7652-64-4	1			
1,1,1-Trifluoro-N-[(trifluoromethyl) sulfonyl] methanesulfonamide lithium salt	90076-65-6	25			
1,1,1,2-Tetrachloroethane	630206			U208	100
1,1,1-Trichloroethane	71556			U226	1,000
1,1,2,2-Tetrachloroethane	79345			U209	100
1,1,2-Trichloroethane	79005			U227	100
1,10-(1,2-Phenylene)pyrene	193395			U137	100
1,1-Dichloroethane	75343			U076	1,000
1,1-Dichloroethylene	75354			U078	100
1,1-Dichloroethylene				D029	100
1,1-Dichloropropane	78999				
1,1-Dimethylhydrazine	57147		1,000	U098	10
1,1'-Methylenebis[4- isocyanatocyclohexane]	5124- 30-1				
1,2,3-Propanetnol, trinitrate- (R)	55630			P081	10
1,2,4,5-Tetrachlorobenzene	95943			U207	5,000
1,2,4-Trichlorobenzene	120821				100
1,2:3,4-Diepoxybutane (I,T)	1464535		500	U085	10
1,2:5,6-Dibenzanthracene	53703			U063	1
1,2-Benzanthracene	56553			U018	10

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
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
1,2-Benzenedicarboxylic acid, dioctyl ester	117840			U107	5,000
1,2-Benzenediol, 4-[1-hydroxy-2-(methylamino)ethyl]- (R) -	51434			P042	1,000
1,2-Benzisothiazol-3(2H)-one, 1,1-dioxide	81072			U202	100
1,2-Benzphenanthrene	218019			U050	100
1,2-Dibromo-3-chloropropane	96128	0.1		U066	1
1,2-Dichloroethane	107062			U077	100
1,2-Dichloroethane				D028	100
1,2-Dichloroethylene	156605			U079	1,000
1,2-Dichloropropane	78875			U083	1,000
1,2-Dimethylhydrazine	540738			U099	1
1,2-Diphenylhydrazine	122667			U109	10
1,2-Epoxybutane	106887				100
1,2-Ethanediamine, N,N-dimethyl-N'-2-pyridinyl-N'-(2-thienylmethyl)-	91805			U155	5,000
1,2-Oxathiolane, 2,2-dioxide	1120714			U193	10
1,2-Propylenimine	75558		10,000	P067	1
1,3,4-Metheno-2H-cyclobutal[cd]pentalen-2-one,1,1a,3,3a,4,5,5a,5b,6-decachlorooctahydro-	143500			U142	1
1,3,5-Trinitrobenzene (R,T)	99354			U234	10
1,3,5-Trioxane, 2,4,6-trimethyl-	123637			U182	1,000
1,3-Benzenedimethanamine N-(2-phenylethyl) derivs		25			
1,3-Benzenediol	108463			U201	5,000
1,3-Benzodioxole, 5-(1-propenyl)-	120581			U141	100
1,3-Benzodioxole, 5-(2-propenyl)-	94597			U203	100

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
1,3-Benzodioxole, 5-propyl-	94586			U090	10
1,3-Butadiene	106990				10
1,3-Butadiene, 1,1,2,3,4,4-hexachloro-	87683			U128	1
1,3-Cyclopentadiene, 1,2,3,4,5,5- hexachloro-	77474			U130	10
1,3-Dichloropropane	142289				
1,3-Dichloropropene	542756			U084	100
1,3-Isobenzofurandione	85449			U190	5,000
1,3-Pentadiene (I)	504609			U186	100
1,3-Propane sultone	1120714			U193	10
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
1,4-benzoquinone	106-51-4	1			
1,4-Dichloro-2-butene (I,T)	764410			U074	1
1,4-Dichlorobenzene				D027	100
1,4-Diethylenedioxide	123911			U108	100
1,4-Dioxane	123911			U108	100
1,4-Naphthalenedione	130154			U166	5,000
1,4-Naphthoquinone	130154			U166	5,000
13-cis-Retinoic acid	4759-48-2	0.1			
1-Acetyl-2-thiourea	591082			P002	1
1-Butanamine, N-butyl-N-nitroso-	924163			U172	10
1-Butanol	71363			U031	5,000
1-Chloro-2,3-epoxypropane	106898			U041	100
1H-1,2,4-Triazol-3-amine	61825			U011	10
1-Methylbutadiene (I)	504609			U186	100
1-Naphthalenamine	134327			U167	100
1-Propanamine (I,T)	107108			U194	5,000
1-Propanamine, N-nitroso-N-propyl-	621647			U111	10
1-Propanamine, N-propyl-	142847			U110	5,000

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
1-Propanol, 2,3-dibromo-, phosphate (3:1)	126727			U235	10
1-Propanol, 2-methyl- (I,T)	78831			U140	5,000
1-Propene, 1,1,2,3,3,3-hexachloro-	1888717			U243	1,000
1-Propene, 1,3-dichloro-	542756			U084	100
2,2,4-Trimethylpentane	540841				1,000
2,2,6,6,-Tetramethyl-4-aminopiperidine reaction product with mixture of dodecyl acrylate and tetradecyl acrylate					
2,2'-[Methylenebis[(2,6-dimethyl-4, 1-phenylene) oxymethylene]] bisoxirane	93705-66-9	25			
2,2'-Thiodiethanethiol	3570-55-6	1			
2,2'-Bioxirane	1464535			U085	10
2,2-Dichloropropionic acid	75990				5,000
2,2'-Dithiobis(benzothiazole)	120-78-5				
2,3,4,6-Tetrachlorophenol	58902			U212	10
2,3,4-Trichlorophenol	15950660				
2,3,5-Trichlorophenol	933788				
2,3,6-Trichlorophenol	933755				
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	1746016				1
2,3-Dibromopropanenitrile	4554-16-9	1			
2,3-Dichloropropene	78886				
2,3-Epoxypropyltrimethylammonium chloride	3033-77-0	0.1			
2,4-(1H,3H)-Pyrimidinedione,5-[bis(2-chloroethyl) amino]-	66751			U237	10
2,4,5 Trichlorophenol				D041	10
2,4,5-T	93765	1		U232	1,000
2,4,5-T acid	93765			U232	1,000
2,4,5-T amines	1319728				5,000
2,4,5-T amines	3813147				5,000
2,4,5-T amines	6369966				5,000
2,4,5-T amines	6369977				5,000

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
2,4,5-T amines	2008460				5,000
2,4,5-T esters	1928478				1,000
2,4,5-T esters	2545597				1,000
2,4,5-T esters	25168154				1,000
2,4,5-T esters	61792072				1,000
2,4,5-T esters	93798				1,000
2,4,5-T salts	13560991				1,000
2,4,5-TP				D017	100
2,4,5-TP acid	93721			U233	100
2,4,5-TP acid esters	32534955				100
2,4,5-Trichlorophenol	95954			U230	10
2,4,6-Trichlorophenol	88062			U231	10
2,4-D	94-75-7				
2,4-D (Dichlorophenoxyacetic acid)				D016	100
2,4-D Acid	94757			U240	100
2,4-D ester	94791				100
2,4-D ester	94804				100
2,4-D ester	1320189				100
2,4-D ester	1928387				100
2,4-D ester	1928616				100
2,4-D ester	1929733				100
2,4-D ester	2971382				100
2,4-D ester	25168267				100
2,4-D ester	53467111				100
2,4-D Ester	94111				100
2,4-D, salts & esters (2,4-Dichlorophenoxyacetic Acid)	94757			U240	100
2,4-Dichloro-6-nitrophenol	609-89-2	1			
2,4-Dichlorophenol	120832			U081	100
2,4-Dimethylphenol	105679			U101	100

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
2,4-Dinitroaniline	97-02-9				
2,4-Dinitrophenol	51285			P048	10
2,4-Dinitrotoluene	121142			U105	10
2,4-Dinitrotoluene				D030	10
2,5-Cyclohexadiene-1,4-dione	106514			U197	10
2,5-Dinitrophenol	329715				
2,5-Di-tert-butyl-1,4-phenylenebis (oxymethylene) bisoxirane	64777-22-6	25			
2,5-Furandione	108316			U147	5,000
2,6-Dichlorophenol	87650			U082	100
2,6-Dinitrophenol	573568				
2,6-Dinitrotoluene	606202			U106	100
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
2,7:3,6-Dimethanonaphth [2,3b] 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-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
2-Acetylaminofluorene	53963			U005	1
2-Bromoethanol	540-51-2				
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
2-Butenal	4170303		1,000	U053	100
2-Butenal	123739			U053	100
2-Butene, 1,4-dichloro- (I,T)	764410			U074	1

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
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
2-Butyne-1 ,4-diol	110-65-6				
2-Chloro-5-(chloromethyl) pyridine	70258-18-3	1			
2-Chlorobenzenamine	95-51-2				
2-Chloroethanol	107-07-3	1			
2-Chloroethyl vinyl ether	110758			U042	1,000
2-Chloroethyldiethyl ammonium chloride	869-24-9	25			
2-Chloronaphthalene	91587			U047	5,000
2-Chloropyridine	109-09-1				
2-Cyclohexanone	131895			P034	100
2-Ethylhexanoic acid cobalt (2+) salt		25			
2-Furancarboxaldehyde (I)	98011			U125	5,000
2-Furanmethanol	98-00-0	25			
2H-1,3,2-Oxazaphosphorin-2-amine, N,N bis (2-chloroethyl)tetrahydro-, 2-oxide	50180			U058	10
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
2-Hydrazinoethanol	109-84-2	1			
2-Hydroxy-4,4'-dichlorodiphenyl ether	3380-30-1	25			
2-Imidazolidinethione	96457			U116	10
2-Methyl-2-propenoylchloride	920-46-7	1			
2-Methylactonitrile	75865			P069	10
2-Methylpropanenitrile	78-82-0				
2-Naphthalenamine (beta-Naphthylamine)	91598			U168	1
2-Naphthylamine	91-59-8	0			
2-Naphthylamine	91-59-8	0.1			
2-n-Butyl-benzo[d]isothiazol-3-one	4299-07-4				
2-Nitropropane (I,T)	79469			U171	10

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
2-Picoline	109068			U191	5,000
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-Prepenoic acid, ethyl ester (I)	140885			U113	1,000
2-Propanone (I)	67641			U002	5,000
2-Propanone, 1-bromo-	598312			P017	1,000
2-Propen-1-ol	107186			P005	100
2-Propenal	107028			P003	1
2-Propenamide	79061			U007	5,000
2-Propenamide homopolymer reaction products with chloromethane, di- methylamine and formaldehyde	70750-20-8	1			
2-Propenenitrile	107131			U009	100
2-Propenenitrile, 2-methyl- (I,T)	126987			U152	1,000
2-Propenoic acid (I)	79107			U008	5,000
2-Propyn-1-ol	107197			P102	1,000
2-Thienylacetonitrile	20893-30-5	25			
2-Vinylpyridine	100-69-6				
3(2H)-Isoxazolone, 5-(aminomethyl)-	2763964			P007	1,000
3,3,4,4-Tetrachlorotetrahydrothiophene 1,1-dioxide	3737-41-5	25			
3,3'-Dihydroxybenzidine		25			
3,3'-Dichlorobenzidine		1			
3,3-Diacetoxy-1-pro- pene	869-29-4	1			
3,3'-Dichlorobenzidine	91941			U073	1
3,3'-Dimethoxybenzidine	119904			U091	10
3,3'-Dimethylbenzidine	119937			U095	10
3,4,5-Trichlorophenol	609198				
3,4-Benzopyrene	50328			U022	1
3,4-Dinitrotoluene	610399				
3,6-Pyridazinedione, 1,2-dihydro-	123331			U148	5,000

