NATO STANDARD

AJEPP-2

ENVIRONMENTAL PROTECTION FOR MILITARY CAMPS IN NATO OPERATIONS

Edition B, Version 1

NOVEMBER 2022

NORTH ATLANTIC TREATY ORGANIZATION

ALLIED JOINT ENVIRONMENTAL PROTECTION PUBLICATION

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NORTH ATLANTIC TREATY ORGANIZATION (NATO)

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NATO LETTER OF PROMULGATION

7 November 2022

1. The enclosed Allied Joint Environmental Protection Publication AJEPP-2, Edition B , Version 1, ENVIRONMENTAL PROTECTION FOR MILITARY CAMPS IN NATO OPERATIONS, which has been approved by the nations in the Military Committee Joint Standardization Board, is promulgated herewith. The agreement of nations to use this publication is recorded in STANAG 2582.

2. AJEPP-2, Edition B, Version 1, is effective upon receipt and supersedes AJEPP-2, Edition A, version 2, which shall be destroyed in accordance with the local procedure for the destruction of documents.

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4. This publication shall be handled in accordance with C-M(2002)60.

Dimitrios SIGOULAKIS
Major General, GRC (A)
Director, NATO Standardization Office

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RECORD OF RESERVATIONS

CHAPTER	RECORD OF RESERVATION BY NATIONS
Note: The reservations listed on this page include only those that were recorded at time of promulgation and may not be complete. Refer to the NATO Standardization Document Database for the complete list of existing reservations.	

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RECORD OF SPECIFIC RESERVATIONS

[nation]	[detail of reservation]
BGR	1. Capability to use energy efficient materials is not available (Annex B). 2. There are no available waste water management systems (Annex C). 3. There are no capabilities for monitoring and inspection of harmful emissions into the air (Annex G).
GRC	Army: The limits and parameters depicted in AJEPP-2 are to be considered as non-mandatory quality standards, unless it is differently agreed by legal acts. Air Force: The limits and parameters depicted in AJEPP-2 are to be considered as non-mandatory quality standards, pending compliance with national legislation.
USA	1. The U.S. does not agree with the inclusion of definitions in this AJEPP that are not NATO Agreed: biochemical or biological oxygen demand (BOD5), carbonaceous biochemical oxygen demand (CBOD), chemical oxygen demand (COD), coliform, disinfectant, habitat, health care waste, infectious health care waste, pathological waste, landscape, liquid waste, maximum contaminal level (MCL), phenols, pH, scrap metal, spill response, solid waste, total suspended solids (TSS), total dissolved solids (TDS). This reservation will be removed upon the approval of Terminology Transmission File for these terms and their inclusion in the publication. 2. The U.S. does not agree with the altered definitions used in this AJEPP that conflict with the NATO agreed definitions in the NATOTerm database: concentration time (CT), hazardous waste. This reservation will be removed when the NATO agreed definitions are used in the publication.

Note: The reservations listed on this page include only those that were recorded at time of promulgation and may not be complete. Refer to the NATO Standardization Document Database for the complete list of existing reservations.

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CHAPTER 1 – GENERAL

1.1. PURPOSE

The purpose of this Allied Joint Environmental Protection Publication (AJEPP) is to provide NATO commanders and environmental protection (EP) officers with best EP practices and standards for military camps to minimize adverse environmental impacts during NATO-led operations. The agreement of nations to use this publication is recorded in Standardization Agreement (STANAG) 2582. NATO Military Principles and Policies for Environmental Protection (EP), MC 0469, gives NATO commanders the authority to establish EP procedures and standards and to direct their compliance. AJEPP-2 contains best practices and standards that enable the commander to effectively execute that authority. It also provides troop-contributing nations (TCNs), and other nations contributing materiel, equipment, and infrastructure, with guidance to enable interoperability and standardization.

1.2. SCOPE

AJEPP-2 is intended to apply only to deployed military camps during NATO operations. Any nation that desires to apply AJEPP-2 to domestic military camps or to use it on exercises or non-NATO operations is encouraged to do so.

1.3. OVERVIEW

1. AJEPP-2 is part of a larger family of AJEPPs that deal with a multitude of EP issues. The following STANAGs (AJEPPs) have been promulgated by the NATO Standardization Office - see References and Related Documents (Master List):

   a. STANAG 2583 (AJEPP-3) describes the development and implementation of an environmental management system (EMS) for NATO operations and the integration of an EMS into the operations planning process (OPP);

   b. STANAG 7141 (AJEPP-4) provides EP doctrine, guidance for environmental planning and risk management, commanders' environmental responsibilities and recommendations for environmental education and training;

   c. STANAG 6500 (AJEPP-6) describes all the components of the environmental file on a deployed camp; and

   d. STANAG 2594 (AJEPP-7) provides best practices for the sustainability of national military training areas.

2. AJEPP-2 is organized into nine annexes, each dealing with a specific EP aspect – see Table of Contents. Each annex is generally organized into headings and subheadings as follows:

a. Description of the Situation. Explains the environmental aspect that needs to be addressed.

b. Objectives. Outlines the outcome(s) that the EP procedures expect to achieve.

c. Responsibilities. Describes actions required to implement the best practices and standards. While the annexes describe numerous EP officer actions, it is important to keep in mind that many of these tasks must be done in coordination with other staff officers and with other subject matter experts in the fields of logistics; medicine; chemical, biological, radiological and nuclear (CBRN); engineering; and others. The EP responsibilities of NATO commanders, TCNs, and host nations (HNs) are well articulated in MC 0469 and STANAG 7141 (AJEPP-4) and are not addressed further in this publication.

d. Best Practices and Standards. Details the current knowledge of EP best practices among NATO and Partner nations, and provides EP standards where applicable.

e. References. Provides a list of the most relevant documents pertaining to the subject of the annex. A master reference list is also included near the back of this publication.

3. Setting standards for EP within a NATO camp is necessary for defining and monitoring the potential level of environmental impacts. The establishment of environmental standards for a deployed camp should consider the following, as applicable:

a. Stage of camp development;

b. HN or local environmental regulations;

c. National regulations of TCNs;

d. International agreement obligations;

e. Availability of technologies to monitor and enforce standards;

f. Environmental risk and health impacts associated with camp activities;

g. Feasibility based on manpower, equipment and materials, cost, time, and mission demands;

h. Current HN infrastructure available to integrate sustainable practices such as recycling, composting, reuse, and life cycle management; and

i. Suitability based on terrain characteristics, weather conditions, and environmentally sensitive, and natural and cultural protected areas.

4. NATO-led forces may operate in an absence, uncertainty, or non-application of local environmental laws and regulations. Conversely, NATO-led forces must also be prepared to operate in nations having high regulatory and accountability standards for EP. As a general rule, TCNs must adhere to the due diligence principle in the application of environmental measures. Importantly, in accordance with MC 0469, HN environmental laws and regulations will be respected. The use of the term "respect" in this context is generally recognized to indicate agreement to honour the intent or spirit of HN law rather than to comply with every detailed provision, and to protect the sovereignty of TCNs and the HN. EP standards identified in AJEPP-2 are the minimal level to be achieved. When an individual TCN has EP standards that are more protective than (but do not contravene) HN environmental laws and regulations, the more protective standards should be applied by that TCN. NATO Commanders will generally give priority to situations of military necessity and urgency when addressing conflicts between military objectives and EP standards identified in this publication.

5. Environmental protection planning and the implementation of EP procedures and standards vary with the duration of the operation - see Figure 1-1. The terms "initial", "interim" and "sustainment" are used to identify the stages of an operation. The initial phase is typically characterized by high tempo operations under austere conditions where few EP resources exist. As operations mature, logistics and service support elements are more robust, and EP resources and staff expertise also grow, permitting a more comprehensive approach to EP.

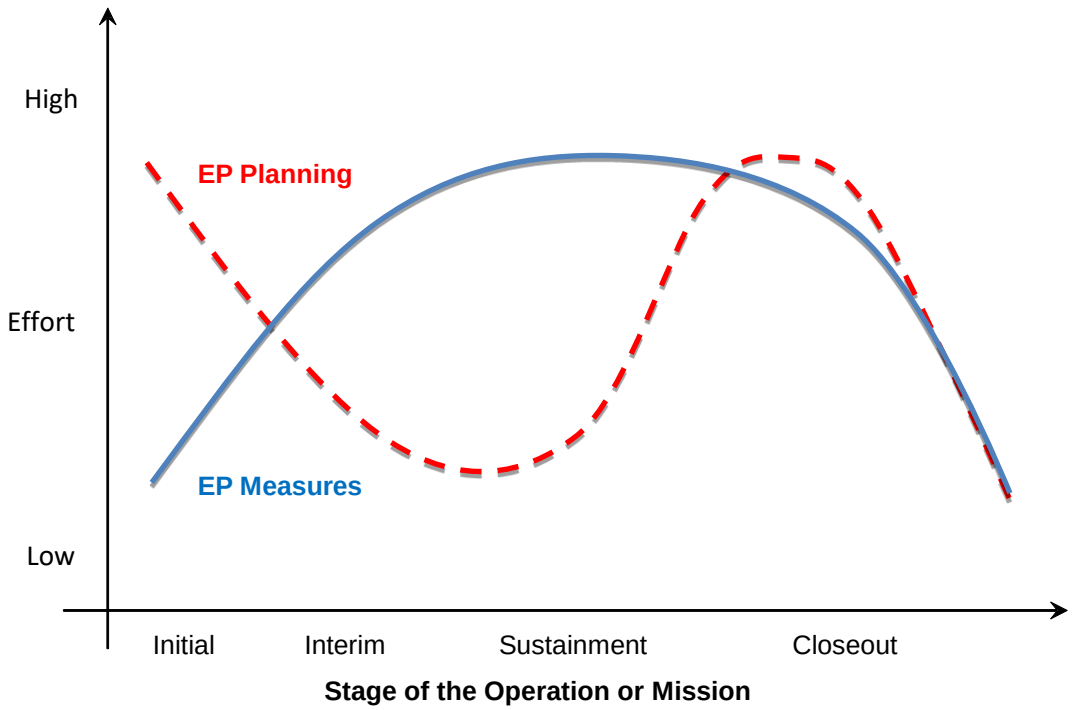

Figure 1-1. Typical EP Effort and Implementation during an Operation

Details of the planning aspects of EP corresponding to the stages of the duration of operations and the phases of the OPP can be found in STANAG 2583 (AJEPP-3); and a template for developing environmental baseline studies (EBSs) can be found in STANAG 6500 (AJEPP-6).

6. Environmental protection planning in a NATO operation is inherently multi-disciplinary given the composition of forces, thus, consideration should be given to standing up an Environmental Management Board (EMB) comprising subject-matter experts from various disciplines and backgrounds to provide advice and coordination to a NATO commander.

1.4. TERMINOLOGY

1. The lexicon at the back of this publication provides details of acronyms, abbreviations, terms and definitions. However, several terms used throughout this publication require specific attention. These terms have neither a NATO agreed definition nor an appropriate authorized[1] dictionary definition.

a. Best Practice. The concept of best practice has been used extensively in civilian environmental management, in particular ISO 14001. Best practice can be thought of as an adaptive learning process rather than a fixed set of rules or guidelines. Nonetheless, a best practice always has the following three attributes:

(1) It is a method or technique that has consistently shown results superior to those achieved by other means;

(2) It is used as a benchmark; and

(3) It can evolve to become better as improvements are discovered.

b. Standard. A standard in NATO wording convention reflects a mandatory requirement used in documents covered by STANAGs that establish procedures or specifications required for interoperability, and generally requires the use of “shall” to indicate that the application of such a procedure or specification is mandatory. Non-conformances with established standards shall be appropriately documented and reported.

c. Stages of an Operation. The stages initial, interim and sustainment are related to Tiers 1, 2 and 3 pertaining to the minimum military requirements of deployed force infrastructure (DFI), details of which can be found in Allied Tactical Publication (ATP) 3.12.1.4, *Deployed Force Infrastructure* (STANAG 2632). These terms and tiers help define the level of support during NATO operations as follows:

[1] NATO’s two authorized dictionaries are the Concise Oxford English Dictionary and Le Petit Robert.

(1) Initial. Tier 1 support is what the first personnel deploying on an operation can carry on their person or in their support vehicles. It normally lasts for several weeks or months.

(2) Interim. Tier 2 provides austere working and living space in order to get the headquarters operational. It normally spans the period of 1-2 months to two years.

(3) Sustainment. Tier 3 infrastructure provides semi-permanent accommodation and services for a period of 2-10 years.

1.5. SUMMARY

A summary of EP best practices and standards has been compiled in Table 1-1 below, as they relate to the initial, interim, and sustainment stages of an operation. Details are contained in the annexes as outlined in the Table of Contents. As reflected in Figure 1-1 and Table 1-1, EP measures in the earlier stage of an operation will carry forward into the later stages where they will become increasingly comprehensive and protective of human health and the environment with the maturing of the military camp.

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Table 1-1. Summary of EP Best Practices and Standards (Part 1 of 6)

Environmental Aspect	Duration of Operation		
	Initial	**Interim**	**Sustainment**
Infrastructure Planning (Annex A)	Consider HN infrastructure facilities and resources, local geographical and climatic characteristics, size of force, etc. Incorporate environmental protection/sustainability aspects in infrastructure planning at earliest stage of mission and camp development. Consider complete life cycle requirement of camp when planning. Conduct an environmental baseline study (EBS) in accordance with STANAG 6500 (AJEPP-6).	Treat DFI as a system of systems. Conduct a supplemental EBS, environmental condition report (ECR), and/or environmental impact assessment (EIA) in accordance with STANAG 6500 (AJEPP-6). Continue to include EP and sustainable infrastructure aspects into continued camp development. Continue to consider complete life cycle requirements into camp development.	Aspire to utilize best practice sustainable infrastructure such as light-emitting diodes (LEDs), motion detectors, insulation, timed flow taps, etc. Conduct an environmental closeout study (ECS), according to AJEPP-6, if a military camp, or part thereof, is vacated.
Energy Management (Annex B)	Use natural lighting where force protection conditions permit. Orient structures for optimal conditions. Choose energy-efficient equipment and appliances, where possible. Promote awareness concerning energy use and conservation.	Plan camps with energy conservation in mind. Establish power grids including micro grids for load balancing and to offload power. Use energy efficient materiel and insulation. Consider waste to energy conversion systems, where applicable.	Use alternative or renewable energy sources and waste to energy converters. Use efficient techniques for heating and air conditioning (e.g. heat pumps). Establish behaviour modification protocols concerning energy use and conservation.

Table 1-1. Summary of EP Best Practices and Standards (Part 2 of 6)

Environmental Aspect	Duration of Operation		
	Initial	**Interim**	**Sustainment**
Potable / Non-Potable Water (Annex C)	Ensure military camp layout to protect wells and water intakes from pollution emanating from camp operations. Employ mobile water treatment systems and municipal water systems where feasible. Meet STANAG 2136 (AMed-P-4.9) requirements.	Develop water management plan to identify and quantify all potable water resources. Encourage water conservation.	Encourage sustainable infrastructure systems to conserve water usage (e.g., use of composting toilets) and used water for other activities (e.g., firefighting; vehicle washing; dust control) when practicable. Utilize on-site bottled water systems, where practicable, to reduce logistical burden.
Waste Water – Black (Annex C)	Employ field expedient methods for waste water treatment (e.g., burn barrels; slit trenches; pit latrines; chemical toilets; and/or contracted waste water disposal.	Transition to more sustainable and environmentally protective infrastructure (e.g., semi-permanent latrines; composting toilets; incinerating toilets; aerobic or anaerobic lagoons; mobile package plant; use of HN waste water plant). Consider reclamation and reutilization systems to reduce the amount of waste water and sewage sludge. Contract off-site sewage sludge disposal; land apply; or compost.	Continue to promote reduction in the amount of waste water and sewage sludge through sustainable infrastructure systems.

Table 1-1. Summary of EP Best Practices and Standards (Part 3 of 6)

Environmental Aspect	Duration of Operation		
	Initial	**Interim**	**Sustainment**
Waste Water – Grey (Annex C)	Employ field expedient methods (e.g., evaporation beds; soakage pits; French drains).	Consider reclamation and reutilization systems to reduce the amount of grey water to be treated from showers, laundries, and other sources, where the quality of grey water complies with standards for its intended purposes (e.g., vehicle washing; firefighting; dust control).	As per Interim.
Storm Water (Annex C)	Control storm water run-off to prevent on-site (camp) and off-site flooding, erosion, and movement of deleterious substances. Manage storm water separately from waste water when possible to minimize treatment of run-off.	Provide containment (e.g., equalization basin) to prevent overload to waste water treatment systems. Treat storm water from hardstands used for vehicle parking/ and washing, and hazardous materials/waste storage areas (e.g., sand filtration; oil-water separation).	As per Interim.
Solid Waste (Annex D)	Employ field expedient methods (e.g., tactical burial in-place; back-haul/retrograde; burn barrels). Only allow open-air burning when no other alternative is feasible	Employ recycling; disposal in landfill; incineration. Consider use of mobile waste-to-energy conversion systems to reduce amount of waste to be treated off-site. Develop preliminary solid waste management plan.	Amend solid waste management plan implementing source reduction; reuse; recycling; energy recovery; and disposal as last resort. Construct engineered landfill.

Table 1-1. Summary of EP Best Practices and Standards (Part 4 of 6)

Environmental Aspect	Duration of Operation		
	Initial	**Interim**	**Sustainment**
Hazardous Waste (Annex D)	Properly collect; label: manifest; store hazardous wastes. Separate waste to avoid incompatible storage materials; promote reuse; and reduce the cost of hazardous waste disposal. Assess availability of compliant local HN treatment and/or disposal facilities. Locate storage areas away from dining and billeting facilities and key water resources.	Employ centralized collection; consolidation; storage of hazardous wastes. Retrograde; recycle; treat; or dispose of hazardous waste in compliant systems/facilities. Ensure transboundary transit of hazardous waste conforms with international agreement obligations.	As per interim.
Health Care Waste (Annex D)	Employ proper field collection; consolidation; storage; separation; labelling; retrograde; autoclaving.	Properly store (refrigerate) infectious wastes. Contract for off-site disposal; retrograde. Employ compliant local or on-site health care waste incineration.	As per interim.
Petroleum, Oils, and Lubricants (POL) (Annex E)	Avoid storing and handling POL near water bodies and other sensitive areas. Establish spill response procedures. Use secondary containment methods.	Improve bulk fuel storage. Enhance spill response and prevention. Establish contaminated soil disposal or remediation procedures, as applicable.	Sustain spill prevention activities. Respond to and report spills.

