FORCE DEVELOPMENT DIRECTORATE
UNITED STATES ARMY COMBINED ARMS SUPPORT COMMAND
FORT LEE, VIRGINIA 23801-1809

WATER PLANNING GUIDE

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POTABLE WATER CONSUMPTION PLANNING FACTORS BY ENVIRONMENTAL REGION AND COMMAND LEVEL

WATER PLANNING GUIDE

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SECTION I – OVERVIEW

PURPOSE

This planning guide provides commanders and logistics staff planners at all levels with a comprehensive water sustainment planning tool. Information presented will enable logistics planners to identify requirements, assess capabilities and identify water purification, storage and distribution requirements to support military force projection operations.

SCOPE

This planning guide provides Army force water planning factors. Data in this guide includes gallons/person/day planning factors for both conventional and integrated theaters by Army force echelon/command level and climatic environment. Discrete population factors are provided for Enemy Prisoner of War (EPW) and civilian internee/refugee operations, Force Provider operations, redeployment vehicle wash rack operations, aircraft and watercraft maintenance and engineer operations.

REFERENCES

This planning guide is a consolidation and integration of information presented in the numerous references, which are listed in Appendix W of the US Army CASCOM Potable Water Planning Data Study Report, 24 July 2008.

ARMY EXECUTIVE AGENCY RESPONSIBILITIES

As the land force component of the US Military Services, the US Army has been designated as the Department of Defense (DoD) Executive Agent for water resources management in support of contingency operations. In this role, the Army is responsible for coordination with other services and the Joint Staff to develop joint policy, procedures and requirements for water management resources in support of land based forces. Army Service Component Commanders (ASCC) are responsible to ensure that water support for other services, when required to be provided by the Army, is incorporated into Operational Plans (OPLANS) or preplanned with Inter-Service Support Agreements (ISSA). In general, The Army Service Component (ASC) is responsible for providing backup water support to other US Military Services in an area of operations when requested and/or when water support requirements of the other services exceed their own organic capability.

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Army Water Proponency: Within the Department of the Army, the Deputy Chief of Staff, G4 (DA G4) is designated as the Army Staff proponent for all land based water resource matters. Under the guidance and policies of the DA G4, the US Army Training and Doctrine Command (TRADOC) is responsible for validating DoD and Army water consumption planning factors. Within TRADOC, the US Army Combined Arms Support Command (CASCOM) is the TRADOC proponent for the development, validation, and maintenance of Army water consumption planning factors. To accomplish this, the CASCOM acquires battlefield functional mission water usage profile data from related studies and the following proponents.

- The US Army Quartermaster Center and School (USAQMC&S) - field feeding, shower, laundry, mortuary affairs, and Force Provider functional mission operations.

- The US Army Maneuver Support Center (MANSCEN) - horizontal and vertical construction, well drilling, topographic functional mission operations, personnel and equipment decontamination functional mission operations, enemy prisoner of war, civilian internee, and displaced civilian and refugee functional mission operations.

- The U.S. Army Aviation Center of Excellence (USAACE) - aviation maintenance functional mission operations.

- The US Army Medical Department Center and School (USAMEDDCS) - drinking, personal hygiene, heat casualty treatment and level I through level IV medical functional mission operations.

- The US Army Ordnance Center and School (USAOCS) - ground vehicle maintenance functional mission operations.

- The US Army Transportation School (USATS) - ground vehicle and watercraft washing functional mission operations.

WATER CONSERVATION AND SUPPLY DISCIPLINE

Water is a resource that is essential not only for the sustainment of life, but critical to the combat effectiveness of a military force. Commanders at all levels are responsible to ensure that water conservation and supply discipline are continuously exercised by all personnel and that waste is minimized, regardless of water availability. Procedures for water supply discipline must be established and enforced. Adequate water availability and consumption must be maintained to prevent heat casualties. Water inventories must be protected from pilferage, contamination, capture, and damage or loss from

natural causes. In temperate, tropical or cold theater environments, where raw water is readily available, potable water will be provided with minimum controls. However, even in these environments, considerable materiel and manpower force structure might be required to produce and distribute potable water that meets the minimum standards for personnel consumption. In arid theaters, where raw water sources are scarce, water conservation and waste minimization become even more critical to sustained force operations. In these theaters, water will be centrally managed by Materiel Management Centers as a critical supply commodity, and all water distributed within the theater will, by necessity, be potable. To ensure the availability of quality water to meet the critical minimum requirements for unit level drinking, personal hygiene, field feeding, heat injury treatment and medical operations, commanders must be prepared to compromise non-critical requirements for other operations such as centralized hygiene, laundry and engineer construction. Water conservation and supply discipline training should be conducted periodically to ensure a thorough understanding of principles, practices and procedures.

ASSUMPTIONS

The following assumptions were made in developing the water consumption estimates presented in this planning guide. Whenever actual logistics intelligence of the theater, historical data, experience or command planning guidance provide different or more accurate data, logistics planners should modify appropriate consumption data as necessary.

- Water requirements for drinking, personal hygiene, field feeding, heat casualty treatment, and medical operations will not be compromised.
- Water production will be accomplished with U.S. Army equipment.
- Only potable water will be available for mission support in an arid environment.
- Water sources are accessible and exploitable.
- Required water distribution support equipment is in place.
- A 10% loss factor, comprised of 4% evaporation and 6% waste/spillage, is required through all environments.
- Two showers and up to 15 pounds of laundry will be provided to each individual per week.
- Only back-up support will be provided to other services.

- Food Preparation.
  - Water requirements for sustained operations are based on a ration cycle of two hot meals and one Meal Ready to Eat (MRE) per day. Water requirements for minimum operations are based on a ration cycle of three MREs per day.
  - When the ration cycle is exclusively MREs, company and/or battalion field feeding equipment sanitation/cleanup operations will not be established. When the ration cycle calls for serving hot meals, the field feeding equipment sanitation/cleanup operations and/or the Mobile Kitchen Trailer (MKT) will be charged with only the requisite amount of water required for each hot meal.
  - Disposable dinnerware will be used for all hot ration meals, when practicable.
- Raw water acquired from available sources in hot, tropical, temperate, and cold climatic environments will normally not require ROWPU processing to meet the minimum quality standards required for non-potable water-consuming functional mission operations.

HOW TO USE THE GUIDE

This guide is a comprehensive and flexible water requirements planning tool. Logistics planners can access individual sections to expeditiously determine situational requirements using Standard Planning Factors. During deliberate planning, logistics planners should sequentially work through each section of this planning guide to ensure the most accurate determination and balance between force water consumption and water purification, storage and distribution capability.

Section I is an overview of the water planning process and is a quick reference for general theater water requirements determination. It contains:

- A discussion of Department of Army (DA), Army Service Component Command (ASCC) and US Army Training and Doctrine Command (TRADOC) responsibilities associated with the Army's designation as DoD Executive Agent for water resources management.
- Water planning assumptions used in developing standard Army water planning factors.
- Tables containing standard planning factors by climatic environment for conventional and integrated theaters.

- Water consumption estimates applicable to all theaters for discrete population sets, workloads and equipment.

Section II provides detailed rationale for the standard planning factors presented in Section I. It describes the currently-recognized operations that consume water and the computations used to derive standard planning factors. Logistics planners should use the data presented in this section as a quick reference for situational determination of singular force/mission operation water requirements for a force element. For deliberate planning, planners should use this section to modify/adjust standard planning factors based upon theater logistics preparation of the battlefield assessments, theater threat intelligence or operation-unique requirements.

Section III provides planning factors by echelon/command level based on theater, environmental region and related functional mission profiles. Use this section to determine the gallons/person/day consumption associated with various force echelons and command levels.

Section IV contains potable water production tables for Reverse Osmosis Water Purification Units (ROWPU). If the water temperature and total dissolved solids are known, the hourly production rate can be calculated. Knowing the production rate and the production requirement, the planner can estimate the number of ROWPUs needed to meet the mission.

Section V provides tables of usage factors and consumables associated with ROWPUS (e.g., chemicals, cartridge filters, and RO elements).

Section VI provides an abbreviated list of Line Item Numbers (LIN) for the principal water purification, storage and distribution equipment (e.g., ROWPUs, tanks, storage and distribution systems, water quality analysis sets, pumps, drums, etc.) and associated transportation equipment (e.g., trucks, tractors, semi-trailers, drum tie-down kit).

Section VII is a glossary of abbreviations and acronyms used in the Water Planning Guide.

Section VIII provides definitions of terms used in the Water Planning Guide.

Section IX summarizes water quality requirements by function.

WATER PLANNING FACTOR TABLES

Water planning factors are based upon estimates shown in the approved Water Planning Data Study, US Army CASCOM, 24 July 2008. These estimates have been converted to daily factors using various units of measure, such as gallons/person/day, gallons/day, gallons/unit and gallons/hospital bed. The methods for converting these estimates into daily factors are discussed in Section II of this guide.

Certain planning factors, which are referred to in this guide as “standard planning factors,” are based on the number of personnel in a theater force. Tables 1 and 2 provide these standard planning factors for sustaining and minimum consumption rates within each environmental region. Table I should be used for military forces operating in conventional theaters. Table 2 should be used for military forces operating in integrated theaters.

Several water-consuming activities are driven by discrete military and/or civilian population sets, workloads, or specific equipment densities. Consumption for these activities cannot be easily reduced to *per capita* planning factors that can be applied against the military personnel population in a theater. Nevertheless, standard planning factors have been developed for some of these functions. Table 3, which is applicable to both conventional and integrated theater planning, provides these planning factors for sustaining and minimum consumption rates within each environmental region.

The tables provide a summary of the water consumption profiles associated with force projection operations. Potable water requirements in tables are shaded. **Bold print** indicates totals of one or more factors in the table. For example, a total of requirements for non-potable might be shown. The tables also reflect the total theater water requirements (the sum of potable and non-potable water requirements) for both conventional and integrated theaters. These totals are shown in **reversed print**. Note that in arid environments, all water is potable.

Use the data provided in the following tables for general theater planning. Note that the standard planning factors in these tables were developed to be consistent with the assumptions discussed on pages I-3 and I-4, above. Planners may modify or adjust these standard planning factors based on latest logistics preparation of the battlefield assessments or other unique conditions associated with a given operation or area of operation. Section II of this guide provides a detailed discussion of the components and rationale for computation of consumption rates for each of the functions identified in Tables 1 through 5. Planners should refer to Section II when making required modifications or adjustments to standard planning factors.

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USER INFORMATION

This document supersedes Potable Water Planning Guide, US Army CASCOM, 15 July 1999. Planning factors presented in this document incorporate the results of the Water Planning Data Study, US Army CASCOM, 24 July 2008. These revised planning factors will be incorporated into the Army logistics data base and supersede planning factors currently published in Chapter 3 and Appendix B of FM 10-52. The proponent for this publication is the US Army CASCOM. Users are encouraged to recommend changes and submit comments for its improvement. Users should key comments to the specific page and paragraph to which the change is recommended. To send changes or comments, prepare DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forward it to:

COMMANDER
U.S. Army CASCOM
Force Development Directorate
ATTN: ATCL-CDF-Q
3901 A Avenue
Fort Lee, VA 23801-1809

TABLE I-1 STANDARD PLANNING FACTORS RELATED TO PERSONNEL IN FORCE (GAL/PERSON/DAY)
CONVENTIONAL THEATER
NOTE: SHADED AREA REPRESENTS POTABLE WATER

Function	Tropical		Arid		Temperate		Cold	
	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Universal Unit Level[a]	6.91	4.87	7.27	5.23	5.26	3.22	5.81	3.77
Role I and II Medical Treatment	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Role III and IV Medical Treatment	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Central Hygiene - Showers[b]	2.07	1.87	2.07	1.87	2.07	1.87	2.07	1.87
Mortuary Affairs Operations	0.03	0.03	0.22	0.22	0.03	0.03	0.03	0.03
Potable Total	**9.92**	**7.68**	**10.47**	**8.23**	**8.27**	**6.03**	**8.82**	**6.58**
Centralized Hygiene - Laundry[b]	0.26	0.12	0.26	0.12	0.26	0.12	0.26	0.12
Mortuary Affairs Operations	0.19	0.19	NA	NA	0.14	0.14	0.14	0.14
Engineer Construction	1.98	0.00	1.98	0.00	1.98	0.00	1.98	0.00
Aircraft Maintenance	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Vehicle Maintenance (non-potable part of UUL)	0.36	0.36			0.19	0.19	0.19	0.19
Non-potable Total[c]	**2.93**	**0.81**	**NA**	**NA**	**2.72**	**0.60**	**2.72**	**0.60**
Theater Total	**12.86**	**8.49**	**12.86**	**8.49**	**10.99**	**6.63**	**11.54**	**7.18**

[a] Includes gal/person/day and/or *per capita* requirements for drinking, personal hygiene, field feeding, heat injury treatment and vehicle maintenance.

[b] Based on a central hygiene goal of two showers and 15 pounds of laundry per soldier per week.

[c] All potable in arid environment.

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TABLE I-2 STANDARD PLANNING FACTORS RELATED TO PERSONNEL IN FORCE (GAL/PERSON/DAY)
INTEGRATED THEATER
NOTE: SHADED AREA REPRESENTS POTABLE WATER

FUNCTION	HOT				TEMPERATE		COLD	
	TROPICAL		ARID[3]					
	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Universal Unit Level [1]	7.46	5.41	7.82	5.77	6.36	4.31	5.81	3.76
Role I and II Medical Treatment	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Role III and IV Medical Treatment	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Central Hygiene - Showers	2.07	1.87	2.07	1.87	2.07	1.87	2.07	1.87
Mortuary Affairs Operations	0.03	0.03	0.23	0.23	0.03	0.03	0.03	0.03
CBRN Decontamination	1.05	1.05	2.12	2.12	1.05	1.05	1.05	1.05
Potable Total	**11.52**	**9.28**	**13.15**	**10.90**	**10.42**	**8.18**	**9.87**	**7.63**
Central Hygiene - Laundry[2]	0.26	0.12	0.26	0.12	0.26	0.12	0.26	0.12
Mortuary Affairs Operations	0.20	0.20	NA	NA	0.15	0.15	0.15	0.15
Engineer Construction[4]	1.98	0.00	1.98	0.00	1.98	0.00	1.98	0.00
Aircraft Maintenance	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Vehicle Maintenance (Non-potable part of UUL)	0.36	0.36	NA	NA	0.19	0.19	0.19	0.19
CBRN Decontamination	1.91	1.91	**NA**	**NA**	1.91	1.91	1.91	1.91
Non-potable Total	**4.86**	**2.73**	**NA**	**NA**	**4.64**	**2.52**	**4.64**	**2.52**
Theater Total	**16.38**	**12.01**	**15.54**	**11.17**	**15.07**	**10.69**	**14.52**	**10.14**

[1] Includes gal/person/day and/or *per capita* requirements for drinking, personal hygiene, field feeding, heat injury treatment and vehicle maintenance.

[2] Based on a central hygiene goal of two showers and 15 lb of laundry per soldier per week.

[3] All potable in arid environment.

TABLE I-3 WATER REQUIREMENTS RELATED TO DISCRETE THEATER POPULATION SETS, WORKLOADS AND EQUIPMENT[1]
ALL THEATERS

FUNCTION		HOT				TEMPERATE		COLD	
		TROPICAL		ARID					
		Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
EPW, Civilian Internee and Refugee Operations[2] (gal/person/day)		8.70	6.66	8.70	6.66	7.33	8.58	7.88	5.83
Force Provider Operations3 (gal/person/day)	Military Missions	34.16	34.16	34.16	34.16	34.16	34.16	34.16	34.16
	Operations Other Than War	42.91	42.91	42.91	42.91	42.91	42.91	42.91	42.91
Redeployment Vehicle Washrack Operations[4] (gal/company-size unit)	Light Force	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900
	Armored / Mechanized Force	11,000	11,000	11,000	11,000	11,000	11,000	11,000	11,000
Aircraft Maintenance Operations (gal/day)	Heavy CAB	2,979	2,979	2,979	2,979	2,979	2,979	2,979	2,979
	Medium CAB	2,254	2,254	2,254	2,254	2,254	2,254	2,254	2,254
	Light CAB	2,583	2,583	2,583	2,583	2,583	2,583	2,583	2,583
	Expeditionary CAB	2,539	2,539	2,539	2,539	2,539	2,539	2,539	2,539
Watercraft Maintenance Operations[4] (gal/day)	Joint High Speed Vessel (JHSV)[5]	825	825	825	825	825	825	825	825
	Logistics Support Vessel (LSV)	550	550	550	550	550	550	550	550
	Landing Craft, Utility (LCU)	495	495	495	495	495	495	495	495
	Landing Craft, Mechanized (LCM)	330	330	330	330	330	330	330	330
	Large Tug	275	275	275	275	275	275	275	275
	Pusher Tug	138	138	140	140	138	138	138	138
Engineer Operations[6]		1.98	0.00	1.98	0.00	1.98	0.00	1.98	0.00
Ice[7]	Mortuary Affairs	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01
	Food Preparation	0.79	0.79	0.79	0.79	0.26	0.26	0.26	0.26

[1] See appendices for potability requirements for all factors in this table.

[2] Applied only against discrete theater EPW, internee and refugee population estimates. Includes gallonl/person/day and/or *per capita* requirements for drinking, personal hygiene,

[3] Applied only against discrete military and/or civilian population sets expected to be serviced by Force Provider on a daily basis. Includes water for centralized hygiene, latrines, and food preparation. Quantities already provided in the Universal Unit Level have been subtracted to prevent double counting of requirements.

[4] Based on average vessel and vehicle densities and per vessel and vehicle requirements. See pages II-C-4 and II-C-5, respectively.

[5] In fleet by 2011.

[6] Gallon/person/day and/or *per capita* based upon estimated requirement divided by TAA 08-13 strength.

[7] Requirement shown as water equivalent of ice calculated at 0.12 gallons per pound of ice.

[8] All factors include a 10% adjustment for waste.

SECTION II – WATER REQUIREMENTS AND STANDARD PLANNING FACTORS

A description of recognized water-consuming operations and the rationale for computations used to derive standard planning factors.