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
3-[(Prop-1-en-2-yl) phenyl]prop-2-yl isocyanate	2094-99-7	1			
3-Chloropropionitrile	542767			P027	1,000
3-Dodecyl-1 -(2,2,6,6- tetramethyl-4-piperidinyl)- 2,5-pyrrolidinedione	79720-19-7	10			
3-Ethoxypropylamine	6291-85-6				
3-Methoxybutyl chloroformate	75032-87-0	25			
3-Methylcholanthrene	56495			U157	10
4(1H)-Pyrimidinone, 2,3-dihydro-6-methyl-2-thioxo-	56042			U164	10
4,4'""-(1 -Methylethylidene) bisphenol polymer with (chloromethyl) oxirane	25068-38-6				
4,4'""-Bisphenol A	80-05-7				
4,4'-Carbonylbis-1 ,2-benzenedicarboxylic acid compd. With 2-methyl-1 H-imidazole(1:2)	172140-94-2	25			
4,4'-Methylenebisv[3-methylbenzenamine]		25			
4,4'-Methylenedianiline	101779				10
4,4'-Dipyridyl	553-26-4				
4,4'-Methylenebis(2-chloroaniline)	101144	0.1		U158	10
4,6-Dinitro-o-cresol and salts	534521		10/10,000	P047	10
4,7-Methano-1H-indene, 1,2,4,5,6,7,8,8 octachloro-2,3,3a,4,7,7a-hexahydro-	57749			U036	1
4,7-Methano-1H-indene, 1,4,5,6,7,8,8 heptachloro-3a,4,7,7a-tetrahydro-	76448			P059	1
4-[α-[4-(Dimethylamino)phenyl]benzylidene] cyclohexa-2,5-dien-1 -ylidene] dimethyl ammonium chloride	569-64-2	25			
4-Aminobiphenyl	92671				1
4-Aminobiphenyl	92-67-1	0			
4-Aminobiphenyl	92-67-1	0.1			
4-Aminobiphenyl hydrochloride	2113-61-3	0.1			
4-Aminopyridine	504245			P008	1,000
4-Bromo-2-(4-chlorophenyl)-1-(ethoxymethyl)-5-(trifluoromethyl)pyrrole-3-carbonitrile	122453-73-0				

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
4-Bromophenyl phenyl ether	101553			U030	100
4-Chloro-3-hydroxybutyronitrile		25			
4-Chloro-o-toluidine, hydrochloride	3165933			U049	100
4-Chlorophenyl phenyl ether	7005723				5,000
4-Mercaptomethyl- 3,6-dithia-1,8-octane dithiol	131538-00-6	1			
4-Mercaptophenyl methane sulfonate	62262-84-4				
4-Methyl-2-pentanone (I)	108101			U161	5,000
4-Nitrobiphenyl	92933				10
4-Nitrotoluene	99-99-0	25			
4-Pyridinamine	504245			P008	1,000
4-tert-Octylphenol	140 - 66-9	25			
4-vinylpyridine	100-43-6				
5-(Aminomethyl)-3-isoxazolol	2763964			P007	1,000
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
5H-1,2-Oxathiole, 2,2 dioxide		25			
5-Nitro-o-toluidine	99558			U181	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
7,12-Dimethylbenz[a]anthracene	57976			U094	1
7-Oxabicyclo[2,2,1]heptane-2,3-dicarboxylic acid	145733			P088	1,000
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, 2-fluoro-	640197			P057	100
Acetamide, N-(4-ethoxyphenyl)-	62442			U187	100

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Acetamide, N-(aminothioxomethyl)-	591082			P002	1,000
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, (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 acid, lead(2+) salt	301042			U144	10
Acetic acid, thallium(1+) salt	563688			U214	1000
Acetic anhydride	108247				5,000
Acetone (I)	67641			U002	5,000
Acetone cyanohydrin	75865		1,000	P069	10
Acetone thiosemicarbazone	1752-30-3	1			
Acetone thiosemicarbazide	1752303		1,000/10,000		1
Acetonitrile (I,T)	75058			U003	5,000
Acetophenone	98862			U004	5,000
Acetyl bromide	506967				5,000
Acetyl chloride (C,R,T)	75365			U006	5,000
Acrinathrin	101007-06-1	25			
Acrolein	107028		500	P003	1
Acrolein	107-02-8				
Acrylamide	79061	0.1	1,000/10,000	U007	5,000
Acrylic acid (I)	79107			U008	5,000
Acrylonitrile	107131	0.1	10,000	U009	100
Acrylyl chloride	814686		100		1
ACTP	79456-26-1				
Adipic acid	124049				5,000
Adiponitrile	111693		1,000		1
Alanycarb	83130-01-2				

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Aldicarb	116063	1	100/10,000	P070	1
Aldoxycarb	1646-88-4	1			
Aldrin	309002	0.1	500/10,000	P004	1
Alkyl aniline					
Alloy of potassium and sodium	11135-81-2				
Allyl alcohol	107186		1,000	P005	100
Allyl alcohol	107-18-6				
Allyl chloride	107051				1,000
Allylamine	107119		500		1
Allylcarb	6392-46-7	1			
alpha, alpha-Dimethylphenethylamine	122098			P046	5,000
alpha,alpha- Dimethylbenzylhydroperoxide(R)	80159			U096	10
alpha-BHC	319846				10
alpha-Endosulfan	959988				1
alpha-Naphthylamine	134327			U167	100
alpha-Naphthylthiourea	86884			P072	100
Aluminum phosphide (R,T)	20859738	1	500	P006	100
Aluminum sulfate	10043013				5,000
Amidithioate	54381-26-9	1			
Amine,tert-alkyl(C=1 2-14), 1 -amino-9, 1 0-di hydro- 9,1 0-dioxo-4-(2,4,6- trimethylanilino)- anthracene-2- sulfonic acid					
Aminocarb	2032-59-9	1			
Aminopterin	54626		500/10,000		1
Amiton	78535	1	500		1
Amiton oxalate	3734972		100/10,000		1
Amitrole	61825	0.1		U011	10
Ammonia	7664417	10	500		100
Ammonium acetate	631618				5,000
Ammonium benzoate	1863634				5,000

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Ammonium bicarbonate	1066337				5,000
Ammonium bichromate	7789095				10
Ammonium bifluoride	1341497	1			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	5972736				5,000
Ammonium oxalate	14258492				5,000
Ammonium oxalate	6009707				5,000
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	3164292				5,000
Ammonium tartrate	14307438				5,000
Ammonium thiocyanate	1762954				5,000
Ammonium vanadate	7803556			P119	1,000
Amphetamine	300629		1,000		1
Amyl acetate	628637				5,000
Anabasin	494-52-0	1			
Aniline (I,T)	62533		1,000	U012	5,000
Aniline, 2,4,6- trimethyl	88051		500		1

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Anthracene	120127				5,000
Antimony compounds		1			
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
Antimony ⁺⁺	7440360				5,000
Antimycin A	1397940		1,000/10,000		1
Antu	86-88-4	1			
ANTU (Thiourea 1-Naphthalenyl)	86884		500/10,000		100
Aphidan	5827-05-4	5			
Apholate	52-46-0	1			
Aphoxide	545-55-1	1			
Argentate(1-), bis(cyano-C)-, potassium	506616			P099	1
Aroclor 1016	12674112				1
Aroclor 1016	12674112				1
Aroclor 1221	11104282				1
Aroclor 1221	11104282				1
Aroclor 1232	11141165				1
Aroclor 1232	11141165				1
Aroclor 1242	53469219				1
Aroclor 1242	53469219				1
Aroclor 1248	12672296				1
Aroclor 1248	12672296				1
Aroclor 1254	11097691				1
Aroclor 1254	11097691				1

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Aroclor 1260	11096825				1
Aroclor 1260	11096825				1
Aroclors	1336363				1
Arsenic				D004	1
Arsenic	7440-38-2	0.1			
Arsenic acid H ₃ AsO ₄	7778394			P010	1
Arsenic acid H ₃ AsO ₄	1327522			P010	1
Arsenic disulfide	1303328				1
Arsenic oxide As ₂ O ₃	1327533			P012	1
Arsenic oxide As ₂ O ₅	1303282			P011	1
Arsenic pentoxide	1303282	0.1	100/10,000	P011	1
Arsenic trichloride	7784341				1
Arsenic trioxide	1327533			P012	1
Arsenic trisulfide	1303339				1
Arsenic ⁺⁺	7440382				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
Azindine, 2-methyl-	75558			P067	1
Azinphos-ethyl	2642719		100/10,000		100
Azinphos-methyl	86500	1	10/10,000		1
Aziridine	151564			P054	1

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Azirino[2',3',3,4]pyrrolo[1,2-a]indole-4, 7-dione,6-amino-8-[[aminocarbonyloxy methyl]-1,1a,2,8,8a,8b-hexahydro-8a- methoxy-5-methyl-, [1aS-(1a-alpha, 8-beta, 8a-alpha, 8b-alpha)]-	50077			U010	10
Azocyclotin	41083-11-8	1			
Barium				D005	1,000
Barium cyanide	542621			P013	10
Bendiocarb	22781-23-3	1			
Benfluralin	1861-40-1				
Benfuracarb	82560-54-1	1			
Bensulide	741 -58-2				
Benz[a]anthracene	56553			U018	10
Benz[a]anthracene, 7,12-dimethyl-	57976			U094	1
Benz[c]acridine	225514			U016	100
Benz[j]aceanthrylene, 1,2-dihydro-3-methyl-	56495			U157	10
Benzal chloride	98873		500	U017	5,000
Benzamide, 3,5-dichloro-N-(1,1-dimethyl-2-propynyl)-	23950585			U192	5,000
Benzenamine (I,T)	62533			U012	5,000
Benzenamine, 2-methyl-	95534			U328	100
Benzenamine, 2-methyl-, hydrochloride	636215			U222	100
Benzenamine, 2-methyl-5-nitro-	99558			U181	100
Benzenamine, 3-(Trifluoromethyl)	98168		500		1
Benzenamine, 4,4'-carbonimidoylbis (N,N-dimethyl-	492808			U014	100
Benzenamine, 4,4'-methylenebis(2-chloro-	101144			U158	10
Benzenamine, 4-chloro-	106478			P024	1,000
Benzenamine, 4-chloro-2-methyl-, hydrochloride	3165933			U049	100
Benzenamine, 4-methyl-	106490			U353	100
Benzenamine, 4-nitro-	100016			P077	5,000
Benzenamine, N,N-dimethyl-4- (phenylazo-)	60117			U093	10

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Benzene				D018	10
Benzene (I,T)	71432			U109	10
Benzene, (trichloromethyl)-	98077			U023	10
Benzene, 1-(Chloromethyl)-4-Nitro-	100141		500/10,000		1
Benzene, 1,1'-(2,2,2-trichloroethylidene) bis[4-methoxy-	72435			U247	1
Benzene, 1,1'-(2,2,2-tri- chloroethylidene) bis[4-chloro-	50293			U061	1
Benzene, 1,1'-(2,2-dichloroethylidene) bis[4-chloro-	72548			U060	1
Benzene, 1,2,4,5-tetrachloro-	95943			U207	5,000
Benzene, 1,2-dichloro-	95501			U070	100
Benzene, 1,3,5-trinitro-	99354			U234	10
Benzene, 1,3-dichloro-	541731			U071	100
Benzene, 1,3-diisocyanotomethyl- (R,T)	91087		100	U223	100
Benzene, 1,3-diisocyanotomethyl- (R,T)	264716254		100	U223	100
Benzene, 1,3-diisocyanotomethyl- (R,T)	584849			U223	100
Benzene, 1,4-dichloro-	106467			U072	100
Benzene, 1-bromo-4-phenoxy-	101553			U030	100
Benzene, 1-methyl-2,4-dinitro-	121142			U105	10
Benzene, 1-methylethyl- (I)	98828			U055	5,000
Benzene, 2-methyl-1,3-dinitro-	606202			U106	100
Benzene, chloro-	108907			U037	100
Benzene, chloromethyl-	100447			P028	100
Benzene, dichloromethyl-	98873			U017	5,000
Benzene, dimethyl (I,T)	1330207			U239	100
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, nitro-	98953			U169	1,000

