UNITED STATES MARINE CORPS
ENGINEER EQUIPMENT INSTRUCTION COMPANY
MARINE CORPS DETACHMENT
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LESSON PLAN

LOGISTICAL ESTIMATIONS

EEO/EEC-B08

WARRANT OFFICER/CHIEF COURSE

A16ACN1/A1613E1

REVISED 09/08/2014

APPROVED BY _____ DATE_____

(ON SLIDE #1)

INTRODUCTION **(5 MIN)**

1. **GAIN ATTENTION**: There are two goals to Marine Corps leadership. One is mission accomplishment, the second is troop welfare. Inadequate estimates for logistical support requirements will lead to a failure of both goals. Marines without chow and water will eventually fail to accomplish a mission and will result in a demoralized unit. The same applies to equipment, without fuel and proper maintenance it will fail to perform its intended functions. Both failures of leadership.

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_____
_____

(ON SLIDE #2)

2. **OVERVIEW**: Good morning/afternoon class, my name is _____. The purpose of this lesson is to be able to identify logistical support needs, to familiarize the student with priority of work, and supply areas to be considered when determining the logistical support required for a horizontal construction the project (mission directive).

INSTRUCTOR NOTE
Introduce the learning objectives.

(ON SLIDE #3)

3. **LEARNING OBJECTIVE(S)**:

INSTRUCTOR NOTE
Have students read learning objectives to themselves.

a. **TERMINAL LEARNING OBJECTIVE**:

(1) Provided a horizontal construction mission, resources, and references; manage/supervise horizontal construction project production and logistical requirements, to develop project estimates in support of mission requirements. (1310-HORZ-2002/1349-HORZ-2002)

b. **ENABLING LEARNING OBJECTIVE:**

(1) Without the aid of reference, identify logistical tasks and responsibilities by rank per the FM 5-35. (1310-HORZ-2002ab/1349-HORZ-2002ab)

(2) Given a scenario, and with the aid of references, compute the logistical requirements for the mission directive per the references. (1310-HORZ-2002ac/1349-HORZ-2002ac)

(ON SLIDE #4)

4. **METHOD/MEDIA:** This lesson will be presented by lecture, demonstration, and practical application. I will be aided by computer slides, and the dry erase board.

INSTRUCTOR NOTE
Explain Instructional Rating Forms and Safety Questionnaire to students.

(ON SLIDE #5)

5. **EVALUATION:** A closed book written/performance examination, covering the material in this lesson, will be administered at the end of this period of instruction.

(ON SLIDE #6)

6. **SAFETY/CEASE TRAINING (CT) BRIEF:**
There are no safety / cease training concerns for this period of instruction.

INSTRUCTOR NOTE
Ensure to explain Crane Shed fire and inclement weather procedures.

(ON SLIDE #7)

TRANSITION: Are there any questions over what is going to be taught, how it will be taught, or how you the student will be evaluated? Let's start by discussing what Logistical Estimations involves.

_____
_____
_____

BODY **(8 HOURS 10 MIN)**

(ON SLIDE #8)

1. **TASKS/RESPONSIBILITIES BY RANK: (1 HR 30 MIN)**

Before any logistical estimation can be done certain questions must be answered. Responsibilities for gaining this information and performing these tasks are broken down by rank.

(ON SLIDE #9)

a. Although there are responsibilities by rank, everyone in the chain must know what the others are doing. The first check list is for the engineer officer. The list is as follows and is only a guide. This list may be added to or taken away from depending on the extent of the mission. More information on engineer planning can be found in FM-FM 4-4 Par 706. Engineer responsibilities are found in FM 5-35, page 18-11.