SECTION II-A CONVENTIONAL THEATER

SECTION II-B INTEGRATED THEATER

SECTION II-C DISCRETE POPULATION SETS, WORKLOADS AND EQUIPMENT

This section provides the rationale for the Standard Planning Factors presented in Section I. Logistics planners should use this section:

1. For situational determination of singular force/mission operation water requirements for a force element.

2. To modify/adjust standard planning factors to meet unique theater or operational requirements.

Start with the Standard Planning Factors presented in Section I, and then go to the appropriate paragraph in this section to examine the rationale, apply rates to situational requirements or modify the Standard Planning Factor.

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SECTION II-A – CONVENTIONAL THEATER REQUIREMENTS

Universal Unit Level (UUL)

1. Description. The Universal Unit Level is the amount of water required by all Army units, regardless of their location in the theater. It includes water for drinking, personal hygiene, food preparation, heat injury treatment and vehicle maintenance.

2. Water Quality Requirement. Water for drinking, personal hygiene and food preparation must be potable. Permission to use other than potable water for heat injury treatment requires a risk assessment by Preventive Medicine personnel and approval from the Command/Theater Surgeon and Commander. Water for vehicle maintenance operations must be fresh but does not have to be potable.

3. Explanatory Notes.

a. Planning factors for the UUL apply to both conventional and integrated theaters, but they vary by climate. Factors for drinking, personal hygiene and food preparation reflect average direct gallon/person/day consumption. Factors for heat injury treatment and vehicle maintenance are *per capita* consumption estimates based on the number of personnel in the theater.

b. Minimum factors are based on The Surgeon General's recommendation of one shower and 7.2 pounds of laundry per week, shaving (males) and brushing teeth once per day, washing hands three times per day, and sponge bathing five times per week. The Army goal is two showers and 15 pounds of laundry per week. Sustaining factors are based the Army goal of one shower and one field expedient shower and 15 pounds of laundry per week, shaving (males) once per day, brushing teeth three times per day, washing hands six times per day, and sponge bathing five times per week. The factor for shaving assumes that 81% of the theater population is males based on data provided by DA G1 from PAM XXI.

c. Food preparation planning factors are based on a sustaining ration cycle of two UGR meals (A or heat and serve) and one Meal, Ready to Eat (MRE), and a minimum ration cycle of three MREs.

d. The heat injury treatment factor applies to all theaters and represents the maximum amount of chilled water required for expected daily heat stroke casualties. Heat injury treatment factors are calculated by applying the amount of water required per patient to the TAA 08-13 theater population.

e. Potable water for vehicle maintenance is normally required only in hot, arid environments. However, if raw water from available sources in any other theater environment requires ROWPU processing to meet minimal vehicle maintenance quality standards, tropical, temperate and cold factors should be modified to indicate that potable water is required. Vehicle maintenance factors are derived by multiplying the expected radiator coolant replacement quantity (1.0 gallon/vehicle/day in hot climates, and 0.5 gallons/vehicle/day in temperate and cold climates) by the number of vehicles in the theater and dividing by the theater population. If ROWPU processing of water is required, the Standard Planning Factors for tropical, temperate and cold climates must be increased by .0.33 and 0.17 gallons/person/day, respectively.

f. Drinking factors for the UUL are based on climate and level of activity.

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REQUIREMENTS FOR UNIVERSAL UNIT LEVEL (UUL) (GAL/PERSON/DAY)
CONVENTIONAL THEATER[a]

Function		Tropical		Arid		Temperate		Cold	
		Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Drinking[f]		3.30	3.30	3.30	3.30	1.65	1.65	2.20	2.20
Personal Hygiene[b]	Brushing Teeth 3 Times/Day	0.22	NA	0.22	NA	0.22	NA	0.22	NA
	Brushing Teeth 1 Time/Day	NA	0.08	NA	0.08	NA	0.08	NA	0.08
	Shaving	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
	Washing Hands 6 Times/Day	0.83	NA	0.83	NA	0.83	NA	0.83	NA
	Washing Hands 3 Times/Day	NA	0.42	NA	0.42	NA	0.42	NA	0.42
	Sponge Bath 5 Times/Week	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Food Preparation[c]	Individual Meal (MRE)	0.14	0.43	0.14	0.43	0.14	0.43	0.14	0.43
	Unitized Group Ration (UGR) - A or H&S	1.78	NA	1.78	NA	1.78	NA	1.78	NA
Heat Injury Treatment[d]		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Vehicle Maintenance[e]		0.36	0.36	0.36	0.36	0.19	0.19	0.19	0.19
Non-potable Total		**0.36**	**0.36**	**NA**	**NA**	**0.19**	**0.19**	**0.19**	**0.19**
Potable Total		**6.91**	**4.87**	**7.27**	**5.23**	**5.26**	**3.22**	**5.81**	**3.77**
Theater Total		**7.27**	**5.23**	**7.27**	**5.23**	**5.45**	**3.41**	**6.00**	**3.96**

STANDARD PLANNING FACTORS FOR UNIVERSAL UNIT LEVEL (GAL/PERSON/DAY)
CONVENTIONAL THEATER[a]

Function	Tropical		Arid		Temperate		Cold	
	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Drinking[f]	3.30	3.30	3.30	3.30	1.65	1.65	2.20	2.20
Personal Hygiene[b]	1.67	1.13	1.67	1.13	1.67	1.13	1.67	1.13
Food Preparation Total[c]	1.93	0.43	1.93	0.43	1.93	0.43	1.93	0.43
Heat Injury Treatment[d]	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Vehicle Maintenance[e]	0.36	0.36	0.36	0.36	0.19	0.19	0.19	0.19
Non-potable Total	**0.36**	**0.36**	**NA**	**NA**	**0.19**	**0.19**	**0.19**	**0.19**
Potable Total	**6.91**	**4.87**	**7.27**	**5.23**	**5.26**	**3.22**	**5.81**	**3.77**
Theater Total	**7.27**	**5.23**	**7.27**	**5.23**	**5.45**	**3.41**	**6.00**	**3.96**

WATER PLANNING GUIDE

Central Hygiene Operations – Shower and Laundry

1. Description. Shower and laundry water is that which is required by theater Quartermaster elements to provide individual soldier laundry and shower field services. Water requirements for these functions are constant for conventional and integrated environments and for all climates.

2. Water Quality Standard. Potable water is required for showers. Water for laundry operations should be free of foreign matter and microorganisms, and local medical authority might require that it be disinfected prior to use.

3. Explanatory Notes.

a. Factors for central hygiene apply to conventional and integrated theaters as well as all climates.

b. Potable water is required for laundry only in arid environments. Laundry factors are determined based on daily pounds of laundry and daily laundry unit water use assuming 20-hour, 7-day-per-week operations.

The Surgeon General recommends a minimum of one shower and one change of uniform per person per week for health reasons. From a morale standpoint, the Army goal is one standard shower and one field expedient shower per week with two changes of uniform. Shower water requirements are derived directly from per-shower consumption. A seven-minute shower requires 11.9 gallons, and a field-expedient shower requires 1.25 gallons. The minimum factors are based on The Surgeon General's recommendation, and the sustaining factors are based on the Army goal.

STANDARD PLANNING FACTORS FOR CENTRAL HYGIENE (GAL/PERSON/DAY)

CONVENTIONAL THEATER[a]

Function	Tropical		Arid		Temperate		Cold	
	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Showers[c]	2.07	1.87	2.07	1.87	2.07	1.87	2.07	1.87
Laundry[b]	0.26	0.12	0.26	0.12	0.26	0.12	0.26	0.12
Non-potable Total	**0.26**	**0.12**	**NA**	**NA**	**0.26**	**0.12**	**0.26**	**0.12**
Potable total	**2.07**	**1.87**	**2.33**	**1.99**	**2.07**	**1.87**	**2.07**	**1.87**
Theater Total	**2.33**	**1.99**	**2.33**	**1.99**	**2.33**	**1.99**	**2.33**	**1.99**

Role I & II Medical Operations

1. Description. Role I & II Medical Operations include water for washing ambulance interiors and litters, cleaning patients, washing instruments and washing hands of direct patient care providers. It does not include staff requirements common to all units (e.g., drinking, personal hygiene, and central hygiene).

2. Water Quality Standard. All water for medical operations must be potable.

3. Explanatory Notes.

a. Water planning factors for Role I & II Medical Operations apply to both conventional and integrated theaters as well as to all climates.

b. Role I and II Medical Operations factors do not include requirements common to all units (e.g., drinking, personal hygiene, and central hygiene).

c. The factors for this function are derived by multiplying the gallon/patient/day requirements by TAA 08-13 force attrition and dividing by the theater population.

REQUIREMENTS FOR ROLE I & II MEDICAL OPERATIONS (GAL/PATIENT/DAY)
CONVENTIONAL AND INTEGRATED THEATERS[a,b]

Function	Tropical		Arid		Temperate		Cold	
	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Ambulance Washdown	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Litter Washdown	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Medical Instrument Wash	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
Direct Patient Care Provider Hand Washing	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
Patient Washing	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Role I & II Medical Operations Total[c]	**4.13**	**4.13**	**4.13**	**4.13**	**4.13**	**4.13**	**4.13**	**4.13**

STANDARD PLANNING FACTORS FOR ROLE I & II MEDICAL OPERATIONS (GAL/PERSON/DAY)
CONVENTIONAL AND INTEGRATED THEATERS[a,b]

Function	Tropical		Arid		Temperate		Cold	
	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Role I & II Medical Operations[c]	**0.03**	**0.03**	**0.03**	**0.03**	**0.03**	**0.03**	**0.03**	**0.03**

Role III & IV Medical Operations

1. Description. Role III & IV Medical Operations include all functions accomplished by Combat Support Hospitals (CSH). This includes all water used for patient care, food preparation for patients and staff, showers and laundry for patients, surgery scrub-up, instrument sterilization and operating room clean-up, extra staff showers and laundry for staff and laboratory and x-ray processing.

2. Water Quality Standard. All water for medical operations must be potable.

3. Explanatory Notes.

a. Factors for Role III & IV Medical Operations apply to both conventional and integrated theaters as well as all climates.

b. Role III and IV Medical Operations factors do not include requirements common to all units (e.g., drinking, personal hygiene, and central hygiene).

c. The Standard Planning Factors for this function are based on patient and staff requirements and the TAA 08-13 number of hospitals in the theater.

d. Includes showers for ambulatory patients and extra showers for direct patient care providers.

WATER PLANNING GUIDE

REQUIREMENTS FOR ROLE III & IV MEDICAL OPERATIONS (GAL/HOSPITAL/DAY)
CONVENTIONAL AND INTEGRATED THEATERS[a,b]

Function			Tropical		Arid		Temperate		Cold	
			Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Patient Support	General Patient Care	Food Preparation	272.80	272.80	272.80	272.80	272.80	272.80	272.80	272.80
		Patient Bed Baths	644.60	644.60	644.60	644.60	644.60	644.60	644.60	644.60
		Bed Pan Wash	352.00	352.00	352.00	352.00	352.00	352.00	352.00	352.00
		Laboratory	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00
		Sterilizer Refill	792.00	792.00	792.00	792.00	792.00	792.00	792.00	792.00
		Radiology/Computer Tomography	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
		Direct Patient Care Provider Handwash	545.60	545.60	545.60	545.60	545.60	545.60	545.60	545.60
		Patient Area Cleanup	272.80	272.80	272.80	272.80	272.80	272.80	272.80	272.80
	Surgical Care	Instrument Sterilization	1,287.00	1,287.00	1,287.00	1,287.00	1,287.00	1,287.00	1,287.00	1,287.00
		Surgical Scrub	3,828.00	3,828.00	3,828.00	3,828.00	3,828.00	3,828.00	3,828.00	3,828.00
		Operating Room Cleanup	158.40	158.40	158.40	158.40	158.40	158.40	158.40	158.40
Hospital Support	Showers[d]		1,309.00	1,309.00	1,309.00	1,309.00	1,309.00	1,309.00	1,309.00	1,309.00
	Laundry		7,392.00	7,392.00	7,392.00	7,392.00	7,392.00	7,392.00	7,392.00	7,392.00
Staff Support - Food Preparation			543.40	543.40	543.40	543.40	543.40	543.40	543.40	543.40
Hospital Total[c]			**17,463.60**	**17,463.60**	**17,463.60**	**17,463.60**	**17,463.60**	**17,463.60**	**17,463.60**	**17,463.60**

STANDARD PLANNING FACTORS FOR ROLE III & IV MEDICAL OPERATIONS (GAL/PERSON/DAY)
CONVENTIONAL THEATER[a,b]

Function	Tropical		Arid		Temperate		Cold	
	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Hospital Total[c]	**0.88**	**0.88**	**0.88**	**0.88**	**0.88**	**0.88**	**0.88**	**0.88**

Mortuary Affairs Operations

1. Description. Water used in Mortuary Affairs operations is primarily for facility cleaning, sanitation of equipment and instruments, and personal hygiene after handling remains and personal effects to protect MA personnel from potentially infectious materials and blood-borne pathogens.

2. Water Quality Standard.

a. Water for processing remains can be non-potable.

b. Water that comes into contact with Mortuary Affairs personnel when they are not in protective posture must be potable.

3. Explanatory Notes.

a. The factors for this function are based on Theater and Forward Collection Teams, which are each comprised of six personnel and can process 20 remains/day.

b. One pound of ice contains 0.12 gal of water.

c. Mortuary Affairs personnel require one shower per day when handling remains due to occupational exposure to potentially infectious material and blood-borne pathogens. Field expedient measures may be used periodically when shower facilities are not available. Mortuary Affairs specialists are also required to wash their hands immediately after processing remains. Water requirements for these additional functions are shown in the tables below. The central hygiene factor accounts for two showers/person/week for a total of 1.88 gallons/person/day. Therefore, the additional requirement is for five showers at 11.9 gallons each, or 2.55 gallons/remains/day.

REQUIRMENTS FOR MORTUARY AFFAIRS COLLECTION POINT AND THEATER MORTUARY AFFAIRS EVACUATION POINT (GAL/REMAINS)[a]
CONVENTIONAL AND INTEGRATED THEATERS

Function		Tropical		Arid		Temperate		Cold	
		Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Non-potable	Refrigeration Unit Sanitation	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50
	Litter Wash	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
	Instrument Sterilation	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
	Transfer Case Sanitation	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20
	Total Facility Maintenance (Cleaning)	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30
	Wet Ice Preparation[b]	11.88	11.88	11.88	11.88	5.28	5.28	5.28	5.28
	Vehicle Sanitation	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30
Potable	MA Personnel Hand Wash	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
	Emergency Eye Rinse	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
	Personal Hygiene Showers[c]	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81
Total		**32.46**	**32.46**	**32.46**	**32.46**	**25.86**	**25.86**	**25.86**	**25.86**

STANDARD PLANNING FACTORS FOR MORTUARY AFFAIRS (GAL/PERSON/DAY)
CONVENTIONAL THEATER

	Tropical		Arid		Temperate		Cold	
	Sustaining	**Minimum**	**Sustaining**	**Minimum**	**Sustaining**	**Minimum**	**Sustaining**	**Minimum**
Potable	0.03	0.03	0.22	0.22	0.03	0.03	0.03	0.03
Non-potabl	0.19	0.19	NA	NA	0.14	0.14	0.14	0.14
Total	**0.22**	**0.22**	**0.22**	**0.22**	**0.18**	**0.18**	**0.18**	**0.18**

Engineer Construction Operations

1. Description. Water used for this function includes all water used for road and airfield construction, quarry operations, asphalt plant operations, well drilling, concrete construction and pipeline testing.

2. Water Quality Standard. Potable water is required only for well-drilling operations. Fresh water is required for petroleum pipeline testing, and it is desired for most other operations, as salt water can cause corrosion or reduce material strength.

3. Explanatory Notes.

a. Factors for Engineer construction operations are based on Table of Organization and Equipment (TOE) mission capabilities. These factors may be modified for local use depending upon actual field conditions in various theaters and climates. Potable water requirements for Engineer construction operations normally apply only to arid theater planning. However, if raw water from available sources in any other theater environment requires ROWPU processing to meet minimal quality standards, the water requirements should be considered potable.

b. Well drilling operations are performed by Engineer Well Drilling Teams (TOE 05520LE00). An Engineer Well Drilling Team is normally attached to an Engineer Battalion (Construction), and is dependent upon a Horizontal Construction Company for site preparation, transportation of casing and supplies beyond organic capabilities, procurement and transport of drilling water (as much as 2,000 gallons per day might be required), supply and transportation of fuel to site, external security and elements of the theater for a water purification team to check water purity and to conduct sanitary testing. Standard Planning Factors for Engineer construction operations do not include potable water for well-drilling operations, as well drilling is not expected to satisfy a significant portion of the total theater water requirement.

c. The Standard Planning Factors are derived by dividing expected daily consumption by the TAA 08-13 theater population.

d. The Standard Planning Factors assume that one-third of construction occurs at division level and two-thirds at echelons above division.

WATER PLANNING GUIDE

REQUIREMENTS FOR ENGINEER CONSTRUCTION OPERATIONS[a]
CONVENTIONAL AND INTEGRATED THEATERS

Function		Tropical		Arid		Temperate		Cold	
		Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Road/Airfield Construction	Class A Road/Airfield Compaction (gal/100 ft)	2,310	803	9,130	4,070	2,310	803	2,310	803
	Class A Road/Airfield Soil Stabilization (gal/100 ft)	42,900	1,683	42,900	1,683	42,900	1,683	42,900	1,683
	Dust Control (gal/sq yd/hr)	1	1	1	1	1	1	1	1
Engineer Quarry Operations	75 ton/hr Washing/Screening Crusher (gal/hr)	99,000	66,000	99,000	66,000	99,000	66,000	99,000	66,000
	225 ton/hr Washing/Screening Crusher (gal/hr)	99,000	99,000	99,000	99,000	99,000	99,000	99,000	99,000
Engineer Well Drilling (gal/linear ft)[b]		44	44	44	44	44	44	44	44
Concrete Construction (gal/cu yd)		55	55	66	66	55	55	55	55
Engineer Topographic Operations - Film Processing (gal/day)		1,100	825	1,100	825	1,100	825	1,100	825
Pipeline Testing Operations (gal/cu ft)		7	7	7	7	7	7	7	7
TRADOC Pam 525-11 Net Engineer Construction Water Requirement (gal/theater/day)		550,000	550,000	550,000	550,000	550,000	550,000	550,000	550,000

STANDARD PLANNING FACTORS FOR ENGINEER OPERATIONS[b,c] (GAL/PERSON/DAY)
CONVENTIONAL AND INTEGRATED THEATERS

Function	Tropical		Arid		Temperate		Cold	
	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Division Level	0.66	NA	0.66	NA	0.66	NA	0.66	NA
Echelons above Division Level	1.32	NA	1.32	NA	1.32	NA	1.32	NA
Theater Total[d]	**1.98**	**0.00**	**1.98**	**0.00**	**1.98**	**0.00**	**1.98**	**0.00**

Aircraft Maintenance Operations

1. Description. Water is used for turbine wash, aircraft wash, and maintenance actions.

2. Water Quality Standard. Engines of aircraft operating over salt water or in dusty conditions should be flushed after each day's flight. Clean water with chloride content less than 400 parts per million should be used or as directed by TM 1-1500-344-23-1.