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Benzene, pentachloro-	608935			U183	10
Benzene, pentachloronitro-	82688			U185	100
Benzeneacetic acid, 4-chloro-alpha-(4-chlorophenyl)-alpha-hydroxy-, ethyl ester	510156			U038	10
Benzeneacetonitrile	140-29-4				
Benzeneearsonic Acid	98055		10/10,000		1
Benzenebutanoic acid, 4-[bis(2-chloroethyl)amino]-	305033			U035	10
Benzenediamin, ar-methyl-	95807			U221	10
Benzenediamin, ar-methyl-	496720			U221	10
Benzenediamin, ar-methyl-	823405			U221	10
Benzenediamin, ar-methyl-	25376458			U221	10
Benzeneethanamine, alpha, alpha- dimethyl-	122098			P046	5,000
Benzenesulfonic acid chloride (C,R)	98099			U020	100
Benzenesulfonyl chloride	98099			U020	100
Benzenethiol	108985			P014	100
Benzidine	92875	0.1		U021	1
Benzimidazole, 4,5-Dichloro-2-(Trifluoromethyl)-	3615212		500/10,000		1
Benzo[a]anthracene	56553			U018	10
Benzo[a]pyrene	50328			U022	1
Benzo[b]fluoranthene	205992				1
Benzo[ghi]perylene	191242				5,000
Benzo[j,k]fluorene	206440			U120	100
Benzo[k]fluoranthene	207089				5,000
Benzo[rs]t]pentaphene	189559			U064	10
Benzoic acid	65850				5,000
Benzonitrile	100470				5,000
Benzophenone hydrazone		25			
Benzotrichloride (C,R,T)	98077		500	U023	10
Benzoximate	291 04-30-1	1			

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Benzoyl chloride	98884				1,000
Benzyl chloride	100447		500	P028	100
Benzyl cyanide	140294		500		1
Benzyltrimethylocta-decylammonium chloride	122-19-0	25			
Beryllium chloride	7787475				1
Beryllium fluoride	7787497				1
Beryllium nitrate	7787555				1
Beryllium nitrate	13597994				1
Beryllium ⁺⁺	7440417			P015	10
beta-BHC	319857				1
beta-Chloronaphthalene	91587			U047	5,000
beta-Endosulfan	33213659				1
beta-Naphthylamine (2-Naphthalenamine)	91598			U168	1
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
Binapacryl	485-31-4	0.1			
Biphenyl	92524				100
Bis(2-chloroethoxy)methane	111911			U024	1,000
Bis(2-chloroethyl)ether	111444	0.1		U025	10
Bis(2-ethylhexyl) phthalate		25			
Bis(2-ethylhexyl)amine	106-20-7				
Bis(2-ethylhexyl)phthalate	117817			U028	100
Bis(chloromethyl) ketone	534076		10/10,000		1
Bis(chloromethyl)ether	542-88-1	0.1			
Bisphenol A bis(diphenyl phosphate)	5945-33-5				
Bisthiosemi	39603-48-0	2			
Bitoscanate	4044659		500/10,000		1
Blasticidin-S	2079-00-7	1			
Bomyl	122-10-1	1			

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Boron trichloride	10294345		500		1
Boron trifluoride	7637072		500		1
Boron trifluoride compound with methyl ether (1:1)	353424		1,000		1
Brodifacoum	56073-10-0	1			
Bromadiolone	28772567	1	100/10,000		1
Bromethalin	63333-35-7	1			
Bromine	7726956		500		1
Bromo-2-propanone	598-31-2	1			
Bromoacetone	598312			P017	1,000
Bromoform	75252			U225	100
Bromophos-ethyl	4824-78-6	1			
Bronopol	52-51-7	1			
Brucine	357573			P018	100
Bufencarb	8065-36-9				
Butocarboxim	34681-10-2	1			
Butyl acetate	123864				5,000
Butyl benzyl phthalate	85687				100
Butylamine	109739				1,000
Butylbenzyl phthalate		25			
Butylbenzyl phthalate	85-68-7				
Butyltriphenylphos phonium chloride	13371-17-0				
Butyric acid	107926				5,000
Cacodylic acid	75605			U136	1
Cadmium				D006	10
Cadmium acetate	543908				10
Cadmium bromide	7789426				10
Cadmium chloride	10108642				10
Cadmium compounds					
Cadmium oxide	1306190		100/10,000		1

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Cadmium stearate	2223930		1,000/10,000		1
Cadmium ⁺⁺ (2+)	7440439				10
Cadusafos	95465-99-9				
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
Campechlor	8001352	1	500/10,000		1
Camphene, octachloro-	8001352			P123	1
Cantharidin	56257		100/10,000		1
Captafol	2425-06-1	0.1			
Captan	133062	0.1			10
Carbachol chloride	51832		500/10,000		1
Carbamic acid, ethyl ester	51796			U238	100
Carbamic acid, Methyl-, 0-(((2,4-Dimethyl-1,3-Dithiolan-2-yl)Methylene)Amino)-	26419738		100/10,000		1
Carbamic acid, methylnitroso-, ethyl ester	615532			U178	1
Carbamic chloride, dimethyl-	79447			U097	1
Carbamodithioic acid, 1,2-ethaneiybis, salts & esters	111546			U114	5,000
Carbamothioic acid, bis(1-methylethyl)-,S-(2,3-dichloro-2-propenyl) ester	2303164			U062	100
Carbanolate	67 1-04-5	1			
Carbaryl	63252	5			100
Carbofuran	1563662	1	10/10,000		10
Carbon disulfide	75150	0.1	10,000	P022	100
Carbon oxyfluoride (R,T)	353504			U033	1,000

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Carbon tetrachloride	56235	1		U211	10
Carbon Tetrachloride	56-23-5	1		D019	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	1	500		1
Carbosulfan	55285-14-8	1			
Carguophos	106870-78-4	1			
Cartap	15263-53-3	2			
Catechol	120809				100
Cellocidin	543-21-5	1			
Cerezin	2346-99-8	1			
Chinomethionat	2439-01-2				
Chloral	75876			U034	5,000
Chlorambem	133904				100
Chlorambucil	305033			U035	10
Chlordan	57-74-9	1			
Chlordane	57749		1,000	U036	1
Chlordane				D020	1
Chlordane, alpha & gamma isomers	57749			U036	1
Chlordane, technical	57749			U036	1
Chlordimeform	6164-98-3	3			
Chlorfenvinphos	470906	1	500		1
Chloric acid, salts		1			
Chlorinated champhene (Campheclor)	8001352				1
Chlorine	7782505		100		10
Chlormephos	24934916	1	500		1

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Chlormequat chloride	999815		100/10,000		1
Chlornaphazine	494031			U026	100
Chloroacetic acid	79118		100/10,000		100
Chloroacetophenone	532274				100
Chlorobenzene	108907			U037	100
Chlorobenzene				D021	100
Chlorobenzilate	510156	1		U038	10
Chlorodibromomethane	124481				100
Chloroethane	75003				100
Chloroethanol	107073		500		1
Chloroethyl chlorofomate	627112		1,000		1
Chloroform	67663		10,000	U044	10
Chloroform				D022	10
Chlorohydrin	96-24-2	1			
Chloromethane	74873			U045	100
Chloromethyl ether	542881		100	P016	1
Chloromethyl methyl ether	107302		100	U046	10
Chlorophacinone	3691358	0.025	100/10,000		1
Chloropicrin	76-06-2	1			
Chloroprene	126998				100
Chloropromurite	5836-73-7	1			
Chlorosulfonic acid	7790945				1,000
Chlorothalonil	1897-45-6	0.1			
Chloroxuron	1982474		500/10,000		1
Chlorphonium chloride	115-78-6	1			
Chlorpyrifos	2921882	1			1
Chlorthiophos	21923239	1	500		1
Choroacetaldehyde	107200			P023	1,000
Chromic acetate	1066304				1,000

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Chromic acid	7738945				10
Chromic acid	11115745				10
Chromic acid H ₂ CrO ₄ , calcium salt	13765190			U032	10
Chromic acid, salts		0.1			
Chromic anhydride	1333-82-0	0.1			
Chromic chloride (Chromium chloride)	10025737		1/10,000		1
Chromic sulfate	10101538				1,000
Chromium				D007	10
Chromium ⁺⁺	7440473				5,000
Chromous chloride	10049055				1,000
Chrysene	218019			U050	100
Chrysotile	12001-29-5	1			
Cloethocarb	51487-69-5	1			
Cobalt carbonyl	10210681		10/10,000		1
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
Cobaltous formate	544183				1,000
Cobaltous sulfamate	14017415				1,000
Coke Oven Emissions	NA				1
Colchicine	64868		10/10,000		1
Copper cyanide	544923			P029	10
Copper ⁺⁺	7440508				5,000
Coumachlor	81 -82-3	1			
Coumafuryl	1 17-52-2	1			
Coumaphos	56724		100/10,000		10
Coumatetralyl	5836293	1	500/10,000		1
Coumithoate	572-48-5	1			
Creosote	8001589			U051	1

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Cresol	1319-77-3	5		D026	100
Cresol(s) (Phenol, Methyl)	1319773			U052	100
Cresylic acid	1319773			U052	100
Crimidine	535897		100/10,000		1
Crimidine	535-89-7	1			
Crocidolite; Amosite; Anthophyllite asbestos; Actinolite asbestos; Tremolite asbestos	12001-28-4 12172-73-5 77536-67-5 77536-66-4 77536-68-6	1			
Crotonaldehyde	4170303		1,000	U053	100
Crotonaldehyde	123739		1,000	U053	100
Crotonaldehyde	4170-30-3	1			
Crotyphos	7700-17-6	1			
Cryolite	15096-52-3	1			
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
Cupric sulfate, ammoniated	10380297				100
Cupric tartrate	815827				100
Cyanamide	420-04-2				
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

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Cyanogen iodide (Iodine cyanide)	506785		1,000/10,000		1
Cyanophos	2636262		1,000		1
Cyanuric fluoride	675149		100		1
Cyclohexane (l)	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 (l)	108941			U057	5,000
Cycloheximide	66819	0.2	100/10,000		1
Cyclohexylamine	108918		10,000		1
Cyclonite	121-82-4	1			
Cyclophosphamide	50180			U058	10
Cyfluthrin	68359-37-5	0.5			
Cyhalothrin	68085-85-8				
Cyhexatin	13121-70-5	5			
Cyprodinil	121552-61-2				
Cyprofuram	69581-33-5	1			
Cythioate	115-93-5	1			
Daunomycin	20830813			U059	10
DDD, 4,4'DDD	72548			U060	1
DDE, 4,4'DDE	72559				1
DDT	50-29-3	1			
DDT, 4,4'DDT	50293			U061	1
Decamethrin	52918-63-5				
Decaborane (14)	17702419		500/10,000		1
DEHP (Diethylhexyl phthalate)	117817			U028	100
delta-BHC	319868				1
Demeton	8065483	1	500		1
Demeton-methyl	8022-00-2	1			
Demeton-S-Methyl	919868		500		1
Demeton-S-methylsulfone	17040-19-6	1			