CHECK LIST FOR THE ENGINEER OFFICER:

START	COMPLETE	TASK
		CONDUCT SITE RECONNAISSANCE
		ORDER SURVEY
		ORDER SOIL ANALYSIS
		ORDER ENVIRONMENTAL IMPACT STUDY
		ORDER GRADE STAKES TO BE PLACED AND ENVIRONMENTAL AREAS MARKED
		SUPPLY BLUE PRINT AND ENVIRONMENTAL STUDY TO CHIEFS
		HAVE EACH CHIEF MAKE WRITTEN ESTIMATIONS FOR EACH AREA OF CONCERN.
		COLLECT DATA FROM ALL CHIEFS AND FORMULATE TOTAL ESTIMATION
		IDENTIFY CONSTRUCTION REQUIREMENTS/LIMITATIONS/ RESTRICTIONS

		CRITICAL PATH METHOD
		ISSUE THE ORDERS TO THE CHIEFS TO CONDUCT THE MISSION

EXPLANATION OF OFFICERS CHECK LIST:

(ON SLIDE #10)

(1) **CONDUCT SITE RECONNAISSANCE:** Conduct site reconnaissance of area if possible. If not possible, collect data by way of maps and/or by topographical observation platoon (TOPO). The mission of TOPO is to give satellite imagery of an area. This imagery can be made into three dimensional maps that may be used to estimate mission requirements. More information on engineer reconnaissance is found in FM 5-35, page 18-10.

(2) **ORDER SURVEY:** A survey of an area is very important to the mission, if it entails detail work such as roads and runways. It is next to impossible for a carpenter to build without a blue print. The same goes for the engineer equipment officer. Survey teams are organic to most engineer units. More information on surveying, maps, and aerial photography, can be found in FM-3-35, page 17-1.

(3) **ORDER SOIL ANALYSIS:** Soil analysis is needed to determine several factors in the estimation. The soil classification is done by a soil analysis team. More information on how soils are classified can be found in FM 5-35, page 4-1.

(4) **ORDER ENVIRONMENTAL IMPACT STUDY:** Environmental studies can be attained through the environmental protection agency (EPA).

(ON SLIDE #11)

(5) **GRADE STAKES TO BE PLACED AND ENVIRONMENTAL ARE MARKED:** The survey team will place the grade stakes and mark environ-mental areas.

(6) **SUPPLY BLUE PRINT AND ENVIRONMENTAL IMPACT STUDY TO CHIEF:** The chief needs to have the blue print and all studies to estimate the mission. Without the prints and studies, a chief cannot make an accurate estimation.

(ON SLIDE #12)

(7) **ORDER EACH CHIEF TO MAKE A WRITTEN ESTIMATION FOR EACH AREA OF CONCERN:** Most engineer units are broken down into sections and have an equipment chief, a technical engineer chief, an utilities chief, etc. Each has a specific area of responsibility and knowledge of those areas.

(8) **COLLECT DATA FROM ALL CHIEFS AND FORMULATE TOTAL ESTIMATION:** To formulate data you need to know some formulas they are as follows. Starting with fuel consumption, this formula computation comes from FM 101-10-1 page 2-18.

(ON SLIDE #13)

(9) **IDENTIFY CONSTRUCTION REQUIREMENTS /RESTRICTIONS / LIMITATIONS:** After receiving the written estimation from the chiefs make one last check for any requirement that may have been over looked. For example, if working at night, is a floodlight going to be used? This is the catch all check.

(10) **CRITICAL PATH METHOD (CPM):** Is now made from Chiefs estimation. It is next to impossible to do the CPM without estimations. Work with the Chiefs to complete the CPM.

(11) **ISSUE THE ORDER:** To the Chiefs with the CPM.