Table 1-1. Summary of EP Best Practices and Standards (Part 5 of 6)

Environmental Aspect	Duration of Operation		
	Initial	**Interim**	**Sustainment**
HAZMAT (Annex F)	Ensure current safety data sheets (SDS) are available to personnel handling HAZMAT. Properly separate; label; store (e.g., secondary containment). Promote HAZMAT training and communicate risks to personnel. Have appropriate personal protective equipment (PPE) and spill kits available. Have spill response plan in place. Have trained spill response team available.	Construct HAZMAT storage areas (e.g., for pesticides) with secondary containment. Limit releases of ozone depleting substances during maintenance of refrigerant equipment.	Consider on-site HAZMAT exchange to reduce amount needed to be retrograded.
Air Quality (Annex G)	Reduce air pollutant emissions where possible; minimize open fires; and only allow open-air burning when no other alternative is feasible. Take prevailing wind direction and off-site air emissions into consideration when siting camp infrastructure.	Monitor, inspect; and document emissions from camp operations. Properly maintain vehicles and equipment. Operate incinerators to manufacturers specifications and applicable emission limits. Properly design and operate open-air burn pits.	As per Interim.

Table 1-1. Summary of EP Best Practices and Standards (Part 6 of 6)

Environmental Aspect	Duration of Operation		
	Initial	**Interim**	**Sustainment**
Natural Resources Protection (Annex H)	Obtain information on local sensitive species, ecosystems and landscapes; survey camps to identify natural resources in need of protection; limit impacts; post off limits areas; avoid or minimize damage due to mission requirements. Avoid alteration of water courses and disturbance of landscapes. Prohibit buying, selling, and trading of endangered species. Promote awareness training.	Consider development and implementation of a natural resources management plan.	As per Interim.
Cultural Property Protection (Annex I)	Communicate Cultural Property Protection (CPP) guidelines and concerns. Demonstrate respect when requisitioning or using historic properties. Contact HN authorities for expertise on CPP when possible. Provide CPP awareness training.	Consider development and implementation of a CPP plan; and CPP considerations in operational planning and military targeting.	As per Interim.

ANNEX A – INFRASTRUCTURE PLANNING

A.1. DESCRIPTION OF THE SITUATION

1. Suitable planning for infrastructure is of importance in order to provide protection and quality of life conditions to TCN forces, while minimizing life cycle costs and the impact on the local population and environment.

2. Deploying forces can expect a wide range of potential support from the HN. This support may range from no support at all to full integration into the existing infrastructure systems. In most cases infrastructure will be non-existent, damaged or have limited capacities to support the operational mission.

3. The infrastructure plan shall consider the DFI generic organization, encompassing services[2] and accommodation[3], as detailed in STANAG 2632 (ATP-3.12.1.4) - see Reference A.5.1.f. DFI is comprised of the buildings, facilities and installations required to support military forces when deployed. Infrastructure planning is primarily influenced by operational requirements but significant second order influences also include:

a. Size of the force;

b. Availability and condition of local infrastructure facilities, material and services;

c. Force protection and security requirements;

d. Stage and duration of operations, from deployment through camp closure;

e. Geography, climate, topography, hydrology, other local physical characteristics, and changes to these conditions caused by climate change;

f. Environmental conditions and sensitivities;

g. Impact on the local population;

h. Natural resources (to include threatened species and critical habitat);

i. Cultural property;

[2] In STANAG 2632 (ATP-3.12.1.4), services include force protection, fire protection, communication and information systems, power generation, water supply, waste management, environmental protection, climate control, and road network and associated infrastructure.
[3] In STANAG 2632 (ATP-3.12.1.4), accommodation includes messing, recreation, sanitation, working, living, logistics, medical and training facilities.

j. Financial and political limitations; and

k. Risk of transporting invasive aliens species or diseases.

A.2. OBJECTIVES

1. Fit for purpose infrastructure that avoids adverse environmental impacts and limits the harmful influence of operations on the local environment.

2. Planned, sustainable infrastructure that reaches toward a best-case scenario of a camp that minimizes the impact on the environment.

3. EP aspects incorporated into infrastructure planning from the earliest stage of mission and camp development in order to maximize its effectiveness.

4. The planning process conducted with a complete life cycle analysis of the infrastructure requirements in order to reduce the use of mission resources (e.g., personnel, equipment, fuel, water, energy).

A.3. RESPONSIBILITIES

Commanders shall ensure that personnel are advised on environmental aspects of infrastructure planning, throughout all stages of an operation. In coordination with other applicable military camp staff, the EP officer shall support and help the Commander in this duty.

A.4. BEST PRACTICES AND STANDARDS

A.4.1. General

1. Infrastructure planning should follow the phases of the operations planning process and be balanced amongst a variety of demanding military factors in order to achieve operational sustainability. Based on information from the environmental baseline study (EBS), ensure areas of environmental concern will not adversely impact the mission or that the mission will not adversely impact areas of environmental concern (or have minimal impacts).

2. Sustainability should be included in all facets of camp design to sufficiently provide services to all personnel until camp closure.

3. Infrastructure planning should be initiated by collecting data regarding HN military and civilian engineering capabilities and resources and local/regional impacts from climate change.

4. Environmental best practices should be employed in infrastructure design, wherever suitable (e.g., light emitting diode (LED) lights, motion detectors, insulation).

5. DFI should be treated as a system of systems in which all infrastructure construction and operations are interconnected and interrelated. For example, power generation, waste management and water management should be considered as interconnected and interrelated systems.

6. An EBS shall be conducted prior to occupying the area or as soon as possible upon occupation. An EBS serves to document existing environmental conditions, identify risk factors and assist with camp layout. Documenting existing conditions limits liability to NATO forces for any environmental issues incurred prior to occupation.

7. An environmental impact assessment (EIA) shall be conducted to assess the potential impact of a proposed individual project or activity (e.g., construction project, projects involving significant changes of use of a facility or area) and to recommend measures for the prevention and mitigation of significant adverse impacts. An environmental condition report (ECR) shall be used to document changes in the environmental conditions of a used area over time, as well as helping to ensure that an appropriate environmental focus is being maintained. An additional EBS may also be necessary during such changes (e.g., camp expansions).

8. An environmental closeout study (ECS) shall be conducted at conclusion of occupation/handover/transition of the camp or before closure of an area. The goal of the ECS is to identify environmental conditions that should be addressed prior to handover/closure and assist with the development of a corrective action plan.

9. Guidance, procedures and templates for conducting an EBS, ECS, EIA, and ECR are contained within STANAG 6500 (AJEPP-6) – see Reference A.5.1.g.

A.4.2. Planning Principles

1. Implement EP best practices and standards into infrastructure planning as early as possible.

2. Consider inhabited vs. uninhabited areas (i.e., coordinating the use of existing local infrastructure or building new facilities).

3. Consider distributed vs. centralised services (i.e., single area zoning vs. common utilities installation).

4. Distinguish spacing between environmentally compatible and incompatible services (e.g., water well sufficiently separated from fuel stations is essential).

5. Maximize use of modular, scalable systems in order to allow for expansion or contraction as the camp demands dictate.

6. Consider the use of all available energy sources for power generation (local, mobile, alternative) - see Annex B – Energy Management for details.

7. Incorporate effective water and waste water management - see Annex C - Water and Waste Water Management for details.

8. Incorporate effective waste management – see Annex D – Waste Management for details.

9. Incorporate effective spill/leak prevention measures for POL and other chemicals – see Annex E – Management of Petroleum, Oils and Lubricants (POL) and Spill Response.

10. Incorporate effective storage for Hazardous Materials - see Annex F – Hazardous Materials and Substances Management.

11. Incorporate measures to reduce air pollution that may impact camp users and the local population - see Annex G – Air Quality.

12. Plan to avoid adverse effects on the natural environment – see Annex H – Natural Resources Protection.

13. Plan to avoid damaging and disrespecting local cultural and historical sites - see Annex I - Cultural Property Protection.

14. Incorporate measures in camp design to reduce noise sources that may impact the surrounding environment of the camp (in particular local inhabitants and fauna habitats).

15. Select camp sites that are not subject to periodic flooding or climate-related hazards.

16. Incorporate measures to prevent the spread of invasive alien species or diseases, such as vehicle decontamination facilities.

A.5. REFERENCES

1. The following references and related documents were used in developing this annex or are sources of additional information on infrastructure planning:

   a. Environmental Guidebook for Military Operations, FIN-SWE-USA, March 2008;

   b. Environmental Toolbox for Deploying Forces: An Awareness Training Supplement to the Environmental Guidebook for Military Operations, FIN-SWE-USA, 2016;

c. European Commission, EU Science Hub, Energy Efficiency, https://ec.europa.eu/jrc/en/energy-efficiency;

d. STANAG 2238, *Allied Joint Doctrine for Military Engineering*, AJP-3.12;

e. STANAG 2394, *Allied Tactical Doctrine for Military Engineering*, ATP-3.12.1;

f. STANAG 2632, *Deployed Force Infrastructure*, ATP-3.12.1.4;

g. STANAG 6500, *NATO Environmental File During NATO-Led Activities,* AJEPP-6;

h. United Nations Environment Programme (UNEP), *Greening the Blue Helmets,* https://postconflict.unep.ch/publications/UNEP_greening_blue_helmets.pdf;

i. United States Environmental Protection Agency (USEPA), *Green Building* (archived), http://www.epa.gov/greenbuilding/; and

j. Standards Related Document – AJEPP-6.1 – Manual for Environmental Sampling Protocols.

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ANNEX B – ENERGY MANAGEMENT

B.1. DESCRIPTION OF THE SITUATION

1. Energy is an essential element of every military operation. It powers and supports military systems, vehicles and infrastructure. Current NATO military operations require significant quantities of energy, like diesel fuel, in order to maintain mission performance. This can have significant logistical, financial and human resource costs, as well as environmental impacts.

2. NATO is actively promoting a framework for the efficient and sustainable use of energy in military camps. In this annex, energy management refers to energy efficiency, energy conservation procedures and practices, as well as to the effective use of sources of energy. Energy efficiency is considered as the ratio of output to input performance required for services, equipment, and materials. It does not specifically address energy management in terms of controlling a facility's energy systems (e.g. heating, cooling, ventilation, and lighting). In this context, two things are considered important to ensure the effective implementation of appropriate energy management:

   a. Energy Data Collection (EDC), which provides a solid background and a representative analysis of a camp's energy profile and energy distribution. In these terms, the establishment of a suitable energy baseline is crucial.

   b. Personnel behaviour monitoring so that the implementation of procedures for improving camp energy efficiency are identified and maintained.

B.2. OBJECTIVES

1. Optimize the use of energy and reduce associated energy costs, while maintaining or improving mission performance.

2. Reduce adverse environmental impacts.

3. Improve resiliency, sustainability, and the logistical footprint of operations.

B.3. RESPONSIBILITIES

1. Operational level commands should outline internal Command and Control (C2) responsibilities regarding energy management, to be able to support and enable the Energy Manager to complete their activities at the tactical level.

2. In coordination with the EP Officer, and other applicable military camp staff, the Energy Manager shall implement the aforementioned C2 responsibilities by:

a. Establishing relevant networks and relationships conducting a Handover/Takeover (HOTO) with predecessor;

b. Developing an Energy Management Team (where possible);

c. Introducing or updating in-processing / out-processing procedures;

d. Establishing an energy management data collection and analysis plan;

e. Developing or identifying relevant SOPs (for accommodation, duty staff, ablutions, environmental protection, etc.);

f. Presenting of the findings to the chain of command;

g. Delivering progress updates / feedback on the energy management measure(s) to the relevant chain of command and obtain approval for any changes required to the energy management measure(s);

h. Documenting approval of the action plans;

i. Implementing energy management measure(s);

j. Dissemination of orders, directives, guidance communicating any significant changes to camp infrastructure or policies;

k. Recording lessons learned and archiving energy management findings for future use.

3. In coordination with a camp energy manager, and other applicable military camp staff, the EP Officer shall:

a. Advocate for energy resource conservation, with energy management being one means to achieve this.

b. Support the energy manager to implement an energy management action plan.

c. Raise awareness, provide guidance and advise camp personnel which are involved in critical energy uses, procurement and contracting.

B.4. BEST PRACTICES AND STANDARDS

B.4.1. Energy Management Action Plan

1. An energy management action plan should be established for camps, and is comprised of the following elements:

a. Energy data collection and analysis, including the appropriate baseline measurements;

b. The commander's energy policy;

c. Identification of critical energy uses;

d. Appointment of key performance indicators;

e. Suitable energy efficiency goals;

f. Planning of appropriate energy management programs in order to establish and achieve goals; and

g. Periodic feedback to the commander.

B.4.2. Design and Construction

1. Design and construction of military camps should be guided by, but not limited to, the following thermal insulation considerations:

a. Proper building insulation, taking into account existing temperature and humidity conditions;

b. Proper insulation of heating and cooling ducts; and

c. Appropriate double/triple glazed windows and doors, in extreme climates.

2. Consider the separate (and not simultaneous) operation of heating and air-conditioning systems.

3. Consider the use of efficient space heating/cooling equipment. In suitable regions, install heat pumps to efficiently meet space heating and cooling needs and avoid the use of inefficient fuel or electrical space heating systems.

4. Consider the use of heat/energy recovery ventilations between incoming and outgoing air.

5. Consider the use of wind driven ventilators.

6. Consider the use of energy efficient lighting rather than fluorescent or incandescent lights.

7. Consider the use of motion sensitive light switches and efficient light dimmers.

8. Use natural lighting, when possible, and where force protection conditions permit.

9. Install or relocate energy monitoring systems (energy metering equipment), when possible, to help establish a baseline and identify usage, potential inefficiencies, and optimal configurations.

B.4.3. Operation and Maintenance

1. Connection to the local power grid should be considered based on the impacts to the local population and the energy source that is used to generate the power.

2. Consumption of fossil fuels and net carbon footprint can be reduced by applying energy solutions that mix energy sources (e.g. conventional fossil fuel and renewable solar or wind energy). Electrical storage, such as batteries, can help meet peak electrical demands as well as ensure traditional diesel generators operate at their prime efficiency. These conditions should be assessed prior to deployment.

3. Use low flow and/or controlled flow water systems to reduce water consumption and energy usage.

4. Use controlled heating and cooling systems. Control temperature and humidity within the human comfort range.

5. Monitor energy usage and identify optimal system configuration and operation.

6. Regularly maintain air conditioning units, such as cleaning the filter, cleaning the outdoor coil, and ensuring there is sufficient airflow around the outdoor coil, leading to improved energy efficiency.

7. Ensure tents / rooms are not conditioned unless necessary (e.g. avoid cooling shelters that are unoccupied).

8. Ensure windows and doors are closed in air conditioned tents or structures to avoid unnecessary heating or cooling losses.

9. Turn off lights in unoccupied shelters or rooms.

10. Use solar shades to reduce the cooling load on a shelter, reducing the load on the air conditioner.

B.4.4. Equipment

1. Consider the use of energy storage equipment for excess power from renewable sources.

2. Consider the use of efficient generators and smart grids in order to efficiently respond to energy demands.

3. Place thermometers and hygrometers in representative environments in a visible place clearly indicating the suggested temperature and humidity limits. Include communication or action procedures if limits are exceeded.

4. Procure energy efficient appliances (e.g. computers, refrigerators, dishwashers, and clothes washers and dryers) while considering disposal requirements.

5. Properly maintain vehicles and use speeds at which engines are more efficient to reduce vehicle energy consumption.

6. Consider the use of more efficient vehicles (e.g. electric, hybrid) inside a camp.

B.4.5. Collection of Energy Data

1. Creating an energy metering plan is essential as it helps to establish a baseline and identify Significant Energy Uses (SEUs) in a camp. A plan also helps to track the progress of reducing the camp's fuel dependency and increasing its energy efficiency. The baseline provides an overview of the electrical demand profiles; without a suitable baseline, Energy Performance Indicators (EnPIs) cannot be measured and, ultimately, verified to see whether the energy management measure implemented has had an impact.

2. Once an energy metering plan has been developed, an energy management data collection and analysis schedule should be established to routinely collect the information needed to update the EnPIs and track progress.

3. To normalize energy data and establish trends, weather data should also be recorded.

4. Additionally, historical fuel consumption and weather data should be acquired, along with current and historical camp occupancy data, if available.

5. The type and amount of data to collect depends upon the extent of a camp. For energy management purposes, the camp should be split up into logical sectors for measurement (e.g. accommodations, ablutions, messing, logistics, operations, and welfare). Sectors and nodes should be defined so that they can be measured separately. Their totals can then be conveniently added or subtracted. Metering equipment and installation expertise should be available through reach back support. Essential elements of information for energy management are included in Table B1:

Table B1. Energy Metering Information Template (Part 1 of 2)

Types of Information	Sources
Amount/costs of energy consumed. Billing services for electricity, gas, long-distance heating, etc. Maybe also self-supply.	Accounting (energy bills from the energy supplier, oil/gas supplier, filling station bills) Energy supply contracts

Table B1. Energy Metering Information Template (Part 2 of 2)

Types of Information	Sources
Kilometres travelled, times of operation	Vehicle/power generator logbooks
Soldiers in the camp	Camp administration
Times of operation of machinery and power generators	(Estimated) times of operation Logbooks
Name of areas belonging to the camp (according to interface definition), including their surface and volume (m^2, m^3) for the definition of key figures.	Construction plan, camp plans Fire protection plans
Pipes and linings (gas, compressed air, electricity, etc.). Measurement points, shut-off devices, among others for the registration of measurement points.	Records about distribution nets Camp plans Fire protection plans
Number, performance, and age of power generators (all kinds of machinery related to that, heat exchangers available for heat recovery, etc.). These data are necessary to find out the actual energy demands.	Lists of machinery in use Technical descriptions Logbooks

B.4.6. Human Factors, Awareness, Guidance, and Training

1. Appropriate actions and processes that can raise awareness and provide guidance to the camp's personnel are listed below:

a. Increasing knowledge or understanding: Arranging for lectures and distributing posters about the importance of saving energy, and/or distributing leaflets with guidelines for everyday energy use reduction;

b. Training on the operational importance of saving energy and on energy management during the mission preparation phase. Personnel should be encouraged to report waste and provide direct feedback on behaviour;

c. Giving briefings on reducing the energy consumption of vehicles through maintenance and good driving techniques, like ECO-DRIVING;

d. Promoting the best possible use of natural lighting during the setting of workspaces and for other situations of use of facilities;

e. Performing a survey to identify the root causes for inefficient processes (i.e. COM-B method – Capability, Opportunity and Motivation) to lead to behaviour change;

f. Collaborating with procurement personnel by providing advice on procurement of equipment (power generation, smart grid) to improve the energy efficiency of the camp;

g. Monitoring the use of energy, providing baseline analysis of energy consumption data and providing recommendation how to optimize energy efficiency in the camp;

h. Reporting situations when behaviour of military personnel makes a negative impact on overall energy efficiency efforts within the camp;

i. Coordinating with procurement personnel in order to ensure that energy procurement contracts with local providers are conducted and performed in a way that serves the camp's best interests; and

j. Ensuring that adequate energy storage solutions and related infrastructure are included in contracts.