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
D-Glucose, 2-deoxy-2- [[[methylnitrosoamino)-carbonyl]amino]-	18883664			U206	1
Diafenthuron	80060-09-9				
Dialifor	10311849	1	100/10,000		1
Diallate	2303164			U062	100
Diamidafos	1754-58-1	1			
Diazinon	333415	1			1
Diazomethane	334883				100
Dibenz[a,h]anthracene	53703			U063	1
Dibenz[a,i]pyrene	189559			U064	10
Dibenzo[a,h]anthracene	53703			U063	1
Dibenzofuran	132649				100
Diborane	19287457		100		1
Dibromoethane	106934			U067	1
Dibutyl phthalate	84742			U069	10
Dibutyl phthalate		25			
Dicamba	1918009				1,000
Dichlobenil	1194656				100
Dichlofenthion	97-1 7-6	3			
Dichlone	117806				1
Dichloro(phenyl) phosphine	644-97-3	25			
Dichloroacetic acid	79-43-6				
Dichlorobenzene	25321226				100
Dichlorobromomethane	75274				5,000
Dichlorodifluoromethane	75718			U075	5,000
Dichloroethyl ether	11444		10,000	U025	10
Dichloroisopropyl ether	108601			U027	1,000
Dichloromethoxy ethane	111911			U024	1,000
Dichloromethyl ether	542881			P016	10
Dichloromethylphenylsilane	149746		1,000		1

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Dichlorophenylarsine	696286			P036	1
Dichloropropane	26638197				1,000
Dichloropropane-Dichloropropene (mixture)	8003198				100
Dichloropropene	26952238				100
Dichlorvos	62737	0.1	1,000		10
Dichromeic acid	13530-68-2	0.1			
Dicofol	115322				10
Dicrotophos	141662	1	100		1
Dieldrin	60571	1		P037	1
Diethanolamine	111422				100
Diethyl chlorophosphate	814493		500		1
Diethyl phthalate	84662			U088	1,000
Diethyl sulfate	64675				10
Diethylamine	109897				1,000
Diethylarsine	692422			P038	1
Diethylcarbmazine citrate	1642542		100/10,000		1
Diethylhexyl phthalate	117817			U028	100
Diethyl-p-nitrophenyl phosphate	311455			P041	100
Diethylstilbestrol	56531			U089	1
Difenacoum	560 73-07-5	1			
Difenoconazole	119446-68-3				
Digitoxin	71636		100/10,000		1
Diglycidyl ether	2238075		1,000		1
Digoxin	20830755		10/10,000		1
Dihydrosafrole	94586			U090	10
Diisodecyl phthalate		25			
Diisononyl phthalate		25			
Diisopropyfluorophosphate	55914			P043	100
Diisopropyl xanthogen polysulphide	137398-54-0	25			

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
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
Dimefox	115264	1	500		1
Dimetan	122-15-6	1			
Dimethoate	60515	1		P044	10
Dimethoate	60515	1	500/10,000		10
Dimethyl Phosphorochloridothioate	2524030		500		1
Dimethyl phthalate	131113			U102	5,000
Dimethyl sulfate	77781		500		100
Dimethyl sulfate	77781			U103	100
Dimethylamine (l)	124403			U092	1,000
Dimethylcarbamoyl chloride	79447			U097	1
Dimethyldichlorosilane	75785		500		1
Dimethylformamide	68122				100
Dimethyl-p-phenylenediamine	99989		10/10,000		1
Dimethylvinphos	2274-67-1	1			
Dimetilan	644644	1	500/10,000		1
Di-n-butyl phthalate	84742			U069	10
Di-n-butylamine	111-92-2				
Dinex	131-89-5	0.5			
Dinitrobenzene (mixed)	25154545				100
Dinitrophenol	25550587				10
Dinitrotoluene	25321146				10
Dinobuton	973-21-7	1			
Dinocap	39300-45-3	1			
Di-n-octyl phthalate	117840			U107	5,000
Dinoseb	88857	1	100/10,000	P020	1,000
Dinoseb acetate	281 3-95-8	1			

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Dinoterb	1420071	1	500/10,000		1
Di-n-propylnitrosamine	621647			U111	10
Diocetyl phthalate		25			
Dioxabenzofos	3811-49-2	1			
Dioxacarb	6988-21-2	1			
Dioxathion	78342	1	500		1
Diphacinone	82666	1	10/10,000		1
Diphenyl iodonium salt with 7,7-dimethyl-2-oxobicyclo[2.2.1]heptane-1-metane sulfonic acid (1:1)		1			
Diphenylmethane 4,4'-diisocyanate	101-68-8				
Diphosphoramidate, octamethyl-	152169		100	P085	100
Diphosphoric acid, tetraethyl ester	107493			P111	10
Dipropylamine	142847			U110	5,000
Diquat	2764729				1,000
Diquat	85007				1,000
Diquat dibromide	85-00-7	1			
Disodium[3-hydroxy-4-[(2-hydroxy-1 - naphthyl) azo]-1-naphthalenesulfonato(3-)] [1 -[[2-hydroxy-5-[(r-methoxyphenyl) azo] phenyl] azo]-2-naphtholato(2-)] chromate(2-)	30785-74-1				
Disulfoton	298044		500	P039	1
Disulfoton	298-04-4	1			
Disulfoton	298-04-4	5			
Dithianone	3347-22-6				
Dithiazanine iodide	514738		500/10,000		1
Dithiobiuret	541537		100/10,000	P049	100
Dithiopyr	97886-45-8				
Diuron	330541				100
DMAB	74-94-2				
DNOC	534-52-1	1			

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Dodecyl or tetradecyl N-(2,2,6,6-tetramethyl-4-piperidiny)-BB-alanine		25			
Dodecylbenzenesulfonic acid	27176870				1,000
Dodine	2439-10-3				
Drazoxolon	5707-69-7	1			
DSP	3078-97-5	1			
Ebivit	67-97-0	1			
Edifenphos	17109-49-8	2			
Emetine, Dihydrochloride	316427		1/10,000		1
Endosulfan	115297	1	10/10,000	P050	1
Endosulfant sulfate	1031078				1
Endothal	145-73-3	1			
Endothall	145733			P088	1,000
Endothion	2778043		500/10,000		1
Endothion	2778-04-3	1			
Endrin	72208	1	500/10,000	P051	1
Endrin		1		D012	1
Endrin & metabolites	72208			P051	1
Endrin aldehyde	7421934				1
Epichlorohydrin	106898	0.1	1,000	U041	100
Epinephrine	51434			P042	1,000
EPN	2104645	1	100/10,000		1
Ergocalciferol	50146	1	1,000/10,000		1
Ergotamine tartrate	379793		500/10,000		1
Esfenvalerate	66230-04-4	25			
Ethanal	75070			U001	1,000
Ethanamine, N-ethyl-N-nitroso-	55185			U174	1
Ethane, 1,1,1,2-tetrachloro-	630206			U208	100
Ethane, 1,1,1-trichloro-	71556			U226	1,000
Ethane, 1,1,2,2-tetrachloro-	79345			U209	100

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Ethane, 1,1,2-trichloro-	79005			U227	100
Ethane, 1,1'-[methylenebis(oxy)]bis(2-chloro-	111911			U024	1,000
Ethane, 1,1-dichloro-	75343			U076	1,000
Ethane, 1,1'-oxybis-	60297			U117	100
Ethane, 1,1'-oxybis(2-chloro-	111444			U025	10
Ethane, 1,2-dibromo-	106934			U067	1
Ethane, 1,2-dichloro-	107062			U077	100
Ethane, hexachloro-	67721			U131	100
Ethane, pentachloro-	76017			U184	10
Ethanedinitrile	460195			P031	100
Ethanesulfonyl chloride, 2-chloro	1622328		500		1
Ethanethioamide	62555			U218	10
Ethanimidothioic acid, N-[[[(methylamino) carbonyl] oxy]-, methyl ester	16752775			P066	100
Ethanol, 1,2-Dichloro-, acetate	10140871		1,000		1
Ethanol, 2,2'-(nitrosoimino) bis-	1116547			U173	1
Ethanol, 2-ethoxy-	110805			U359	1,000
Ethanone, 1-phenyl-	98862			U004	5,000
Ethene, 1,1-dichloro-	75354			U078	100
Ethene, 1,2-dichloro- (E)	156605			U079	1,000
Ethene, 2-chloroethoxy-	110758			U042	1,000
Ethene, chloro-	75014			U043	1
Ethene, tetrachloro-	127184			U210	100
Ethene, trichloro-	79016			U228	100
Ethiofencarb	29973-13-5	1			
Ethion	563122	1	1,000		10
Ethoprophos	13194484	1	1,000		1
Ethyl 5,5-diphenyl-2-isoxazoline-3-carboxylate	163520-33-1				
Ethyl acetate	141-78-6				
Ethyl acetate (l)	141786			U112	5,000

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Ethyl acrylate (I)	140885			U113	1,000
Ethyl caramate		1			
Ethyl carbamate (urethane)	51796			U238	100
Ethyl chloride	75003				100
Ethyl cyanide	107120			P101	10
Ethyl ether (I)	60297			U117	100
Ethyl methacrylate	97632			U118	1,000
Ethyl methanesulfonate	62500			U119	1
Ethyl thiocynoacetate	5349-28-0	1			
Ethylbenzene	100414				1,000
Ethylbis(2-Chloroethyl)amine	538078		500		1
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	0.1	1,000	U115	10
Ethylenebisdithiocarbamic acid, salts & esters	111546			U114	5,000
Ethylenediamine	107153				5,000
Ethylenediamine	107153		10,000		5,000
Ethylenediamine-tetraacetic acid (EDTA)	60004				5,000
Ethyleneimine	151564		500	P054	1
Ethylenethiourea	96457			U116	10
Ethylidene dichloride	75343			U076	1,000
Ethylthiocyanate	542905		10,000		1
Famoxadone	131807-57-3				
Famphur	52857	1		P097	1,000
Fenamphos	22224926	1	10/10,000		1
Fenazaquin	120928-09-8				

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Fenbutatin oxide	13356-08-6	1			
Fenlrothion	122145		500		1
Fenothiocarb	62850-32-2				
Fenoxaprop-p	71283-80-2				
Fenpyroximate	134098-61-6	25			
Fensulfothion	115902	1	500		1
Fenthion	55-38-9	2			
Fenvalerate	51630-58-1	1			
Ferric ammonium citrate	1185575				1,000
Ferric ammonium oxalate	55488874				1,000
Ferric ammonium oxalate	2944674				1,000
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	7782630				1,000
Ferrous sulfate	7720787				1,000
Fipronil	120068-37-3				
Flocoumafen	90035-08-8	1			
Fluoroboric acid	16872-11-0				
Fluazinam	79622-59-6	2			
Fluazinam	79622-59-6	25			
Flucythrinate	70124-77-5				
Fludioxonil	131341-86-1				
Fluometil	4301502		100/10,000		1
Fluoracetic acid	144490		10/10,000		1
Fluoranthene	206440			U120	100