ENGINEER CHIEF CHECK LIST:

START	COMPLETE	TASK
		CONDUCT SITE RECONNAISSANCE
		READ SURVEY (BLUE PRINT)
		GET SOIL ANALYSIS INFORMATION
		VIEW ENVIRONMENTAL IMPACT STUDY
		PLAN ORDER OF WORK

		MAKE ESTIMATIONS OFF OF MEASUREMENTS GIVEN IN BLUE PRINT
		MAKE MATHEMATICAL ESTIMATION FOR EQUIPMENT, PERSONNEL, TIME, MATERIALS
		RETURN WRITTEN ESTIMATION TO PROJECT OFFICER
		ISSUE THE ORDER TO THE NCO's TO EMPLOY EQUIPMENT

EXPLANATION OF CHIEF'S CHECK LIST

(ON SLIDE #14)

(1) **CONDUCT SITE RECONNAISSANCE:** After receiving the blue prints, you need to look at the area if possible to get a better idea of what equipment is needed to meet the mission. Also look for things that are not shown on the blue prints, trees, large boulders, and things that will slow production.

(2) **READ SURVEY (BLUE PRINT):** Read the blue print very carefully. Look for lines that may be barred like power lines, phone lines, sew-age lines, and so on.

(3) **GET SOIL ANALYSIS INFORMATION:** Most of the formulas use the information found in the soil analysis report. If you do not know what type of soil you are working in, it is next to impossible to determine what equipment will be used or the amount of time it will take to meet mission.

(4) **VIEW ENVIRONMENTAL IMPACT STUDY:** Make sure that everyone knows the areas that are protected. There are all kinds of plant and endangered species that depend on us doing our job correctly.

(ON SLIDE #15, 16)

(5) **MAKE WRITTEN ESTIMATIONS OFF OF MEASUREMENTS GIVEN IN BLUE PRINT:** Making a written estimation is done with the formulas previously shown in this class and in the production estimation class. If a formula is needed that was not in this class, you can fine other formulas in FM 5-434; when performing estimations, remember to view TE/LM2 reports, to determine what available equipment. If

external sup-port is needed, request external report. Order all supplies that may be needed.

(ON SLIDE #17)

(6) **RETURN WRITTEN ESTIMATION TO PROJECT OFFICER:** This can also be asked for in brief form, so be ready to make a presentation with the appropriate media.

(7) **PLAN ORDER OF WORK WITH THE CPM:** Look at mission requirements and restrictions of job site. Plan the work as to where it can be conducted without confusion or unsafe working conditions. Make daily schedules and bar charts at this point off of CPM or GANT Chart. Ensure to plan routes of travel.

(8) **ISSUE THE ORDER TO THE NCO's TO EMPLOY EQUIPMENT:** Once the order has been given by the officer, the chief relays the order to begin work. Remember to give a safety brief and map the way to the project.

NCO'S RESPONSIBILITIES:

START	COMPLETE	TASK
		REQUEST THE SUPPORT OF FUEL, OILS, AND OTHER REQUIREMENTS NEEDED.
		EMPLOY EQUIPMENT TO JOB SITE
		PERIODICALLY SUPERVISE CREWS AND TEAMS

(ON SLIDE #18)

EXPLANATION OF NCO's CHECK LIST

(1) **REQUEST THE SUPPORT OF FUEL, OIL, AND OTHER REQUIREMENTS NEEDED:** The formulas to get this information are at the end of this handout.

(2) **EMPLOY EQUIPMENT TO THE JOB SITE:** Moving the equipment is very dangerous. Be watchful of anything that may endanger personnel or damage the equipment. After all, you do not need to start behind schedule or get

someone hurt. Also make sure that tools, fuel, oil, and water that may be needed are taken.

(3) **PERIODICALLY SUPERVISE CREWS AND TEAMS:** Supervision is the NCO's main mission on the job site. He/she is the one who insures everything runs smoothly and safely.

(ON SLIDE #19)

TRANSITION: So far we have covered conducting the site billet responsibilities. Are there any questions?

OPPORTUNITY FOR QUESTIONS:

1. QUESTIONS FROM THE CLASS

2. QUESTIONS TO THE CLASS:

Q. Who is responsible for conducting the site survey?

A. Equipment/project officer

Q. Who is responsible for conducting the mathematical estimations?

A. Engineer Equipment Chief

(BREAK – 10 Min)

TRANSITION: Each billet in a typical engineer equipment platoon has responsibilities that pertain to conducting logistical estimations. Now that we have discussed those billet responsibilities, let's get into the actual mathematical process for conducting logistical estimations.