3. Explanatory Notes.

a. Factors for aircraft maintenance operation normally apply only to arid theater planning. However, if raw water from available sources in any other theater environment requires ROWPU processing to meet minimal quality standards, the water requirements should be considered potable.

b. Standard Planning Factors for aircraft maintenance operations can be derived by multiplying the number of each type of aircraft by its corresponding consumption factor and dividing by the theater population. Standard Planning Factors can also be calculated by multiplying the number of each type of brigade by its corresponding requirement and dividing by the theater population.

WATER PLANNING GUIDE

REQUIREMENTS FOR AIRCRAFT MAINTENANCE[a] (GAL/AIRCRAFT)
CONVENTIONAL AND INTEGRATED THEATERS

Function		Tropical		Arid		Temperate		Cold	
		Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Daily Engine Wash	CH-47	27.50	27.50	27.50	27.50	27.50	27.50	27.50	27.50
	AH-64	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00
	UH-60	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00
	UH-1	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
	ARH-70	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
	OH-6	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
	OH-58	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
	LUH	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00
Monthly Wash	CH-47	1,320.00	1,320.00	1,320.00	1,320.00	1,320.00	1,320.00	1,320.00	1,320.00
	AH-64	660.00	660.00	660.00	660.00	660.00	660.00	660.00	660.00
	UH-60	660.00	660.00	660.00	660.00	660.00	660.00	660.00	660.00
	UH-1	440.00	440.00	440.00	440.00	440.00	440.00	440.00	440.00
	ARH-70	330.00	330.00	330.00	330.00	330.00	330.00	330.00	330.00
	OH-6	330.00	330.00	330.00	330.00	330.00	330.00	330.00	330.00
	OH-58	330.00	330.00	330.00	330.00	330.00	330.00	330.00	330.00
	LUH	440.00	440.00	440.00	440.00	440.00	440.00	440.00	440.00
Scheduled Maintenance	AMC	6.60	6.60	6.60	6.60	6.60	6.60	6.60	6.60
	ASC	4.40	4.40	4.40	4.40	4.40	4.40	4.40	4.40
Unscheduled Maintenance	AMC	4.40	4.40	4.40	4.40	4.40	4.40	4.40	4.40
	ASC	6.60	6.60	6.60	6.60	6.60	6.60	6.60	6.60
Shop Cleaning and Mechanic Hand Wash (per aircraft per maintenance)		11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00

REQUIREMENTS FOR AIRCRAFT MAINTENANCE BY TYPE BRIGADE[b] (GAL/BRIGADE/DAY)
CONVENTIONAL AND INTEGRATED THEATERS

Type Brigade	Gal/Brigade/Day
Heavy CAB	2,979
Medium CAB	2,254
Light CAB	2,583
Expeditionary CAB	2,539

WATER PLANNING GUIDE

STANDARD PLANNING FACTORS FOR AIRCRAFT MAINTENANCE (GAL/PERSON/DAY)
CONVENTIONAL AND INTEGRATED THEATERS

Function	Tropical		Arid		Temperate		Cold	
	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Non-potable	0.14	0.14	NA	NA	0.14	0.14	0.14	0.14
Total Potable	NA	NA	0.14	0.14	NA	NA	NA	NA
Total	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14

WATER PLANNING GUIDE

SECTION II-B – INTEGRATED THEATER REQUIREMENTS

Universal Unit Level (UUL)

1. Description. The Universal Unit Level is the amount of water required by all Army units, regardless of their location in the theater. It includes water for drinking, personal hygiene, food preparation, heat injury treatment and vehicle maintenance.

2. Water Quality Requirement. Water for drinking, personal hygiene and food preparation must be potable. Permission to use other than potable water for heat injury treatment requires a risk assessment by Preventive Medicine personnel and approval from the Command/Theater Surgeon and Commander. Water for vehicle maintenance operations must be fresh but does not have to be potable.

3. Explanatory Notes.

a. Planning factors for the UUL apply to both conventional and integrated theaters, but they vary by climate. Factors for drinking, personal hygiene and food preparation reflect average direct gallon/person/day consumption. Factors for heat injury treatment and vehicle maintenance are *per capita* consumption estimates based on the number of personnel in the theater.

b. Minimum factors are based on The Surgeon General's recommendation of one shower and 7.2 pounds of laundry per week, shaving (males) and brushing teeth once per day, washing hands three times per day, and sponge bathing five times per week. The Army goal is two showers and 15 pounds of laundry per week. Sustaining factors are based the Army goal of one shower and one field expedient shower and 15 pounds of laundry per week, shaving (males) once per day, brushing teeth three times per day, washing hands six times per day (every meal/latrine trip), and sponge bathing five times per week. The factor for shaving assumes that 81% of the theater population is males based on data provided by DA G1 from PAM XXI.

c. Food preparation planning factors are based on a sustaining ration cycle of two UGR meals (A or heat and serve) and one Meal, Ready to Eat (MRE), and a minimum ration cycle of three MREs.

d. The heat injury treatment factor applies to all theaters and represents the maximum amount of chilled water required for expected daily heat stroke casualties. Heat injury treatment factors are calculated by applying the amount of water required per patient to the TAA 08-13 theater population.

e. Potable water for vehicle maintenance is normally required only in hot, arid environments. However, if raw water from available sources in any other theater environment requires ROWPU processing to meet minimal vehicle maintenance quality standards, tropical, temperate and cold factors should be modified to indicate that potable water is required. Vehicle maintenance factors are derived by multiplying the expected radiator coolant replacement quantity (1.0 gallon/vehicle/day in hot climates, and 0.5 gallons/vehicle/day in temperate and cold climates) by the number of vehicles in the theater and dividing by the theater population. If ROWPU processing of water is required, the Standard Planning Factors for tropical, temperate and cold climates must be increased by .0.33 and 0.16 gallons/person/day, respectively.

f. Drinking factors for the UUL are based on climate and level of activity.

WATER PLANNING GUIDE

REQUIREMENTS FOR UNIVERSAL UNIT LEVEL (UUL) (GAL/PERSON/DAY)
INTEGRATED THEATER[a]

Function		Tropical		Arid		Temperate		Cold	
		Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Drinking[f]		3.85	3.85	3.85	3.85	2.75	2.75	2.20	2.20
Personal Hygiene[b]	Brushing Teeth 3 Times/Day	0.22	NA	0.22	NA	0.22	NA	0.22	NA
	Brushing Teeth 1 Times/Day	NA	0.08	NA	0.08	NA	0.08	NA	0.08
	Shaving 1 Time/Day	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
	Washing Hands 6 Times/Day	0.83	NA	0.83	NA	0.83	NA	0.83	NA
	Washing Hands 3 Times/Day	NA	0.42	NA	0.42	NA	0.42	NA	0.42
	Sponge Bath 1 Time/Day	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Food Preparation[c]	Individual Meal (MRE)	0.14	0.43	0.14	0.43	0.14	0.43	0.14	0.43
	Unitized Group Ration (UGR) - A or H&S	1.78	NA	1.78	NA	1.78	NA	1.78	NA
Heat Injury Treatment[d]		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Vehicle Maintenance[e]		0.36	0.36	0.36	0.36	0.19	0.19	0.19	0.19
Non-potable Total		**0.36**	**0.36**	**NA**	**NA**	**0.19**	**0.19**	**0.19**	**0.19**
Potable Total		**7.46**	**5.42**	**7.82**	**5.77**	**6.36**	**4.32**	**5.81**	**3.77**

STANDARD PLANNING FACTORS FOR UNIVERSAL UNIT LEVEL (UUL) (GAL/PERSON/DAY)
INTEGRATED THEATER[a]

Function	Tropical		Arid		Temperate		Cold	
	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Drinking[f]	3.85	3.85	3.85	3.85	2.75	2.75	2.20	2.20
Personal Hygiene[b]	1.67	1.12	1.67	1.12	1.67	1.12	1.67	1.12
Food Preparation Total[c]	1.93	0.43	1.93	0.43	1.93	0.43	1.93	0.43
Heat Injury Treatment[d]	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Vehicle Maintenance[e]	0.36	0.36	0.36	0.36	0.19	0.19	0.19	0.19
Non-potable Total	**0.36**	**0.36**	**NA**	**NA**	**0.19**	**0.19**	**0.19**	**0.19**
Potable Total	**7.46**	**5.41**	**7.82**	**5.77**	**6.36**	**4.31**	**5.81**	**3.76**
Total	**7.82**	**5.77**	**7.82**	**5.77**	**6.55**	**4.50**	**6.00**	**3.95**

Central Hygiene Operations – Shower and Laundry

1. Description. Shower and laundry water is that which is required by theater Quartermaster elements to provide individual soldier laundry and shower field services. Water requirements for these functions are constant for conventional and integrated environments and for all climates.

2. Water Quality Standard. Potable water is required for showers. Water for laundry operations should be free of foreign matter and microorganisms, and local medical authority might require that it be disinfected prior to use.

3. Explanatory Notes.

a. Factors for central hygiene apply to conventional and integrated theaters as well as all climates.

b. Potable water is required for laundry only in arid environments. Laundry factors are determined based on daily pounds of laundry and daily laundry unit water use assuming 20-hour, 7-day-per-week operations.

The Surgeon General recommends a minimum of one shower and one change of uniform per person per week for health reasons. From a morale standpoint, the Army goal is one standard shower and one field expedient shower per week with two changes of uniform. Shower water requirements are derived directly from per-shower consumption. A seven-minute shower requires 11.9 gallons, and a field-expedient shower requires 1.25 gallons. The minimum factors are based on The Surgeon General's recommendation, and the sustaining factors are based on the Army goal.

REQUIREMENTS FOR CENTRAL HYGIENE (GAL/PERSON/DAY)
CONVENTIONAL AND INTEGRATED THEATERS[a]

Function		Tropical		Arid		Temperate		Cold	
		Sustaining	**Minimum**	**Sustaining**	**Minimum**	**Sustaining**	**Minimum**	**Sustaining**	**Minimum**
Showers[c]	Surgeon General Minimum	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87
	Field Expedient Shower	0.20	NA	0.20	NA	0.20	NA	0.20	NA
Laundry[b]	15 lbs / person / week	0.26	NA	0.26	NA	0.26	NA	0.26	NA
	Surgeon General Minimum	NA	0.12	NA	0.12	NA	0.12	NA	0.12
Non-potable Total		**0.26**	**0.12**	**NA**	**NA**	**0.26**	**0.12**	**0.26**	**0.12**
Potable Total		**2.07**	**1.87**	**2.33**	**1.99**	**2.07**	**1.87**	**2.07**	**1.87**
Theater Total		**2.33**	**1.99**	**2.33**	**1.99**	**2.33**	**1.99**	**2.33**	**1.99**

WATER PLANNING GUIDE

STANDARD PLANNING FACTORS FOR CENTRAL HYGIENE (GAL/PERSON/DAY)
CONVENTIONAL THEATER AND INTEGRATED THEATERS[a]

Function	Tropical		Arid		Temperate		Cold	
	Sustaining	**Minimum**	**Sustaining**	**Minimum**	**Sustaining**	**Minimum**	**Sustaining**	**Minimum**
Showers[c]	2.07	1.87	2.07	1.87	2.07	1.87	2.07	1.87
Laundry[b]	0.26	0.12	0.26	0.12	0.26	0.12	0.26	0.12
Non-potable Total	**0.26**	**0.12**	**NA**	**NA**	**0.26**	**0.12**	**0.26**	**0.12**
Potable total	**2.07**	**1.87**	**2.33**	**1.99**	**2.07**	**1.87**	**2.07**	**1.87**
Theater Total	**2.33**	**1.99**	**2.33**	**1.99**	**2.33**	**1.99**	**2.33**	**1.99**

Role I & II Medical Operations

1. Description. Role I & II Medical Operations include water for washing ambulance interiors and litters, cleaning patients, washing instruments and washing hands of direct patient care providers. It does not include staff requirements common to all units (e.g., drinking, personal hygiene, and central hygiene).

2. Water Quality Standard. All water for medical operations must be potable.

3. Explanatory Notes.

a. Water planning factors for Role I & II Medical Operations apply to both conventional and integrated theaters as well as to all climates.

b. Role I and II Medical Operations factors do not include requirements common to all units (e.g., drinking, personal hygiene, and central hygiene).

c. The factors for this function are derived by multiplying the gallon/patient/day requirements by TAA 08-13 force attrition and dividing by the theater population.

REQUIREMENTS FOR ROLE I & II MEDICAL OPERATIONS (GAL/PATIENT/DAY)
CONVENTIONAL AND INTEGRATED THEATERS[a,b]

Function	Tropical		Arid		Temperate		Cold	
	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Ambulance Washdown	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Litter Washdown	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Medical Instrument Wash	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
Direct Patient Care Provider Hand Washing	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
Patient Washing	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Role I & II Medical Operations Total[c]	**4.13**	**4.13**	**4.13**	**4.13**	**4.13**	**4.13**	**4.13**	**4.13**

STANDARD PLANNING FACTORS FOR ROLE I & II MEDICAL OPERATIONS (GAL/PERSON/DAY)
CONVENTIONAL AND INTEGRATED THEATERS[a,b]

Function	Tropical		Arid		Temperate		Cold	
	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Role I & II Medical Operations[c]	**0.03**	**0.03**	**0.03**	**0.03**	**0.03**	**0.03**	**0.03**	**0.03**

Role III & IV Medical Operations

1. Description. Role III & IV Medical Operations include all functions accomplished by Combat Support Hospitals (CSH). This includes all water used for patient care, food preparation for patients and staff, showers and laundry for patients, surgery scrub-up, instrument sterilization and operating room clean-up, extra staff showers and laundry for staff and laboratory and x-ray processing.

2. Water Quality Standard. All water for medical operations must be potable.

3. Explanatory Notes.

a. Factors for Role III & IV Medical Operations apply to both conventional and integrated theaters as well as all climates.

b. Role III and IV Medical Operations factors do not include requirements common to all units (e.g., drinking, personal hygiene, and central hygiene).

c. The Standard Planning Factors for this function are based on patient and staff requirements and the TAA 08-13 number of hospitals in the theater.

d. Includes showers for ambulatory patients and extra showers for direct patient care providers.

REQUIREMENTS FOR ROLE III & IV MEDICAL OPERATIONS (GAL/HOSPITAL/DAY)

CONVENTIONAL AND INTEGRATED THEATERS[a,b]

Function			Tropical		Arid		Temperate		Cold	
			Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Patient Support	General Patient Care	Food Preparation	272.80	272.80	272.80	272.80	272.80	272.80	272.80	272.80
		Patient Bed Baths	644.60	644.60	644.60	644.60	644.60	644.60	644.60	644.60
		Bed Pan Wash	352.00	352.00	352.00	352.00	352.00	352.00	352.00	352.00
		Laboratory	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00
		Sterilizer Refill	792.00	792.00	792.00	792.00	792.00	792.00	792.00	792.00
		Radiology/Computer Tomography	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
		Direct Patient Care Provider Handwash	545.60	545.60	545.60	545.60	545.60	545.60	545.60	545.60
		Patient Area Cleanup	272.80	272.80	272.80	272.80	272.80	272.80	272.80	272.80
	Surgical Care	Instrument Sterilization	1,287.00	1,287.00	1,287.00	1,287.00	1,287.00	1,287.00	1,287.00	1,287.00
		Surgical Scrub	3,828.00	3,828.00	3,828.00	3,828.00	3,828.00	3,828.00	3,828.00	3,828.00
		Operating Room Cleanup	158.40	158.40	158.40	158.40	158.40	158.40	158.40	158.40
Hospital Support	Showers[d]		1,309.00	1,309.00	1,309.00	1,309.00	1,309.00	1,309.00	1,309.00	1,309.00
	Laundry		7,392.00	7,392.00	7,392.00	7,392.00	7,392.00	7,392.00	7,392.00	7,392.00
Staff Support - Food Preparation			543.40	543.40	543.40	543.40	543.40	543.40	543.40	543.40
Hospital Total[c]			**17,463.60**	**17,463.60**	**17,463.60**	**17,463.60**	**17,463.60**	**17,463.60**	**17,463.60**	**17,463.60**

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STANDARD PLANNING FACTORS FOR ROLE III & IV MEDICAL OPERATIONS (GAL/PERSON/DAY)
CONVENTIONAL THEATER[a,b]

Function	Tropical		Arid		Temperate		Cold	
	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Hospital Total[c]	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88

Mortuary Affairs Operations

1. Description. Water used in Mortuary Affairs operations are primarily for facility cleaning, sanitation of equipment and instruments, and personal hygiene after handling remains and personal effects to protect Mortuary Affairs personnel from potentially infectious materials and blood-borne pathogens.

2. Water Quality Standard.

a. Water for processing remains can be non-potable.

b. Water that comes into contact with Mortuary Affairs personnel when they are not in protective posture must be potable.