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Fluorene	86737				5,000
Fluorine	7782414		500	P056	10
Fluoroacetamide	640197	1	100/10,000	P057	100
Fluoroacetic acid	144-49-0	1			
Fluoroacetic acid, sodium salt	62786			P058	10
Fluoroaceto-p-bromo aniline	351-05-3	1			
Fluoroacetyl chloride	359068		10		1
Fluorosilicic acid	16961-83-4	1			
Fluorouracil	51218		500/10,000		1
Fluquinconazole	136426-54-5	25			
Flusulfamide	106917-52-6				
Fluvalinate	69409-94-5				
Folpet	133-07-3	0.1			
Fonofos	944229	1	500		1
Formaldehyde	50000	1	500	U122	100
Formaldehyde cyanohydrin	107164		1,000		1
Formaldehyde polymer with 1,3-benzene dimethanamine and phenol	57214-10-5	25			
Formalin	50-00-0	1			
Formetanate	22259-30-9	1			
Formetanate hydrochloride	23422539		500/10,000		1
Formic acid (C,T)	64186			U123	5,000
Formothion	2540821		100		1
Formparanate	17702577		100/10,000		1
Fosthiazate	98886-44-3				
Fosthiethan	21548-32-3	1			
Fosthletan	21548323		500		1
Fubendazole	3878191		100/10,000		1
Fujithion	3309-87-3	1			
Fulminic acid, mercury(2-) salt (R,T)	628864			P065	10

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Fumaric acid	110178				5,000
Fuming sulfuric acid	8014-95-7				
Furan (I)	110009		500	U124	100
Furan, tetrahydro- (I)	109999			U213	1,000
Furathiocarb	65907-30-4	1			
Furfural (I)	98011	1		U125	5,000
Furfuran (I)	110009			U124	100
Gallium trichloride	13450903		500/10,000		1
gamma-BHC	58899			U129	1
Glucopyranose, 2-deoxy-2-(3-methyl-3-nitrosoureido)-	18883664			U206	1
Glutaraldehyde	1 11-30-8				
Glycidyl acrylate	106-90-1				
Glycidyl butyrate		25			
Glycidylaldehyde	765344			U126	10
Glycol Ethers ⁵					**
Guanidine, N-methyl-N'-nitro-N-nitroso-	70257			U163	10
Guazatine	13516-27-3	3.5			
Guthion	86500				1
Halfenprox	111872-58-3				
Halogenated hydantoin	16079-88-2	1			
HCH	608-73-1	1			
HCH	608-73-1	1.5			
Heptachlor	76448	6		P059	1
Heptachlor (and epoxide)				D031	1
Heptachlor epoxide	1024573				1
Heptenophos	23560-59-0	1			
Hexabromocyclododecane	25637-99-4 3194-55-6	25			
Hexachlorobenzene	118741			U127	10

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Hexachlorobenzene				D032	10
Hexachlorobutadiene	87683			U128	1
Hexachlorobutadiene				D033	1
Hexachlorocyclohexane (gamma isomer)	58899			U129	1
Hexachlorocyclopentadiene	77474		100	U130	10
Hexachloroethane	67721			U131	100
Hexachloroethane				D034	100
Hexachlorophene	70304			U132	100
Hexachloropropene	1888717			U243	1,000
Hexaethyl tetraphosphate	757584	1		P062	100
Hexafluoro-1,3-butadiene	685-63-2	25			
Hexamethylene diisocyanate	822-06-0				
Hexamethylene-1,6-diisocyanate	822060				100
Hexamethylenediamine, N,N'-Dibutyl	4835114		500		1
Hexamethylphosphoramide	680319				1
Hexane	110543				5,000
Hexone (Methyl isobutyl ketone)	108101			U161	5,000
Hydrazine (R,T)	302012	0.1	1,000	U133	1
Hydrazine hydrate		25			
Hydrazine, 1,1-dimethyl-	57147			U098	10
Hydrazine, 1,2-diethyl-	1615801			U086	10
Hydrazine, 1,2-dimethyl-	540738			U099	1
Hydrazine, 1,2-diphenyl-	122667			U109	10
Hydrazine, methyl-	60344			P068	10
Hydrazinecarbothioamide	79196			P116	100
Hydrochloric acid	7647010				5,000
Hydrocyanic acid	74908		100	P063	10
Hydrofluoric acid	7664393			U134	100
Hydrogen bromide	10035-10-6	1			

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Hydrogen chloride	7647-01-0	10			
Hydrogen chloride (gas only)	7647-01-0		500		5,000
Hydrogen cyanide	74908			P063	10
Hydrogen fluoride	7664393	1	100	U134	100
Hydrogen iodide	10034-85-2	1			
Hydrogen peroxide	7722-84-1	6			
Hydrogen peroxide (Conc. > 52%)	7722-84-1		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
Hydroxylamine	7803-49-8	1			
Ibotenic acid	2552-55-8	1			
Imibenconazole	86598-92-7				
Imidacloprid	105827-78-9				
Indeno(1,2,3-cd) pyrene	193395			U137	100
Indoxacarb	173584-44-6				
Inorganic cyanide compounds		1			
Inorganic silver, salts					
Inorganic tin, salts					
Inorganic zinc, salts					
Iodomethane	74884			U138	100
Ioxynil	1689-83-4	3			
Iprobenfos	26087-47-8	1			
Iron, Pentacarbonyl-	13463406		100		1
Isazofos	42509-80-8	1			
Isoamyl acetate	123922				
Isobanzan	297789	1	100/10,000		1

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Isobutyl acetate	110190				
Isobutyl alcohol (I,T)	78831			U140	5,000
Isobuty amine	78819				
Isobutyric acid	79312				
Isobutyronitrile	78820		1,000		1
Isocyanic acid, 3,4-Dichlorophenyl ester	102363		500/10,000		1
Isodrin	465736		100/10,000	P060	1
Isofenphos	2531 1-71-1	1			
Isofluorophate	55914	1	100		100
Isolan	119-38-0	1			
Isophorone	78591				5,000
Isophorone Diisocyanate	4098719		500		1
Isoprene	78795				100
Isopropanolamine dodecylbenzene sulfonate	42504461				1,000
Isopropyl chloroformate	108236		1,000		1
Isopropylmethylpyrazolyl dimethylcarbamate	119380		500		1
Isosafrole	120581			U141	100
Isothioate	36614-38-7	1			
Isoxathion	18854-01-8	1			
Kepone	143500			U142	1
Lactonitrile	78977		1,000		1
Lasalocid	25999-31 -9	2			
Lasiocarpine	303344			U143	10
Lead				D008	10
Lead	7439-92-1	0.6			
Lead acetate	301042			U144	#
Lead arsenate	7645252				1
Lead arsenate	10102484				1
Lead arsenate	7784409	0.1			1

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Lead chloride	7758954				10
Lead compounds					
Lead fluoborate	13814965				10
Lead fluoride	7783462				10
Lead iodide	10101630				10
Lead nitrate	10099748				10
Lead phosphate	7446277			U145	10
Lead stearate	1072351				10
Lead stearate	52652592				10
Lead stearate	56189094				10
Lead stearate	7428480				10
Lead subacetate	1335326			U146	10
Lead sulfate	7446142				10
Lead sulfate	15739807				10
Lead sulfide	1314870				10
Lead thiocyanate	592870				10
Lead, bis(acetato-O) tetrahydroxytri	1335326			U146	10
Leptophos	21609905	1	500/10,000		1
Lewisite	541253		10		1
Lindane	58899		1,000/10,000	U129	1
Lindane				D013	1
Linuron	330-55-2				
Lithium chromate	14307358				10
Lithium hydride	7580678		100		1
L-Phenylalanine, 4-[bis(2-chloroethyl)aminol]	148823			U150	1
L-Serine, diazoacetate (ester)	115026			U015	1
Malathion	121755	1			100
Maleic acid	110167				5,000
Maleic anhydride	108316			U147	5,000

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Maleic hydrazide	123331			U148	5,000
Malononitrile	109773		500/10,000	U149	1,000
m-Aminochlorobenzene	108-42-9				
Manganese, tricarbonyl methylcyclopentadienyl	12108133		100		1
m-Benzene, dimethyl	108383				1,000
m-Benzene, dimethyl	108383				1,000
m-Cresol	108394		1,000/10,000		100
m-Cresol	108394				
m-Cresol				D024	100
m-Cresylic acid	108394				100
MDI (Methylene diphenyl diisocyanate)	101688				5,000
m-Dichlorobenzene (1,3)	541731			U071	100
m-Dinitrobenzene	99650				
Mecarbam	2595-54-2	1			
Mechlorethamine	51752	0.1	10		1
Medinoterb acetate	2487-01-6	1			
MEK (Methyl ethyl ketone)	78933			U159	5,000
Melphalan	148823			U150	1
Mephosfolan	950107	1	500		1
Mercaptoacetic acid	68-11-1				
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	7782867				10

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Mercurous nitrate	10415755				10
Mercury	7439976	1		U151	1
Mercury		1		D009	1
Mercury (acetate-O)phenyl-	62384			P092	100
Mercury fulminate	628864			P065	10
Metaldehyde	108-62-3				
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	1	100/10,000		1
Methamidophos	10265-92-6	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	10
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	10
Methane, tetrachloro-	56235			U211	10
Methane, tetranitro- (R)	509148			P112	10
Methane, tribromo-	75252			U225	100
Methane, trichloro-	67663			U044	10
Methane, trichlorofluoro-	75694			U121	5,000

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Methanesulfonyl chloride, trichloro-	594423			P118	100
Methanesulfonic acid, ethyl ester	62500			U119	1
Methanesulfonyl		1			
Methanesulfonyl fluoride	558258		1,000		1
Methanethiol (I,T)	74931			U153	100
Methanol (I)	67561			U154	5,000
Methapyrilene	91805			U155	5,000
Methasulfocarb	66952-49-6	1			
Methidathion	950378	1	500/10,000		1
Methiocarb	2032657	1	500/10,000	P199	10
Methomyl	16752775	1	500/10,000	P066	100
Methoxychlor	72435			U247	1
Methoxychlor				D014	1
Methoxyethylmercuric acetate	151382		500/10,000		1
Methyl 2-chloroacrylate	80637		500		1
Methyl alcohol (I)	67561			U154	5,000
Methyl aphoxide	57-39-6	1			
Methyl aziridine	75558			P067	1
Methyl bromide	74839	1	1,000	U029	1,000
Methyl chloride (I,T)	74873	1		U045	100
Methyl chloroacetate	96-34-4				
Methyl chlorocarbonate (I,T)	79221			U156	1,000
Methyl chloroform	71556			U226	1,000
Methyl chloroformate	79221		500	U156	1,000
Methyl ethyl ketone				D035	5,000
Methyl ethyl ketone (MEK) (I,T)	78933			U159	5,000
Methyl ethyl ketone peroxide (R,T)	1338234			U160	10
Methyl hydrazine	60344		500	P068	10
Methyl iodide	74884	0.1		U138	100

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Methyl isobutyl ketone	108101			U161	5,000
Methyl isocyanate	624839		500	P064	10
Methyl isothiocyanate	556616	1	500		1
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
Methyl tert-butyl ether	1634044				1,000
Methyl thiocyanate	556649		10,000		1
Methyl trithion	953-1 7-3	1			
Methyl vinyl ketone	78944	1	10		1
Methylene bithio-cyanate	6317-18-6	1			
Methylene bromide	74953			U068	1,000
Methylene chloride	75092			U080	1,000
Methylene diphenyl diisocyanate (MDI)	101688				5,000
Methylhydrazine	60-34-4	1			
Methylmercuric dicyanamide	502396		500/10,000		1
Methylthiouracil	56042			U164	10
Methyltrichlorosilane	75796		500		1
Metolcarb	1129415		100/10,000		1
Mevinphos	7786347		500		10
Mexacarbate	315184	1	500/10,000		1,000
Mitomycin C	50077		500/10,000	U010	10
Mixture of trihexyl-phosphine oxide, tri-n-octyl phoshine oxide, dioctyl mono-octyl dihexyl phosphine oxide					
MNFA	5903-13-9	1			
m-Nitrophenol	554847				100
m-Nitrotoluene	99081				