2. Depending on the availability of properly qualified personnel, these duties could be delivered by certified energy experts through reach-back support, partnerships or consultants.

B.5. REFERENCES

1. The following references and related documents were used in developing this Annex or are sources of additional information on energy management:

a. NATO Smart Energy, http://natolibguides.info/smartenergy;

b. United Nations Department of Peace Keeping Operations (UNDPKO), Department of Field Support, Ref. 2009.6, *Environmental Policy for UN Field Missions*, 1 June 2009;

c. United Nations Economic Commission for Europe (UNECE), "Environment for Europe" Process, http://www.unece.org/env/efe/welcome.html;

d. United Nations Environment Programme (UNEP), *Assessment of Energy, Water and Waste Reduction Options for the Proposed AMISOM HQ Camp in Mogadishu, Somalia and the Support Base in Mombasa, Kenya*, February 2010, http://postconflict.unep.ch/publications/unep_dfs_unsoa.pdf;

e. United States Army, Europe (USAREUR), *Standards for Base Camps*, 15 June 2020, https://media.defense.gov/2020/Jun/15/2002315681/-1/-1/0/AER420-100.PDF;

f. United States Environmental Protection Agency (USEPA), ENERGY STAR, http://www.energystar.gov/;

g. ISO 50001: 2011 Energy Management Systems Guidelines and Principles, available at www.iso.org;

h. European Commission, EU Science Hub, Energy Efficiency, https://ec.europa.eu/jrc/en/energy-efficiency; and

i. NATO SPS G5525 project.

j. NATO Energy Security Centre of Excellence, NATO Military Engineering Centre of Excellence, Natural Resources of Canada, UK MoD, Energy Management Handbook: Energy Management for Military Deployed Force Infrastructure

ANNEX C – WATER AND WASTE WATER MANAGEMENT

C.1. DESCRIPTION OF THE SITUATION

1. In many locations, fresh water, especially of a quality for drinking or other human use, is a scarce resource. Therefore, water is often a contributing factor in many conflicts or a force protection issue. At the same time, used water can be hard to dispose of at a mission location (i.e., military camp). As such, both fresh and waste water have the potential to become a logistical burden on the operation.

2. Polluted water discharged to an urban or a natural environment without treatment could potentially contaminate local waterways, groundwater resources, fisheries and crops where it is used as irrigation water causing severe health issues and environmental degradation.

3. The major sources of potential water contamination at a mission location are sewage, vehicle washing (including decontamination), vehicle maintenance, soil carried by erosion, kitchens, dining facilities, laundries, and the leakage of chemical products.

4. Designing a military camp without taking into account all types of waste water may lead to an insufficient waste water collection and treatment system unable to handle the waste water volume and/or their constituents. In addition, storm water and melting water should be treated separately as their highly varying volumes and components could overload the main waste water treatment system.

5. This Annex recommends best practices and standards in water management in order to enhance the sustainability of a military camp. Water management in terms of standards for potable water (i.e., water purification) is beyond the scope of EP and this publication. Potable water standards can be found in STANAG 2136 (AMedP-4.9), *Requirements for Water Potability During Field Operations and in Emergency Situations*.

C.2. OBJECTIVES

1. Reduce the logistical burden by effective and well-planned water and waste water management. This includes water conservation measures, reuse of waste and storm water, installation and/or construction of a waste water treatment plant with inclusion of techniques to minimize sludge production, and, where feasible, reuse of waste and storm water and reuse of the hygienic and stabilized sludge for local agricultural use.

2. Transition as soon as practicable from the use of field expedient methods of waste water disposal during the initial stage of an operation to more sustainable and environmentally protective infrastructure approaches and systems for waste water treatment and disposal during the interim and sustainment stages of an operation.

3. Ensure effective camp layout design so that hazardous material (HAZMAT) is properly managed (e.g., inspected, contained) and is never co-located with any significant water point such as wells, boreholes or water evacuation system to avoid any possible contamination of the surface water, groundwater, waste water, or storm water systems - see Annex F – Hazardous Materials and Substances Management.

4. Identify potential sources of water pollution generated by the military camp and take preventive measures to ensure polluted water does not reach the environment without adequate treatment.

5. Ensure effective waste water treatment with appropriate release of effluent and management of biosolids (sludge) in accordance with paragraphs 1.3.4 (Chapter 1) and C.4.7 of this Annex.

C.3. RESPONSIBILITIES

1. Commanders and TCNs should use the best practices and standards available for the specific situation within the mission area.

2. In support of the commander, the EP officer shall:

   a. Provide advice on water management solutions, including water conservation and reuse, in close coordination with the engineering branch, force health protection branch and, when needed, specialized contractors;

   b. Monitor water and waste water quality by arranging for relevant analysis, ensure close cooperation with preventive medicine, veterinary, and other personnel, as applicable, regarding water quality and use, and in monitoring the effectiveness of treatment;

   c. Monitor water usage and wastewater production quantity by arranging for relevant measurements and maintain monitoring records;

   d. Seek to identify the origin of pollutants that result in exceedances to the waste water treatment standards in paragraph C.4.7 of this Annex, and employ adequate pre-treatment or preventive measures, as necessary;

   e. Participate in the planning of water and waste water systems with the engineering branch based on future expansion or drawdown of the camp, taking into consideration changes in flows due to troop surges, rotations, or redeployments;

f. Participate in the planning for camp upgrades during all phases of the operation from field expedient treatment methods to more sustainable and long-term solutions as the camp size and duration increases;

g. Participate in the preparation of contract EP requirements regarding water and waste water;

h. Report incidents and accidents involving water-hazardous substances;

i. Participate in site closure planning. Ensure wastewater facilities are properly closed and marked before leaving a camp site.

C.4. BEST PRACTICES AND STANDARDS

C.4.1. Water Management Plan

1. A water management plan shall be included within the EP appendix of relevant directives at the appropriate level (e.g., local camp Standard Operating Procedures (SOP)). The water management plan is a part of mission planning and shall be adjusted to the mission specific goals. This is usually achieved by minimizing the logistic burden and use of manpower, creating a reliable and robust system, and minimizing the adverse impacts on the local environment and population. Water supply and waste water treatment are interrelated and shall be managed as a system in a manner such as that illustrated by Figure C1.

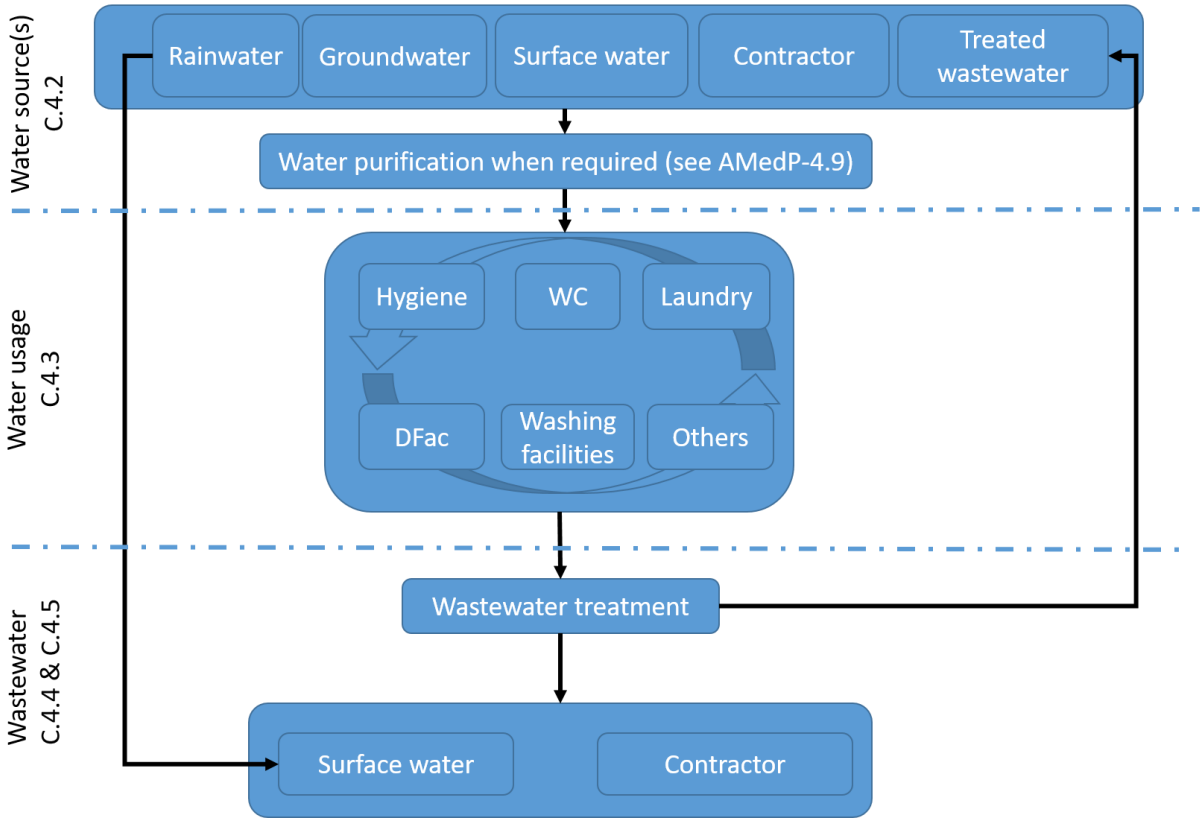

Figure C1. Illustration of a Possible Water System within a NATO Camp

2. The water management plan shall take into consideration the following:

   a. Planning and mission specific conditions to include:

      (1) Identification and quantification of all influents (i.e., water resources), uses of water, and effluents generated in the mission location by development of a schematic water balance reflecting these different water points and flows;

      (2) Preventive measures to separate and minimize the influents and effluents. The demand for water production, and subsequently waste water treatment and discharge, can be reduced by active planning, technical solutions, and sound behaviour.

      (3) Identification of water and waste water requirements and standards.

      (4) Evaluation of information about the local conditions of a planned mission location to include:

(a) Type of terrain and the receiving soil and waters, including local critical parameters (e.g. limiting eutrophic factors, soil permeability, protection of aquifers);

(b) Local water sources (e.g., distribution systems and water networks, contractor provided, availability and vulnerability of groundwater, surface water and/or rainwater);

(c) Local climate that could influence the performance of treatment systems (e.g. temperatures, dust) and the volume and constituents of storm and melting water;

(d) Logistical constraints and possibilities;

(e) Local treatment facilities, including capacity; and

(f) Projected size and population of the military camp and duration of the mission.

b. Operation and maintenance of equipment. Ensure that personnel operating water and waste water systems are adequately trained;

c. Monitoring and evaluation of water usage and waste water generation (by type) to identify potential areas of concern or optimization opportunities. This implies the installation of water meters at optimal points in the water system, where practicable;

d. Production of bottled water on site to reduce the logistic effort if determined to be economically and environmentally sustainable; and

e. Site closure requirements for water and waste water systems.

C.4.2. Water Sources Management and Purification

1. Depending on the quality of the water source and on its intended use after treatment, the applied treatment method before use will differ. Water quality requirements are stated in STANAG 2136 (AMed-P 4.9) and controlled by medical or veterinary personnel. Following treatment, potable water shall be used for drinking, food preparation, and hygiene, while disinfected water shall be directed for use in vehicle washing, flushing wet toilets, and for laundry washing.

2. Groundwater wells shall be protected from infiltration of HAZMAT and other possible pollutants. Wells no longer in use shall also be properly closed and sealed.

3. Both groundwater wells and surface water shall be monitored in order to prevent the depletion of the aquifer(s) and/or to protect locally used water resources.

4. Water purification itself is a water consumer and, therefore, the quality of the water should be adjusted based on its intended final use (e.g., for potable water, irrigation). Reverse osmosis water purification units (ROWPUs) can have an output as low as 70% and also generate waste (e.g., brine water and spent filters) which shall be properly managed – see Annex D – Waste Management.

5. Storm water should be considered as a possible water source for military camps, especially in the interim and sustainment stages of an operation when supported by the appropriate infrastructure and climate.

C.4.3. Water Usage

1. Negatively impacting water sources shall be avoided whenever possible and best practices employed (e.g., biodegradable soaps for cleaning, washing, hygiene).

2. The washing, lubricating, and fuelling of vehicles should be carried out on an impermeable surface with the effluent, including eventual storm-water runoff, should pass through an oil-water separator and a settling tank - see C.4.4.

3. Water conservation on military camps shall be encouraged at all times with consideration given the following practices and modifications to infrastructure, where practicable:

a. Mixer taps to significantly reduce water usage;

b. Proper maintenance of water lines and storage systems to avoid leaks;

c. Plumbing with built-in waste separation to limit the load on the waste water treatment system;

d. Use of circulation pumps for the hot water circuit or decentralised (solar) boilers and/or tankless water heaters positioned as close as possible to the locations where hot water is needed to help lower water consumption and to help ensure the desired output temperatures are reached sooner;

e. Education and environmental awareness sessions to help camp personnel understand how and why they have to manage their use of water;

f. Use of waterless urinals, where practicable, to reduce water usage;

g. Use of composting toilets, where practicable, to reduce water usage;

h. Use of used water for other activities (e.g., firefighting, vehicle washing, dust control) when practicable, to reduce water usage; and

i. Vehicle wash racks equipped with systems for the recycling of used water to significantly reduce water consumption. Some advantages and disadvantages of such systems are as follows:

(1) Advantages: Recycle up to 90% of the used water. Integrated units are commercially available or can be constructed with ad hoc equipment and a sand filter.

(2) Disadvantages: Cost more than a simple wash rack installation and require more maintenance. They are susceptible to more failures.

C.4.4. Waste Water Treatment

1. Avoid waste water discharges when possible. When needed, employ the appropriate waste water treatment technology based on the duration of the operation and an engineering assessment. Field expedient methods for waste water disposal during the initial stage of an operation are contained within STANAG 2561, Standards Related Document (SRD) to AJMedP-4. Some technologies demand large amounts of chemicals that may not be appropriate when transportation or transboundary import is a challenge.

2. Consider the use of mobile (e.g., package) waste water treatment systems for force sustainment systems to reduce the amount of waste water treated offsite.

3. Effluents contaminated by chemicals (e.g., chemical toilets, rainwater runoff contaminated with POL, vehicle disinfection fluids), shall be pre-treated separately, as such chemicals can reduce the efficiency of a biological waste water treatment system or render it inoperable for extended periods of time.

4. Treat potentially polluted stormwater runoff originating from hardstands used for vehicle parking and washing, and storage of dangerous goods, using appropriate processes (e.g., sand filtration, percolation, oil-water separation) where applicable.

5. Oil-water separators shall be sized and emptied according to water flow and degree of pollution. Detergents may interrupt the proper function of the oil-water separator by dissolving oil in the water being treated.

6. Biosolids (sludge) contaminated with industrial residues shall not be applied to agricultural farms if not hygienized and stabilized so as not to contaminate the food supply - see Annex D – Waste Management.

7. Necessary sampling and monitoring of waste water discharges and receiving waters shall be carried out. Determine the critical parameters (constituents) of the receiving water or ground (soil) to be sampled for. Waste water treatment system effluent parameters and standards that shall be monitored are outlined in C.4.7.

8. Brine effluent (e.g., from reverse osmosis) should be discharged at a flow rate that does not affect the environment (e.g., by dilution), or disposed of by a local contractor, depending on its salts concentration when evacuated from the system. Such effluent, if not diluted sufficiently, will have a negative impact on the soil and water where released.

9. Personnel designated to operate and monitor the waste water treatment system shall be skilled and familiar with its technology.

10. Local conditions (e.g. temperature) shall be considered as they can have an important influence on the performance of water treatment systems. For example, the dissolved oxygen level needed by aerobic bacteria in water depends heavily on water temperature.

11. Sewage shall be collected, treated and discharged in a way that does not pose a risk to the environment or to the health of camp personnel. From a sanitation point of view, biological aerobic treatment generally results in an effluent of better quality and better reduction rate of pathogens as contrasted with chemical sedimentation.

12. Latrines, septic systems, and treatment lagoons shall be located downgradient from intakes used for sources of potable water (e.g., wells, surface waters).

13. The following is a comprehensive, but not necessarily exhaustive, list of solutions to the treatment of human sewage (black water) during the various stages of an operation, and their respective advantages, disadvantage, and limitations:

a. Latrines.

(1) Advantages: Immediate implementation. Simple system.

(2) Disadvantages: Only for short term use. Can attract vectors or pests. Possible soil and groundwater pollution.

(3) Limitations: Requires periodic relocation.

b. Chemical/portable toilet.

(1) Advantages: Hygienic expeditionary field method. Can be relocated.

(2) Disadvantages: Must be emptied frequently. More expensive than other expeditionary methods.

(3) Limitations: Contract support required. Procurement timeline (lead time) may not meet expeditionary timeline.

c. Composting toilets.

(1) Advantages: Almost no water usage. No waste water production. If well-operated the solids could be reused as fertilizer for local agricultural use.

(2) Disadvantages: More complex to operate. Sanitary risks (e.g., diseases, insects, parasites.

(3) Limitations: Cleaning of composted material on regular basis.

d. Incinerating toilet.

(1) Advantages: Waterless. Sterile ashes. No black water treatment system needed.

(2) Disadvantages: Energy consumption. Gas emissions.

(3) Limitations: Requires a source of energy.

e. Anaerobic lagoon.

(1) Advantages: Effective. Low maintenance. Least expensive for large volumes. Little energy requirements.

(2) Disadvantages: Large space requirement. Needs to be deep. Can attract insects or other animals. Retention time. Odour. Needs impermeable liner or compaction. Possible soil and groundwater pollution.

(3) Limitations: No disinfection possible. Site away from airfields because of aircraft bird strike hazard. Temperature dependent.

f. Aerated lagoon.

(1) Advantages: Effective. Inexpensive for large volumes. Smaller space requirement than other lagoons. Shorter treatment residence time.

(2) Disadvantages: Large space requirement. Can attract insects or other animals. Odour. Needs impermeable liner or compaction. Can require additional treatment for the discharge to meet the allowed effluent requirements. Possible soil and groundwater pollution.