3. Explanatory Notes.

a. The factors for this function are based on Theater and Forward Collection Teams, which are comprised of six personnel and can process 20 remains/day.

b. One pound of ice contains 0.12 gal of water.

c. Mortuary Affairs personnel require one shower per day when handling remains due to occupational exposure to potentially infectious material and blood-borne pathogens. Field expedient measures may be used periodically when shower facilities are not available. Mortuary Affairs specialists are also required to wash their hands immediately after processing remains. Water requirements for these additional functions are shown in the tables below. The central hygiene factor accounts for two showers/person/week for a total of 1.88 gallons/person/day. Therefore, the additional requirement is for five showers at 11.9 gallons each, or 2.55 gallons/remains/day.

d. The factors for this function are based on a Mortuary Affairs Decontamination Collection Point,

e. The central hygiene function accounts for two showers/person/week for a total of 1.88 gallons/person/day. Therefore, the additional requirement is for five showers at 11.9 gallons, which equates to 8.5 gallons/MADCP person/day, or 289 gallons/12-hour shift/MADCP.

f. In arid environments, potable water is used.

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REQUIRMENTS FOR MORTUARY AFFAIRS COLLECTION POINT AND THEATER MORTUARY AFFAIRS EVACUATION POINT (GAL/REMAINS)[a]
CONVENTIONAL AND INTEGRATED THEATERS

Function		Tropical		Arid		Temperate		Cold	
		Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Non-potable	Refrigeration Unit Sanitation	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50
	Litter Wash	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
	Instrument Sterilation	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
	Transfer Case Sanitation	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20
	Total Facility Maintenance (Cleaning)	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30
	Wet Ice Preparation[b]	11.88	11.88	11.88	11.88	5.28	5.28	5.28	5.28
	Vehicle Sanitation	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30
Potable	MA Personnel Hand Wash	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
	Emergency Eye Rinse	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
	Personal Hygiene Showers[c]	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81
Total		**32.46**	**32.46**	**32.46**	**32.46**	**25.86**	**25.86**	**25.86**	**25.86**

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REQUIREMENTS FOR MORTUARY AFFAIRS DECONTAMINATION COLLECTION POINT
(GAL/12-HOUR SHIFT/MADCP)
INTEGRATED THEATER

FUNCTION		CONSUMPTION		
		BIOLOGICAL	CHEMICAL	RADIOLOGICAL
MA Personnel Hygiene	MA Personnel Decontamination Station (30 personnel x 3 rotations/12-hour shift x 10 gal/shower)	990.00	990.00	990.00
	Personal Hygiene Showers (34 personnel x 11.9 gal/day)[d]	317.90	317.90	317.90
Remains Processing	Remains Wash/ Rinse Station - Biological Decontamination of Remains (48 remains x 5 gal/remains)	264.00	NA	NA
	Remains Wash/ Rinse Station - Chemical Decontamination of Remains (48 remains x 10 gal/remains)	NA	528.00	NA
	Remains Wash/ Rinse Station - Radiological Decontamination of Remains (48 remains x 10 gal/remains)	NA	NA	528.00
	Transfer Case Decontamination (48 remains x 2 gal/remains)	105.60	105.60	105.60
	Equipment Cleaning (48 remains x 10 gal/remains)	528.00	528.00	528.00
Total Potable		**1,307.90**	**2,469.50**	**1,307.90**
Total Non-Potable[f]		**897.60**	**NA**	**1,161.60**
Total		**2,205.50**	**2,469.50**	**2,469.50**

STANDARD PLANNING FACTORS FOR MORTUARY AFFAIRS (GAL/PERSON/DAY)
INTEGRATED THEATER

	Tropical		Arid		Temperate		Cold	
	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Potable	0.03	0.03	0.23	0.23	0.03	0.03	0.03	0.03
Non-potable	0.20	0.20	NA	NA	0.15	0.15	0.15	0.15
Total	**0.23**	**0.23**	**0.23**	**0.23**	**0.19**	**0.19**	**0.19**	**0.19**

Engineer Construction Operations

1. Description. Water used for this function includes all water used for road and airfield construction, quarry operations, asphalt plant operations, well drilling, concrete construction and pipeline testing.

2. Water Quality Standard. Potable water is required only for well-drilling operations. Fresh water is required for petroleum pipeline testing, and it is desired for most other operations, as salt water can cause corrosion or reduce material strength.

3. Explanatory Notes.

a. Factors for Engineer construction operations are based on Table of Organization and Equipment (TOE) mission capabilities. These factors may be modified for local use depending upon actual field conditions in various theaters and climates. Potable water requirements for Engineer construction operations normally apply only to arid theater planning. However, if raw water from available sources in any other theater environment requires ROWPU processing to meet minimal quality standards, the water requirements should be considered potable.

b. Well drilling operations are performed by Engineer Well Drilling Teams (TOE 05520LE00). An Engineer Well Drilling Team is normally attached to an Engineer Battalion (Construction), and is dependent upon a Horizontal Construction Company for site preparation, transportation of casing and supplies beyond organic capabilities, procurement and transport of drilling water (as much as 2,000 gallons per day might be required), supply and transportation of fuel to site, external security and elements of the theater for a water purification team to check water purity and to conduct sanitary testing. Standard Planning Factors for Engineer construction operations do not include potable water for well-drilling operations, as well drilling is not expected to satisfy a significant portion of the total theater water requirement.

c. The Standard Planning Factors are derived by dividing expected daily consumption by the TAA 08-13 theater population.

d. The Standard Planning Factors assume that one-third of construction occurs at division level and two-thirds at echelons above division.

WATER PLANNING GUIDE

REQUIREMENTS FOR ENGINEER CONSTRUCTION OPERATIONS[a]
CONVENTIONAL AND INTEGRATED THEATERS

Function		Tropical		Arid		Temperate		Cold	
		Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Road/Airfield Construction	Class A Road/Airfield Compaction (gal/100 ft)	2,310	803	9,130	4,070	2,310	803	2,310	803
	Class A Road/Airfield Soil Stabilization (gal/100 ft)	42,900	1,683	42,900	1,683	42,900	1,683	42,900	1,683
	Dust Control (gal/sq yd/hr)	1	1	1	1	1	1	1	1
Engineer Quarry Operations	75 ton/hr Washing/Screening Crusher (gal/hr)	99,000	66,000	99,000	66,000	99,000	66,000	99,000	66,000
	225 ton/hr Washing/Screening Crusher (gal/hr)	99,000	99,000	99,000	99,000	99,000	99,000	99,000	99,000
Engineer Well Drilling (gal/linear ft)[b]		44	44	44	44	44	44	44	44
Concrete Construction (gal/cu yd)		55	55	66	66	55	55	55	55
Engineer Topographic Operations - Film Processing (gal/day)		1,100	825	1,100	825	1,100	825	1,100	825
Pipeline Testing Operations (gal/cu ft)		7	7	7	7	7	7	7	7
TRADOC Pam 525-11 Net Engineer Construction Water Requirement (gal/theater/day)		550,000	550,000	550,000	550,000	550,000	550,000	550,000	550,000

STANDARD PLANNING FACTORS FOR ENGINEER OPERATIONS[b,c] (GAL/PERSON/DAY)
CONVENTIONAL AND INTEGRATED THEATERS

Function	Tropical		Arid		Temperate		Cold	
	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Division Level	0.66	NA	0.66	NA	0.66	NA	0.66	NA
Echelons above Division Level	1.32	NA	1.32	NA	1.32	NA	1.32	NA
Theater Total[d]	**1.98**	**0.00**	**1.98**	**0.00**	**1.98**	**0.00**	**1.98**	**0.00**

Aircraft Maintenance Operations

1. Description. Water is used for turbine wash, aircraft wash, and maintenance actions.

2. Water Quality Standard. Engines of aircraft operating over salt water or in dusty conditions should be flushed after each day's flight. Clean water with chloride content less than 400 parts per million should be used or as directed by TM 1-1500-344-23-1.

3. Explanatory Notes.

a. Factors for aircraft maintenance operation normally apply only to arid theater planning. However, if raw water from available sources in any other theater environment requires ROWPU processing to meet minimal quality standards, the water requirements should be considered potable.

b. Standard Planning Factors for aircraft maintenance operations can be derived by multiplying the number of each type of aircraft by its corresponding consumption factor and dividing by the theater population. Standard Planning Factors can also be calculated by multiplying the number of each type of brigade by its corresponding requirement and dividing by the theater population.

WATER PLANNING GUIDE

REQUIREMENTS FOR AIRCRAFT MAINTENANCE[a] (GAL/AIRCRAFT)
CONVENTIONAL AND INTEGRATED THEATERS

Function		Tropical		Arid		Temperate		Cold	
		Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Daily Engine Wash	CH-47	27.50	27.50	27.50	27.50	27.50	27.50	27.50	27.50
	AH-64	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00
	UH-60	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00
	UH-1	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
	ARH-70	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
	OH-6	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
	OH-58	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
	LUH	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00
Monthly Wash	CH-47	1,320.00	1,320.00	1,320.00	1,320.00	1,320.00	1,320.00	1,320.00	1,320.00
	AH-64	660.00	660.00	660.00	660.00	660.00	660.00	660.00	660.00
	UH-60	660.00	660.00	660.00	660.00	660.00	660.00	660.00	660.00
	UH-1	440.00	440.00	440.00	440.00	440.00	440.00	440.00	440.00
	ARH-70	330.00	330.00	330.00	330.00	330.00	330.00	330.00	330.00
	OH-6	330.00	330.00	330.00	330.00	330.00	330.00	330.00	330.00
	OH-58	330.00	330.00	330.00	330.00	330.00	330.00	330.00	330.00
	LUH	440.00	440.00	440.00	440.00	440.00	440.00	440.00	440.00
Scheduled Maintenance	AMC	6.60	6.60	6.60	6.60	6.60	6.60	6.60	6.60
	ASC	4.40	4.40	4.40	4.40	4.40	4.40	4.40	4.40
Unscheduled Maintenance	AMC	4.40	4.40	4.40	4.40	4.40	4.40	4.40	4.40
	ASC	6.60	6.60	6.60	6.60	6.60	6.60	6.60	6.60
Shop Cleaning and Mechanic Hand Wash (per aircraft per maintenance)		11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00

REQUIREMENTS FOR AIRCRAFT MAINTENANCE BY TYPE BRIGADE[b] (GAL/BRIGADE/DAY)
CONVENTIONAL AND INTEGRATED THEATERS

Type Brigade	Gal/Brigade/Day
Heavy CAB	2,979
Medium CAB	2,254
Light CAB	2,583
Expeditionary CAB	2,539

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STANDARD PLANNING FACTORS FOR AIRCRAFT MAINTENANCE (GAL/PERSON/DAY)
CONVENTIONAL AND INTEGRATED THEATERS

Function	Tropical		Arid		Temperate		Cold	
	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Non-potable	0.14	0.14	NA	NA	0.14	0.14	0.14	0.14
Total Potable	NA	NA	0.14	0.14	NA	NA	NA	NA
Total	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14

Chemical, Biological, Radiological and Nuclear (CBRN) Decontamination Operations

1. Description. Water is used in the decontamination process to remove biological and radiological contamination hazards from exposed skin of personnel and chemical, biological, and radiological hazards from contaminated individual and unit equipment.

2. Water Quality Requirement. Water used to decontaminate personnel contaminated by biological and radiological agents should meet the same standards as water used for routine showers. Water used to decontaminate weapons, vehicles, and equipment should be free of any contaminants, but may otherwise be of a lesser quality.

3. Explanatory Notes.

a. Weathering effects unique to hot, arid environments eliminate the need for primary wash in deliberate major end item decontamination operations.

b. The same procedures for operational and deliberate decontamination apply to wheeled and tracked vehicles as well as aircraft.

c. It is assumed that.

(1) 10% of the total force operating in an integrated theater will be operating under MOPP 3 or 4 alert conditions on a daily basis.
(2) 33% of the total force under MOPP 3 or 4 alert conditions will be exposed to CBRN attack daily.
(3) 100% of the personnel and 25% of the major end items of equipment exposed to CBRN attack will require decontamination.

d. Permission to use other than potable water for this activity requires a risk assessment by preventive medicine personnel and approval from the Command/Theater Surgeon and Commander.

REQUIREMENTS FOR CBRN DECONTAMINATION
GAL/APPLICATION/DAY)[c]
INTEGRATED THEATER

Function		Tropical/ Temperate/ Cold	Arid[a]
Individual and Small Unit Decontamination[d]		31.68	31.68
Vehicle Decontamination[b]	Operational - Vehicle	165.00	165.00
	Deliberate - Vehicle	522.50	220.00
Aircraft Decontamination[b]	Operational - Aircraft	330.00	330.00
	Deliberate - Aircraft	660.00	660.00

STANDARD PLANNING FACTORS FOR CBRN DECONTAMINATION[c] (GAL/PERSON/DAY)
INTEGRATED THEATER

Function		Tropical/ Temperate/ Cold	Arid[a]
Individual and Small Unit Decontamination[d]		1.05	1.05
Vehicle Decontamination[b]	Operational - Vehicle	0.46	0.46
	Deliberate - Vehicle	1.44	0.61
Aircraft Decontamination[b]	Operational - Aircraft	0.01	0.01
	Deliberate - Aircraft	0.01	0.01
Potable Total		1.05	2.13
Non-potable Total		1.93	NA
Total		**2.97**	**2.13**

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SECTION II-C – DISCRETE THEATER POPULATION SET, WORKLOAD AND EQUIPMENT REQUIREMENTS

Enemy Prisoner of War (EPW), Civilian Internee and Refugee Operations

1. Description. EPW and civilian internee and refugee water is that which is required for maintaining the general health and welfare of detained military and/or civilian personnel while under the protection of Army forces. Water requirements under this category include drinking, personal hygiene, field feeding, and central hygiene, shower and laundry.

2. Water Quality Requirement. Water quality requirements are the same as for US personnel for comparable functions. Potable water is required for all functions except laundry. However, due to the very small quantity in relation to the other requirements, all water for this function should be considered potable to simplify planning.

3. Explanatory Notes.

a. Based on 100% light physical activity.

b. Based on one shower/week and 7.2 pounds of laundry/week.

c. Based on the same ration cycle as US Forces.

d. Due to the extreme variability that can occur in the number of EPWs, civilian internees and refugees, modifications to the consumption planning factors might be required. Adjustments might also be required for local ethnic, cultural, dietary, sanitation or religious beliefs.

e. Standard planning factors are derived directly from the consumption planning factors.

REQUIREMENTS FOR ENEMY PRISONER OF WAR (EPW), CIVILIAN INTERNEE AND REFUGEE OPERATIONS (GAL/PERSON/DAY)
CONVENTIONAL AND INTEGRATED THEATERS

Function		Tropical		Arid		Temperate		Cold	
		Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Drinking[a]		2.20	2.20	2.20	2.20	0.83	0.83	1.38	1.38
Personal Hygiene		1.67	1.12	1.67	1.12	1.67	1.12	1.67	1.12
Central Hygiene[b]	Showers	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87
	Laundry[f]	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Food Preparation[c]		1.93	0.43	1.93	0.43	1.93	0.43	1.93	0.43
Medical Aid		0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
EPW, Internee and Refugee Total[d]		**8.70**	**6.66**	**8.70**	**6.66**	**7.33**	**5.28**	**7.88**	**5.83**

WATER PLANNING GUIDE

STANDARD PLANNING FACTORS
ENEMY PRISONER OF WAR (EPW), CIVILIAN INTERNEE AND REFUGEE OPERATIONS (GAL/PERSON/DAY)
CONVENTIONAL AND INTEGRATED THEATERS

Function	Tropical		Arid		Temperate		Cold	
	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
EPW, Internee and Refugee	8.70	6.66	8.70	6.66	7.33	5.28	7.88	5.83

Force Provider Operations

1. Description. Force Provider Expeditionary Modular (FPE (M)) is a readily- deployable, containerized and pre-packaged base camp equipped for feeding, billeting, and provided health, hygiene and medical services for up to 600 personnel. It is flexible enough to serve as a forward-deployed life support system, intermediate staging base and convoy support center, theater hospitalization or in-theater reception base camp. Its operating environment is primarily in the Theater Support Area (TSA), but it is suitable for employment as far forward as the Brigade Combat Team and might perform the role of supporting a Forward Operating Base (FOB) as small as 150 personnel. FPE (M) can support operations in a hostile environment, to include CBRN, as well as humanitarian and disaster relief efforts. Its modular design allows it to be deployed in smaller deployment packages, adding flexibility while enhancing its transportability. It has been demonstrated that a single C-17 can transport a 150-person capability.

2. Water Quality Requirement. Force Provider has a single water supply and distribution system that requires potable water. The system can store 51,000 gallons in 27 3,000-gallon fabric storage tanks.

3. Explanatory Notes.

a. Planning factors for Force Provider are based on a ratio of consumption to the number of personnel supported per module (600).

b. When used in operations other than war, such as humanitarian and disaster relief for the civilian population, all requirements can be attributed directly to Force Provider. When used to support military missions, such as for a Forward Operating Base, where the water requirements for each person are already accounted for in the factors for each function, it is important that the Force Provider requirements and the normal theater requirements are not duplicated. For example, a food preparation factor is already accounted for in the UUL requirement. If Force Provider were used for disaster relief, the water for food preparation would not be accounted for anywhere else, but if it were used for a military mission the water for food preparation would have already been accounted for in the UUL and would have to be subtracted from the Force Provider factors. The factors described below and listed in the tables that follow show the requirements for both military missions and operations other than war. The same amount of water is used in both modes, but the water is accounted for differently.