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
MNNG	70257			U163	10
Molinate	2212-67-1				
Monensin	17090-79-8	8			
Monocrotophos	6923224	1	10/10,000		1
Monoethylamine	75047				100
Monomethylamine	74895				100
Muscimol	2763964		500/10,000	P007	1,000
Mustard gas	505602	0.1	500		1
N-(1,3-Dimethylbutyl-N'- phenyl-p-phenylenediamine	793-24-8				
N-(2-Aminoethyl)-1,3-propanediamine	13531-52-7	10			
N,N'''-1,6-hexanediylbis(N'-cyanoguanidine) polymer with 1,6- hexanediamine, hydrochloride	27083-27-8				
N,N-Dimethyl-N-2-propenyl-2-propen-1 -aminium reaction products with Sodium tetraphenylborate(1 -)	153965-50-5	25			
N,N'-Bis[3-(dimethylamino)propyl]urea polymer with 1,1'-oxybis[2-chloroethane		25			
N,N-Bis(2-ethyl hexyl) -[(1,2,4- triazol-1-yl)methyl]amine	91273-04-0	1			
N,N'-Bis(3-aminopropyl)-1,2-ethane diamin	10563- 26-5				
N,N-Diethylaniline	91667				1,000
N,N'-Diethylhydrazine	1615801			U086	10
N-[2-Methyl-4-(oxiranylmethoxy)phenyl]-N-(oxiranylmethyl)oxiranemethanamine	110656-67-2	1			
N-[3-(Oxiranylmethoxy)phenyl]-N-(oxiranylmethyl)oxiranemethanamine	71604-74-5	1			
N'-[3-(Dimethylamino)propyl]- N,N-dimethyl propane-1,3-diamine;	6711-48-4	25			
N-2-Propenyl-2-pro-pen-1-amine	124-02-7				
Naled	300765	1			10
N-Alkyl toluidine					

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
N-Alkyl(C=8-22)polytrimethylenepolyamin es, carboxymethylderivs., sodium salt	97659-53-5	25			
N-Alkyldimethylbenzylammonium chloride		1			
Naphthalenamine, N,N'-bis(2-chloroethyl)-	494031			U026	100
Naphthalene	91203			U165	100
Naphthalene, 2-chloro-	91587			U047	5,000
Naphthenic acid	1338245				100
n-Butyl alcohol (l)	71363			U031	5,000
n-Butyl phthalate	84742			U069	10
N-Butylpyrrolidine	767-10-2				
N-Ethyl-N'-[(1-diethylamino)propylidene] thiourea		25			
N-Hexadecyltrimethyl ammonium chloride	112-02- 7	25			
Nickel ammonium sulfate	15699180				100
Nickel carbonyl	13463393		1	P073	10
Nickel carbonyl	13463-39-3	0.1			
Nickel carbonyl Ni(CO) ₄ , (T-4)-	13463393			P073	10
Nickel chloride	37211055				100
Nickel chloride	7718549				100
Nickel cyanide	557197			P074	10
Nickel hydroxide	12054487				10
Nickel nitrate	14216752				100
Nickel oxides, sulfides					
Nickel sulfate	7786814				100
Nickel ⁺⁺	7440020				100
Nicotine & salts	54115	1	100	P075	100
Nicotine sulfate	65305		100/10,000		1
Nitric acid	7697372	10	1,000		1,000
Nitric acid, thallium(1+) salt	10102451			U217	100
Nitric oxide	10102439		100	P076	10
Nitrilotriacetic acid	139-13-9	1			

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Nitrobenzene	98-95-3			D036	1,000
Nitrobenzene (I,T)	98953		10,000	U169	1,000
Nitrocyclohexane	1122607		500		1
Nitrofen	1836-75-5	0.1			
Nitrogen dioxide	10544-72-6		100	P078	10
Nitrogen dioxide	10102-44-0		100	P078	10
Nitrogen oxide	10102-43-9			P076	10
Nitroglycerine	55630			P081	10
Nitrophenol (mixed)	25154556				100
Nitrotoluene	1321126				1,000
Nitrous acid, salts					
N-Nitrosodiethanolamine	1116547			U173	1
N-Nitrosodiethylamine	55185			U174	1
N-Nitrosodimethylamine	62759		1,000	P082	10
N-Nitrosodi-n-butylamine	924163			U172	10
N-Nitrosodiphenylamine	86306				100
N-Nitrosomethylvinylamine	4549400			P084	10
N-Nitrosomorpholine	59892				1
N-Nitroso-N-ethylurea	759739			U176	1
N-Nitroso-N-methylurea	684935			U177	1
N-Nitroso-N-methylurethane	615532			U178	1
N-Nitrosopiperidine	100754			U179	10
N-Nitrosopyrrolidine	930552			U180	1
Nonphenols Nonphenol ethoxylates	25154-52-3, 104-40-5 84852-15-3 139-84-4 136-83-4 9016-45-9	0.1			

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Nonylphenols	25154-52-3, 104-40-5, 84852-15-3, 139-84-4, 136 -83-4	25			
Norbromide	991424		100/10,000		1
N-Phenyl-1 -naphthalamine	90-30-2				
n-Propylamine	107108			U194	5,000
n-Propylchloroformate	109-61-5	25			
O,O-Diethyl O-1 -phenyl-3-trifluoromethyl pyrazol-5-ylphosphorothioate	122431-24-7				
O,O-Diethyl O-pyrazinyl phosphorothioate	297972			P040	100
O,O-Diethyl S-methyl dithiophosphate	3288582			U087	5,000
o-Anisidine	90040				100
o-Benzene, dimethyl	95476				1,000
o-Benzene, dimethyl	95476				1,000
o-Chlorophenol (2)	95578			U048	100
o-Cresol	95487				100
o-Cresol	95487				
o-Cresol				D023	100
o-Cresylic acid	95487				100
Octabromodiphenyl oxide; 0.1% of it	93-76-5	0.1			
Octahydro-4,7-methano-1H-inden-5-yl 2- methyl 2-propenoate polymer with oxiranylmethyl 2- methyl-2-propenoate		25			
Octamethylpyrophosphoramide	152169			P085	100
o-Dichlorobenzene (1,2)	95501			U070	100
o-Dinitrobenzene	528290				
Omadine	1121-31-9	1			
Omethoate	1113-02-6	1			
o-Nitrophenol (2)	88755				100

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
o-Nitrotoluene	88722				
Organorhodium complex (PMN-82-147)	0		10/10,000		1
Osmium tetroxide	20816120			P087	1,000
Osmium tetroxide	20816-12-01				
o-Toluenesulfonyl chloride	133-59-5				
o-Toluidine	95534			U328	100
o-Toluidine hydrochloride	636215			U222	100
Ouabain	630604		100/10,000		1
Oxamyl	23135220	1	100/10,000	P194	1
Oxetane, 3,3-bis(chloromethyl)-	78717		500		1
Oxirane (I,T)	75218			U115	10
Oxirane, (chloromethyl)-	106898			U041	100
Oxiranecarboxyaldehyde	765344			U126	10
Oxiranylmethyl 2-methyl-2-prenoate polymer with ethenylbenzene		25			
Oxydemeton-methyl	301-12-2	1			
Oxydeprofos	2674-91-1	1			
Oxydisulfoton	2497076		500		1
Ozone	10028156		100		1
p-Aminoazobenzene	60-09-3				
Paracetic acid	79210		500		1
Paraformaldehyde	30525894				1,000
Paraldehyde	123637			U182	1,000
Paraquat	1910425		10/10,000		1
Paraquat methosulfate	2074502		10/10,000		1
Paraquat, salts		1			
Parathion	56382	1	100	P089	10
Parathion-methyl	298000	1	100/10,000		100
Paris green	12002038		500/10,000		100
PBBs	59536-65-1	0			

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
PBBs	59536-65-1	0.1			
p-Benzene, dimethyl	106423				100
p-Benzoquinone	106514			U197	10
PCBs	1336-36-3	0.005			
PCBs	1336-36-3	0			
p-Chloroaniline	106478			P024	1,000
p-Chloro-m-cresol (4)	59507			U039	5,000
PCNB (Pentachloronitrobenzene)	82688			U185	100
Cresol	106445				100
Cresol(s) (Phenol, Methyl)	106445				100
p-Cresylic acid	106445				100
p-Dichlorobenzene (1,4)	106467			U072	100
p-Dimethylaminoazobenzene	60117			U093	10
p-Dimethylaminobenzenediazo sulfonate	150-70-9	1			
p-Dinitrobenzene	100254				
Pentaborane	19624227		500		1
Pentachlorobenzene	608935			U183	10
Pentachloroethane	76017			U184	10
Pentachloronitrobenzene (PCNB)	82688			U185	100
Pentachlorophenol	87865	1		U242	10
Pentachlorophenol	87-86-5	1		D037	10
Pentadecylamine	2570265		100/10,000		1
Pentyl-Nonylphenols					
Perachloroethylene	127184			U210	100
Perchloromethylmercaptan	594423		500		100
Perfluorocyclopentene	559-40-0	20			
Permethrin	52645-53-1				
Petnabromodiphenyl oxide	32534-81-9	0.1			

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Phenacetin	62442			U187	100
Phenanthrene	85018				5,000
Phencapton	2275-14-1	1.5			
Phenol	108952	5	500/10,000	U188	1,000
Phenol, 2-(1-methylpropyl)-4,6-dinitro	88857			P020	1,000
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, 2,3,4,6-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
Phenol, 2,4-dichloro-	120832			U081	100
Phenol, 2,4-dimethyl-	105679			U101	100
Phenol, 2,4-dinitro-	51285			P048	10
Phenol, 2,6-dichloro-	87650			U082	100
Phenol, 2-chloro-	95578			U048	100
Phenol, 2-cyclohexyl-4,6-dinitro-	131895			P034	100
Phenol, 2-methyl-4,6-dinitro- and salts	534521			P047	10
Phenol, 3-(1-methylethyl)-, methylcarbamate	64006		500/10,000		1
Phenol, 4,4'-(1,2-diethyl-1,2-ethenediyl)bis-, (E)	56531			U089	1
Phenol, 4-chloro-3-methyl-	59507			U039	5,000
Phenol, 4-nitro-	100027			U170	100
Phenol, methyl-	1319773			U052	1,000
Phenol, pentachloro-	87865			U242	10
Phenoxarsine, 10,10'-oxydi-	58366		500/10,000		1
Phenthoate	2597-03-7	3			
Phenyl dichloroarsine	696286		500		1
Phenylenediamine	25265-76-3				
Phenylhydrazine	100-63-0	1			

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Phenylhydrazine hydrochloride	59881		1,000/10,000		1
Phenylmercuric triethanol ammonium borate		1			
Phenylmercury acetate	62384	1	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	1	100/10,000		1
Phosalone	231 0-1 7-0	2.2			
Phosfolan	947024	1	100/10,000		1
Phosgene	75445		10	P095	10
Phosmet	732116	1	10/10,000		1
Phosostigmine, salicylate (1:1)	57647		100/10,000		1
Phosphamidon	13171216	1	100		1
Phosphine	7803512	1	500		100
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
Phosphorochloridic acid diethyl ester	814-49-3	1			
Phosphorodithioic acid, O,O-diethyl S-(ethylthio), methyl ester	298022			P094	10
Phosphorodithioic acid, O,O-diethyl S-[2(ethylthio) ethyl] ester	298044			P039	1
Phosphorodithioic acid, O,O-diethyl S-methyl ester	3288582			U087	5,000
Phosphorodithioic 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 pyrazinyl ester	297972			P040	100