_____
_____
_____

(ON SLIDE #20)

2. LOGISTICAL ESTIMATIONS: (2 HRS)

(ON SLIDE #21)

a. Logistical estimations can be made up from check lists that are broken down into areas of responsibility by

rank. When all the questions from the check lists are answered, there are formulas to work out to determine quantity requirements.

(ON SLIDE #22)

FUEL CONSUMPTION FORMULA

X X X =

QTY OF EQUIPMENT X GALS/HR X HOURS/DAY X # OF DAYS = TOTAL GALS

(ON SLIDE #23)

NOTE: To get the gals/hour refer to the equipment TM for fuel consumption or to FM 5-35 par. 3-4. **FOR CLASS ROOM PURPOSES USE TABLE #1.**

(ON SLIDE #24)

TABLE #1 FUEL CONSUMPTION

EQUIPMENT	TYPE OF FUEL	GALS/HOUR
LOADER 624KR	DIESEL	6.00
MAC 50 (ATC)	DIESEL	6.00
GRADER (120M)	DIESEL	4.00
COMPACTOR(563E)	DIESEL	4.00
SCRAPER (621G)	DIESEL	10.00
DOZER (1150E)	DIESEL	6.00
DOZER (1155E)	DIESEL	6.00
DOZER (MCT)	DIESEL	8.00
BACKHOE (420E)	DIESEL	4.00

(ON SLIDE #25)

INTERIM TRANSITION: Now that you understand the formula for estimating fuel consumption, follow along with the example in your student handout during the demonstration.

INSTRUCTOR NOTE

Introduce the following demonstration.

DEMONSTRATION (1): (10 MIN) Have the students follow along as you (the instructor) demonstrates how to put the formula in a table for each piece of equipment and totals the estimated fuel requirement at the bottom of the table.

STUDENT ROLE: Students will observe the instructor and follow along with the example in the student handout. Students are encouraged to ask questions.

INSTRUCTOR(S) ROLE: The instructor will draw a table on the dry erase board. Fill in the formula at the top of the table and list all equipment from the example in the table.

QTY OF EQUIP	X	GALS/HR	X	HRS/DAY	X	NUMBER OF DAYS	=	TOTAL GALS
621G	3	X 10	X	12	X	10		= 3600
624KR	2	X 6	X	12	X	4		= 576
120M	2	X 4	X	12	X	13		= 1,248
								TOTAL GALS = 5,424 gals

1. **Safety Brief:** There are no safety concerns.
2. **Supervision & Guidance:** Students will perform each step as it is completed by the instructor. Ensure students are recording their data.
3. **Debrief:** Now that you've seen the process, you can complete the "What Have You Learned" problem in the book.

EXAMPLE: Total fuel consumption for 3 Scrapers (621G) working 12 hr/day for 10 days and 2 loaders (624KR) working 12 hr/day for 4 days, and 2 graders (120M) working 12 hr/day for 13 days.

(ON SLIDE #26)

Solution:

QTY OF EQUIP	X	GALS/HOUR	X	HOURS/DAY	X	NUMBER OF DAYS	=	TOTAL GALS
621G	3	X 10	X	12	X	10	=	3600
624KR	2	X 6	X	12	X	4	=	576

120M	2 **X**	4 **X**	12 **X**	13	**= 1,248**
				TOTAL GALS =	**5,424 gals**

(Same example problem as in the demonstration box.)

INTERIM TRANSITION: You have now seen how to put the formula into a table format. Now, solve the "What Have You Learned" problem in the student handout.

_____
_____
_____

INSTRUCTOR NOTE
Introduce the following practical application.