(3) Limitations: No disinfection. Aerator requires power. Site away

from airfields because of aircraft bird strike hazard. Temperature dependent.

g. Septic system.

(1) Advantages: Effective. Low maintenance.

(2) Disadvantages: Large space requirement.

(3) Limitations: Lower soil percolation requires more land area. Dependent on water table height. Land cannot be used for other purposes.

h. Host Nation (HN) treatment.

(1) Advantages: Low capital costs, only storage tanks. Low maintenance. Could use either HN collection or connection to local sewer.

(2) Disadvantages: Potentially high contract costs.

(3) Limitations: HN must have capability and capacity. Lack of control over disposal. Contract management requirements. Friendly nation only. Quality assurance for compliance.

i. Fixed treatment package plant.

(1) Advantages: More likely to meet discharge standards at C.4.7 right after treatment. Smaller footprint than lagoon.

(2) Disadvantages: High capital costs. Long start up time.

(3) Limitations: Long term bases only. Contract oversight.

j. Mobile treatment (package) plant.

(1) Advantages: More likely to meet discharge standards at C.4.7 right after treatment. Smaller footprint than lagoon.

(2) Disadvantages: High capital costs. Long procurement time if not integral to TCNs inventory.

(3) Limitations: Long lead time. Must plan in advance if using for initial entry stage of the operation. Contract oversight.

14. Water conservation during waste water treatment:

a. Treated waste water should be used as applicable if the effluent complies with the standards related to its intended purpose. The EP officer shall coordinate with the commander and medical/veterinary team to determine the approved reuse.

b. Water recycling reduces the demand for fresh water and effluent of used water, which makes the military camp more self-sufficient and less reliant on other sources of water (e.g., pumped groundwater).

c. Recycling used water for use as utility water should be encouraged when the quality of (treated) water complies with the required standards (e.g., vehicle washing, firefighting, dust control). The advantages, disadvantages, and limitations of recycling water are:

(1) Advantages: Can reduce total water demand. Increases self-sufficiency and security.

(2) Disadvantages: Higher capital and maintenance costs. Increased recycling may require increased waste water treatment volume.

(3) Limitations: The availability of specific recuperation systems is a limiting factor. The quality of the treatment system and the technical possibilities to meet the required standards are determining.

C.4.5. Waste Water Discharge

1. Direct discharge of untreated waste water into streams, rivers or other bodies of water shall be prohibited.

2. Discharge of treated waste water can involve risks or disturbance to personnel in the area and, therefore, outlets (effluent discharge points) shall be placed with consideration of such impacts on military camp and HN populations.

3. Waste water effluent standards are provided at C.4.7. The standards to be applied shall respect HN legislation in conformance with 1.3.4 of Chapter 1, and other agreements, taking into consideration the waste water effluent flows and quality, and the uses and flow of the HN receiving watercourse or ground.

4. The contracted disposal of waste water from the military camp to the final disposal site shall be supervised and monitored. Waste water transported out of a military camp presents force protection risks. The amount of trucks required to remove waste water places a burden on force protection assets and allows opportunities for adverse insurgent or enemy action. The difficulty of controlling where the waste water is finally discharged varies with the circumstances. The discharged waste water shall be monitored as long as the threat level allows it.

5. The capacity of a waste water treatment system shall be determined by the size and capacity of its elements. If connected to a communal system, it will be determined by the capacity and condition of the local sewers, discharges from storm connectors, catch basin overflows, and any other connections.

C.4.6. Storm Water

1. Storm water run-off shall be controlled to prevent on-site and off-site flooding, erosion, and movement and deposition of deleterious substances. Storm water shall be managed separately from waste water streams, where feasible.

2. If separate collection of storm water run-off is not possible, and storm water is directed to the main waste water treatment system, containment (equalization) should be provided to prevent malfunction or overload of the system and to keep waste water composition and flow rates as constant as possible until the storm event passes.

3. See C.4.4. for treatment of storm water run-off that may be polluted from vehicle parking, washing facilities, or HAZMAT storage and handling locations.

4. Areas should be monitored and corrected where the soil, due to lack of infiltration, causes waste water accumulation that may attract vectors and produce other hygienic risks.

C.4.7. Waste Water Treatment Standards

1. The level of treatment and environmental measures will be dependent on the level of development of the military camp and resources available to the TCNs.

2. Treatment techniques may vary with TCNs but a common understanding of the standards to be reached shall be clearly identified within the mission EP SOP's.

3. As treatment techniques may vary depending on type of infrastructure used and level of camp development, the testing and monitoring scheme could vary as well. Directive 91/271/EEC and U.S. EPA Effluent Limitations Guidelines offer details on waste water testing frequency and procedures – see C.5. The use of an approved environmental laboratory within the camp may be required to conduct the testing. If not possible, a contracted laboratory, which has been approved in accordance with the applicable NATO testing guidelines, will conduct both testing and monitoring. Waste water testing should be conducted at an ISO 17025 accredited laboratory.

4. At a minimum, considering NATO environmental protection policy, the values in Table C1 for waste water effluent standards shall apply during NATO operations. The values were obtained based on a comparison of several international standards and retaining the minimum protective levels (i.e., keeping the lowest ones). Their application may vary in accordance with the national and/or agreed standards in force.

Parameter	Effluent Standards
BOD5 (mg/L)	30
CBOD (mg/L)	25
COD (mg/L)	125
Temperature (°C)	Not to alter ambient temp by more than 1°C
Total Suspended Solids (mg/L)	35
Total Dissolved Solids (mg/ L)	1000
Faecal Coliform	400 per 100 ml
Chlorine Residual (mg/L)	.02
pH	6 to 9
Phenols (µg/L)	20
Oils and Greases (mg/L)	20
Phosphorous (Total P)- (mg/L)	2
Total Nitrogen (mg/L)	50

Table C1. Waste Water Effluent Standards

C.5. REFERENCES

1. The following references and related documents were used in developing this Annex, or are sources of additional information on water and waste water management:

a. Environmental Guidebook for Military Operations, FIN-SWE-USA, March 2008;

b. Environmental Toolbox for Deploying Forces: An Awareness Training Supplement to the Environmental Guidebook for Military Operations, FIN-SWE-USA, 2016;

c. STANAG 2136, *Requirements for Water Potability During Field Operations and in Emergency Situations*, AMedP4.9;

d. STANAG 2561, *Field Hygiene and Sanitation*, SRD to AJMedP-4;

e. STANAG 2632, *Deployed Force Infrastructure,* ATP-3.12.1.4;

f. STANAG 2885, Emergency Supply of Water in Operations;

g. United States Environmental Protection Agency (USEPA), Water, http://water.epa.gov/;

h. United States Environmental Protection Agency (USEPA) Effluent Guidelines, http:water.epa.gov/scitech/wastetech/guide/index.cfm; and

i. European Commission Urban Waste Water Directive (Council Directive 91/271/EEC) adopted 21 May 1991 (last consolidated version: 01/01/2014: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A01991L0271-20140101).

ANNEX D – WASTE MANAGEMENT

D.1. DESCRIPTION OF THE SITUATION

1. A deployed force will generate a variety of hazardous and non-hazardous waste which needs to be handled, stored, transported and disposed of in a manner that protects human health, the environment and equipment. These activities must also meet applicable waste management requirements.

2. Proper waste disposal measures contribute to environmental protection and force protection. The basic rule of waste management is that waste reduction is better than even the most sophisticated method of disposal. This can only be achieved when waste is considered from the very first stage of an operation.

3. Problems that can arise from ineffective waste management can include:

   a. Pollution of soil, water or air due to incorrect handling of waste;

   b. Adverse health effects from pollution, infectious waste, pest infestations and disease vectors;

   c. Waste of resources due to a lack of recycling;

   d. Loss of information security; and

   e. Costly and time consuming cleanup actions.

4. This Annex does not address the management and treatment of material which is classified for security reasons, warfare agents and explosive ordnance, ammunition, decontaminating agents, radioactive substances, and waste in connection with maritime operations.

D.2. OBJECTIVES

1. Minimize adverse environmental impacts of waste.

2. Respect and comply with applicable waste management legal requirements.

3. Prevent soil, air and water contamination from waste.

4. Prevent health and safety issues from waste.

D.3. RESPONSIBILITIES

1. Commanders and TCNs are responsible to ensure effective waste management practices are conducted by their personnel within the mission area.

2. In support of the commander, the EP officer should:

   a. Develop a waste management plan that covers all relevant waste streams from the point of generation to disposal;

   b. Institute and maintain procedures for record keeping, monitoring and reporting. Additional direction and guidance is provided in STANAG 6500 (AJEPP-6);

   c. Investigate the availability and expertise of the host nation and/or contractors, safe storage and treatment areas, as well as relevant water and wind conditions;

   d. Check that those who remove and dispose of waste are authorized to do so and equipped with appropriate PPE;

   e. Check that waste leaving each mission location is being taken only to the authorized and controlled waste management facility;

   f. Ensure transboundary movements of waste meet legal requirements;

   g. Define which contracts have to be implemented for the transportation of hazardous waste back to the TCN's home nation if there is no safe way of disposing these materials in theatre;

   h. Ensure that all personnel are aware of, and trained to deal with their environmental responsibilities;

   i. Coordinate with logistics staff to ensure waste is managed appropriately;

   j. Investigate local facilities capabilities for waste collection, transportation and treatment;

   k. Coordinate with military engineers and logisticians to ensure storage areas are properly contained to prevent spills;

   l. Ensure that storage and disposal methods for each chemical are established and are known by personnel managing the chemicals; and

   m. Coordinate with medical staff to ensure healthcare waste is managed appropriately and separated at the point of origin.

D.4. BEST PRACTICES AND STANDARDS

D.4.1. Waste Management Plan

1. A waste management plan should be included within the EP appendix of the relevant directives at the appropriate level (e.g. SOPs). The plan should be based on the following principles:

   a. When managing waste, the following hierarchy shall be used (listed in order of priority): prevention, reuse, recycle, recovery (including energy recovery) and disposal. Waste disposal should be the last option and, in accordance with MC 0469, it has to be done as environmentally sound as given circumstances allow.

   b. Producers of waste are responsible for the safe and environmentally sound disposal of the waste they produce.

   c. Waste disposal should take place as close as possible to the location where the waste originated to minimize the risks associated with waste transport.

2. The following should be provided and clearly articulated in the waste management plan:

   a. Site map of the camp and list of locations of waste accumulation, collection and (if applicable) incineration and landfill points with descriptions;

   b. List of individual types of waste with information on centralized/decentralized collection (filling instructions for waste containers, central collecting point for recycling material and waste), and procedures for reducing, reuse, recycling, recovery or disposal; and

   c. List of responsibilities, forms and points of contact.

3. The waste management plan should assess where, how much, and what kind of waste will be generated to ensure that sufficient and appropriate storage space is considered during the camp planning process.

4. During the conduct of contingency operations the following types of waste can be expected to be generated, with planning figures outlined in Table D1. These figures may change based on the phase of the mission and the camp.

Table D1. Solid Waste Planning Figures

	Planning Figures (kg/person/day)[4]
Dry Solid Waste	1.1
Wet Solid Waste- Kitchen	0.7
Wet Solid Waste- Other	0.4
Total	2.2

D.4.2. Transboundary Movement

1. As far as shipments of waste are concerned, applicability of the Basel Convention governing transboundary movements of hazardous wastes is to be taken into consideration. Countries that signed the convention accepted the principle that legitimate transboundary shipments of hazardous wastes may only be effected from countries that lack both the facilities and the expertise to dispose of this type of waste safely. Countries accepting these hazardous wastes must have appropriate disposal facilities in place. Exported wastes should be labelled according to the UN recommended guidelines.

2. TCNs that are subject to EU legislation shall ship and handle waste to and within the EU in accordance with the Regulation on Shipments of Waste of the European Parliament and Council (Regulation (EC) No 1013/2006 on Shipments of Waste) and the Directive 2008/98/EC. Regulation (EC) No 1013/2006 contains an exemption clause for shipments of waste from missions abroad to the EU [Article 1(3)(g)], which facilitates the administrative effort.
http://ec.europa.eu/environment/waste/shipments/guidance.htm

D.4.3. Waste Treatment - General

1. Prior to deployment of NATO-led forces, specific data related to the environmental situation in the deployment area should be collected. The capacity and effectiveness of local disposal procedures and possible HN support should be assessed.

2. To ensure that waste is always handled in an appropriate way and according to all relevant laws and regulations, it is essential that only expert personnel are tasked with responsible positions.

3. Materials and equipment shall be procured in a manner that the amount of waste generated is reduced.

4. Avoid products with unnecessary packaging or packaging that is difficult to

[4] For additional waste management planning figures, see TM 3-34.56 Waste Management for Deployed Forces.

recycle or dispose.

5. Consider use of green or biobased products to reduce the amount of overall or hazardous waste that needs to be managed.

6. Replace disposable items with reusable ones when possible. For example, use rechargeable instead of non-rechargeable batteries.

7. The use and dispersion of environmentally harmful materials and substances should be minimized by:

   a. Creating a register of environmentally harmful materials;

   b. Establishing a hazardous materials exchange system where units can bring in usable hazardous material they no longer need and other units can access the excess hazardous material without having to order a new supply;

   c. Developing procedures for handling and treating all environmentally hazardous waste generated by the force; and

   d. Substitute non-hazardous materials when available and appropriate.

8. The best available technology to pre-process waste for recycling, treatment or disposal should be used.

9. Scrap metal disposal should be minimized and scrap metal recycling should be preferred. If scrap metal is contaminated with hazardous substances it shall be disposed of as hazardous waste.

10. If reusable materials (e.g. copper wires, electrical equipment) occur in waste from construction projects, they should be separated from the demolition debris and taken to a recycling facility, if possible.

11. Consider selling or donating reusable goods in the area of deployment.

12. Separate solid waste from liquid waste and hazardous waste from non-hazardous waste.

13. Properly identify and manage liquid waste. In some jurisdictions, hazardous and liquid wastes must be registered and may only be disposed of at licensed facilities.

14. Separate solid waste into recyclable components, such as plastics, glass, aluminium, tin and paper products. For waste that is not recyclable, use energy from waste recovery, if possible.

15. Separate waste into biodegradable and non-biodegradable materials. Compost biodegradable materials, if possible.

16. Identify, characterize, and separate waste at the source. Then deliver materials to waste collection systems.

17. Compress, bundle, return, sell or burn cardboard in accordance with approved procedures.

18. Separate waste streams and label storage areas and containers according to the different types of waste. Ensure labels are in languages understandable to all personnel involved in use and handling.

19. Store all waste in a designated area that prevents leaching to soil, drains and water sources.

20. Limit time that waste is stored on camp. Certain waste, such as food waste, will attract vermin and insects.

21. Consider the use of tactical and mobile waste to energy conversion systems to reduce the amount of solid waste to be treated.

22. Consider the use of mobile solid waste disposal systems (e.g. incinerators).

23. If landfilling is required for disposal of solid or dry garbage, burial in existing landfills is preferred. The use of an existing landfill should be approved by an EP officer. If existing landfills are not available or do not meet applicable regulations, a landfill may be designed and constructed in accordance with appropriate specifications. The landfill should be lined to prevent leakage of substances into the soil/groundwater. During site closeout, the landfill shall be completely covered and the GPS location of the landfill shall be provided to the HN.[5]

24. Incinerators shall meet requirements specified in this Annex and Annex G as well as applicable HN standards. Safety officers and Preventive Medicine officers should ensure personnel have the proper personal protective equipment (PPE) and are trained on PPE use and maintenance.

25. Incinerators are typically used to dispose of items such as health care waste, wastes with chemical residues and textiles contaminated with waste oil. This may result in ash containing hazardous substances. Incinerator ashes should be sampled to determine the proper disposal method and should be

[5] For additional guidance on the planning, design, construction, and operation of landfills, see Unified Facilities Criteria (UFC) on Landfills in Support of Military Operations.

regarded as hazardous waste unless proven otherwise by laboratory analysis. If the types of wastes being incinerated vary routinely, it is recommended to analyse the ash on a regular basis.

26. Monitor waste incineration performance and ensure waste streams are compatible with the incinerator. Ensure that temperature and duration are in accordance with the manufacturer's specifications in order to minimize harmful substances in ash and emissions.

27. For safe disposal, the properties of the incinerator ash should not exceed the values shown in Table D2.

Table D2. Safe Ash Properties from Incinerators without Air Cleaning

Parameter	Solid or Elute
Loss on ignition [mass%] (only solid)	≤ 3 mass%
Electric conductivity [µS/cm]	≤ 10,000
pH-value	5.5 – 13.0
Dissolved organic carbon (DOC) [mg/l]	≤ 50
Adsorbable organic halogens (AOX) [mg/l]	≤ 0.3

28. When contracts are used for waste management, monitor contract operations for proper handling, treatment and disposal of all waste.

D.4.4. Hazardous Waste

D.4.4.1. Hazardous Waste Treatment - General

1. Waste should be separated at the source to minimize potential hazards associated with mixing incompatible materials and to reduce costs of shipping and disposing mixed hazardous wastes. Separation also increases the possibility of local recycling.

2. Separate hazardous waste, based on hazard characteristics, using different secondary containment to prevent incompatible wastes from coming into contact in the event of a leak or spill and producing an adverse chemical reaction or toxic fumes.

3. If the origin and/or composition of the waste is unknown, it shall be tested to determine if it is hazardous.

4. All waste shall be properly documented, marked, packaged and stored.

5. Ensure proper storage locations and receptacles are selected.

6. All hazardous wastes should be properly labelled and manifested to ensure a complete audit trail from point of origin to ultimate disposal.

7. Ensure proper storage locations and receptacles are selected.

8. Storage areas should be located at a safe distance from water resources, ammunition storage, down gradient and downwind of billeting and dining facilities.

9. Storage areas should have signage in the major languages used.

10. The combined storage capability for different wastes shall be checked and observed.

11. Access to the storage locations shall be controlled and security shall be ensured.

12. The duration of hazardous waste storage should be minimized.

13. The EP officer shall coordinate with the Safety Officer to ensure that proper safety equipment (eye wash, chemical showers, fire suppressants, etc.) is on site.

14. Necessary/required PPE shall be provided and used.

15. Spill response shall be provided.

16. Provide awareness of the dangers of exposure to such materials and appropriate response when exposure/releases occur. Promote appropriate selection, maintenance, use and disposal of PPE when managing hazardous waste. Also promote international and national regulations covering the movement, import and export of such waste.

17. Provide training for proper management, handling, storage and disposal of hazardous waste.

18. Appropriate disposal options shall be selected (with waste minimization, reuse and recycling having already been considered).