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Phosphorothioic acid, methyl-, O-(4-nitrophenyl) o-phenyl ester	2665307		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, O,[4-[(dime-thylamino)sulfonyl]phenyl]O,O-dimethyl ester	52857			P097	1,000
Phosphorothioic acid, O,O-diethyl O-(4-nitrophenyl) ester	56382			P089	10
Phosphorothioic acid, O,O-dimethyl O-(4-nitrophenyl) ester	298000			P071	100
Phosphorothioic acid, o,o-Dimethyl-s (2-Methylthio) ethyl ester	2587908		500		1
Phosphorous pentachloride	10026138		500		1
Phosphorus	7723140		100		1
Phosphorus oxychloride	10025873		500		1,000
Phosphorus pentachloride	10026-13-8				
Phosphorus pentasulfide (R)	1314803	1		U189	100
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
Picotoxin	124878		500/10,000		1
Picric acid	88-89-1				
Pindone	83-26-1	1			
Piperidine	110894		1,000		1
Piperidine, 1-nitroso-	100754			U179	10
Piproctanyl, salts		1			
Pirimicarb	231 03-98-2	1			
Pirimifos-ethyl	23505411	1	1,000		1
Plumbane, tetraethyl-	78002			P110	10

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
p-Nitroaniline	100016			P077	5,000
p-Nitrophenol (4)	100027			U170	100
p-Nitrotoluene	99990				
Polychlorinated biphenyls (See PCBs or Aroclor)	1336363				1
Potassium	7440-09-7				
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 fluoride	7789-23-3				
Potassium hydroxide	1310583	5			1,000
Potassium permanganate	7722647				100
Potassium silver cyanide	506616		500	P099	1
p-Phenylenediamine	106503				5,000
Profenofos	41 198-08-7				
Promecarb	2631370	1	500/10,000		1
Pronamide	23950585			U192	5,000
Propanal, 2-methyl-2-(methylthio)-, O-[(methylamino) carbonyl]oxime	116063			P070	1
Propane 1,2-dichloro-	78875			U083	1,000
Propane, 1,2-dibromo-3-chloro	96128			U066	1
Propane, 2,2'-oxybis[2-chloro-	108601			U027	1,000
Propane, 2-nitro- (I,T)	79469			U171	10
Propanedinitrile	109773			U149	1,000
Propanenitrile	107120			P101	10
Propanenitrile, 2-hydroxy-2-methyl-	75865			P069	10
Propanenitrile, 3-chloro-	542767			P027	1,000
Propaphos	7292-1 6-2	1			
Propaquizafop	111479-05-1				

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Propargite	2312358	1			10
Propargyl alcohol	107197			P102	1,000
Propargyl bromide	106967		10		1
Propetamphos	31218-83-4	1			
Propiolactone, beta-	57578		500		1
Propionaldehyde	123386				1,000
Propionic acid	79094				5,000
Propionic acid, 2-(2,4,5-trichlorophenoxy)-	93721			U233	100
Propionic anhydride	123626				5,000
Propionitrile	107120		500		10
Propionitrile, 3-chloro-	542767		1,000		1,000
Propiononitrile	107-12-0	25			
Propiophenone, 1,4-amino phenyl	70699		100/10,000		1
Propoxor (Baygon)	114261			U411	100
Propoxur	114-26-1	1			
Propyl chloroformate	109615		500		1
Propylene dichloride	78875			U083	1,000
Propylene oxide	75-56-9		10,000		100
Prothoate	2275185	1	100/10,000		1
p-Toluidine	106490			U353	100
p-tolyl diiodomethyl sulfone	20018-09-1	1			
Pyraclofos	89784-60-1	2			
Pyraclofos	89784-60-1	25			
Pyrazothion	108-35-0	1			
Pyrazoxon	108-34-9	1			
Pyrene	129000		1,000/10,000		5,000
Pyrethrins	121211				1
Pyrethrins	8003347				1
Pyrethrins	121299				1

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Pyridaben	96489-71 -3				
Pyridine	110861			U196	1,000
Pyridine				D038	1,000
Pyridine, 2-methyl-	109068			U191	5,000
Pyridine, 2-methyl-5-vinyl-	140761		500		1
Pyridine, 3-(1-methyl-2-pyrrolidinyl)-, (S)	54115			P075	100
Pyridine, 4-amino-	504245		500/10,000		1,000
Pyridine, 4-nitro-, 1-oxide	1124330		500/10,000		1
Pyridine-triphenylborane(1 /1)	971-66-4	25			
Pyriminil	53558251	1	100/10,000		1
Pyrimitate	5221 -49-8	1			
Pyrrolidine, 1-nitroso-	930552			U180	1
Quinalphos	13593-03-8	1			
Quinoclamine	2797-51 -5	1			
Quinoline	91225				5,000
Quinone (p-Benzoquinone)	106514			U197	10
Quintobenzene	82688			U185	100
Reaction products of epichlorohydrin, 2 mercaptoethanol, sodium sulfide, thiourea		25			
Reserpine	50555			U200	5,000
Resmethrin	10453-86-8	1			
Resorcinol	108463			U201	5,000
Rotenone	83-79-4	2			
S,S,S-Tributyl phos-phorotrithioate	78-48-8	1			
Saccharin and salts	81072			U202	100
Safrole	94597			U203	100
Salcomine	14167181		500/10,000		1
Salinomycin	53003-10-4	1			
Salt of the Malachite green	10309-95-2	0.1			
Sarin	107448		10		1

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Schradan	152-16-9	1			
Sec-Amyl acetate	626380				
sec-Butyl acetate	105464				
sec-Butylamine	513495				
Selenious acid	7783008		1,000/10,000	U204	10
Selenious acid, dithallium (1+) salt	12039520			P114	1,000
Selenium				D010	10
Selenium	7782-49-2	1			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
Silane, (4-aminobutyl)diethoxymethyl-	3037727		1,000		1
Silver				D011	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 4-(2,4 -Dichloro-3- methylbenzoyl)-1,3-di-dimethyl-5-pyrazolate					
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 chlorite	7758-19-2				

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Sodium chromate	7775113				10
Sodium cyanide	143339		100	P106	10
Sodium dimethyldithiocarbamate	128-04-1	25			
Sodium dodecylbenzenesulfonate	25155300				1,000
Sodium fluoride	7681494				1,000
Sodium fluoroacetate	62748		10/10,000		10
Sodium hydrosulfide	16721805				5,000
Sodium hydroxide	1310-73-2	5			1,000
Sodium hypochlorite	10022705				100
Sodium hypochlorite	7681529				100
Sodium methylate	124414				1,000
Sodium nitrite	7632000				100
Sodium peroxide	1313-60-6	5			
Sodium phosphate, dibasic	10039324				5,000
Sodium phosphate, dibasic	10140655				5,000
Sodium phosphate, dibasic	7558794				5,000
Sodium phosphate, tribasic	7758294				5,000
Sodium phosphate, tribasic	7785844				5,000
Sodium phosphate, tribasic	10101890				5,000
Sodium phosphate, tribasic	10124568				5,000
Sodium phosphate, tribasic	10361894				5,000
Sodium phosphate, tribasic	7601549				5,000
Sodium pentachlorophenate	131522		100/10,000		1
Sodium selenate	13410010		100/10,000		1
Sodium selenite	7782823		100/10,000		100
Sodium selenite	10102188		100/10,000		100
Sodium tellurite	10102202		500/10,000		1
Stannane, acetoxypentaphenyl	900958		500/10,000		1
Streptozotocin	18883664			U206	1

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Strontium chromate	7789062				10
Strychnidin-10-one	57249			P108	10
Strychnidin-10-one, 2,3-dimethoxy-	357573			P018	100
Strychnine	57-24-9	1			
Strychnine sulfate	60413		100/10,000		1
Strychnine, & salts	572494		100/10,000	P108	10
Styrene	100425				1,000
Styrene oxide	96093				100
Sulfotep	3689-24-5	1	500		100
Sulfoxide, 3-chloropropyl octyl	3569571		500		1
Sulfur chloride	10025-67-9				
Sulfur dioxide	7446095		500		1
Sulfur monochloride	12771083				1,000
Sulfur phosphide (R)	1314803			U189	100
Sulfur tetrafluoride	7783600		100		1
Sulfur trioxide	7446119		100		1
Sulfuric Acid	8014957		1,000		1,000
Sulfuric acid	7664939	10	1,000		1,000
Sulfuric acid, dimethyl ester	77781			U103	100
Sulfuric acid, dithallium (1+) salt	10031591			P115	100
Sulfuric acid, dithallium (1+) salt	7446186			P115	100
Sulfuryl fluoride	2699-79-8	1			
Sulprofos	35400-43-2	3			
Tabun	77816		10		1
TDE (Dichloro diphenyl dichloroethane)	72548			U060	1
Tebufenpyrad	119168-77-3				
Tebupirimfos	96182-53-5	1			
Tefluthrin	79538-32-2	1			
Tellurium	13494809		500/10,000		1

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Tellurium hexafluoride	7783804		100		1
TEPP (Tetraethyl ester diphosphoric acid)	107493		100		10
Terbufos	13071-79-9	1	100		1
tert-Amyl acetate	625161				
tert-Butyl acetate	540885				
tert-Butylamine	75649				
tert-Butylamine	13952846				
Tetraalkyl lead		1			
Tetrachloroethylene				D039	100
Tetrachloroethylene	127-18-4			U210	100
Tetraethyl lead	78002		100	P110	10
Tetraethyl pyro-phosphate	107-49-3	1		P111	10
Tetraethyldithiopyrophosphate	3689245			P109	100
Tetraethyltin	597648		100		1
Tetrahydrofuran (I)	109999			U213	1,000
Tetraisocyanatosilane	3410-77-3	1			
Tetramethylammonium hydrogen phthalate	79723- 02-7	1			
Tetramethylammonium hydroxide	75-59-2	25			
Tetramethylammonium perfluorooctanenoate					
Tetramethylammoniumchloride	75-57-0	1			
Tetramethyllead	75741		100		1
Tetranitromethane (R)	509148		500	P112	10
Tetraphosphoric acid, hexaethyl ester	757584			P062	100
Thallic oxide	1314325			P113	100
Thallium ⁺⁺	7440280				1,000
Thallium acetate	563-68-8	1		U214	100
Thallium carbonate	6533739			U215	100
Thallium chloride	7791120			U216	100
Thallium nitrate	101 02-45-1	1		U217	100

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Thallium oxide	1314325			P113	100
Thallium selenite	12039520			P114	1,000
Thallium sulfate	10031591		100/10,000	P115	100
Thallium sulfate	7446-18-6	1	100/10,000	P115	100
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
Themvinphos	35996-61-3	1			
Thenylchlor	96491-05-3				
Thioacetamide	62555			U218	10
Thiocarbazine	2231574		1,000/10,000		1
Thiocyclam	31895-21 -3	3			
Thiodicarb	59669-26-0	1			
Thiodiphosphoric acid, tetraethyl ester	3689245			P109	100
Thiofanox	39196-18-4		100/10,000	P045	100
Thioimidodicarbonic diamide [(H ₂ N)C(S)] ₂ NH	541537			P049	100
Thiomethanol (I,T)	74931			U153	100
Thiometon	640-15-3	1			
Thionazin	297-97-2	1	500		100
Thionyl chloride	7719-09-7				
Thioperoxydicarbonic diamide [(H ₂ N)C(S)] ₂ S ₂ , tetra-methyl-	137268			U244	10
Thiophenol	108985		500	P104	100
Thiosemicarbazide	79-19-6	1	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