REQUIREMENTS FOR FORCE PROVIDER (GAL/DAY)[a]
MILITARY FORCE MISSIONS
CONVENTIONAL AND INTEGRATED THEATERS

Function		Tropical		Arid		Temperate		Cold	
		Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Food Preparation[b]		1,353.00	1,353.00	1,353.00	1,353.00	1,353.00	1,353.00	1,353.00	1,353.00
Central Hygiene	Showers[b]	11,959.20	11,959.20	11,959.20	11,959.20	11,959.20	11,959.20	11,959.20	11,959.20
	Laundry[b]	5,561.60	5,561.60	5,561.60	5,561.60	5,561.60	5,561.60	5,561.60	5,561.60
Latrine Operations		2,970.00	2,970.00	2,970.00	2,970.00	2,970.00	2,970.00	2,970.00	2,970.00
Total		**20,490.80**	**20,490.80**	**20,490.80**	**20,490.80**	**20,490.80**	**20,490.80**	**20,490.80**	**20,490.80**

WATER PLANNING GUIDE

STANDARD PLANNING FACTORS FOR FORCE PROVIDER (GAL/PERSON/DAY)[a]
MILITARY FORCE MISSIONS
CONVENTIONAL AND INTEGRATED THEATERS

Function		Tropical		Arid		Temperate		Cold	
		Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Food Preparation[b]		2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26
Central Hygiene	Showers[b]	19.93	19.93	19.93	19.93	19.93	19.93	19.93	19.93
	Laundry[b]	9.27	9.27	9.27	9.27	9.27	9.27	9.27	9.27
Latrine Operations		4.95	4.95	4.95	4.95	4.95	4.95	4.95	4.95
Total		**34.16**	**34.16**	**34.16**	**34.16**	**34.16**	**34.16**	**34.16**	**34.16**

REQUIREMENTS FOR FORCE PROVIDER (GAL/DAY)[a]
OPERATIONS OTHER THAN WAR
CONVENTIONAL AND INTEGRATED THEATERS

Function		Tropical		Arid		Temperate		Cold	
		Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Drinking[b]		1,320.00	1,320.00	1,320.00	1,320.00	495.00	495.00	825.00	825.00
Central Hygiene	Showers[b]	13,200.00	13,200.00	13,200.00	13,200.00	13,200.00	13,200.00	13,200.00	13,200.00
	Laundry[b]	5,720.00	5,720.00	5,720.00	5,720.00	5,720.00	5,720.00	5,720.00	5,720.00
Food Preparation[b]		2,508.00	2,508.00	2,508.00	2,508.00	2,508.00	2,508.00	2,508.00	2,508.00
Role I and II Medical Operations[b]		19.80	19.80	19.80	19.80	19.80	19.80	19.80	19.80
Heat Injury Treatment[b]		6.60	6.60	6.60	6.60	6.60	6.60	6.60	6.60
Latrine		2,970.00	2,970.00	2,970.00	2,970.00	2,970.00	2,970.00	2,970.00	2,970.00
Total		**25,744.40**	**25,744.40**	**25,744.40**	**25,744.40**	**24,919.40**	**24,919.40**	**25,249.40**	**25,249.40**

WATER PLANNING GUIDE

STANDARD PLANNING FACTORS FOR FORCE PROVIDER (GAL/PERSON/DAY)[a]
OPERATIONS OTHER THAN WAR
CONVENTIONAL AND INTEGRATED THEATERS

Function		Tropical		Arid		Temperate		Cold	
		Sustaining	**Minimum**	**Sustaining**	**Minimum**	**Sustaining**	**Minimum**	**Sustaining**	**Minimum**
Drinking[b]		2.20	2.20	2.20	2.20	0.83	0.83	1.38	1.38
Central Hygiene	Showers[b]	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00
	Laundry[b]	9.54	9.54	9.54	9.54	9.54	9.54	9.54	9.54
Food Preparation[b]		4.18	4.18	4.18	4.18	4.18	4.18	4.18	4.18
Role I and II Medical Operations[b]		0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Heat Injury Treatment[b]		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Latrine		4.95	4.95	4.95	4.95	4.95	4.95	4.95	4.95
Total		**42.91**	**42.91**	**42.91**	**42.91**	**41.54**	**41.54**	**42.09**	**42.09**

Vehicle Wash Rack Operations

1. Description. Special precautions are needed when forces are redeployed CONUS to avoid introducing exotic plants and animal pests that might be harmful to the public or to agriculture. Such introduced exotic pests can cause irreparable damage to public health, agriculture or the environment.

2. Water Quality Requirement. Water used at overseas wash racks need not be potable, but some treatment might be necessary to ensure that equipment is not contaminated with unwanted organisms. Salt water should be avoided because of corrosion problems.

3. Explanatory Notes.

a. Consumption factors are shown separately for types of vehicles and for types of units.

b. Standard planning factors are not provided due to the extreme variability in the scheduling of washing and in the number of vehicles to be washed.

REQUIREMENTS FOR VEHICLE WASH RACK OPERATIONS BY TYPE VEHICLE (GAL/END ITEM)
CONVENTIONAL AND INTEGRATED THEATERS

Function		Tropical		Arid		Temperate		Cold	
		Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Wheeled Vehicles	Station 1 - Primary Wash	275.00	275.00	275.00	275.00	275.00	275.00	275.00	275.00
	Station 4 - Rinse	220.00	220.00	220.00	220.00	220.00	220.00	220.00	220.00
Armored/Large Vehicles	Station 1 - Primary Wash	330.00	330.00	330.00	330.00	330.00	330.00	330.00	330.00
	Station 4 - Rinse	220.00	220.00	220.00	220.00	220.00	220.00	220.00	220.00

REQUIREMENTS FOR VEHICLE WASH RACK OPERATIONS BY TYPE UNIT (GAL/COMPANY-SIZE UNIT)
CONVENTIONAL AND INTEGRATED THEATERS

Function	Tropical		Arid		Temperate		Cold	
	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Light Force	9,900.00	9,900.00	9,900.00	9,900.00	9,900.00	9,900.00	9,900.00	9,900.00
Armored/Mechanized Force	11,000.00	11,000.00	11,000.00	11,000.00	11,000.00	11,000.00	11,000.00	11,000.00

Watercraft Maintenance Operations

1. Description. Water used in watercraft maintenance operations is required to prevent vessel deterioration due to constant exposure to salt water.

2. Water Quality Requirement. Fresh water is required for watercraft maintenance since salt water causes corrosion. The Joint High Speed Vessel (JHSV), Logistical Support Vessel (LSV), and Landing Craft, Utility (LCU) can produce their own potable water.

3. Explanatory Notes.

a. The number and types of vessels that will be deployed to a theater varies and is dependent upon the number and types of ports as well as the types of materials and materiel that are to be moved. Therefore, requirements are shown for a variety of vessel configurations, and Standard Planning Factors are not provided.

b. Requirements are shown for each vessel wash. Watercraft are washed approximately every four days. Daily consumption can be calculated by dividing the gallon-per-wash figures in the tables below by four.

c. The factors shown in this table reflect the gallons/wash/vessel multiplied by the number of vessels of each type.

REQUIREMENTS FOR WATERCRAFT MAINTENANCE OPERATIONS (GAL/WASH/VESSEL)[b]
INDIVIDUAL VESSELS[a]
CONVENTIONAL AND INTEGRATED THEATERS

Function	Tropical		Arid		Temperate		Cold	
	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Logistical Support Vessel (LSV)	2,200.00	2,200.00	2,200.00	2,200.00	2,200.00	2,200.00	2,200.00	2,200.00
Landing Craft, Mechanized (LCM)	1,320.00	1,320.00	1,320.00	1,320.00	1,320.00	1,320.00	1,320.00	1,320.00
Landing Craft, Utility (LCU)	1,980.00	1,980.00	1,980.00	1,980.00	1,980.00	1,980.00	1,980.00	1,980.00
Large Tug (128 or 100 feet)	1,100.00	1,100.00	1,100.00	1,100.00	1,100.00	1,100.00	1,100.00	1,100.00
Pusher Tug	550.00	550.00	550.00	550.00	550.00	550.00	550.00	550.00
Joint High Speed Vessel (JHSV)	3,300.00	3,300.00	3,300.00	3,300.00	3,300.00	3,300.00	3,300.00	3,300.00

WATER PLANNING GUIDE

REQUIREMENTS FOR WATERCRAFT MAINTENANCE OPERATIONS (GAL/WASH/VESSEL)[c]
PRE-POSITIONED PACKAGE[a]
CONVENTIONAL AND INTEGRATED THEATERS

Vessel	Number in Pre-positioned Package	Tropical		Arid		Temperate		Cold	
		Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Landing Craft, Mechanized (LCM)	9	11,880.00	11,880.00	11,880.00	11,880.00	11,880.00	11,880.00	11,880.00	11,880.00
Landing Craft, Utility (LCU)	10	19,800.00	19,800.00	19,800.00	19,800.00	19,800.00	19,800.00	19,800.00	19,800.00
Large Tug (100 feet)	2	2,200.00	2,200.00	2,200.00	2,200.00	2,200.00	2,200.00	2,200.00	2,200.00
Pusher Tug	4	2,200.00	2,200.00	2,200.00	2,200.00	2,200.00	2,200.00	2,200.00	2,200.00
Pre-positioned Vessel Package Total		**36,080.00**	**36,080.00**	**36,080.00**	**36,080.00**	**36,080.00**	**36,080.00**	**36,080.00**	**36,080.00**

SECTION III –ECHELON- AND COMMAND-LEVEL REQUIREMENTS

Gallon/person/day water requirements for Army force echelon and command levels.

SECTION III-A CONVENTIONAL THEATER REQUIREMENTS

SECTION III-B INTEGRATED THEATER REQUIREMENTS

This section provides general Army force echelon- and command-level requirements and Standard Planning Factors. Logistics planners should use this section to:

1. **Determine the gallon/person/day consumption associated with various force echelon and command levels.**

2. **Identify force package multi-echelon functional mission profile water requirements.**

Logistics planners should start with a basic factor for the force echelon or command level and add to it the requirements for any additional non-organic functional mission requirements.

WATER PLANNING GUIDE

REQUIREMENTS AND STANDARD PLANNING FACTORS FOR FORCE SEGMENTS/ECHELONS - COMPANY THROUGH BRIGADE
(UNITS OF MEASURE SHOWN IN TABLE)
CONVENTIONAL THEATER[a]

SEGMENT OF FORCE	APPLICABLE FACTORS	HOT				TEMPERATE		COLD	
		TROPICAL		ARID					
		Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Maneuver Company	Universal Unit Level (gal/person/day)	6.91	4.87	7.27	5.23	5.26	3.22	5.81	3.77
Battalion/Separate Company	Universal Unit Level (gal/person/day)	6.91	4.87	7.27	5.23	5.26	3.22	5.81	3.77
Maneuver/ Separate Brigade	Universal Unit Level (gal/person/day)	6.91	4.87	7.27	5.23	5.26	3.22	5.81	3.77
	Role I & II Medical Operations (gal/person/day)	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Non-organic Functional Missions	Central Hygiene Operations - Showers	2.07	1.87	2.07	1.87	2.07	1.87	2.07	1.87
	Central Hygiene Operations - Laundry (gal/person/day)	0.26	0.12	0.26	0.12	0.26	0.12	0.26	0.12
	Role III & IV Medical Operations (gal/person/day)	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
	Mortuary Affairs Operations - Potable (gal/person/day)	0.03	0.03	0.22	0.22	0.03	0.03	0.03	0.03
	Mortuary Affairs Operations - Non-potable (gal/person/day)	0.19	0.19	NA	NA	0.14	0.14	0.14	0.14
	Engineer Operations (gal/person/day)	1.98	1.98	1.98	1.98	1.98	1.98	1.98	1.98
	Aircraft Maintenance Operations (gal/person/day)	0.14	0.14	0.13	0.13	0.14	0.14	0.14	0.14
Other Theater Functional Missions	EPW, Civilian Internee Operations - Potable (gal/person/day)	8.70	6.66	8.70	6.66	7.33	5.28	7.88	5.83
	Force Provider Operations - Military Missions (gal/person/day)	34.16	34.16	34.16	34.16	34.16	34.16	34.16	34.16
	Force Provider Operations - Operations Other Than War (gal/person/day)	42.91	42.91	42.91	42.91	42.91	42.91	42.91	42.91
	Redeployment Vehicle Wash Rack Operations - Light Force (gal/company-size unit)	9,900.00	9,900.00	9,900.00	9,900.00	9,900.00	9,900.00	9,900.00	9,900.00
	Redeployment Vehicle Wash Rack Operations - Armored/ Mechanized Force (gal/company-size unit)	11,000.00	11,000.00	11,000.00	11,000.00	11,000.00	11,000.00	11,000.00	11,000.00
	Watercraft Maintenance Operations	Specific Theater End Item Density Computation - Refer to Section II-C							

WATER PLANNING GUIDE

REQUIREMENTS AND STANDARD PLANNING FACTORS FOR FORCE SEGMENTS/ECHELONS - COMPANY THROUGH BRIGADE
(UNITS OF MEASURE SHOWN IN TABLE)
INTEGRATED THEATER[a]

SEGMENT OF FORCE	APPLICABLE FACTORS	HOT				TEMPERATE		COLD	
		TROPICAL		ARID					
		Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Maneuver Company	Universal Unit Level (gal/person/day)	7.46	5.41	7.82	5.77	6.36	4.31	5.81	3.76
Battalion/Separate Company	Universal Unit Level (gal/person/day)	7.46	5.41	7.82	5.77	6.36	4.31	5.81	3.76
Maneuver/ Separate Brigade	Universal Unit Level (gal/person/day)	7.46	5.41	7.82	5.77	6.36	4.31	5.81	3.76
	Role I & II Medical Operations (gal/person/day)	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Non-organic Functional Missions	Central Hygiene Operations - Showers	2.07	1.87	2.07	1.87	2.07	1.87	2.07	1.87
	Central Hygiene Operations - Laundry (gal/person/day)	0.26	0.12	0.26	0.12	0.26	0.12	0.26	0.12
	Role III & IV Medical Operations (gal/person/day)	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
	Mortuary Affairs Operations - Potable (gal/person/day)	0.03	0.03	0.23	0.23	0.03	0.03	0.03	0.03
	Mortuary Affairs Operations - Non-potable (gal/person/day)	0.20	0.20	NA	NA	0.15	0.15	0.15	0.15
	Engineer Operations (gal/person/day)	1.98	1.98	1.98	1.98	1.98	1.98	1.98	1.98
	Aircraft Maintenance Operations (gal/person/day)	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
	Decontamination - Potable	1.05	1.05	1.94	1.94	1.05	1.05	1.05	1.05
	Decontamination - Non-potable	1.93	1.93	NA	NA	1.93	1.93	1.93	1.93
Other Theater Functional Missions	EPW, Civilian Internee Operations - Potable (gal/person/day)	8.70	6.66	8.70	6.66	7.33	5.28	7.88	5.83
	Force Provider Operations - Military Missions (gal/person/day)	34.16	34.16	34.16	34.16	34.16	34.16	34.16	34.16
	Force Provider Operations - Operations other Than War (gal/person/day)	42.91	42.91	42.91	42.91	42.91	42.91	42.91	42.91
	Redeployment Vehicle Wash Rack Operations - Light Force (gal/company-size unit)	9,900.00	9,900.00	9,900.00	9,900.00	9,900.00	9,900.00	9,900.00	9,900.00
	Redeployment Vehicle Wash Rack Operations - Armored/ Mechanized Force (gal/company-size unit)	11,000.00	11,000.00	11,000.00	11,000.00	11,000.00	11,000.00	11,000.00	11,000.00
	Watercraft Maintenance Operations	Specific Theater End Item Density Computation - Refer to Section II-C							

SECTION IV – POTABLE WATER PRODUCTION GRAPHS

This section provides graphs for estimating the water production capabilities for each type of ROWPU if the source water temperature and Total Dissolved Solids (TDS) are known. The number of ROWPUs necessary to meet requirements can be calculated as shown in the examples on the following pages.

WATER PLANNING GUIDE

How to Use the Water Production Graphs

1. Obtain a Total Dissolved Solids (TDS) and temperature measurement for the proposed water source.

2. Select the corresponding graph for the type of ROWPU that will be used (e.g., 600 gallon/hour or 3,000 gallon/hour).

3. From the legend in the graph, select the plot line that represents the TDS of your water source. If the TDS value of your water source is between two represented values, choose the higher TDS value.

4. Locate the source water temperature value on the horizontal axis (Temperature in F°/C°) of the graph. Extend a vertical line from the temperature value until it intersects the curve corresponding to the source water TDS. Extend a horizontal line from this intersection point until it intersects the vertical axis (Product Water Flow Rate (Gal/Hr)) of the graph. This value is the amount of water that can be produced per hour by one ROWPU from the proposed source water.

5. A standard operating day is 20 hours leaving 4 hours for system maintenance.

6. Purification Production Rates:

Source:	3,000gph ROWPU:	600gph ROWPU:
Fresh Water	3,000 GPH	900 GPH
Salt Water	2,000 GPH	600 GPH

Examples:

1) An Interim Brigade Combat Team (IBCT) of 3,429 soldiers will be deployed in a conventional theater within an arid environment. The temperature of the source water is 86°F, and the TDS is 40,000 milligrams/Liter. How many 3,000 gallon/hour ROWPUs must be used to sustain the operation?

A factor of 7.30 gallons/person/day is obtained from the Potable Water Planning Guide (page III-A-1). Multiply that factor by the number of soldiers:

3,429 soldiers X 7.30 gallons/person/day = 25,032 gallons/day
25,032 gallons/day ÷ 20 hours/day = 1,252 gallons/hour

Using the graph for the 3,000 gallon/hour ROWPU, obtain the corrected water production rate for the source water conditions (86°F and 40,000 milligrams/Liter TDS). The water production rate for one 3,000 gallon/hour ROWPU is approximately 1,400 gallons/hour.

Dividing the water requirement by the amount of water that can be produced by a single 3,000 gallon/hour ROWPU yields the total number of these ROWPUs required to support the operation.

1,202 gallons/hour ÷ 1,400 gallons/hour = .86 units

Therefore, approximately one 3,000 gallon/hr ROWPUs must be sent to meet the water requirements within this environment.

2) Two Heavy Brigade Combat Teams (HBCT) of 3,810 soldiers each will be deployed in a conventional theater within a cold environment. The water temperature is 41°F, and the TDS is 10,000 milligrams/Liter. How many 600 gallon/hour ROWPUs must be used to sustain the operation?

A factor of 5.84 gallons/person/day is obtained from the Potable Water Planning Guide (page III-A-1). Multiplying the factor by the number of soldiers:

7,620 X 5.84 gallons/person/day = 44,501 gallons/day
44,501 gallons/day ÷ 20 hours/day = 2225 gallons/hour

Using the graph for the 600 gallons/hour ROWPU, obtain the corrected water production rate for the source water conditions (41°F and 10,000 milligrams/Liter TDS). The water production rate for one 600 gallon/hour ROWPU is approximately 775 gallons/hour.