19. Appropriate contractors shall be chosen and their performance shall be controlled and verified.

20. EP officers shall know the disposal routes of each individual waste stream and ensure that they are compatible with legislative requirements.

21. Disposal records and documents shall be maintained.

22. Transportation of hazardous waste, especially transboundary movements, shall be in accordance with the OPLAN Environmental Annex and applicable international agreement obligations.

23. The appropriate method of transportation shall be selected. Measures for spill prevention and response shall be included.

24. Hazardous waste shall be suitably packaged and all means of transportation shall be labelled with appropriate symbols and placards. Corresponding records and documents shall be maintained.

25. Waste from medical facilities may be treated like any other hazardous or non-hazardous waste unless it is infectious. If there is a possibility that medical waste contains infectious parts it shall be treated as infectious waste (see D.4.5).

D.4.4.2. Used Oils and Other Lubricants Management

1. A small quantity of POL can contaminate millions of litres of fresh water. Used oil, oil-water mixtures or oil-contaminated material (e.g. filters or rags) deposited in a landfill can contaminate ground and surface waters causing human health issues and adversely affecting the local flora and fauna. Burning used oil or oil-contaminated material can release sulphur oxides, nitrous oxides, carbon monoxide, carbon dioxide, volatile organic compounds (VOCs), fine particulates, lead, zinc, arsenic, cadmium, manganese, nickel and chromium into the atmosphere.

2. Used POL products and mixtures and POL-contaminated material might be considered hazardous waste and shall be disposed of accordingly.

3. Used oils shall not be burned in the open.

4. Separate different types of oil to facilitate re-processing or re-refining, if available.

5. Used POL products and mixtures, and POL-contaminated material shall be stored in safe areas away from personnel. They shall be stored separately from sorbents and chemicals and in sealable containers or tanks that are properly labelled and have secondary containment.

6. Used oil and other lubricant containers or tanks shall be monitored for rust, leaks and deterioration.

7. Ensure dykes or berms around storage tanks provide capacity for any spills or leaks. Refer to Annex E – Management of Petroleum, Oils, and Lubricants (POL) and Spill Response for details.

8. Contain spilled oil promptly using clean-up materials (rags, sand, booms, clay, kitty litter or other sorbent material). Then dispose of used/contaminated cleaning material as hazardous waste.

9. Take appropriate precautions when dealing with electrical transformers. Be aware of potential for polychlorinated biphenyls (PCBs) in the heat dissipation oil.

10. Send used oils and lubricants to a re-refiner whenever possible.

11. Provide proper training for operation and maintenance personnel.

12. Use properly designed incinerators, if available.

13. Employ source reduction (minimizing consumption) and spill prevention techniques (leak detection, bulk oil dispensing).

D.4.4.3. Batteries and Battery Acid Management

1. Hazards due to improper handling and disposal of used batteries include the release of corrosive fluids that can cause chemical burns and damage to the local environment. Batteries can include lead, lithium, nickel-cadmium, nickel-metal-hydride and dry cell.

2. Carry out proper maintenance to extend battery life and test to confirm that a battery is spent.

3. In many locations batteries can be returned to the source for recycling or proper disposal. Implement recycling of materials, where possible.

4. Batteries shall be separated by type and compatibility. Batteries should be stored in a secured place in drums or on pallets in an upright position appropriately labelled and protected from risk of damage, leakage, freezing or excessive heat. Battery acid should be stored in sealable containers that are undamaged and fully labelled.

5. Wear PPE when handling battery acid.

6. Batteries and battery acid shall be stored away from other HAZMAT.

7. Tape open poles on the lithium batteries to avoid a short circuit.

D.4.4.4. Used Tires

1. Properly store tires to minimize potential insect or rodent infestations. Minimize precipitation accumulation in stored tires.

2. Minimize fire hazard by minimizing used tire storage.

3. Commanders and TCNs shall ensure that the local procurement of tires (if applicable) includes the return of used tires to the supplier for proper disposal.

4. Investigate local, regional or international possibilities for the removal of old tires. It may be possible to have tires retreaded and reused locally or crumbed and shredded for reuse for other purposes.

D.4.4.5. Contaminated Scrap Metal and Wood

1. Non-contaminated scrap metal should be treated according to D.4.3.

2. Where HN facilities do not exist, dispose of contaminated scrap metal away from water sources and in a manner (enclosed space or under protective cover) that will minimize the potential for fire and/or soil, surface water and ground water contamination due to leaching or run-off from components containing HAZMAT.

3. If possible, remove hazardous waste materials such as used oils, fuel, etc. from scrap metal or derelict items and provide appropriate management.

4. Separate and dispose of barbed wire separately from other scrap metal.

5. Manage scrap wood that has been treated with pesticides (such as wood pallets, wooden packing containers, or construction scraps) to ensure personnel do not use it for personal use (build furniture, etc.).

D.4.4.6. Electronic Waste

1. Electronic waste shall not be burned or disposed in landfills.

2. Explore the potential of returning the equipment to the manufacturer for proper recycling or disposal.

3. Dispose of empty printer cartridges and removable batteries from electronic waste separately.

D.4.4.7. Construction Waste Containing Asbestos

1. When renovating or demolishing old buildings / facilities, the resulting construction waste may be contaminated with asbestos. Asbestos is a highly dangerous carcinogenic substance and is disposed of as hazardous waste in the EU. When carrying out construction work, local construction companies are commissioned to recycle or dispose of the construction waste. When not contaminated, construction waste can be reused on site or recycled where resources exist.

2. Use certified, licensed and trained contractors for asbestos removal when available. Ensure contractors properly store and transport the material to a licensed disposal site.

3. Store asbestos waste separate from the non-asbestos construction wastes.

4. Asbestos waste transported to a waste disposal site should be in a rigid, impermeable and sealed container of sufficient strength to accommodate the weight and nature of the waste. Every container must be free from punctures, tears or

leaks. Where a container is a cardboard box, the waste must be sealed in a 6 mil[6] thick polyethylene bag placed within the box.

5. Asbestos waste should be properly packaged for transportation. Transport vehicles should be identified as to contents.

6. Asbestos waste shall be deposited only at locations in a landfill site suitable for that purpose.

7. Exercise extreme caution where exposed to asbestos and asbestos dust because of the health risks associated with the inhalation of asbestos fibres.

D.4.4.8. Obsolete Stocks of Chemicals

1. Store and dispose of obsolete chemicals with minimal risk to human health and the environment.

2. Many obsolete chemicals may be hazardous waste and should be disposed of in accordance with the manufacturer's recommendations and HN, TCN or international requirements.

3. Proper management includes chemical destruction, stabilization, incineration or appropriate storage for disposal by specialised contractors.

4. Return obsolete chemicals to the country of origin when disposal cannot be achieved without risk to human health and the environment. Ensure this movement respects national regulations and the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal.

5. All chemicals shall be handled with care since most are toxic at some level.

6. Label all chemicals clearly and store safely in locked and ventilated cabinets.

7. The EP officer shall maintain an inventory of all chemicals and a copy of the associated SDS for each chemical.

8. For some types of waste, investigate encapsulation or applying techniques to render the waste inert.

9. Personnel involved in the management of chemicals should be aware and maintain current knowledge of internationally recognized procedures for chemical management including SDS, the United Nations Economic Commission for Europe Globally Harmonized System of Classification and Labelling of Chemicals (GHS), and the European Commission Classification, Labelling and Packaging of substances and mixtures (CLP). See the reference list at the end of this Annex for electronic links to these systems and procedures.

[6] Six-mil thickness is 0.006 inches, or 1.5 µm, which is the standard for "super heavy duty" waste bag.

10. Provide training for operators and maintenance personnel.

D.4.5. Healthcare Waste

1. Healthcare waste, when not handled or disposed of safely, has the potential to create major health problems and to impact the local environment. Problems arise when such wastes are directed to sewage treatment systems or sent to landfills.

2. Healthcare waste in theatre should be disposed either by incineration (preferred), another suitable method or by local contract with medical agencies of the HN.

3. Waste separation and recycling best practices and standards as detailed in D.4.3 shall be implemented.

4. Healthcare waste shall be separated and secured at the point of generation and medical or infectious waste shall not be mixed with hazardous or radioactive waste. Ensure that heavy metals waste is separated and managed in accordance with Annex F. Healthcare waste should be separated into the following six categories established by the World Health Organization:

a. Sharps waste: discarded needles, syringes, broken glass and other sharps;

b. Infectious waste: waste suspected to contain pathogens and thus poses a risk of disease transmission (e.g. waste contaminated with blood and other body fluids, laboratory cultures and microbiological stocks);

c. Pathological waste: human tissues, organs or fluids, body parts, foetuses and unused blood products;

d. Pharmaceutical and chemical waste: pharmaceuticals that are expired or no longer needed, items contaminated by or containing pharmaceuticals, cytotoxic waste containing substances with geno-toxic properties, and waste containing chemical substances (e.g. laboratory reagents, film developer, disinfectants that are expired or no longer needed, and solvents);

e. Radioactive waste: waste contaminated by radionuclides including radioactive diagnostic material or radio-therapeutic materials; and

f. General health-care waste: waste that does not pose any particular biological, chemical, radioactive or physical hazard.

5. Healthcare waste shall be properly coded to ensure appropriate disposal. Table D3 provides the recommended colour coding for healthcare waste.

Table D3. WHO-recommended Separation Scheme

Type of waste	Colour of container and markings	Type of container
Highly infectious waste	Yellow, marked “HIGHLY INFECTIOUS”, with biohazard symbol	Strong, leak-proof plastic bag, or container capable of being autoclaved
Other infectious waste, pathological and anatomical waste	Yellow with biohazard symbol	Leak-proof plastic bag or container
Sharps	Yellow, marked “SHARPS”, with biohazard symbol	Puncture-proof container
Chemical and pharmaceutical waste	Brown, labelled with appropriate hazard symbol	Plastic bag or rigid container
Radioactive waste	Labelled with radiation symbol	Lead box
General health-care waste	Black	Plastic bag

6. Medical and infectious waste shall be properly labelled, bagged, containerized and stored in a secure location close to the source of generation.

7. When storing infectious wastes, hygiene measures shall be observed, which are specified by the respective responsible health supervisor.

8. If the Medical Service has not specified other requirements, infectious wastes should be stored at 3 to 8 °C until they are treated. Storage at temperatures between +8 and +15 °C should not exceed one week. Gas formation must be prevented.

9. Seek alternative treatments other than incineration for some types of medical or infectious wastes. Sharps can usually be chemically treated and then disposed of as solid waste. Certain biological fluids may be disposed of with or without chemical treatment in the sanitary sewer system, with local approval. Other biological fluids may be chemically treated and then disposed of in a similar manner.

10. Properly treated healthcare waste may be deposited in a landfill and should be covered with other waste to minimize the potential for direct contact. Infectious healthcare waste shall be incinerated or disinfected prior to final disposal in a landfill.

D.5. REFERENCES

1. The following references and related documents were used in developing this Annex, or are sources of additional information on waste management:

a. AJP-4 Allied Joint Logistics Doctrine, 10 March 2004;

b. STANAG 2048, *Chemical Methods of Insect and Rodent Control*, AMedP-3;

c. The *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal*, 22 March 1989, http://www.basel.int/TheConvention/Overview/tabid/1271/Default.aspx;

d. Directive 2008/98/EC Issued by the European Parliament and Council on 19 November 2008 on waste and repealing certain directives (supersedes Directive 91/689/EC and 2006/12/EC);

e. Environmental Guidebook for Military Operations, FIN-SWE-USA, March 2008;

f. Environmental Toolbox for Deploying Forces: An Awareness Training Supplement to the Environmental Guidebook for Military Operations, FIN-SWE-USA, 2016;

g. European Commission (EC) Decision of 16 January 2001 Amending Decision 2000/532/EC as Regards a List of Wastes (Promulgated under File Reference K(2001) 108);

h. European Commission (EC), Enterprise and Industry, *CLP/GHS – Classification, labelling and packaging of substances and mixtures*, https://ec.europa.eu/growth/sectors/chemicals/classification-labelling_en;

i. European Commission (EC), Environment: Waste, http://ec.europa.eu/environment/waste/index.htm;

j. MC 0469 – NATO Military Principles and Policies for Environmental Protection;

k. MC 0334 – NATO Principles and Policies for Host Nation Support (HNS);

l. Regulation (EC) No. 1013/2006 Issued by the European Parliament and Council on 14 June 2006 Concerning Shipments of Waste. [Note: Application of the regulation is obligatory; among other things, it contains an exemption clause for shipments of waste from missions abroad to the European Union];

m. Secretariat of the Basel Convention, *Technical Guidelines on the Environmentally Sound Management of Biomedical and Healthcare Wastes*, September 2003, http://www.basel.int/Portals/4/Basel%20Convention/docs/pub/techguid/tech-biomedical.pdf;

n. STANAG 2535, *Deployment Health Surveillance*, AMedP-21;

o. STANAG 2982, *Essential Field Sanitary Requirements*;

p. STANAG 6500, *NATO Environmental File During NATO-Led Operations*, AJEPP-6;

q. STANAG 7141, *Joint NATO Doctrine for Environmental Protection during NATO-Led Military Activities*, AJEPP-4;

r. United Nations Department of Peace Keeping Operations (UNDPKO), Department of Field Support, Ref. 2009.6, Environmental Policy for UN Field Missions, 1 June 2009;

s. United Nations Economic Commission for Europe (UNECE), *Globally Harmonized System of Classification and Labelling of Chemicals (GHS)*, http://www.unece.org/trans/danger/publi/ghs/ghs_welcome_e.html;

t. TM 3-34.56 Waste Management for Deployed Forces, https://armypubs.army.mil/ProductMaps/PubForm/Details.aspx?PUB_ID=1006600;

u. Unified Facilities Criteria (UFC) on Landfills in Support of Military Operations, published 24 March 2021, https://www.wbdg.org/FFC/DOD/UFC/ufc_3_240_11_2021.pdf;

v. United Nations Environment Programme (UNEP), *Greening the Blue Helmets – Environment, Natural Resources and UN Peacekeeping Operations*, https://postconflict.unep.ch/publications/UNEP_greening_blue_helmets.pdf;

w. United States Environmental Protection Agency (USEPA), *Wastes – Resource Conservation – Common Wastes and Materials*, https://www.epa.gov/rcra;

x. World Health Organization (WHO), *Safe Management of Wastes from Health- Care Activities*, 2nd Edition 2014, https://www.who.int/water_sanitation_health/publications/safe-management-of-wastes-from-healthcare-activities/en/;

y. Cointreau, Sandra, *Sanitary Landfill Design and Siting Criteria*, 2004, http://documents1.worldbank.org/curated/en/461871468139209227/pdf/337800rev0Landfillsitingdesign.pdf; and

z. European Commission Landfill of Waste Directive (Council Directive 99/31/EC adopted 16 July 1999), http://ec.europa.eu/environment/waste/landfill_index.htm.

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ANNEX E – MANAGEMENT OF PETROLEUM, OILS AND LUBRICANTS (POL) AND SPILL RESPONSE

E.1. DESCRIPTION OF THE SITUATION

1. Military operations require the use of POL products. Soil and water may easily be contaminated by such products unless prudent precautions are implemented.

2. On a deployed military camp, POL is typically stored in bulk fuel installations, which invites the risk of large leaks or spills. However, experience shows that most POL spills are the result of product transfer (fuelling) operations. POL is often costly to transport to the mission area. Hence, the inefficient use of POL and losses due to spills create an unnecessary logistical burden, operational risk and environmental risk.

3. POL products are diverse, and include organic and inorganic compounds. Some contain persistent organic pollutants and heavy metals, which are harmful even in small amounts. Legacy POL products may contain such substances like polychlorinated biphenyls (PCBs). Spills of POL and other hazardous material may harm surface or ground water and surrounding soil for a significant duration after the spill, jeopardizing the health of those dependent on local drinking water and agriculture.

4. Appropriate preventative actions and rapid response to spills will mitigate their effect on the mission, people, and the environment. Spills of POL and other hazardous material that are not properly managed may be a source of claims from the HN and other liabilities.

E.2. OBJECTIVES

1. POL management, including spill prevention and response, is included in the operations plan, either in the environmental protection appendix or integrated elsewhere (e.g. in standard operating procedures).

2. Losses of POL are prevented by designing POL storage with environmental, fire, and force-protection measures.

3. Activities are conducted to minimize spills during operations.

4. Responses to spills minimize negative effects to the environment, human health and other liabilities.

5. Contaminated sites and media are managed, remediated and disposed of properly.

6. Records of environmental conditions, incidents, remediation actions, and sample results are maintained as part of the NATO Camp Environmental File, the contents of which are standardized in STANAG 6500 (AJEPP-6).

E.3. RESPONSIBILITIES

1. Commanders and TCNs should use the best practices available for the specific situation within the mission area.

2. In support of the commander, the EP officer should:

   a. Provide advice of POL management best practices;

   b. Ensure aspects of the POL management plan are established by the appropriate parties;

   c. Oversee measures to mitigate the risk of spills;

   d. Ensure spills are reported, resolved and documented; and

   e. Provide training in risk management, spill prevention and response and records management.

E.4. BEST PRACTICES AND STANDARDS

E.4.1. POL Management Plan

1. A plan to manage stocks of POL and other industrial chemicals can achieve both logistical and environmental protection functions. The plan should include, but not necessarily be limited to, the following:

   a. Planning factors of mission-specific conditions, such as constraints, activities, equipment, etc.;

   b. A risk assessment;

   c. Spill prevention measures, such as POL storage, transportation and fuelling procedures;

   d. A spill response plan;

   e. POL contaminated waste management measures;

   f. Documentation of site opening conditions, closure conditions, spills and disposal or remediation actions;

   g. The requirement for personnel working with fuels and lubricants to be qualified on fuel facility operations; and

   h. Estimation of fuel volume needed.

E.4.2. POL Aspects of Risk Assessment

1. A risk assessment should be conducted to identify POL requirements that could have a negative impact on soil and water quality. The outputs of this risk assessment will feed POL infrastructure requirements, practices and response procedures in the POL management plan. Risks should consider contaminant sources, pathways and receptors. Some risks and questions to consider are:

a. Is the POL facility located in an area where there are, or will be, significant vehicle movements?

b. Is the POL facility located over a sensitive aquifer? If so, are there any nearby abstractions (withdrawals) of water?

c. Is there any existing evidence of land or water contamination?

d. Are there any drainage systems and nearby surface-water courses?

e. Is the camp or POL facility located in an ecologically sensitive area? Is it within or near any designated conservation areas?

f. Are there pathways and a risk of contaminated soil vapour migration to basements or poorly ventilated facilities?

g. Is there potential of off-site migration should a spill occur?

h. What POL products are stored and how much?

i. Is the POL facility secured? If so, is it manned or does it rely on automatic sensor alarms?

j. How long could it take for a spill to be discovered, and how long would it take to respond to a spill?

k. Impact on air, soil and water quality.