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Thiram	137-26-8			U244	10
Titanium tetrachloride	7550450		100		1,000
Toluene	108-88-3			U220	1,000
Toluene diisocyanate (R,T)	91087		100	U223	100
Toluene diisocyanate (R,T)	26471625		100	U223	100
Toluene diisocyanate (R,T)	584849		500	U223	100
Toluenediamine	496720			U221	10
Toluenediamine	823405			U221	10
Toluenediamine	25376458			U221	10
Toluenediamine	95807			U221	10
Toluenediamine					
Toluidine					
Tolyfluanid	731 -27-1				
Toxaphene	8001352			P123	1
Toxaphene				D015	1
Tralomethrin	66841-25-6				
Trans-1,4-dichlorobutene	110576		500		1
Trialkyl tin hydroxide		0.1			
Trialkyl tin hydroxide, its chloride (including Trialkyl tin oxide), and tributyltin		0.1			
Triamiphos	1031-47-6	1	500/10,000		1
Triaryl tin hydroxide, salt tributyltin compound		2			
Triazamate	112143-82-5				
Triazophos	24017-47-8	1	500		1
Tributylamine	102-82-9	25			
Tributyltetradecylphosphonium chloride		25			
Trichlorfon	52-68-6	10			100
Trichloro(chloromethyl) silane	1558254		100		1
Trichloro(dichlorophenyl) silane	27137855		500		1
Trichloroacetic acid	76-03-9				

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Trichloroacetonitrile	545-06-2	25			
Trichloroacetyl chloride	76028		500		1
Trichloroethene	79016			U228	100
Trichloroethylene	79016			U228	100
Trichloroethylene				D040	100
Trichloroethylsilane	115219		500		1
Trichloromethanesulfonyl chloride	594423			P118	100
Trichloromonofluoromethane	75694			U121	5,000
Trichloronate	327-98-0	1			
Trichloronate	327980		500		1
Trichlorophenol	21567822				10
Trichlorophenylsilane	98135		500		1
Triethanolamine dodecylbenzene-sulfonate	27323417				1,000
Triethoxysilane	998301		500		1
Triethylamine	121448				5,000
Triethylammoniumfluoride	73602-61-6	25			
Trietramethylammonium 4,5-dihydro-5-oxo- 1 - (4- sulfophenyl)-4-[(4-sulfophenyl)azo]-1 H-pyrazole-3- carboxylate	131013-81-5	25			
Triflic acid	1493-13-6	1			
Trifluoroborane	7637-07-2				
Trifluralin	1582098	1			10
Trimethyltin chloride	1066451		500/10,000		1
Trimethylamine	75503				100
Trimethylchlorosilane	75774		1,000		1
Trimethylolpropane phosphite	824113		100/10,000		1
Triphenylphosphate	115-86-6	25			
Triphenylphosphine	603-35-0				
Triphenyltin chloride	639587		500/10,000		1
Tris(2,3-dibromopropyl)phosphate	126-72-7	0.1		U235	10

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Tris(2-chloroethyl)amine	555771		100		1
Trypan blue	72571			U236	10
Unlisted Hazardous Wastes Characteristic of Corrosivity	NA			D002	100
Unlisted Hazardous Wastes Characteristic of Ignitability	NA			D001	100
Unlisted Hazardous Wastes Characteristic of Reactivity	NA			D003	100
Unlisted Hazardous Wastes Characteristic of Toxicity					
Uracil mustard	66751			U237	10
Uranyl acetate	541093				100
Uranyl nitrate	36478769				100
Uranyl nitrate	10102064				100
Urea peroxide	124-43-6	17			
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
Vamidithion	2275-23-2	1			
Vanadic acid, ammonium salt	7803556			P119	1,000
Vanadic oxide V ₂ O ₅	1314-62-1			P120	1,000
Vanadic pentoxide	1314-62-1			P120	1,000
Vanadium pentoxide	1314-62-1		100/10,000		1,000
Vanadyl sulfate	27774136				1,000
Vinyl acetate	108054				5,000
Vinyl acetate monomer	108054		1,000		5,000
Vinyl bromide	593602				100
Vinyl chloride				D043	1
Vinyl chloride	75-01-4	0.1		U043	1
Vinylamine, N-methyl-N-nitroso-	4549400			P084	10

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Vinylidene chloride	75354			U078	100
Warfarin sodium	129066		100/10,000		100
Warfarin, & salts, when present at concentrations greater than 0.3%	81812	0.1	500/10,000	P001	100
White phosphorus	7723-14-0	1			
WSCP	31512-74-0	1			
Xylenes	1330-20-7			U239	100
Xylenol	1300-71-6	5			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
Zeta cypermethrin	52315-07-8				
Zinc ⁺⁺	7440666				1,000
Zinc acetate	557346				1,000
Zinc ammonium chloride	14639975				1,000
Zinc ammonium chloride	14639986				1,000
Zinc ammonium chloride	52628258				1,000
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 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	1314-84-7	1	500	P122	100
Zinc phosphide Zn ₃ P ₂ , when present at concentrations greater than 10%	1314-84-7	1		P122	100

Table B-4
List of Hazardous Materials/Substances/Waste - Continued

Hazardous Materials/Substances/Waste	CAS No. ¹	% ²	Threshold Planning Quantity (Pounds)	USEPA HW No. ³	RQ (Pounds) ⁴
Zinc silicofluoride	16871719				5,000
Zinc sulfate	7733020				1,000
Zinc, dichloro(4,4-dimethyl-5((((methyl-amino) carbonyl) oxy) imino) pentaenitrile)-(t-4)-	58270089		100/10,000		1
Ziram	137-30-4	1			
Zirconium nitrate	13746899				5,000
Zirconium potassium fluoride	16923958				1,000
Zirconium sulfate	14644612				5,000
Zirconium tetrachloride	10026116				5,000

NOTES:

1. Chemical Abstract Service (CAS) Registry Number.
2. Chemical registered as hazard.
3. U.S. Environmental Protection Agency Hazardous Waste Number.
4. Reportable quantity release which requires notification (See Chapter 18).
5. Glyco Ethers: Includes mono- and di- ethers of ethylene glycol, diethylene glycon, and triethylene glycol R-(OCH²CH²)_n-OR'. Where n = 1,2 or 3; R = alky C7 or less; or OR' consisting of carboxylic acid, 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 RQ for asbestos is limited to friable forms only.

(1+) Indicates that the statutory source for designation of this hazardous substance under CERCLA is 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).

Appendix C

Determination of Worst Case Discharge Planning Volume

a. This appendix provides criteria to determine, on an installation-specific basis, the extent of a worst-case discharge (WCD).

b. 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.

c. 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:

(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:

(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.

d. For installations with POL Storage Containers:

(1) Single POL Storage Container Facilities. For facilities containing only one above-ground 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.

(2) Multiple POL Storage Container Facilities.

(a) 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.

(b) 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.

(c) 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:

- The total capacity of the above ground oil and hazardous substance storage tank

container that lacks adequate secondary containment.

- The capacity of the largest single above ground oil or hazardous substance storage container that has adequate secondary containment.

- For purpose 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.

Glossary Abbreviations

AACC	Allowable Average Contaminant Concentration
ABS	Alkyl Benzene Sulfonate
ACM	Asbestos Containing Material
ACWM	Asbestos Containing Waste material
ACofS	Assistant Chief of Staff
AFPMB	Armed Forces Pest Management Board
AHERA	Asbestos Hazard Emergency Response Act
API	American Petroleum Institute
ASTM	American Society for Testing and Materials
BMPs	Best Management Practices
BOD	Biochemical Oxygen Demand
BTU	British Thermal Unit
CAS	Chemical Abstract Service
CBOD	Carbonaceous Biochemical Oxygen Demand
CC	Command Center
CDC	Center for Disease Control
CEMS	Continuous Emissions Monitoring System
CFCs	Chlorofluorocarbons
CFR	Code of Federal Regulations
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
CONUS	Continental United States
CT	Concentration Time
CWS	Community Water System
CX	Categorical Exclusion

dB	Decibel
DLA	Defense Logistics Agency
DLA DS	Defense Logistics Agency Disposition Services
DoD(D)	Department of Defense (Directive)
DODAAC	Department of Defense Activity Address Code
DoDI	DoD Instruction
DOT	Department of Transportation
DW	Designated Waste (ROK)
DWS	Drinking Water Source
DWTS	Domestic Wastewater Treatment System
DWTP	Domestic Wastewater Treatment Plant
EA	Environmental Assessment
EGS	Environmental Governing Standards
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
EPB	Environmental Policy Board
EPO	Environmental Programs Office
FGS	Final Governing Standards
FIC	Facility Incident Commander (previously Installation On-scene Coordinator)
FONSI	Finding Of No Significant Impact
FRT	Facility Response Team (previously Installation Response Team)
GWUDISW	Groundwater Under the Direct Influence of Surface Water
HAA5	Five Haloacetic Acid Species
HEPA	High Efficiency Particulate Air Filter

HM	Hazardous Material
HP	Horsepower
HW	Hazardous Waste
HWAP	Hazardous Waste Accumulation Point
HWPS	Hazardous Waste Processing Sheet
HWSA	Hazardous Waste Storage Area
IATA	International Air Transportation Association
IAW	In Accordance With
IMO	International Maritime Organization
IPM	Integrated Pest Management
IOSC	Installation On Scene Coordinator (new term Facility Incident Commander)
IRT	Installation Response Team (new term Facility Response Team)
ISWM	Integrated Solid Waste Management
IWTP	Industrial Wastewater Treatment Plant
IWTS	Industrial Wastewater Treatment System
LBP	Lead Based Paint
LEC	Lead Environmental Component
MCL	Maximum Contaminant Level
MILCON	Military Construction
MND	Ministry of National Defense
MOCT	Ministry of Culture and Tourism
MOE	Ministry of Environment
SDS	Safety Data Sheet
MSW	Municipal Solid Waste
MSWMF	Municipal Solid Waste Management Facility
MW	Medical Waste

MWI	Medical Waste Incinerator
NOX	Nitrogen Oxides
NPWS	Non-Public Water System
N/SM	New or Substantially Modified
NTNC	Non-Transient, Non-Community (water system)
NTU	Nephelometric Turbidity Units
ODC	Ozone Depleting Chemicals
ODS	Ozone Depleting Substances
OEBDG	Overseas Environmental Baseline Guidance Document
OSHA	Occupational Safety and Health Act
O&M	Operation and Maintenance
PAO	Public Affairs Officer
PCB	Polychlorinated Biphenyl
PCE	Perchloroethylene
PEL	Permissible Exposure Limit
pH	Pouvoir Hydrogene
PMC	Pest Management Consultant
POE	Point Of Entry (into the water distribution system)
POL	Petroleum, Oil, and Lubricants
POU	Point Of Use
PPB	Parts Per Billion
PPE	Personal Protective Equipment
PPM	Parts Per Million
PWS	Public Water System
RACM	Regulated Asbestos-Containing Material
REC	Record of Environmental Consideration

RMW	Regulated Medical Waste
ROK	Republic of Korea
RQ	Reportable Quantity
SEL	Sound Exposure Level
sm ³	Standard Cubic Meter
SOFA	Status of Forces Agreement
SW	Solid Waste
THM	Trihalomethane
TNC	Transient Non-Community
TSDF	Treatment, Storage, and Disposal Facility (old term in previous EGS and OEBGD)
TSP	Trisodium Phosphate
TSS	Total Suspended Solids
TTHM	Total Trihalomethane
TTO	Total Toxic Organics
U.N.	United Nations
U.S.	United States (of America)
U.S.C.	US Code
USINDOPACOM	United States IndoPacific Command
USEPA	United States Environmental Protection Agency
USFK	United States Forces Korea
UST	Underground Storage Tank
VOC	Volatile Organic Compounds
WQP	Water Quality Parameters