Dividing the water requirement by the amount of water that can be produced by one ROWPU, yields the total number of ROWPUs required.

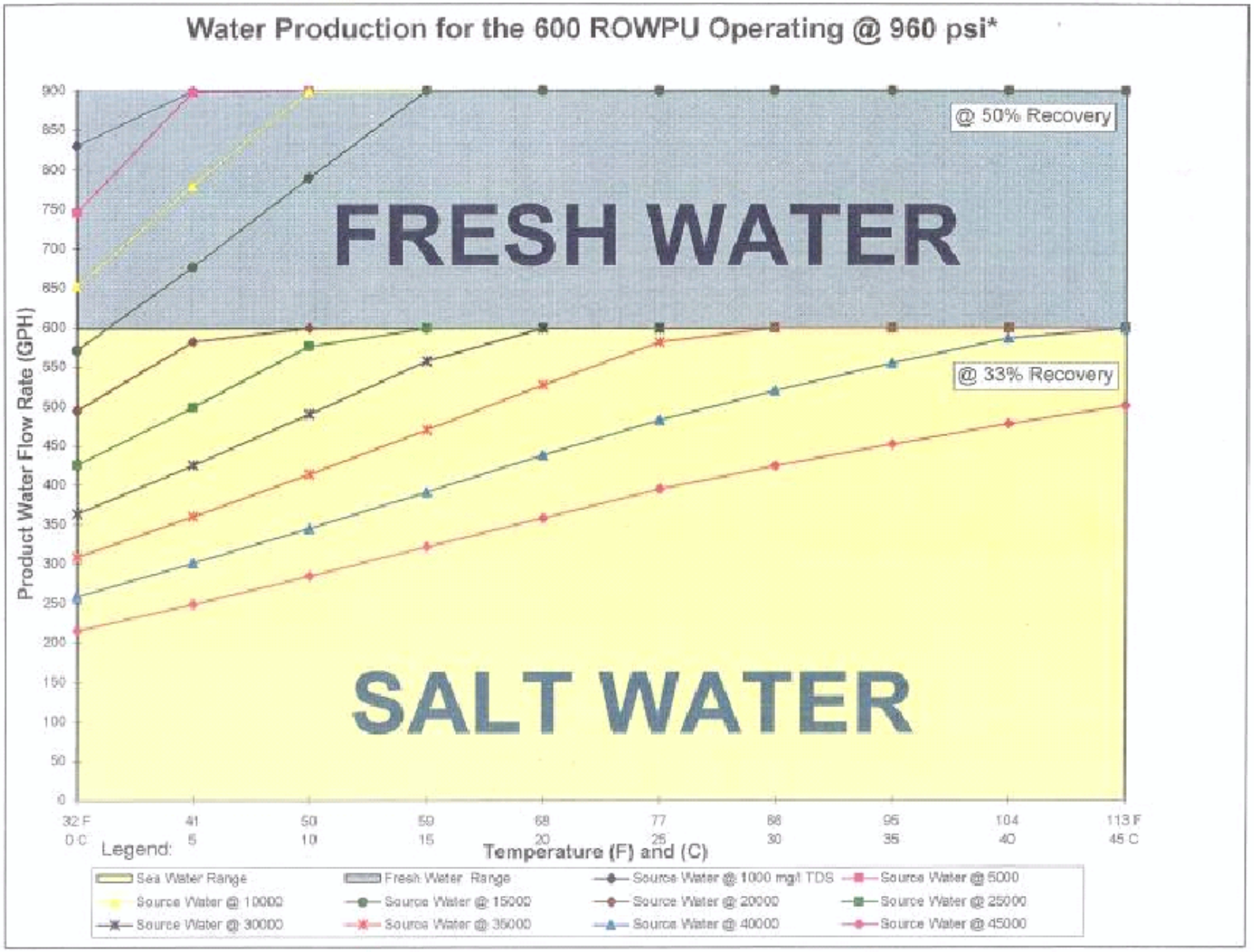
2,225 gallons/hour ÷ 775 gallons/hour = 2.87 units

Therefore, approximately three 600 gallon/hour ROWPUs must be sent to meet the water requirements within this environment.

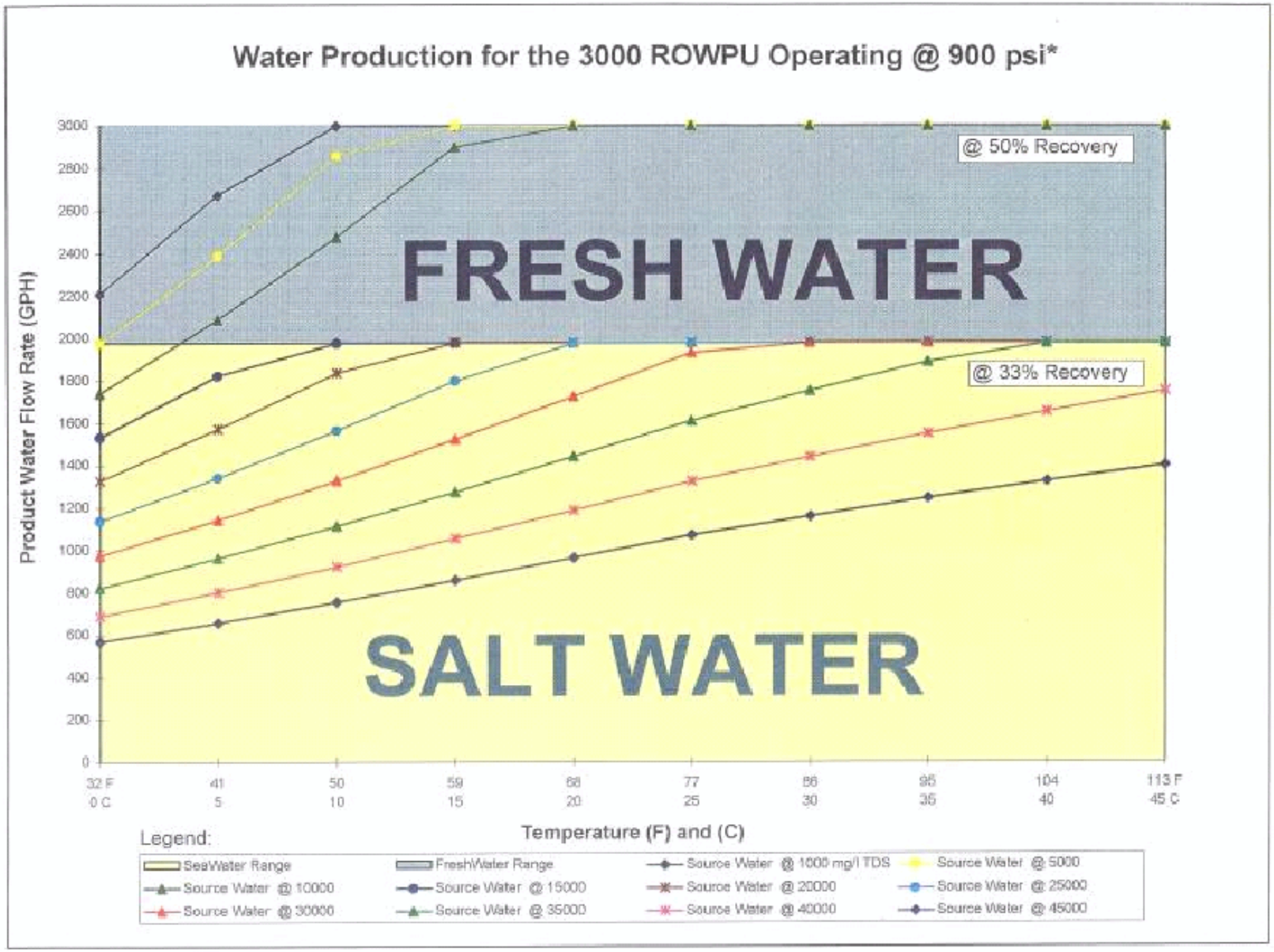
NOTES:

1. Product flow rates were calculated at the maximum operating pressure for each ROWPU: 960 pounds/square inch for the 600 gallon/hour ROWPU and 900 pounds/square inch for the 3,000 gallon/hour model. A fouling factor of 0.85 was taken into consideration for all the calculations. This factor considers fouling of the membrane surface and aging of the membrane and can be considered a safety factor.

2. The curves were constructed at permeate recovery rates of 50% for fresh water and 33% for salt/sea water. These recoveries are recommended by industry. In many cases, the ROWPUs will not need to be operated at the maximum operating pressure to meet these recommended recovery rates.



* 960 psi = maximum operating pressure for 600 ROWPU.



* 900 psi = maximum operating pressure for 3000 ROWPU.

Tactical Water Purification System (TWPS) Water Production Performance Characteristics

RAW WATER CHARACTERISTICS			POTABLE WATER PRODUCTION (normal)
Source	**Composition**	**Temperature**	
Surface water	Up to 20,000 mg/l TDS and up to 150 NTU	32 to 95 degrees F	1500 GPH
Ground water	Up to 2,500 mg/l TDS	32 to 95 degrees F	1500 GPH
Ground water	Over 2,500 mg/l TDS and up to 150 NTU	50 to 95 degrees F	1200 GPH
Seawater	35,000 mg/l TDS	32 to 95 degrees F	1200 GPH
Seawater	45,000 mg/l TDS	50 to 95 degrees F	1200 GPH
Seawater	45,000 mg/l TDS	32 to 50 degrees F	1000 GPH
Seawater	60,000 mg/l TDS	77 degrees F	950 GPH

Water Production for the Lightweight Water Purifier (LWP)

Unlike the larger 600, 1500, and 3000 gallon/hour ROWPUs, production of the LWP does not fluctuate with temperature.

On salt water, the production rate is 75 gallons/hour.

On fresh water, the production rate is 127 gallons/hour.

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SECTION V - CONSUMABLES

This section provides estimated consumable requirements in 5-day/100-operational hour increments.

SECTION V-A	**600 GPH ROWPU**
SECTION V-B	**3,000 GPH ROWPU**
SECTION V-C	**CALCIUM HYPOCHLORITE, WSDS**
SECTION VI-D	**LIGHTWEIGHT WATER PURIFIER (LWP)**
SECTION VI-E	**1,500 TWPS**
SECTION VI-F	**HIPPO**

The tables in this section present information that will enable planners to estimate the amount of consumables (chemicals, filter cartridges, air filter and reverse osmosis elements) in 5-day/100-operational-hour increments for each type of ROWPU, the WSDS, LWP, TWPS and Hippo. The planner should note that most of the chemicals (except those that are rated as hazardous) and some of the Class IX items can be ordered in pre-packaged 5-day sustainment kits. It should also be noted that reverse osmosis elements are generally replaced at increments of 1,000 to 2,000 hours and are generally all replaced at the same time.

WATER PLANNING GUIDE

SECTION V-A - 600 GPH ROWPU CONSUMABLES

ESTIMATED CONSUMABLE REQUIREMENTS FOR 600 GALLON/HOUR ROWPU
(PER 100 HOURS/5 DAYS OF OPERATION)

Nomenclature	NSN	Estimated Requirement	Quantity in Unit of Issue	Unit of Measure	Unit of Issue
Wetting Agent (Detergent)	6850-01-163-7635	1	2	Pound	Bottle
Citric Acid	6810-01-164-3975	5	12	Ounce	Bottle
Coagulant (Polymer)	6850-01-167-5318	2	32	Ounce	Bottle
Sodium Hexametaphosphate	6810-01-164-3941	2	2	Pound	Bottle
Test Tabs (Chlorine)	6550-01-0444-0315	2	100	Tablets	Box
Hypochlorite, Calcium	6810-01-238-8115	2	5	Pound	Bottle
Class IX Items					
Element, Fluid (Cartridge Filter)	4330-01-128-6277	2	8	Each	Box
Reverse Osmosis Element (6-Inch)	4610-01-105-2075	0.8	1	Each	Each

NOTES:

1. Items in **BOLD** print must be ordered separately.

2. Use NSN 6850-01-423-1698 to order a 5-day (100 operational hours) sustainment package for the 600 gal/hr ROWPU. The 5-day sustainment package consists of the above items and respective quantities, *except* for those items marked in **BOLD** print, which must be ordered separately. Calcium hypochlorite has a hazardous material rating. Reverse osmosis elements are replaced at a less frequent interval than the other components of the sustainment package. See Note 4 for determining the reverse osmosis element requirement.

2. The detergent use rate is based on raw water turbidity and the effectiveness of the pre-treatment system. You should not expect to clean elements every 100 hours. One bottle of detergent should last 500 or more hours.

3. The number of cartridge filters needed is a function of raw water turbidity. For very clear source water, one box will generally be sufficient for 100 hours. For muddy or silty source water, 50 boxes or more might be needed for 100 hours of operation.

4. Reverse osmosis elements should normally be replaced every 1000-2000 hours. Recommend eight each be ordered per ROWPU per 1000-2000 hours of operation. The required quantity of 0.8 for 100 hours is prorated based on the usage factor for 1000 hours in order to provide the planner with an average operating cost for consumables for 100 hours.

5. Check the Army Master Data File for current prices.

6. Requirements in the above table are estimates. Actual requirements may vary depending on the quality of source water.

WATER PLANNING GUIDE

SECTION V-B - 3,000 GPH ROWPU CONSUMABLES

ESTIMATED CONSUMABLE REQUIREMENTS FOR 3,000 GALLON/HOUR ROWPU
(PER 100 HOURS/5 DAYS OF OPERATION)

Nomenclature	NSN	Estimated Requirement	Quantity in Unit of Issue	Unit of Measure	Unit of Issue
Eyewash Additive	6840-01-267-4346	0.167	16	Ounce	Box
Detergent Cleaner	6850-01-370-4209	1	25	Pound	Drum
Coagulant (Polyelectrolyte)	6850-01-369-7897	4	1	Gallon	Gallon
Sodium Bisulfite	6810-01-359-4918	7	32	Ounce	Package
Cleaner Ntp-A	6850-01-362-0945	8	128	Ounce	Bottle
Citric Acid	6810-01-359-5011	2	40	Ounce	Bag
Calcium Hypochlorite	6810-01-358-4336	50	16	Ounce	Bag
Color Reagent	6810-01-362-8616	1	4	Ounce	Bottle
Sequestrant	6850-01-362-2182	1	128	Ounce	Bottle
Sulfamic Acid Reagent	6810-01-200-8010	1	100	Pill	Bottle
Sulfite Reagent	6810-01-200-8009	1	100	Pill	Bottle
Sodium Thiosulfate	6810-01-358-4381	1	4	Ounce	Bottle
Class IX Items					
Cartridge Filter Element	4330-01-350-9102	4	10	Each	Box
Air Filter Element	4330-01-350-9101	5	1	Each	Each
Reverse Osmosis Element (8-Inch)	4610-01-253-4294	1.2	1	Each	Each

NOTES:

1. Items in **BOLD** print must be ordered separately.

2. Use NSN 6850-01-423-1699 to order a five-day (100 operational hour) sustainment package for the 3,000 gallon/hour ROWPU. The five-day sustainment package consists of the above items and respective quantities, *except* for those items in **BOLD** print, which must be ordered separately. Calcium hypochlorite and eyewash additive have a hazardous material rating. Reverse osmosis elements are replaced at a less frequent interval than the other components of the sustainment package. See Note 6 for determining the reverse osmosis element requirement.

3. One box of eyewash additive is required every 30 days. Eyewash additive comes in a box with four each 4-ounce tablets. The required quantity of 0.167 for 100-hours is prorated based on the usage factor for 30 days (600 hours).

4. Detergent use depends on the type of source water. For fresh water, the elements are cleaned every 400 hours. For salt water, they are cleaned every 200 hours.

5. Sodium bisulfite is needed only when the ROWPU is shut down for more than two days.

6. The number of cartridge filters needed is a function of raw water turbidity. For very clear source water, one box will be sufficient for 100 hours of operation. For muddy or silty source water, 50 boxes or more may be needed for 100 hours of operation.

7. Reverse osmosis elements should normally be replaced every 1,000-2,000 hours. Recommend 12 each elements be ordered per ROWPU per 1,000-2,000 hours of operation. The required quantity of 1.2 for 100 hours is prorated based on the usage factor for 1,000 hours.

8. Check the Army Master Data File for current prices.

9. Requirements in the above table are estimates. Actual requirements might vary depending on the quality of source water.

SECTION V-C - WSDS CONSUMABLES

WATER STORAGE AND DISTRIBUTION SYSTEMS (WSDS) CALCIUM HYPOCHLORITE REQUIREMENTS ESTIMATE

		NORMAL OPERATIONS (@ 2-3 PARTS/MILLION)			
WSDS TYPE	**Initial Service (@ 15 ppm)***	**Number of Hypochlorinators in Operation****	**1 Day/20 Hours**	**5 Days/100 Hours**	**30 DAYS/600 HOURS**
20,000 gal	16 oz/1 lb for 5,000 gal	One	6 oz	30 oz *or* 1.9 lb	180 oz *or* 11.4 lb
40,000 gal	32 oz/2 lb for 10,000 gal	One	12 oz	60 oz *or* 3.8 lb	360 oz *or* 22.5 lb
300,000 gal	78 oz/5 lb for 25,000 gal	One	91 oz or 5.7 lb	455 oz *or* 28.5 lb	2730 oz *or* 171 lb
		Two	136 oz or 8.6 lb	683 oz or 42.7 lb	4095 oz or 256 lb
800,000 gal	156 oz/10 lb for 50,000 gal	One	243 oz or 15.2 lb	1215 oz *or* 76 lb	7290 oz *or* 456 lb
		Two	365 oz or 22.8 lb	1823 oz or 114 lb	10,935 oz or 684 lb

* Used to place tanks into service initially. Re-circulate through system and discharge to waste. For example, to place a 40,000 gal WSDS into *initial service*, the tanks would be filled with 10,000 gallons of product water at 15 ppm using 32 oz of calcium hypochlorite. After circulation, this water would be discharged to waste and the tanks then filled with fresh product water and chlorinated to 2-3 ppm for normal operations.