E.4.3. POL Infrastructure

1. Well designed, operated and maintained POL infrastructure provides the best measures to prevent spills and responsibly manage POL products. HN, TCN or international standards for POL infrastructure should be considered. POL infrastructure may include, but is not limited to, bulk fuel storage, fuel distribution/transfer areas, oil water catchments and separators, minor fuel storage and generator pads.

2. POL storage areas should be set back at least 50 m from any surface water body.

3. POL storage tanks should be provided with a means of impermeable secondary containment capable of holding at least 110% of the tank's maximum

capacity. If more than one container or tank is located within the secondary containment area, it must be capable of storing at least 110% of the largest tank's capacity or 25% of the total capacity of all the tanks, whichever is greater.

4. POL facilities may have double walled liners providing secondary containment, which shall be operated and maintained in accordance with the manufacturer's instructions.

5. All connection points and POL product transfer areas should be within the secondary containment area. If this is not possible, temporary secondary containment arrangements should be used.

6. Secondary containment may, if necessary, be improvised using sandbags and an impermeable membrane.

7. It is important to place POL containers in such a way that a leak can be noticed. Field-fabricated pipe connections may be placed on top of a bucket with gravel to contain small volumes of spills and to make it easier to observe leaks.

8. Storage areas should be marked and protected, visually, through stand-off, and with barriers, to prevent vehicle impact.

9. Any permanently fixed tap on a mobile fuel pod used to discharge fuel should be fitted with a lock and locked shut when not in use. Equipment couplings should be of the dry-break type. The pipe to a tank nozzle should be provided with a pipe failure valve.

10 A means of draining storm water from a secondary containment berm should be provided. It should be capable of being securely closed when not in use. Additional freeboard (height clearance) or overhead protection should be provided, depending on weather and climate conditions.

11. If there is a requirement to store full or partially full tanker trucks or fuel pods, such a storage area should be within a designated POL area. If it is necessary to store these vehicles outside the POL area, temporary secondary containment should be provided and consideration be given to the area in a risk assessment. This also applies to packaged POL materials.

12. A designated area for emergency response equipment should be located within easy reach of storage areas.

13. Risks of damage from external sources should be considered in the design of any POL facility. Damage can arise through vehicle impact, attack from opposing forces, adverse weather conditions, or other means. Provision should be made for protection from blast, splinter and fuel–air effects munitions when warranted by a force protection assessment.

14. All receptacles, drums and storage tanks of chemical products or fuels, whether new or used, should be placed on impermeable surfaces surrounded by a berm that protects the environment in the case of spills. The drainage of these areas should have a closure valve that guarantees the leak will be retained within the enclosure. The enclosure should also be protected from precipitation.

15. All POL containers and pipelines should be clearly marked and accurately labelled.

E.4.4. POL Spill Prevention Controls and Practices

1. Controls and practices taken by deployed personnel can mitigate the occurrence and severity of POL spills. Sometimes the appropriate POL infrastructure is unavailable or the POL infrastructure requires certain controls to be effective. Some controls and practices need to be performed by trained personnel where others can be conducted by any member.

2. Water discharged from secondary containment shall be checked for the presence of POL prior to discharge. If contamination is observed in the form of a thin film this shall be removed prior to discharge. Larger quantities of POL contamination in secondary containment may need to be removed using a separator.

3. Waste POL materials shall be disposed of as hazardous waste. Refer to Annex D – Waste Management for details.

4. Product transfers to and from fuel pods or tanker trucks shall be supervised at all times.

5. When several TCNs are at one camp, solutions that are compatible with all national operating procedures of POL facilities, including the maintenance and testing of such facilities, should be established. The primary environmental concerns are to minimize spills and leaks, and ensure the responsible disposal of waste products.

6. Vehicle parking, especially for vehicles awaiting maintenance or disposal, should be kept under surveillance in order to assess potential leaks. Drip pans should be put under each vehicle.

7. Deployed equipment should be in good condition and not leaking. Drip pans, plastic sheeting and clean-up supplies should be provided to hold any spilled POL substances.

8. Procedures should be established for periodic inspection and testing of all storage containers. Inspection and testing procedures should include all above ground valves, piping, and devices associated with POL, HAZMAT, or hazardous waste storage containers. The frequency and type of inspection and testing should take into account container size and design (e.g. floating or fixed roof, skid mounted, elevated, cut and cover, partially buried, vaulted above ground, etc.) and industry standards.

9. Description of deficiencies in spill prevention and control measures should be logged and communicated up the chain of command.

10. Trays and/or absorbent material should be used when decanting or transferring packed POL products.

11. Routine maintenance activities should be conducted that will help reduce the potential for POL and HAZMAT releases to the soil or surface waters.

12. SDS and appropriate PPE shall be maintained for all products.

E.4.5. Spill Response Plan

1. Spill response is defined as the initial response to a spill followed by the removal and management of free product and obviously contaminated media that is addressed contemporaneously (e.g. within days or weeks of the release). Continued monitoring, risk management or extensive remediation is not considered spill response.

2. Effective mitigation of a spill that was not prevented by other means will depend upon having a sound spill response plan and competent execution of that plan. The spill response plan should consider used POL and hazardous material discussed in Annex D and F. The plan should include, but not necessarily be limited to, the following:

a. A list of personnel responsible for spill management, including the spill response team members, and include command roles, responsibilities, contact information and training requirements;

b. Alert/activation procedures, immediate actions and other response procedures;

c. Locations and contents of spill response kits and a schedule for their inspection and maintenance;

d. A list of other relevant equipment and infrastructure (e.g. fire extinguishers, first-aid kits, underground electrical utilities, UXOs, etc.);

e. Pre-arranged coordination procedures with other forces, local authorities, contractors, etc.;

f. A list of all products with the potential to contaminate soil and water that exist at the mission location;

g. An evacuation plan, if necessary;

h. Description of general health, safety and fire prevention precautions and equipment such as PPE and materials for spill clean-up actions;

i. A list and map of environmental pathways and receptors that are sensitive to the POL materials stored within the camp, e.g. water courses, groundwater, habitats;

j. The methods available for interrupting these pathways, e.g. drain covers, booms, absorbents;

k. Procedures for recovery, storage and disposal of spilled product;

l. Communications and reporting procedures, including communications with commanders, public affairs, other forces, local authorities and other relevant stakeholders; and

m. Record-keeping requirements.

3. For spill response reporting, a reportable spill shall be defined as an uncontained release to a natural water body or a release to land above the following quantities:

a. For HAZMAT or hazardous waste, any quantity in excess of the reportable quantity listed in the safety data sheet (SDS);

b. For POL, liquid or semi-liquid HAZMAT, or hazardous waste, 50 L;

c. For solid HAZMAT, 225 kg;

d. For combinations of POL and liquid, semi-liquid and solid HAZMAT or hazardous waste, 340 kg;

e. Any spill in a water body, near a property boundary or near a sensitive area; or

f. Any spill that may have a negative impact to human health or the environment.

4. A successful spill response occurs when all spilled products and obviously contaminated media have been recovered from the environment. In reality this may not be feasible to achieve or confirm. Safe sight, smell or touch should inform initial confirmation of a response success. It is then preferable to conduct follow-up confirmation with analytical sampling when possible and compare results against an established set of criteria. The decision to conduct, or not conduct, confirmatory sampling should consider the risk of contaminant impacts.

5. Deployed forces should establish case appropriate environmental quality criteria that respect applicable guidelines and standards. Specific factors and stakeholders should be consulted, preferably during the pre-deployment planning phase, to develop these criteria. Alternatively, the deployed EP officer should consult the appropriate stakeholders, with reach-back support, and recommend criteria to the

appropriate authorities (e.g. Commander, local authorities, land-owners, etc.). This set of criteria should be documented and can then be used as a threshold that defines environmental damages.

6. Factors to be considered when establishing a set of criteria are:

   a. Pre-existing contamination;

   b. Products handled by deployed forces that pose an environmental risk;

   c. Applicable HN and local regulations and guidelines;

   d. Applicable TCN regulations and guidelines;

   e. Property owners and special interest groups;

   f. Past, present and future land-use; and

   g. Soil, geology and natural resources.

7. An example set of soil quality guidelines is included in Table E1.

Table E1. Example Petroleum Hydrocarbon Soil Quality Guidelines (mg/kg) based on Land Use (from Canadian Council of Ministers of the Environment (CCME)) (Part 1 of 2)

Land Use	Soil Texture	Fraction 1	Fraction 2	Fraction 3	Fraction 4
Agricultural	Coarse-Grained Soil[7]	30	150	300	2800
	Fine-Grained Soil[8]	210 (170[9])	150	1300	5600
Residential	Coarse-Grained Soil	30	150	300	2800
	Fine-Grained Soil	210 (170)	150	1300	5600

Notes: Fraction #1: nC6 to nC10; Fraction #2: >nC10 to nC16; Fraction #3:>nC16 to nC34; and, Fraction #4: nC35+).

[7] Coarse-textured soil having a media grain size of >75 µm, as defined by the American Society for Testing and Materials.
[8] Fine-textured soil having a media grain size of <75 µm, as defined by the American Society for Testing and Materials.
[9] Numbers in parentheses indicate protection of potable groundwater, where applicable.

Table E1. Example Petroleum Hydrocarbon Soil Quality Guidelines (mg/kg) based on Land Use (from Canadian Council of Ministers of the Environment (CCME)) (Part 2 of 2)

Land Use	Soil Texture	Fraction 1	Fraction 2	Fraction 3	Fraction 4
Commercial	Coarse-Grained Soil	320 (240)	260	1700	3300
	Fine-Grained Soil	320 (170)	260 (230)	2500	6600
Industrial	Coarse-Grained Soil	320 (240)	260	1700	3300
	Fine-Grained Soil	320 (170)	260 (230)	2500	6600

Notes: Fraction #1: nC6 to nC10; Fraction #2: >nC10 to nC16; Fraction #3:>nC16 to nC34; and, Fraction #4: nC35+).

E.4.6. Contaminated Site Management Practices

1. When contamination has occurred that was not fully resolved by immediate response efforts, contaminated site management practices should be considered. This may involve risk assessments, monitoring efforts, legal and property transaction considerations, and possibly remediation efforts. Additionally, if contamination from a successful response can't be properly disposed of then contaminated site management practices may need to be considered. Generally, reach back support to an environmental specialist will be required.

2. Contaminated site management practices should be considered before any actions are carried out. Such considerations should mitigate the risk to human health and the environment. Actions might include land use controls, risk assessment, soil remediation, long-term monitoring, or other actions to support a property transaction. Consultation with environmental specialists, infrastructure and property staff, political advisors, and legal staff should be conducted to ensure conformance with MC 0469 and applicable TCN EP standards – see 1.3.4 of Chapter 1. The EPO should document the consultation process, including the agreed upon way forward.

3. If remediation is necessary, the appropriate method needs to be selected. Common remediation methods include incineration, soil washing, bioremediation, landfarming, and encapsulation. These activities may be contracted or managed by deployed personnel and a qualified specialist. Ultimate selection of a remediation method will be informed by a qualified specialist and consider factors like climate, contaminants, contaminated media, applicable standards and contractor availability/capabilities. The EPO should document the selected remediation option.

4. If remediation is not necessary then the environmental condition and risk management decision should be well documented. During property transactions the environmental condition should be disclosed to the recipient following the EBS template and accompanied by a hand-over certificate. Consultation with environmental

specialists, infrastructure and property staff, political advisors and legal staff should be conducted throughout this process.

5. The ECS, conducted during a theatre closure, should include details of any contamination and resultant actions. Environmental conditions should be detailed and cross referred to the EBS in order to decide on the necessary response, remediation, or property transaction activities.

E.5. REFERENCES

1. The following references and related documents were used in developing this Annex, or are sources of additional information on the management of POL and other industrial chemicals:

a. Canadian Council of Ministers of the Environment (CCME), *Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil Technical Supplement*, January 2008, http://www.ccme.ca/files/Resources/csm/phc_cws/3_phc_tech_suppl_1.4_e.pdf;

b. Environmental Guidebook for Military Operations, FIN-SWE-USA, March 2008;

c. Environmental Toolbox for Deploying Forces: An Awareness Training Supplement to the Environmental Guidebook for Military Operations, FIN-SWE-USA, 2016;

d. STANAG 2536, *Allied Joint Doctrine for Petroleum*, AJP-4.7;

e. STANAG 3784, *Technical Guidance for the Design and Construction of Aviation and Ground Fuel Installations on NATO Airfields*;

f. STANAG 6500, *NATO Environmental File During NATO-Led Operations*, AJEPP-6;

g. STANAG 7102, *Environmental Protection Handling Requirements for Petroleum Handling Facilities and Equipment*;

h. STANAG 7141, *Joint NATO Doctrine for Environmental Protection during NATO-led Military Activities*, AJEPP-4;

j. UK Ministry of Defence Joint Service Publication 317 (Version 6.4, April 2020), *Joint Service Safety Policy for the Storage and Handling of Fuels, Lubricants and Associated Products*, https://www.gov.uk/government/publications/jsp-317-joint-service-safety-regulations-for-the-joint-storage-and-handling-of-fuels-lubricants-f-l;

k. United Nations Department of Peace Keeping Operations (UNDPKO), Department of Field Support, Ref. 2009.6, *Environmental Policy for UN Field Missions*, 1 June 2009; and

l. US Army Corps of Engineers Europe District – Installation Management Agency Europe Region, *You Spill, You Dig II – An Environmental Handbook for Sustained Deployment Operations*, https://home.army.mil/ansbach/application/files/9615/4696/0914/You_Spill_You_Dig.pdf.

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ANNEX F – HAZARDOUS MATERIALS (HAZMAT) AND SUBSTANCES MANAGEMENT

F.1. DESCRIPTION OF THE SITUATION

F.1.1. General

1. This Annex should be read in conjunction with Annex E – Management of Petroleum, Oils, and Lubricants (POL) and Spill Response. Many of the best practices and standards are similar, as is the approach to spill prevention and response. POL are not addressed in this Annex, since they are thoroughly covered in Annex E. Management of hazardous waste is dealt with in Annex D – Waste Management.

2. HAZMAT is defined as material that may pose a risk for the population, property, safety or the environment owing to its chemical or physical properties or the reactions that it may cause (NATO Agreed 30 January 2012). Harmful risks include fire, sudden increase of pressure and explosion. Harmful health effects include acute, chronic, carcinogenic, mutagenic and reprotoxic effects. Refer to specific SDS for more details on the management and characteristics of HAZMAT.

3. Given the unique characteristics associated with several categories of HAZMAT, paragraphs F.1.2 through F.1.5 provide additional description of their typical use and potential impact on human health and the environment.

F.1.2. Pesticides for Vector and Pest Control

1. Pesticides are HAZMAT and their improper handling, application and disposal can result in serious adverse health and environmental effects.

2. Different pesticides[10], insecticides, rodenticides, herbicides, fungicides, disinfectants and repellents have different constituents. Therefore, their hazard might depend on different exposure pathways (air, soil, water, biota and direct exposure).

F.1.3. Heavy Metals

1. Heavy metals can be found in various products. Although they usually occur in small quantities, they can be highly hazardous via all pathways (air, soil, water, biota and direct exposure) to humans, fauna and flora.

2. Examples of heavy metals that may be found in an operational environment include:

[10] For the purpose of this Annex, the term pesticides shall also include insecticides, rodenticides, herbicides and fungicides.

a. Lead, a highly toxic metal historically used in many products. The main sources of lead exposure have been lead based paint, leaded gasoline, lead contaminated dust, and lead contaminated residential soil. Lead can also be found in ammunition. Exposure to lead may lead to health effects such as developmental problems, learning disabilities, seizures and even death;

b. Mercury, used in thermometers and some types of switches, for example. Mercury attacks the central nervous system, kidneys and reproductive system; and

c. Cadmium, used in paint, batteries and electroplating of aircraft components, for example. Cadmium is predominantly hazardous when inhaled or ingested and can be lethal.

3. The impact areas at firing ranges contain ammunition fragments that can leach heavy metal contaminants, which can adversely impact the environment.

F.1.4. Gases and Ozone Depleting Substances (ODS)

1. Control of ozone depleting substances (ODS) is necessary to protect the earth's ozone layer. ODS also contribute to climate change.

2. Common ODS include:

a. Chlorofluorocarbons (CFCs), used in refrigerators, air conditioners, and certain foam applications;

b. Halons, historically used in fire suppression and fighting equipment, especially in armoured vehicles, ships and aircraft; and

c. Carbon tetrachloride, a highly toxic substance which has historically been used as a solvent for cleaning purposes.

3. Under the Montreal Protocol[11], most ODS have been phased out in developed countries, and their production and import has been restricted in developing countries. However, new equipment with ODS are available on the market, especially in developing countries.

4. Through the Protocol's mechanisms, personnel in most countries have been trained in the servicing, maintenance and replacement of ODS equipment as necessary to ensure long-term compliance. Older air conditioners, refrigerators and fire extinguishers which still use ODS are subject to leaking during maintenance, repair and servicing. Inexperienced service technicians can exacerbate the problem.

[11] The 1987 Montreal Protocol on Substances that Deplete the Ozone Layer is an international treaty signed by 197 countries as of November 2013. See also F.5. - References.

F.1.5. Fire Fighting Foam

1. Several types of fire fighting foam are used on NATO operational camps to fight fuel fires:

    a. Aqueous film-forming foam (AFFF);

    b. Fluoroprotein foam or film-forming fluoroprotein foam; and

    c. Protein foam.

2. Although very effective at their intended purpose, these foams can cause environmental damage, particularly to ground and surface water.

F.2. OBJECTIVES

1. Consider the use of HAZMAT as early as possible in the procurement process and in the planning of operations.

2. Replace HAZMAT with less hazardous alternatives to reduce the exposure of personnel and the environment.

3. Use pesticides only where necessary and in a safe and controlled manner. Implement safe and effective systems for their storage, handling, and application.

4. Mitigate the potential release of heavy metals to the environment.

5. Limit the use and emissions of ODS and ensure ODS releases are documented.

6. Prevent accidental or operational use of fire fighting foams to the extent practicable to avoid environmental harm. Do not use fire fighting foam for training purposes.