** The 300,000 and 800,000 gal WSDS might have one or two hypochlorinators (one on the receipt side, one on the issue side) in service. When a second hypochlorinator is employed, the calcium hypochlorite requirement for the second hypochlorinator is approximately half the requirement of the first. When *two* hypochlorinators are in use, the total requirement is 1.5 times the requirement when only one hypochlorinator is operational. For example, to estimate the total calcium hypochlorite requirement for an 800,000 gal WSDS for 5 days/100 hours of operations with *two* hypochlorinators in use, the calculation would be:

First hypochlorinator = 1215 oz/76 lb
Second hypochlorinator = 1215 oz/76 lb X 0.5 = 608 oz /38 lb
Total requirement for two hypochlorinators = 1215 oz/76 lb + 608 oz/38 lb = 1823 oz/114 lb

NOTE: Calcium hypochlorite may be ordered in three sizes:

5-lb bottle – NSN 6810-00-238-8115
3.75-lb bottle - NSN 6810-00-242-4770
16-oz bag - NSN 6810-01-358-4336

SECTION V-D - LIGHTWEIGHT WATER PURIFIER CONSUMABLES
PART NUMBER 7859MFG
NSN 4610-01-495-0046

Table 1. This work package lists BII for the Lightweight Water Purifier. These essential items are required to place the lightweight water purifier in operation and operate it. Although shipped separately packaged, BII must be with the lightweight water purifier during operation and when it is transferred between property accounts. Listing these items provides authority to request/ requisition them for replacement based on authorization of the end item by the TOE/MTOE.

Additional Authorization List TM 10-4610-310-14			
NSN	**Description, CAGE Code and Part Number**	**Unit of Measure**	**Quantity Required**
6810-01-528-3879	Hydroxide, Sodium, (1R9H9), SH150	GM	1

NOTE: This is not the complete listing of BII from the TM only a select list.

Table 2. This work package lists expendable and durable materials items needed to operate and maintain the Lightweight Water Purifier (LWP). This list is for information only and does not provide authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable/Durable items (Except medical, Class V Repair Parts, and Heraldic Items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

Expendables/Durables List TM 10-4610-310-14			
NSN	**Description, CAGE Code and Part Number**	**Unit of Measure**	**Quantity Required**
6810-01-527-4039	Acid, Citric, M217, Powder Form, 5.5 Pound Box, (76371), 4100217005	BX	
6850-01-527-4119	Antiscalant, M321, Liquid Form, 32 Ounce Bottle, (76371), 4100321000	BT	
6810-01-527-4028	Bisulfite, Sodium, M323, 980 Gram Container, (76371), 4100323980	BX	
6850-01-527-4116	Cleaner, RO Membrane, M326, High pH, 6 Pound Box, (76371), 4100326000	BX	
6850-01-527-4111	Cleaner, RO Membrane, M326, High pH, 6 Pound Box, (76371), 4100326000	BX	
6850-01-527-4102	Coagulant (Flocculant), M322, Liquid Form, 32 Ounce Bottle, (76371), 4100322000	BT	
6850-00-294-0860	Compound, O-ring, Lubricant, Dow Corning 111, (03CA3), PST-511	TU	
4610-01-527-4977	Detergent, M334, Powder Form, 1 Pound Packs, (76371), 4100334105	LB	
6850-01-527-4086	Detergent, M331, 32 Ounce Bottle, (76371), 4100333001	BT	
6840-00-255-0471	Hypochlorite, Calcium (HTH), 6-ounce bottle, 4100229112	BT	
6810-01-527-5777	Hypochlorite, Sodium (Bleach), 24 Ounce Bottle, (4T284), 02450	BT	
6810-01-527-4074	Solution, Buffer, 15 ppm, 1 Pint, (30053), 442-15	PT	
6810-01-399-1289	Solution, Buffer, 30,000 ppm, 1 Pint, (30053) 442-30000	PT	
6850-01-487-8860	Solution, Calibration, Turbidity Meter, (06EF2), HI 93703-0	BT	
6850-01-487-8875	Solution, Calibration, Turbidity Meter, (06EF2), HI 93703-10	BT	
6850-01-487-8862	Solution, Cleaning, Turbidity Meter, (06EF2), HI 93703-50	BT	
6810-01-528-3706	Solution, Storage, pH Cell, (30053), SSQ	QT	
NA	Unit Package, chemical, for 140 hours of Operations, (76371), 4100324000	PK	
7920-00-543-6492	Wipes, Disposable, (33591), 34256	BX	

Table 3. This work package lists additional items authorized for the support of the Lightweight Water Purifier (LWP). These items do not have to accompany the LWP.

Additional Authorization List TM 10-4610-310-14			
NSN	**Description, CAGE Code and Part Number**	**Unit of Measure**	**Quantity Required**
6810-01-528-3879	Hydroxide, Sodium, (1R9H9), SH150	GM	1

NOTE: The sodium yydroxide (NaOH) is to be used for the double-pass operation for iodide, cyanide, and arsenic removal procedure outlined in TM 10-4610-310-14, WP 0022 00.

SECTION V-E - TACTICAL WATER PURIFICATION SYSTEM (TWPS) CONSUMABLES ARMY NSN 4610-01-488-9656; MARINE CORPS NSN 4610-01-488-6961

Table 1. Refer to TM 10-4610-309-10 for expendable and durable items needed to operate and maintain the TWPS. This list is for information only and is not authority to requisition the listed items. These items are authorized by CTA 50-970, Expendable/Durable Items (Except Medical, Class V Repair Parts, and Heraldic Items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

Refer to TM 9-6115-672-14 for expendable and durable items for the Generator, Skid-Mounted, Tactical Quiet, 60 KW, 50/60 Hz.

Refer to TM 10-6630-222-12&P for expendable and durable items for the Water Quality Analysis Set: Purification (WQAS-P).

NSN	Description, CAGE Code, and Part Number	Unit of Measure
8040-01-501-5557	Adhesive, Silicone, 3 Ounce Tube (71984) RTV 732	TU
8030-00-422-9584	Antiseize Compound, Marine Grade, 8 Ounce Can (1Y2R4) NMBTt-8	CN
6850-01-528-9972	Antiscalant (0EXU3) 803-07886	GL
	Antiscalant, 5 gallon pail (57394) 7078886	PA
6135-00-835-7211	Battery, Flashlight, Size D, package of 6 HD-D (77542)	PG
5110-01-428-5269	Blade, Knife, package of 5 11-921 (1CV05)	PG
6840-00-238-8115	Calcium Hypochlorite, Disinfectant, 5 lb bottle	BT
6840-01-065-2410	Calcium Hypochlorite, Disinfectant, 100 lb drum	DR
6810-00-141-2942	Citric Acid, 50-lb drum A-A-59147 (58536)	DR
5350-00-161-9066	Cloth, Abrasive, Package of 50 Sheets (76318) 05144-02459	PG
8305-01-526-9825	Cloth, Drop, Fuel Absorbent (39428) 7516T48	EA
8030-01-414 -7423	Corrosion Preventive Compound, 16 Ounce Spray Bottle, Box of 12 (03GK3) T32CP90S6	BX
6850-00-664-5685	Dry Cleaning Solvent, 1 Quart Can (58536) AA59601-1 D	QT
451 0-01-496-6954	Eyewash, Eyewash Station, Refill (25795) 5T064	EA
6810-01-359-4919	Glycerin, 16 Ounce Bottle (97403) 13229E0172	BT
9150-01-197-7690	Grease, Automotive and Artillery M-10924C (81349)	CN
9150-00-053-0101	Grease, Molybdenum Disulfide, 3 lb can MOLYKOTE Z (94999)	CN

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6850-01-528-9969	High pH Cleaner, 50-lb bucket 2250P (17534)	EA
6850-00-569-7690	Leak Test Compound, 1 Gallon Bottle (03530) 372E	GL
6810-01-527-0515	Low pH Cleaner, 20 lb bucket 803-07891 (0EXU3)	EA
6850-00-294-0860	Lubricant, Silicone, Valve Seal 887-07510-000 (0EXU3)	OZ
9150-01-178-4725	Lubricating Oil, Engine, 1 qt bottle, SAE 15W-40 15W-40/QT/BT/2104 (81349)	QT
4240-01-527-0105	Mask, Air Filtering (Package of 5) 67644 (6M644)	PG
6810-01-527-0524	Media, Resin, Package of 6 Bags (0EXU3) 803-07831	PG
6810-01-527-0537	Media, Carbon, Package of 4 Bags (0EXU3) 803-07832	PG
9150-01-527-0464	Oil, Air Compressor, 1 qt bottle 887-07607-000 (0EXU3)	QT
7920-00-151-6120	Pad, Scouring, package of 10	PG
9150-00-250-0926	Petrolatum, Technical, 1.75 lb can 14P1 (82146)	CN
6515-01-413-7414	Plug, Ear 0485 (3W556)	PR
7920-00-205-1711	Rag, Wiping	BE
8030-01-025-1 692	Sealing Compound, Loctite 242, 250 cc Bottle (05972) 24241	BT
	Sealing Compound, 1 Pint Can (05972) 30557	CN
8030-01-505-0628	Sealing Compound, 6 Ounce Tube with Separate Catalyst (83574) PR- 1440 B-2	CA
6810-01-527-4594	Sodium Bisulfite, 10-Pound Bucket, (09647) 803-07892	EA
6810-01-527-4590	Sodium Bisulfite, 12-Ounce Bags, Container of 10, (09647) 803-07880	EA
	Sodium Bisulfite, 50-lb bag 7128004 (57394)	BG
681 0-01-386-9964	Sodium Carbonate, 50 Pound Container (3D914) 90111	EA
6810-01-527-0510	Sodium Hydroxide (Caustic), 1 Gallon Bottle 803-07888	GL
9905-00-537-8955	Tag, Marker, package of 50	PG
8030-00-889-3535	Tape, Antiseizing, roll, 1/2” wide P5025-2R (81755)	EA
8030-00-889-3534	Tape, Antiseizing, roll, 1/4” wide P5025-1 (81755)	EA
4440-01-475-9949	Vapor Capsule, Corrosion Inhibiting (08TA7) VC2-1	EA

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NOTE: The following listing was provided by the TACOM 1500 TWPS Systems Engineer.

NSN	Description, CAGE Code, and Part Number	U/I	QTY
The following items provide 100 hours of operation, worst case.			
6850-01-528-9972	Antiscalant, (0EXU3), 803-07886	GL	1.44
6840-00-238-8115	Calcium Hypochlorite, Disinfectant, 5 lb bottle	EA	1.08
6810-01-527-	Citric Acid, 20-Pound Bucket, (0EXU3), 803-07891	EA	0.30
6850-01-528-9969	High pH Cleaner, 50-lb bucket 2250P (17534)	EA	0.15
6810-01-527-	Sodium Bisulfite, 10-Pound Bucket, (09647), 803-07892	EA	0.20
The following items provide an additional 100 hours of operation if treating water contaminated by radiological or CW agents.			
6810-01-527-0524	Media, Resin, Package of 6 Bags, (OEXU3), 804-07831	EA	1
6810-01-527-0537	Media, Carbon, Package of 4, (OEXU3), 804-07832	EA	1
6810-01-527-0510	Sodium Hydroxide (Caustic), 1 Gallon Bottle 803-07888	GL	2
The following items provide an additional 100 hours of operation if operating on a chlorinated water source.			
6810-01-527-4590	Sodium Bisulfite, 12-Ounce Bags, Container of 10, (09647) 803-07880	EA	1
The following items are additional items required to perform the Preventive Maintenance Checks and Services every 100 hrs.			
4310-01-460-7980	Cartridge, purifier (57328) 058821A	EA	0.33
4310-01-460-3415	Filter element, air (57328) N00070	EA	0.11
2910-01-310-6566	FILTER, Fuel, Diesel Pump (0AK42) 114250-55121	EA	2
2940-01-310-4495	FILTER, Air, Diesel Pump (0AK42) 114250-12581	EA	2
9150-01-178-4725	Lubricating Oil, Engine, 1 qt bottle, SAE 15W-40 15W-40/QT/BT/2104 (81349)	QT	2.0

SECTION V-F – LOAD HANDLING SYSTEM (LHS)-COMPATIBLE WATER TANK RACK (HIPPO) CONSUMABLES
MODEL NUMBER M105
PART NUMBER 016A0020 LIN: T32629
NSN 5430-01-487-7760

This work package lists expendable and durable items you will need to operate and maintain the Hippo. This listing is for informational purposes only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable/ Durable Items (Except Medical, Class V Repair Parts, and Heraldic Items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

Basic Issue Items TM 10-5430-244-10			
NSN	**Description, CAGE Code, and Part Number**	**Unit of Measure**	**Quantity Required**
6550-01-044-0315	Chlorine Test Tablets, (34807), 6903-J	PK	
6850-01-474-2318	Cleaning Compound: Solvent, Type III, (81349), MIL-PRF-6801 Gallon Can	CN	
6850-01-474-2320	5 Gallon Can	CN	
6850-01-474-2321	55 Gallon Drum	DR	
7930-00-282-9699	Detergent: General Purpose, Liquid, (83421), 7930-00-282-9669 1 Gallon Can	CN	
6550-01-095-6757	Phenol Red pH Test Tablets, (34807), 6915-J	PK	
5330-00-291-7947	Seal, Plain, Encased, (14153), 00044	BL	
8030-01-014-5869	Sealant, (39428), 91458A15	EA	
	Sealant, (39428), 7471A13	EA	
	Sealant, (39428), 9695T1 5	EA	
	Adhesive, (1PBQ8), 27828	EA	
8030-01-516-0406	Sealing Compound, (32849), 91458A14	EA	
6850-01-381-4423	Cleaning Solvent Compound, (OK209), Skysol 10 5-gallon Can	GL	

SECTION VI – WATER/TRANSPORTATION EQUIPMENT LINE ITEM NUMBERS

This section provides the line item numbers (LIN) for the principal equipment used in water purification, storage, distribution and quality analysis, to include non-TOE/Operational Project Stock equipment (150K ROWPU, 5K SMFT, Small Mobile Water Chiller). Also included are the LINs for transportation equipment (trucks, tractors, semi-trailers and drum tie-down kits).

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NUMERIC SEQUENCE	
LIN	**Description**
F42612	Forward Area Water Point Supply System
G12034	Generator Set, 60 KW
G68998	Drum, Fabric Collapsible, Water, 250 gal
G74575	Generator Set, 30 KW
K60988	Hypochlorination Unit, 100 gal/min
P44549	Pump, Centrifugal Water 350 gal/min Trailer Mounted
P92030	Pump, Centrifugal Water 125 gal/min Frame Mounted
P97369	Pump, Centrifugal Water 600 gal/min Trailer mounted
S70027	Semi-Trailer 22½T M871 (for 3K SMFT)
S70159	Semi-Trailer 34T M872 (for 5K SMFT)
T09094	Tactical Water Distribution System
T12688	Tank, Fabric Collapsible, Water (SMFT) 4570 gal
T12938	Tank, Fabric Collapsible, Water, 20,000 gal
T13006	Tank, Fabric Collapsible, Water, 50,000 gal
T14017	Tactical Water Purification System (TWPS)
T19033	Tank, Water Light Weight (Onion), 3,000 gal
T19101	Tank, Fabric Collapsible, Water (SMFT) 3000 gal
T32629	LHS: 2000 Gal Comp Water Tank-Rack (HIPPO)
T37588	Truck Utility, Expanded Capacity
T41135	Truck, Cargo, MTV W/W Dropside 5T
T61103	Truck, Tractor Line Haul M915
T61239	Truck, Tractor M1088
T61307	Truck, Tractor MTV W/E W/W
T61908	Truck, Cargo MTV W/E 5T
T93761	Trailer, PLS M1076
T95924	Trailer, Cargo, High Mobility 1 1/4 T
T96496	Truck Cargo: Tactical 8X8 Heavy Expanded Mob W/LHS
W30051	Lightweight Water Purifier
W35417	Reverse Osmosis Water Purification Unit 600 gph
W37311	Storage & Distribution System, Water, 800,000 gal
W47225	Reverse Osmosis Water Purification Unit 3,000 gal/hr
W47475	Water Quality Analysis Set - Purification
W55968	Storage & Distribution System, Water, 40,000 gal
W98825	Trailer, Water 400 gal M149A2
Y36849	Water Quality Analysis Set - Preventive Medicine
Z36683	Trailer Tank Water (CAMEL) 800 Gal

DESCRIPTION SEQUENCE	
LIN	**DESCRIPTION**
G68998	Drum, Fabric Collapsible, Water, 250 gal
F42612	Forward Area Water Point Supply System
G74575	Generator Set, 30 KW
G12034	Generator Set, 60 KW
K60988	Hypochlorination Unit, 100 gal/min
T32629	LHS: 2000 Gal Comp Water Tank-Rack (HIPPO)
W30051	Lightweight Water Purifier
P92030	Pump, Centrifugal Water 125 gal/min Frame Mounted
P44549	Pump, Centrifugal Water 350 gal/min Trailer Mounted
P97369	Pump, Centrifugal Water 600 gal/min Trailer mounted
W47225	Reverse Osmosis Water Purification Unit 3,000 gal/hr
W35417	Reverse Osmosis Water Purification Unit 600 gph
S70027	Semi-Trailer 22½T M871 (for 3K SMFT)
S70159	Semi-Trailer 34T M872 (for 5K SMFT)
W55968	Storage & Distribution System, Water, 40,000 gal
W37311	Storage & Distribution System, Water, 800,000 gal
T09094	Tactical Water Distribution System
T14017	Tactical Water Purification System (TWPS)
T19101	Tank, Fabric Collapsible, Water (SMFT) 3000 gal
T12688	Tank, Fabric Collapsible, Water (SMFT) 4570 gal
T12938	Tank, Fabric Collapsible, Water, 20,000 gal
T13006	Tank, Fabric Collapsible, Water, 50,000 gal
T19033	Tank, Water Light Weight (Onion), 3,000 gal
Z36683	Trailer Tank Water (CAMEL) 800 Gal
T95924	Trailer, Cargo, High Mobility 1 1/4 T
T93761	Trailer, PLS M1076
W98825	Trailer, Water 400 gal M149A2
T96496	Truck Cargo: Tactical 8X8 Heavy Expanded Mob W/LHS
T37588	Truck Utility, Expanded Capacity
T61908	Truck, Cargo MTV W/E 5T
T41135	Truck, Cargo, MTV W/W Dropside 5T
T61103	Truck, Tractor Line Haul M915
T61239	Truck, Tractor M1088
T61307	Truck, Tractor MTV W/E W/W
Y36849	Water Quality Analysis Set - Preventive Medicine
W47475	Water Quality Analysis Set - Purification

SECTION VII – ICE AND BOTTLED WATER

Information on ice requirements and bottled water packaging and transportation.