F.3. RESPONSIBILITIES

1. The commander shall ensure that no irreversible harm is caused to human health and the environment by HAZMAT.

2. The EP officer shall advise and support the commander to carry out this responsibility, this will include:

    a. Ensuring HAZMAT management is included in the operational plan, either in the EP appendix or integrated elsewhere, as appropriate;

    b. Ensuring HAZMAT is correctly labelled with their contents, hazardous properties, date of receipt, and if appropriate, date of expiration;

c. Ensuring HAZMAT is stored based on its compatibility; storing materials of the same hazard together (e.g., non-flammables with non-flammables, flammables with flammables);

d. Providing, assisting and advising on education and training for TCNs to fulfil their environmental responsibilities in managing HAZMAT;

e. Ensuring PPE is made available and used when handling HAZMAT;

f. Ensuring waste management procedures are followed (e.g., securing food waste containers to limit pests, and safe disposal of heavy metals);

g. Monitoring for lead and other heavy metals in drinking water and soil in coordination with environmental health personnel;

h. Reviewing plans for renovation of existing structures for lead-based paint;

i. Ensuring that technicians servicing, repairing or disposing of ODS or equipment containing ODS have been fully trained; and

j. Ensuring that fire fighting foam is stored, handled, and used only when necessary to avoid environmental damage, and releases are documented.

F.4. BEST PRACTICES AND STANDARDS

F.4.1. General

1. Undertake a risk assessment on transporting, handling, storing, and using HAZMAT, and create routines for spill prevention and emergency response.

2. Raise awareness in personnel of their environmental responsibilities in relation to HAZMAT using a wide range of media such as briefings, seminars, posters, and courses in close collaboration with the logistic and safety officers.

3. Current SDS should always be available when handling HAZMAT. At multinational camps, information such as SDS and warning signs should be in the languages required. Pictures can be effective.

4. When the camp is established, set up a HAZMAT exchange procedure between resident units. This will allow HAZMAT that is no longer required by one unit to be stored and used by another unit that does have a requirement. This in turn prevents unnecessary disposal.

5. Return used compressed gas bottles (e.g. acetylene, oxygen, nitrogen, carbon dioxide, fire extinguisher) to the manufacturer for reuse or disposal.

6. The following are general guidelines for inclusion when labelling HAZMAT:

   a. If the HAZMAT is a single substance, its chemical and common name, and its Chemical Abstract Service (CAS) number;

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

   c. Indicate HAZMAT mixtures that have not been tested as a whole, the chemical and common name(s) of ingredients have been determined to be a health hazard, and comprise 1 percent or greater of the composition. Identify carcinogens if the concentrations are 0.1 percent or greater;

   d. Indicate HAZMAT if the chemical and common name(s) of all ingredients that have been determined to be health hazards, and that comprise less than 1 percent (0.1 percent for carcinogens) of the mixture, if there is evidence that the ingredient(s) could be released from the mixture in concentrations which would exceed an established Occupational Safety and Health Administration (OSHA, EU-OSHA and US OSHA) permissible exposure limit, or could present a health hazard to employees. Also indicate if the chemical and common name(s) of all ingredients that have been determined to present a physical hazard when present in the mixture;

   e. Physical and chemical characteristics of the HAZMAT (such as vapour pressure, flash point);

   f. The physical hazards of the HAZMAT, including the potential for fire, explosion, and reactivity;

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

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

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

   j. Whether the HAZMAT has been found to be a known, probable or possible carcinogen, mutagen or reprotoxic;

k. Any generally applicable precautions for safe handling and use that 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;

l. Any generally applicable control measures that are known to the chemical manufacturer, importer or employer preparing the SDS, such as appropriate engineering controls, work practices, PPE; and

m. 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 HAZMAT and appropriate emergency procedures, if necessary.

F.4.2. Pesticides for Vector and Pest Control

1. Pesticide use should be planned, controlled and recorded. The choice of pesticide shall include considerations about the health and safety of both humans and flora and fauna (e.g. military working animals (dogs), livestock), including potential contamination of the environment in general, and especially water resources. If operating in a ground water protection area, special emphasis should be put into the choice of chemical. A qualified pesticide applicator (e.g. contractor or environmental health personnel) should apply all pesticides.

2. Procured pesticides should have minimal environmental impacts beyond its intended purpose. The quantities procured should be foreseen to be used within a reasonable time frame in order to minimize the need for storage and to prevent pesticides from becoming obsolete.

3. A risk assessment should be made for storage and use of pesticides. The assessment will result in preventive measures, for example:

a. Empty pesticide containers should be pressure or triple-rinsed prior to storage, recycling or landfill disposal;

b. Other materials contaminated by pesticides (such as clothing and materials used during a spill clean-up) should be enclosed in plastic bags prior to disposal;

c. Pesticide residues may be considered hazardous waste and should be disposed of in accordance with local requirements and/or the manufacturers' recommendations. See also Annex D – Waste Management; and

d. Excess pesticide mixtures from spraying should be collected and used again, but safety precautions should be taken.

4. Extreme caution shall be exercised when mixing and loading pesticides since the consequences of exposure are greatest because the chemicals are concentrated. Adhere to the following practices:

a. Read all instructions and warnings thoroughly and wear the correct PPE;

b. Work where it is easy to clean up spills, and in a well-ventilated area or outside. If practical, set up secondary containment to prevent spills from reaching soil or water during mixing and loading;

c. Measure accurately and avoid overflow;

d. Thoroughly clean all mixing and loading equipment; and

e. In the event of a spill, immediately STOP. If qualified and equipped with protective gear, clean up the spill. If not, immediately report the incident to appropriate authorities and take protective action to reduce environmental impacts without endangering any personnel.

5. Safe pesticide storage involves the following practices:

a. Store pesticides in their original containers with labels fully intact;

b. Regularly check containers for leaks;

c. Store pesticides separately in a secure and well ventilated area with secondary containment, protected from temperature extremes and moisture (particularly important for dry pesticides); and

d. Pesticides can be directly poisonous so only personnel working with pesticides should have access to the storage.

6. Safe application of pesticides includes use of the following PPE:

a. Clothing with long sleeves and pants;

b. Unlined, liquid proof and chemical resistant gloves;

c. Unlined neoprene or rubber boots;

d. A wide brimmed hat;

e. A chemical resistant apron when mixing, loading or handling undiluted pesticides;

f. Liquid proof and chemical resistant coveralls or suit with hood or wide brimmed hat if there is a risk of exposure to spray;

g. An appropriate respirator if there is a risk of inhaling pesticide vapours, fumes or dust; and

h. Eye/face protection.

7. Depending upon the type of product and the local circumstances, acceptable methods of disposal include high temperature incineration, chemical treatment, specially engineered landfill for immobilized materials such as incinerator ash and slag, or long-term controlled storage.

8. Pesticides shall not be disposed of by:

a. Dumping or abandonment

b. Open burning;

c. Burying;

d. Discharge to sewer;

e. Solar evaporation;

f. Land farming or superficial application;

g. Deep well injection; or

h. Other methods developed primarily for soil remediation and ground water decontamination.

F.4.3. Heavy Metals

1. A risk assessment should be made for the storage and use of heavy metals. The assessment will result in preventive measures, for example:

a. Specify the use of paint without pigments containing lead or cadmium;

b. Mercury containing equipment should be properly disposed of, and the use of non-mercury containing equipment encouraged;

c. When incinerating products, ensure that they do not contain heavy metals; and

d. Specify that gasoline powered vehicles use unleaded gasoline. If not possible, investigate a potassium additive as an option.

2. Procure unleaded products (e.g. unleaded gasoline and unleaded paint) and alternatives to products containing lead unless mission requirements demand otherwise.

3. Minimize or contain the extent of the impact area at firing ranges, and where possible design ranges with mitigation to reduce risk of contamination such as the inclusion of lining materiel (for example) in order to facilitate restoration or remediation upon redeployment or mission closeout.

F.4.4. Gases and Ozone Depleting Substances (ODS)

1. Procure only non-ODS equipment unless mission requirements demand otherwise.

2. A risk assessment should be made for storage and use of ODS and its containers. The assessment will result in preventive measures, for example:

   a. Technicians shall be properly trained for servicing equipment and for disposing of ODS; and

   b. A list of ODS equipment on the deployed camp shall be prepared and maintained. The list should contain details of the potential for retrofit of such equipment with non-ODS and give details of commonly used alternatives to ODS.

3. It may be possible to change refrigerants in air conditioners, but it is not recommended because the capacity is usually decreased substantially. The changing procedure also involves the risk for leakage.

F.4.5. Aqueous Fire Fighting Foams (AFFF)

1. Only use AFFF when necessary. Do not use AFFF in training exercises.

2. Don't cross contaminate AFFF systems with water suppression systems. Residual AFFF can remain in equipment after the substance has been purged from the system, when that equipment is then used with just water it can inadvertently cause AFFF contamination. If this cannot be avoided, thoroughly decontaminate of AFFF before using the system with just water.

3. Report the use of AFFF in accordance with spill reporting procedures and ensure spills of AFFF are responded to.

4. Document operational equipment and stocks of AFFF in the Environmental File.

F.5. REFERENCES

1. The following references and related documents were used in developing this Annex, or are sources of additional information on HAZMAT management:

a. The *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal*, 22 March 1989, http://www.basel.int/TheConvention/Overview/tabid/1271/Default.aspx;

b. Food and Agricultural Organization of the United Nations, FAO Pesticide Disposal Series 8, *Assessing soil contamination – A reference manual*, 2000, http://www.fao.org/docrep/003/x2570e/x2570e00.HTM;

c. STANAG 2048, *Deployment Pest and Vector Surveillance and Control*, AMedP-4.2;

d. STANAG 3712 ATM, *Airfield Rescue and Fire-Fighting Services Identification Categories*;

e. STANAG 4441, *Allied Multi-Modal Transportation of Dangerous Goods Directive*, AMovP-6;

f. United Nations Department of Peace Keeping Operations (UNDPKO), Department of Field Support, Ref. 2009.6, *Environmental Policy for UN Field Missions*, 1 June 2009;

g. United Nations Economic Commission for Europe (UNECE), *UN Recommendations on the Transport of Dangerous Goods – Model Regulations,* Twelfth revised edition, 2001, http://www.unece.org/trans/danger/publi/unrec/12_e.html;

h. United Nations Environment Programme (UNEP) – Ozone Secretariat, *The Montreal Protocol on Substances that Deplete the Ozone Layer*, https://ozone.unep.org/treaties/montreal-protocol;

i. United Nations Environment Programme (UNEP) – Ozone Secretariat, *The Vienna Convention for the Protection of the Ozone Layer*, https://ozone.unep.org/treaties/vienna-convention;

j. United Nations Economic Commission for Europe (UNECE), *Globally Harmonized System of Classification and Labelling of Chemicals (GHS)*, http://www.unece.org/trans/danger/publi/ghs/ghs_welcome_e.html;

k. United States Environmental Protection Agency (USEPA), Pesticides Science, http://www2.epa.gov/science-and-technology/pesticides-science;

l. United States Environmental Protection Agency (USEPA), Substances and Toxics Science, http://www2.epa.gov/science-and-technology/substances-and-toxics-science;

m. World Health Organization (WHO), *Vector surveillance and control*, http://www.who.int/csr/resources/publications/dengue/en/048-59.pdf; and

n. BAuA: Federal Institute for Occupational Safety and Health, TRGS 510 Storage of Hazardous Substances in Non-Stationary Containers, Technical Rules for Hazardous Substances, Version: January 2013, GMBI 2013 p. 446–475 of 15 May 2013 [No. 22], https://www.baua.de/EN/Service/Legislative-texts-and-technical-rules/Rules/TRGS/TRGS-510.html.

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ANNEX G – AIR QUALITY

G.1. DESCRIPTION OF THE SITUATION

1. Air pollutants such as smoke, exhaust, dust, harmful gas, and odorous chemicals may be emitted by military equipment and operations.

2. Atmospheric emissions from military camps and off-site sources can cause a range of issues from discomfort and irritation to serious illness and death.

G.2. OBJECTIVES

1. Identify sources of air pollutants, properly locate operations and control emissions to reduce noxious gases, odours, and particulates during operations.

2. Reduce air pollutant emissions and associated impacts as much as possible.

3. Prohibit open-air pit burning unless no other alternative is feasible and, where employed, minimize burning to the maximum extent practicable.

G.3. RESPONSIBILITIES

1. In coordination with Force Health Protection (FHP) personnel, and other applicable military camp staff, the EP officer shall:

a. Incorporate air quality considerations into planning and operations;

b. Ensure personnel receive appropriate training, as needed;

c. Identify potential sources of undesirable air emissions from military camp operations;

d. Propose mitigating/corrective measures to reduce undesirable air emissions identified in c;

e. Review acquisition and service contracts for air quality considerations and dangers, and ensure that specifications are included, as appropriate;

f. Ensure air emissions caused by military camp operations are monitored;

g. Keep documentation and records of training, air emissions, mitigation, and inspections; and

h. Advise commanders and lead nations on the impact of air emissions on the environment and the force, and importance of waste separation prior to incineration and/or open-air pit burning.

G.4. BEST PRACTICES AND STANDARDS

1. Prevailing wind directions shall be studied to determine the most favourable location for a military base camp to minimize the impacts of air pollutants.

2. Off-site municipal, industrial, and other air emission sources that pose a potential health hazard to deployed personnel shall be investigated. Investigation could include on-site, off-site, or remote monitoring and inspections as the situation permits. Working, sleeping, recreational, and dining areas should be located to minimize impact from these sources.

3. Military camp stationary sources of air pollution and industrial equipment emitting exhaust, hazardous waste and hazardous material storage areas, and incinerators shall be located as far downwind as practicable from working, sleeping, recreational, and dining areas to minimize the potential for inadvertent exposure to camp personnel.

4. Products/processes should be used that create non-hazardous or less hazardous emissions.

5. Vehicles and fuelling equipment should be well maintained and inspected often.

6. Dust control should be conducted to avoid excessive dust, which could have an adverse health impact inside the military camp and on the local population.

7. Equipment should be employed, properly maintained, and monitored to reduce air emissions whilst operating on a military camp (e.g. power generation and incinerators).

8. Incinerators used to treat solid and health care wastes shall be commercially manufactured and operated in accordance with manufacturer specifications and with Annex D. Incinerators shall meet emission limits of national laws or Directive 2010/75/EU, Part 3, of the European Parliament and of the Council (Reference G.5.1a), as applicable.

9. Open-air burn pits shall be properly designed, constructed, operated, and inspected to minimize the exposure to military camp personnel from air emissions:

a. Open-air burn pits shall be located in a predominantly downwind direction and a safe distance (minimum of 610 meters) from living, dining, recreational, and work areas;

b. Open burning of hazardous waste, used oils and other lubricants, batteries, used tires, electronic wastes, plastics, munitions and explosives, treated wood, hazardous materials, and health care waste shall be prohibited;

c. Open burning operations should be conducted during daylight hours to allow early observation of smoke direction and should only occur between three hours after sunrise, and three hours before sunset;

d. Open burning should not be conducted if local fog or a low cloud ceiling are observed, or if local winds are blowing from the burn site towards working or living spaces; and

e. Open-air burn pits should be sized for the largest expected capacity of the military camp for a minimum anticipated occupation of one year.

10. The intentional venting of refrigerants, other ODS, or halons when maintaining, servicing, disposing, and repairing of air-conditioning and refrigeration equipment or fire suppression equipment shall be avoided. Technicians servicing, repairing or disposing of ODS or equipment containing ODS shall be trained to execute responsibilities as specified in Annex F.

11. Site-specific standard operating procedures and emergency response plans should be developed to minimize sources and generation of air pollution.

12. A list and map of air emission sources should be generated and maintained along with points of contact for the sources.

G.5. REFERENCES

1. The following references and related documents were used in developing this Annex or are sources of additional information on air quality:

a. Directive 2010/75/EU of the European Parliament and of the Council on 24 November 2010 on *Industrial Emissions (Integrated Pollution Prevention and Control)* (recasts Directive 2000/76/EC);

b. World Health Organization (WHO), *Safe Management of Wastes from Health-Care Activities*, 2nd Edition, https://www.who.int/water_sanitation_health/publications/safe-management-of-wastes-from-healthcare-activities/en/;

c. United States Environmental Protection Agency (USEPA), *Hospital, Medical, and Infectious Waste Incinerators*, https://www.epa.gov/stationary-sources-air-pollution/hospital-medical-and-infectious-waste-incinerators-hmiwi-new-source;

d. European Commission (EC), *Air Quality Standards,* https://ec.europa.eu/environment/air/quality/standards.htm;

e. United States Environmental Protection Agency (USEPA), Transportation, Air Pollution, and Climate Change, https://www.epa.gov/transportation-air-pollution-and-climate-change; and

f. World Health Organization (WHO), *Ambient Air Pollution: Pollutants*, http://www.who.int/topics/air_pollution/en/index.html.

ANNEX H – NATURAL RESOURCES PROTECTION

H.1. DESCRIPTION OF THE SITUATION

1. Military operations affect natural resources, such as soil, water, flora, fauna and habitat[12], which contribute to the quality of life, biodiversity and economy of the local area and HN. Changes in resource availability and distribution to communities can cause social effects that may increase the complexity of the mission.

2. Military activity can affect natural resources in a number of ways, such as:

   a. Direct habitat loss due to training, construction, or unregulated clearing of vegetation that serve as habitat;

   b. Habitat fragmentation or obstruction of migration corridors, whereby large areas are broken up by built developments, new transport routes or removal of vegetation corridors;

   c. Damage to or removal of elements that sustain ecosystems and communities (e.g., engineering projects can interfere with both surface water and ground water);

   d. Disturbances to aquatic ecosystems, including biological, chemical, and physical aspects;

   e. Introduction (i.e., importing, exporting) of alien, invasive species that out-compete local species, both naturally occurring and domesticated;

   f. Disturbance of fauna by people, vehicles, vessels, aircraft, equipment and other activities, especially during breeding, roosting, or feeding;

   g. Impacts to threatened species and/or their habitat;

   h. Tracked or wheeled vehicles, as well as concentrated foot traffic, may damage or remove vegetation, and damage or compact the soil. This may cause decreased soil productivity and increase the risk of soil erosion;

   i. Removal of plants or animals and their parts may represent an environmental risk or violation of cultural property rights to the HN;

[12] The Concise Oxford English Dictionary defines habitat as “the natural home or environment of an organism”.

j. Incomplete or otherwise poor closeout of camp may have adverse effects on local biodiversity and landscapes;

k. Materiel left behind may become a source of waste and damage fauna and other natural resources;

l. Spills of POL and other hazardous materials can severely affect flora, fauna, and water sources - see Annex E - Management of Petroleum, Oils and Lubricants (POL) and Spill Response;

m. Use, removal, or other claim of local resources, such as water or minerals, for sustaining an operation may directly impact the environment, the local economy, and HN relations; and

n. Limiting the availability and distribution of resources for communities may cause local shifts in resource use that damage ecosystems and HN relations.

H.2 OBJECTIVES

Protect and preserve natural resources during planning, management, and closeout of military camps in NATO operations.

H.3. RESPONSIBILITIES

1. The Joint Force Engineer shall consult with the EP officer when planning projects or activities to reduce risk of adversely affecting natural resources.

2. In support of the Commander, and in coordination with other applicable military camp staff, the EP officer shall:

a. Identify natural resources that could be affected by the operation;

b. Identify natural resources, which if impacted by military activities, could negatively affect the operation, directly or indirectly;

c. Communicate with local authorities and communities to identify natural resources of local, regional, and national importance;

d. Provide support in conducting risk assessments of planned activities (e.g., infrastructure development);

e. Participate in, and provide environmental protection information for, site surveys in advance of establishment of a new location;

f. Educate personnel on natural resources protection, including prohibitions, and on best practices and standards;

g. Recommend mitigating measures for natural resources protection; and

h. Monitor effectiveness of mitigating measures.

H.4. BEST PRACTICES AND STANDARDS

1. Landscapes[13] should not be disturbed without reason. During the planning phase for a project, take the structure of the natural landscape into account to minimize the consumption of land and the fragmenting of habitats.

2. Landscape diversity can be conserved by environmentally sound management. Wetlands and vegetation, especially continuous vegetation covers such as forests and riparian vegetation, should be protected through proper use.

3. When planning military activities or development of camps and surroundings in an operation a risk assessment should be conducted to evaluate the potential for disturbing natural resources in the proximity of the activity or development, and to evaluate its potential to adversely impact the community and economy.

4. The planning of any project should include considerations to facilitate handover or removal of infrastructure in the closeout phase of the camp or operation.

5. Contracts should be established that task contractors to limit impacts to natural resources and monitor contracted operations to ensure compliance.

6. Habitats favourable to the reproduction and survival of indigenous flora and fauna should be protected. Valuable ecosystems and habitats shall be identified in an EBS and/or EIA, as applicable. Guidance, procedures and templates for conducting an EBS and EIA are contained within STANAG 6500 (AJEPP-6) – see Reference H.5.1.j.

7. Access to protected habitats located within the military camp should be restricted by means of blocking (e.g., fencing or large rocks) and signs, and by providing general information to land users (e.g., camp personnel, tenants, visitors) on their location to reduce the risk of unnecessarily disturbing identified protected areas.

8. Projects shall not alter watercourses that could be supplying water to ecosystems sustaining flora or fauna. If a diversion is necessary, ensure the water returns to the ecosystem via another route.

[13] The Concise Oxford English Dictionary defines landscape as “all the visible features of an area of land”.

9. Surface waters should be conserved in a natural or unobstructed condition. Natural but obstructed surface waters should be returned to natural conditions.

10. Run-off water should be controlled to avoid erosion.

11. Low water crossings or check dams should only be used to allow for vehicle crossing when it is not feasible to use dry crossing, culverts, or bridges. Environmental assessments, approvals, and mitigation measures may be required for wet crossings.

12. Erosion and sedimentation from military operations should be limited in an effort to protect vegetation and topsoil.

13. All vehicles and other equipment (including containers) shall be carefully inspected and cleaned in order to prevent the introduction of invasive species or diseases to the HN territory and to that of any TCN upon redeployment, and to limit the spreading of such inside the area of operation[14].

14. The transportation of any living or dead plant or animal or their parts shall be strictly regulated. Authorization to move any such item should be granted only under the most exceptional circumstances.

15. Personnel shall be educated on the prohibition of buying, selling, trading or acquiring items from endangered species, and non-compliance strictly enforced.

16. The purchasing, harvesting (e.g., hunting, fishing), and transporting of flora and fauna shall be banned unless legal and specific mission approval is granted[15].

H.5. REFERENCES

1. The following references and related documents were used in developing this Annex, or are sources of additional information on natural resources protection:

a. Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), http://www.cites.org/;

b. Council of Europe, *Convention on the Conservation of European Wildlife and Natural Habitats*, 19 September 1979, http://conventions.coe.int/Treaty/EN/Treaties/Html/104.htm;

c. European Commission (EC), *Best Practices on Flood Prevention, Protection and Mitigation*, 25 September 2003, http://ec.europa.eu/environment/water/flood_risk/pdf/flooding_bestpractice.pdf;

[14] STANAG 2557 (AmedP-4.11, (Edition A, Version 1) describes this problem and mitigating measures in more detail.

[15] See also the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) at H.5.1.a.

d. European Commission (EC), *European Habitats Directive, Council Directive 92/43/EEC*, 21 May 1992, http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm;

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f. The International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, http://www.redlist.org;

g. NatureServe, *Conserving Biodiversity on Military Lands – A Guide for Natural Resources Managers*, 2008, http://www.dodbiodiversity.org;

h. STANAG 2557, *Measures to Reduce Risk of Transfer of Biological Hazards During Troop and Materiel Movement*, AMedP-4.11;

i. STANAG 2594, *Best Environmental Protection Practices for Sustainability of Military Training Areas*, AJEPP-7;

j. STANAG 6500, *NATO Environmental File During NATO-Led Operations*, AJEPP-6*;*

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n. United Nations Peacekeeping, *Environment Impact and Sustainability*, http://peacekeeping.un.org/en/environmental-impact-and-sustainability; and

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ANNEX I – CULTURAL PROPERTY PROTECTION

I.1. DESCRIPTION OF THE SITUATION

1. Conflict and military activities have a propensity for damaging cultural, historic, and prehistoric resources in a number of ways, including:

   a. Damage resulting from acts of hostility or use for military purposes, including combat related collateral damage;

   b. Damage caused by military construction activities including camps, roads and infrastructure improvements;

   c. Deliberate destruction, plundering and looting by civilians and combatants of sacred structures, museums, archaeological sites, and other forms of cultural property; and

   d. Inadvertent damage resulting from military supported projects like engagement exercises, training activities, and/or civil-military cooperation (CIMIC) sponsored construction or infrastructure improvements.

2. Damage to cultural property may be detrimental to the cohesion, identity, and heritage of a community, and is often irreversible.

3. Damage to cultural property will most likely attract negative publicity to the operation, and may therefore give rise to tactical problems or even result in conflict escalation. Damage to cultural property can thus complicate the attainment of the desired strategic end state and undermine mission success.

4. Identifying, respecting, and, when necessary, protecting cultural property provides an opportunity for TCNs to demonstrate appreciation for local customs and traditions.

5. All Allied Nations, apart from one, have ratified the 1954 Hague Convention for the Protection of Cultural Property in the Event of Armed Conflict (1954 Hague Convention). All nations, but two, have ratified the 1954 Hague Convention Protocol 1 and most nations have also ratified the 1999 Protocol 2. Most of the Partnership for Peace (PfP) nations have also ratified the 1954 Hague Convention and its Protocols. In addition, customary international law protects cultural property during military operations.

6. In sum, cultural property protection (CPP) is a mission requirement involving strategic and tactical consideration. CPP is a cross-cutting activity that occurs during all phases of NATO operations. It is an aspect in environmental protection, intelligence, CIMIC, geospatial imagery, legal guidance, combat targeting, logistics and MILENG functions.

I.2. OBJECTIVES

1. Include and implement measures for identifying and protecting cultural property throughout all phases of the military mission beginning at the earliest stages of operations planning and continuing through mission closure.

2. Develop measures for mitigating the risks to cultural property that may occur as the result of, or be associated with, NATO operations.

3. Ensure contingency plans are in place for restitution, if necessary.

I.3. RESPONSIBILITIES

1. All TCNs shall ensure that their forces receive appropriate training and instructions to fulfil their CPP responsibilities under international law.

2. Commanders and TCNs shall mitigate harm to cultural property while constructing and managing camps, installations and other infrastructure.

3. In support of the commander, and in coordination with CIMIC, the EP officer shall:

   a. Coordinate with the NATO CPP focal point in J9;

   b. Provide or seek advice on CPP, including the application and responsibilities under the 1954 Hague Convention, and its two Protocols;

   c. Ensure that CPP aspects are considered during the completion of the EBS, as required in AJEPP-6;

   d. Identify cultural sites in order to avoid them when locating camps, installations, infrastructure and other military activity; and

   e. Account for the impact of construction and other military activities considering local concerns about cultural property and community heritage.

I.4. BEST PRACTICES AND STANDARDS

1. For the purpose of identifying cultural property during operations, the definition of cultural property in the 1954 Hague Convention, LEXICON PART II, shall apply and be used in conjunction with host nation and local community definitions of cultural property. Cemeteries, agricultural assets with cultural attributes, natural features with cultural significance, and examples of indigenous infrastructure shall also be treated as forms of cultural property.

2. As part of operations planning, ensure that the best possible geospatial data information is available concerning the presence of cultural property within the proposed operations area.

3. Specialist support should be required for detailed baseline characterization of cultural property. To ensure best practice, and compliance with international law, EP officers shall coordinate CPP related activities with J9 CIMIC staff for verification and reporting.

4. To the extent possible, information about cultural property should be collected from HN experts and/or locals.

5. The baseline characterization of cultural property shall include, but not necessarily be limited to, the following considerations:

   a. If the camp/installation/infrastructure is located in an area which is known for cultural property identified on maps or by other local resources;

   b. Clearly visible cultural property including, but not limited to, standing structures, places of worship, and ancient ruins; and

   c. The potential presence of buried cultural property, such as archaeological sites, ancient infrastructure, and underground features.

6. Utmost respect shall be shown when requisitioning or using historic structures and/or operating in the vicinity of ancient sites.

7. If feasible, activity should be suspended if cultural property is at risk.

8. If human remains are found, recent or historic, notification shall be made to the appropriate NATO commander, NATO CPP focal point in J9, EP officer, and HN law enforcement authorities.

9. The purchase of, trade for, or acceptance as a gift of any cultural property and antiquities by NATO troops shall be prohibited.

10. Evacuation of cultural property for the purposes of protection or damage to cultural property caused by accident or military necessity should be documented, reported, and addressed with the appropriate HN officials.

I.5. REFERENCES

1. The following references and related documents were used in developing this Annex or are sources of additional information on cultural property protection:

   a. The 1954 Hague Convention for the Protection of Cultural Property in the Event of Armed Conflict, http://portal.unesco.org/en/ev.php-URL_ID=13637&URL_DO=DO_TOPIC&URL_SECTION=201.html.

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STANAG 2048, *Deployment Pest and Vector Surveillance and Control*, AMedP-4.2.

STANAG 2136, *Requirements for Water Potability During Field Operations and in Emergency Situations*, AMedP-4.9.

STANAG 2238, *Allied Joint Doctrine for Military Engineering*, AJP-3.12.

STANAG 2394, *Allied Tactical Doctrine for Military Engineering,* ATP-3.12.1.

STANAG 2535, *Deployment Health Surveillance*, AMedP-21.

STANAG 2536, *Allied Joint Doctrine for Petroleum*, AJP-4.7.

STANAG 2557, *Measures to Reduce Risk of Transfer of Biological Hazards During Troop and Materiel Movement*, AMedP-4.11.

STANAG 2561, *Field Hygiene and Sanitation*, SRD to AJMedP-4*.*

STANAG 2594, *Best Environmental Protection Practices for Sustainability of Military Training Areas*, AJEPP-7.

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STANAG 2982, *Essential Field Sanitary Requirements*.

STANAG 3712 ATM, *Airfield Rescue and Fire-Fighting Services Identification Categories.*

STANAG 3784, *Technical Guidance for the Design and Construction of Aviation and Ground Fuel Installations on NATO Airfields*.

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STANAG 6500, *NATO Environmental File During NATO-Led Activities*, AJEPP-6.

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TOPICAL INDEX

LEXICON

PART I – ACRONYMS AND ABBREVIATIONS

AFFF	Aqueous Fire Fighting Foams
AJEPP	Allied Joint Environmental Protection Publication
AJP	Allied Joint Publication
AMedP	Allied Medical Publication
AMovP	Allied Movement Publication
ATP	Allied Tactical Publication
BOD	biochemical oxygen demand
CBOD	carbonaceous biochemical oxygen demand
CBRN	chemical, biological, radiological and nuclear
CCME	Canadian Council of Ministers of the Environment
CFC	chloroflourocarbon
CIMIC	civil-military cooperation
CLP	Classification, Labelling and Packaging of substances and mixtures
COD	chemical oxygen demand
CP	cultural property
CPP	cultural property protection
DFI	deployed force infrastructure
EBS	environmental baseline study
EC	European Commission
ECR	environmental condition report
ECS	environmental closeout study
EIA	environmental impact assessment
EMB	environmental management board
EMS	environmental management system
EP	environmental protection
EPI	Energy Performance Indicator
EPO	environmental protection officer
FHP	Force Health Protection
GHS	Globally Harmonized System of Classification and Labelling of Chemicals
HAZMAT	hazardous material
HN	host nation
ISO	International Organization for Standardization
LED	light emitting diode
Log	logistics
MC	Military Committee
MILENG	military engineering
NATO	North Atlantic Treaty Organization
ODS	ozone-depleting substance
OPP	operations planning process
OPLAN	operations plan
PCB	polychlorinated biphenyl

PfP	Partnership for Peace
PHC	petroleum hydrocarbon
POL	petroleum, oils and lubricants
PPE	personal protective equipment
ROWPU	reverse osmosis water purification unit
SDS	safety data sheet
SEU	Significant Energy Use
STANAG	Standardization Agreement
TCN	troop-contributing nation
UNEP	United Nations Environment Programme
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
WHO	World Health Organization

PART II – TERMS AND DEFINITIONS

biochemical or biological oxygen demand (BOD5)
A measure of the quantity of oxygen consumed by microorganisms during the decomposition of organic matter over a period of 5 days.

carbonaceous biochemical oxygen demand (CBOD)
The portion of oxygen demand involved in the conversion of organic carbon to carbon dioxide, during the oxidation of organic matter, while nitrification is inhibited.

chemical oxygen demand (COD)
A measure of the capacity of organic and inorganic materials to consume oxygen in water through the use of a chemical oxidation agent.

coliform
A type of bacteria. The presence of coliform-type bacteria is an indication of possible pathogenic bacterial contamination. Fecal coliforms are those coliforms found in the faeces of various warm-blooded animals, whereas the term coliform also includes other environmental sources.

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.

cultural property as defined in 1954 Hague

(a) movable or immovable property of great importance to the cultural heritage of every people, such as monuments of architecture, art or history, whether religious or secular; archaeological sites; groups of buildings which, as a whole, are of historical or artistic interest; works of art; manuscripts, books and other objects of artistic, historical or archaeological interest; as well as scientific collections and important collections of books or archives or of reproductions of the property defined above;

(b) buildings whose main and effective purpose is to preserve or exhibit the movable cultural property defined in sub-paragraph (a) such as museums, large libraries and depositories of archives, and refuges intended to shelter, in the event of armed conflict, the movable cultural property defined in sub-paragraph (a);

(c) centres containing a large amount of cultural property as defined in sub-paragraphs (a) and (b), to be known as ‘centres containing monuments’.

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

environment
The surroundings in which an organization operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelations.
(NATO*Term* – NATO Agreed)

environmental baseline study (EBS)
A study of the environmental conditions in a defined area prior to the commencement of military activities.
(NATO*Term* – NATO Agreed)

environmental closeout study (ECS)
A study of the environmental conditions in a defined area at the cessation of military activities.
(NATO*Term* – NATO Agreed)

environmental condition report (ECR)
A report on the environmental conditions in a defined area. Note: the report may be periodic or may follow an environmental incident.
(NATO*Term* – NATO Agreed)

environmental impact
Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects.
(NATO*Term* – NATO Agreed)

environmental impact assessment (EIA)
A study of the environmental impact of an activity or project.
(NATO*Term* – NATO Agreed)

Environmental Management Board (EMB)
A body constituted of subject-matter experts from various disciplines and backgrounds to provide environmental-protection advice and coordination to a NATO commander.
(NATO*Term* – NATO Agreed)

environmental protection (EP)
The prevention or mitigation of adverse environmental impacts.
(NATO*Term* – NATO Agreed)

environmental protection officer (EPO or EP officer)
An officer, non-commissioned officer or civilian to whom environmental protection responsibilities have been assigned by a commander.
(NATO*Term* – NATO Agreed)

habitat
The natural home or environment of an organism.
(Concise Oxford English Dictionary)

hazardous material (HAZMAT)
Material that may pose a risk for the population, property, safety or the environment owing to its chemical or physical properties or the reactions that it may cause.
(NATO*Term* – NATO Agreed)

hazardous waste
Hazardous waste is waste that poses substantial or potential threats to public health or the environment when not properly managed. Hazardous wastes can occur in the form of liquids, solids, sludges or compressed gases. They typically exhibit at least one of the following four characteristics; ignitability, corrosivity, reactivity or toxicity. Once hazardous materials and substances are discarded, they become hazardous waste.

health care waste
Waste generated by health-care activities, including chemical, biological and pharmaceutical residues, outdated products and hazardous chemicals; mercury containing equipment; infectious waste and biomedical, pathological or anatomical wastes.

- **infectious health care waste**: Waste from medical, dental or veterinary treatment activities that may be contaminated by blood, body fluids or other potentially infectious materials, thus posing a significant risk of transmitting infection.

- **pathological waste**: Health care waste including human or animal body parts, including tissues and organs.

landscape
All the visible features of an area of land.
(Concise Oxford English Dictionary)

liquid waste
In the meaning of this AJEPP, unwanted or unusable liquids, without waste water.

maximum contaminant level (MCL)
The maximum permissible level of a contaminant in waste water.

phenols
Phenols are weakly acidic water-soluble organic compounds consisting of one or more hydroxyl groups attached to an aromatic hydrocarbon group.

pH
pH is a measure of the acidity or alkalinity of a solution.

scrap metal
Metallic recyclable material that serves as a secondary raw material. It might be classified as hazardous waste if it is contaminated with hazardous substances, e.g. damaged vehicles contaminated with fuels or machine parts contaminated with lubricants.

spill response
The initial response to a spill followed by the removal and management of free product and obviously contaminated media that is addressed contemporaneously (e.g. within days or weeks of the release).

solid waste
Unwanted or unusable solid materials generated from human activities.

total suspended solids (TSS)
Solids in a water sample that do not pass through a filter. They include organic and inorganic substances. They include volatile suspended solids and total suspended solids.

total dissolved solid (TDS)
Dissolved particles that passed though filter and do not increase the volume of water, measured in parts per million (ppm) of water. This value is only used by a few countries and should not be taken into account when not specifically required by some local guideline or law.

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