Use of Ice

Wet ice is required for medical, MA and food preparation operations.

a. Medical.

(1) Blood. The flow of blood begins at the CONUS donor base. Boxes of blood are moved to the Armed Service Whole Blood Processing Laboratory (ASWBPL) and then to forward-based AF Expeditionary Blood Trans-shipment Centers (EBTC). Once it is in the theater, the blood is re-iced and moved forward to Army Blood Support Detachments (BSD). The Blood Support Detachments (BSD) repack and re-ice the blood for forward movement to the supported hospitals and Forward Surgical Teams (FST). Hospitals and FSTs must also re-ice the blood for any cross leveling of blood from their locations. Ice is also necessary for backup in case of loss of power to blood storage units. Hospital blood banks and BSDs have their own ice-making capability. Units also look for alternate sources (e.g., dining facilities and commercially-available ice sources) in case the main supply is disrupted.

(2) Heat Injury Treatment. Ice is required in conjunction with water to treat heat injuries. The water requirement for treating heat injuries is addressed in Appendix B.

b. Mortuary Affairs. Ice is used to slow decomposition of remains during transportation. Units are directed to transport remains by the quickest means possible to the closest MACP or TMEP for processing and evacuation to CONUS. If transportation of remains from the incident location or medical treatment facility can not be accomplished within four hours of death, remains are moved to an alternate location for cooling to a temperature of 32° to 34° Fahrenheit and proper preservation. Re-icing should occur every 8-12 hours and should be changed immediately before the remains are transported from the MACP and/or TMEP.

c. Food Preparation. Ice is required for ensuring that fresh fruit, vegetables and other perishables are fit for consumption. Potable ice is used in field kitchens to chill perishable subsistence and beverages. Food service advisors can adjust the planning factor to suit the exercise or deployment based on actual unit demands.

Water Quality Requirements

a. Medical.

(1) Blood. Water used to make ice for preserving blood needs to be free of any contaminants (sand, salts, etc.) so that it maintains the proper thermal properties to keep the blood at a temperature of 32°-50° Fahrenheit during shipment.

(2) Heat Injury Treatment. Water used to make ice for heat injury treatment must be potable. Use of other than potable water requires a risk assessment and permission from the Command/Theater Surgeon and the Commander.

b. Mortuary Affairs. Non-potable water is acceptable for making ice to slow the rate of decomposition of remains.

c. Food Preparation. Ice for food preparation must be made with potable water.

Explanatory Notes

a. Medical.

(1) Blood. Fourteen pounds of wet ice (equivalent to 1.68 gallons of water) is needed for one box of up to 20 units of whole blood or 30 units of packed red blood cells. Blood needs to be re-iced every 48 hours when not in a controlled blood bank refrigerator. Considering the amount of blood that is in transit at any given time and the short transit times, the standard planning factor for this function is situation dependent.

(2) Heat Injury Treatment. The amount of ice required for each heat injury treatment depends upon the initial temperature of the water that is used in conjunction with the ice. Sufficient ice is needed to reduce the water temperature to 65° Fahrenheit. Aggressive efforts must be taken to reduce body temperature below 100° Fahrenheit. Considering the relatively low number of heat stroke occurrences in relation to the total population, the *per capita* ice requirement is not significant. Therefore, it is impractical to calculate a *per capita* requirement for this function.

b. Mortuary Affairs. Each remains requires 40 pounds of ice in cold and temperate climates, and 90 pounds in hot climates. This equates to 4.8 and 10.8 gallons of water, respectively. Ice is required at the initial point where the remains are processed. The amount of ice required is based upon the 24-hour processing capacity of each type of MA unit.

(1) Mortuary Affairs Collection Point (MACP). Each MACP can process 20 remains/day. The water requirement to make ice for this function is included in the MA planning factors.

(2) Theater Mortuary Affairs Evacuation Point (TMEP). Each TMEP can process 400 remains/day. The water requirement to make ice for this function is included in the MA planning factors.

(3) Mortuary Affairs Decontamination Collection Point (MADCP). Each MADCP can process 30 to 48 remains/day. The water requirement to make ice for this function is included in the MA planning factors.

c. Food Preparation. Experience in OIF and OEF, and changes to Army field feeding generated a reduction in the planning factors for ice. Containerized Kitchens have refrigeration capability. These rates also assume commercial refrigeration will continue to be used extensively until standard Army systems are fielded. The planning factors are also published in FM 4-20.2, Basic Doctrine for Army Field Feeding and Class I Operations Management.

Standard Planning Factors

a. Medical. The ice requirement for medical use is situation-dependent. Therefore, a standard planning factor has not been developed.

b. Mortuary Affairs. Using TAA 08-13 deaths and total population, the *per capita* water requirement for making ice is 0.02 gallons/person/day in hot climates and .01 gallons/person/day in cold and temperate climates.

c. Food Preparation. Two pounds of ice/person/day are required for food preparation in cold and temperate climates, and six pounds in hot climates. This equates to 0.26 and .79 gallons of water/person/day, respectively (includes 10% waste factor).

NOTE: The following conversion factors were used in the Potable Water Planning Data Study:

1 pound of water is required to make 1 pound of ice

.12 gallons of water are required to make 1 pound of ice

Use of Bottled Water

Consumption of potable water is essential to replenish body fluid losses from breathing, sweating, and urination for all daily physical profile levels.

As bottled water is intended to be used for drinking, it is most often issued along with meals. Doctrinally, bottled water is used in initial stages until bulk water purification, storage and distribution can be established. Joint Publication 4-03 discusses this, and TB Med 577 identifies inspection requirements either through Veterinary Services (as it is for food and bottled drinks, such as soda) or Preventive Medicine.

Water Quality Requirements

Bottled water must be potable and palatable and must meet applicable medical standards.

Sources

Bottled water can come from one or more sources – commercial or military, either within or outside the theater. Senior Army logisticians recommend that military bottling and ice-making capability be co-located and established early. The use of military bottling and ice-making capability not only provides control and security, but also allows positioning of the facilities for minimum impact on the transportation system while allowing maximum use of military water purification, storage and distribution capability.

Packaging

In order to determine the optimum bottle size, a number of factors must be considered, such as restrictions on duration of storage, distribution conditions, disposition of bottles and container weight and size to name a few. Clearly, these are issues that require extensive Mission, Enemy, Terrain, Troops available, Time, and Civilian considerations (METT- TC) consideration.

Interviews with soldiers indicate that the preferred bottle size is ½ L. This preference is consistent among bottlers, consumers and transporters. A review of sales by retail stores indicates that American retailers, consumers and transporters mirror this preference. It is the most convenient size, it has the lowest damage in transport and storage, and it allows the most efficient storage and packaging. It is significant that soldiers who were interviewed noted that the ½ L size also reduced much of the waste that occurs with larger-sized bottles.

Water Discipline

Purifying, storing, packaging, packing and transporting bottled water requires a large amount of logistics resources. In some cases, bottled water competes with other logistics requirements. As a result, commanders at all levels should apply discipline to minimize waste and pilferage.

Packing and Transportation

There are no standards for pallet sizes, pallet loading, shape of bottles or case sizes for bottled water. Use of military facilities for bottling water could lead to the development of standard bottling, palletizing, and packaging. For general reference, the table below shows several packaging configurations used by commercial bottlers.

Due to its high density, weight rather than volume will normally be the limiting factor on the amount of bottled water that can be carried on a vehicle. Also, pallet stacking should be minimized to limit damage to bottles and reduce the waste of bottled water. Commercial shippers typically do not stack pallets of bottled water. In military applications, where road surfaces are generally rougher than commercial carriers experience in the US, the need to avoid stacking is evident. As shown in the examples of water packaging configurations in the table below, even with the variation in packaging and palletizing, pallet weight is usually around 2,000 pounds.

DATA FOR EXAMPLES OF BOTTLED WATER PACKAGING CONFIGURATIONS

Bottles/ Tray	Trays/ Pallet	Rows/ Pallet	Bottles/ Pallet	Lb/ Tray	L/ Pallet	Gal/ Pallet	Lb/ Pallet	ST/ Pallet
24	72	6	1,728	27.0	864	228	2,020.0	1.01
24	72	6	1,728	29.0	864	228	2,128.0	1.06
24	66	7	1,584	27.0	792	209	1,832	0.92
12	132	7	1,584	13.6	792	209	1,845	0.92
24	84	7	2,016	27.0	1,008	266	2,358	1.18
32	60	6	1,920	39.0	960	254	2,425	1.21

Bottled water carrying capacities of some common military transport equipment are shown below.

EXAMPLES OF CARGO CAPACITY

Model	Nomenclature	Number of Pallets[1]	Maximum Load (ST)
M977/985	HEMMT Truck	8	11.00
M989A1	HEMAT Trailer	6	11.00
PLS	Palletized Loading System Flatrack	10	11.00
M871	22.5-ton Trailer	14	22.50
M872	34-ton Trailer	18	34.00

SECTION VIII– GLOSSARY

A

AMC	Aviation Maintenance Company
AMEDDC&S	Army Medical Department Center and School
ASC	Aviation Support Company
ASWBPL	Armed Service Whole Blood Processing Lab

B

BCT	Brigade Combat Team
BSD	Blood Support Detachment

C

CAB	Combat Aviation Brigade
CASCOM	Combined Arms Support Command
CBL	Containerized Batched Laundry
CBRN	Chemical, Biological, Radiological, & Nuclear
CBRNE	Chemical, Biological, Radiological, Nuclear and Explosive
CHPPM	Center for Health Promotion/Preventive Medicine
CONUS	Continental United States
CSH	Combat Support Hospital
CSS	Containerized Shower System
cu	Cubic

D

DoD	Department of Defense

E

EBTC	Expeditionary Blood Trans-Shipment Center
EPW	Enemy Prisoner of War

F

FP	Force Provider
FST	Forward Surgical Team
ft	Foot

G

gal	Gallon

I

IBF	Integrated Battlefield
in	Inch

J

JHSV	Joint High Speed Vessel

L

L	Liter
LADS	Laundry Advanced System
lb	Pound
LCU	Landing Craft Utility
LSV	Logistics Support Vessel
LOGCAP	Logistics Civil Augmentation Program

M

MA	Mortuary Affairs
MACP	Mortuary Affairs Collection Point
MADCP	MA Decontamination Collection Point
MANSCEN	Maneuver Support Center
METT-TC	Mission, Enemy, Terrain, Troops available, Time, and Civilian considerations
mi	Mile
min	Minute
mL	Milliliter
MLSA	Multi-Lift Support Area
MOPP	Mission-Oriented Protective Posture
MRE	Meal, Ready to Eat
MWR	Morale, Welfare, and Recreation

N

NSRDEC	Natick Soldier Research, Development and Engineering Center

P

PPE	Personal Protective Equipment
ppm	Parts Per Million

Q

QM	Quartermaster
qt	Quart

R

R or r	Radius
RDECOM	Research Development and Engineering Command

S

SMFT	Semi-Trailer Mounted Fabric Tank
sq	Square
ST	Short Ton

T

TMEP	Theater Mortuary Affairs Evacuation Point
TOE	Table of Organization and Equipment
TSG	The Surgeon General

U

UGR	Unitized Group Ration
UGR H&S	Unitized Group Ration Heat & Serve
US	United States
USAMANSCEN	United States Army Maneuver Support Center
USAMEDDC&S	United States Army Medical Department Center & School
USAQMC&S	United States Army Quartermaster Center & School
UUL	Universal Unit Level

V

V	Volume

W

wk	Week

Y

yd	Yard

SECTION IX DEFINITIONS

TERM	DEFINITION
Brackish Water	Water containing between 1,500 and 15,000 ppm of dissolved solids. This water is unfit for drinking because of salty or unfit taste.
Cold (arctic)	Areas of the world with an annual mean daily temperature of less than 32° Fahrenheit, where water sources are sufficiently abundant and well distributed. These regions are generally seasonally frozen, do not support forest vegetation and include adjacent lakes, seas or oceans. Potable water will be used only for those purposes specifically requiring potable water standards. These include drinking, field feeding, personal hygiene, and medical operations. Non-potable water can be used untreated or treated on-site, as required, for all other water consumption requirements.
Conventional Battlefield	Theater in which no use of CBRN weapons is anticipated. These planning factors also apply to areas of the IBF not subject to chemical attack.
Direct Patient Care Provider	Personnel who provide direct care to patients (as opposed to administrative and logistics support personnel), and, as a result must take special measures to ensure the health of themselves and their patients.
Fresh Water	Water containing less than 1,500 ppm of dissolved solids and/or chemicals, chlorides, sulfates and alkalis.
Hot (arid)	Areas of the world with an annual mean daily temperature of more than 80° Fahrenheit where water sources are so sparse that water must be distributed from central water sources to the point of use. The possibilities of cross-contamination of potable and non-potable water and water equipment and the difficulties of operating and managing two separate water supply systems dictate the distribution of only potable water. In addition to specified potable water requirements for drinking, field feeding, personal hygiene and medical operations, potable water will also be produced and distributed to meet non-potable water requirements. These non-potable water requirements include central hygiene, vehicle/aircraft/watercraft maintenance, engineer construction operations, mortuary affairs and other unique requirements, such as equipment decontamination and vehicle washing operations.
Hot (tropical)	Areas of the world with an annual mean daily temperature of more than 80° Fahrenheit where water sources are generally plentiful and well distributed. Potable water will be used only for those purposes specifically requiring potable water standards. These include drinking, field feeding, personal hygiene, and medical operations. Non-potable water can be used untreated or treated on-site, as required, for all other water consumption requirements.
Integrated Battlefield (IBF)	Theater in which one or more opponents have CBRN weapons available and employment is anticipated. Factors for an IBFapply to areas of the battlefield subject to CBRN attack.
Minimum Water Requirement	The minimum amount of water that is required to maintain military force mission effectiveness for a period of up to one week. MINIMUM rates identified in this planning guide reflect water consumption in times of water shortage or intense combat. Consumption under these conditions includes only essential functions. In all environmental regions, these functions include drinking, personal hygiene, field feeding, medical operations and heat casualty treatment. In hot, arid environmental regions, essential functions are expanded to include aircraft and vehicle maintenance.
Non-potable Water	Water that has not been disinfected, processed or approved by appropriate authorities as being safe for human consumption. All water is considered non-potable until declared potable.

TERM	DEFINITION
Raw Water	Water used as a source of supply taken from natural or impounded bodies of water, such as streams, lakes, ponds or ground water.
Requirement	Planning factor that includes all water required for a function, sub-function or task and expressed in units of measure unique to the function, sub-function or task. For example, a requirement could be expressed as gal/aircraft/day, gal/hospital bed/day, gal/remains processed/day or gal/vessel/day. Some requirements represent discrete population sets, workloads or specific equipment densities and cannot be easily converted to a gallon/person/day Standard Planning Factors. Examples are Engineer Operations and Watercraft Maintenance Operations.
Role I Medical Support	Medical support that is integral to or allocated to a small unit, and will include the capabilities for providing first aid, immediate lifesaving measures and triage. Additionally, it will contribute to the health and well-being of the unit through provision of guidance in the prevention of disease, non-battle injuries, and operations stress. Normally, routine sick call and the management of minor sick and injured personnel for immediate return to duty are functions of this level of care.
Role II Medical Support	Medical support that is normally provided at larger unit level, usually of brigade or larger size, though it may be provided farther forward, depending upon the operational requirements. In general, it will be prepared to provide evacuation from Role 1 facilities, triage and resuscitation, treatment and holding of patients until they can be returned to duty or evacuated, and emergency dental treatment. Though normally this level will not include surgical capabilities, certain operations may require their augmentation with the capabilities to perform emergency surgery and essential post-operative management.
Role III Medical Support	Medical support that is normally provided at division level and above. It includes additional capabilities, including specialist diagnostic resources, specialist surgical and medical capabilities, preventive medicine, food inspection, dentistry, and operational stress management teams when not provided at Role II. The holding capacity of a Role III facility will be sufficient to allow diagnosis, treatment, and holding of those patients who can receive total treatment and be returned to duty within the evacuation policy laid down by the Force Surgeon for the theater. Normally, this support will be provided by Combat Support Hospitals.
Role IV Medical Support	Medical support that provides definitive care of patients for whom the treatment required is longer than the theater evacuation policy or for whom the capabilities usually found at Role III are inadequate. This would normally comprise specialist surgical and medical procedures, reconstruction, rehabilitation, and convalescence.
Salt Water	Water containing more than 15,000 ppm of dissolved solids.
Standard Planning Factor	Planning factor that indicates water usage allocated to the entire theater population for a function and expressed in gallons per person per day (gal/person/day). Standard planning factors are provided for functions such as Universal Unit Level, Role I - IV medical treatment, central hygiene and mortuary affairs operations. These factors are derived by dividing the total estimated theater water usage for the function and then dividing by the total theater population. In some cases, such as drinking and personal hygiene, standard planning factors are derived directly from consumption planning factors, because the amount of water used by each person is known.
Sustaining Water Requirement	The amount of water that is required to maintain a military force's mission effectiveness for a period in excess of one week. Under this water consumption condition, all functions dependent on water are satisfied for the duration of the operation without any degradation. In hot, arid environmental regions, sustainment functions are expanded to include engineer, aircraft, and vehicle maintenance.
Temperate	Areas of the world with an annual mean daily temperature ranging from 32° Fahrenheit to 80° Fahrenheit where water sources are sufficiently abundant and well distributed. Potable water will only be used for those purposes specifically requiring potable water standards. These include drinking, field feeding, personal hygiene, and medical operations. Non-potable water can be used untreated or treated, on site as required, for all other water consumption requirements.
Treated Water	Disinfected or processed non-potable water, free of CBRN contamination and made safe for showers.