PRACTICAL APPLICATION (1). (30 MIN) Have the students complete the "What Have You Learned" problem in the student to determine the fuel required for 3 dozers (MCT) working 10 hr/day for 8 days, 2 tractors (420EIT) working 10 hr/day for 3 days, and 1 scraper (621G) is working 10 hr/day for 2 days.

PRACTICE: Students will solve the "What Have You Learned" problem in the student handout for practice using the fuel estimation formula. Upon completion review the practical application with the students.

PROVIDE-HELP: Observe the students and answer questions.
1. Safety Brief: No safety concerns for this exercise.
2. Supervision & Guidance: Be sure to follow the step by step directions covered in your student outline along with the instructor's supervision.
3. Debrief: Are there any questions or comments about estimating fuel requirements for various equipment. Accurate estimations for fuel and other logistical requirements for a successful mission will save, time, money and effort in ordering excess fuel (or not enough)and paying for fuel not used, plus effort and space required to transport unused fuel back to your shop.

(ON SLIDE #27)

WHAT HAVE YOU LEARNED?

PROBLEM: Figure the total fuel consumption for 3 dozers (MCT) working 10 hr/day for 8 days, 2 backhoes' (420EIT) working 10 hr/day for 3 days, and 1 scraper (621G) working 10 hr/day for 2 days.

(ON SLIDE #28)

QTY OF EQUIPMENT	X	GALS/HOUR	X	HOURS/DAY	X	NUMBER OF DAYS	=	TOTAL GALS
3	X	8	X	10	X	8	=	1,920
2	X	4	X	10	X	3	=	240
1	X	10	X	10	X	2	=	200
						TOTAL		2,360 GALS
QTY OF EQUIPMENT	X	GALS/HOUR	X	HOURS/DAY	X	NUMBER OF DAYS	=	TOTAL GALS

TRANSITION: Now that we have covered the formula for determining fuel requirements. Let's get into the other logistical requirements such as P.O.L.'s, water, and chow.

_____

_____

_____

(ON SLIDE #29)

b. **Petroleum, oil, and lubricant (POL)**

Once the total gallons of fuel have been determined using the previous fuel consumption formula, all POL requirements can be estimated using the fuel estimation as a guideline.

PETROLEOUM OIL LUBRICATES (POL) CONSUMPTION FORMULAS

(Information for POL is found in FM 101-10-1 page 2-11.)

(ON SLIDE #30)

STEP #1: 10WT THROUGH 50WT FORMULA

X =

.02 X TOTAL GALS OF FUEL EST = TOTAL OIL ENGINE (OE)

(ON SLIDE #31)

STEP #2: 80WT THROUGH 90WT FORMULA

X =

.005 X TOTAL GALS OF FUEL EST = TOTAL GEAR OIL (GO)

(ON SLIDE #32, 33)

STEP #3: GREASE

$$\frac{\text{EST METER HOURS}}{8} \quad X\ .25 = \text{POUNDS OF GREASE}$$

NOTE: The 8 stands for 8 hr on the meter, not hrs of day, the .25 stands for 1/4 lbs of grease for every 8 meter hours. To get the estimate hour meter hours, use this formula.

NUMBER OF EQUIPMENT X HR/DAY X NUMBER OF DAYS = EST METER HRS

NOTE: TO MAKE THINGS SIMPLE TOTALS ARE PUT IN THE CHART

ROUND OFF GALLONS BEFORE PUTTING IN TABLE

STEP #4: TOTALS

	10WT	30WT	40WT	50WT	80WT	90WT	GAA		
624KR									
ATC 50									
120M									
563E									
621G									
1150E									
1155E									
MCT									
420EIT									
TOTALS									

INTERIM TRANSITION: You have now seen how formulate fuel consumption. Now, follow along with the demonstration.

_____

_____

_____

(ON SLIDE #34)

INSTRUCTOR NOTE

Introduce the following demonstration.

DEMONSTRATION (2): (10 MIN) Have the students follow along as you (the instructor) demonstrates how to put the formula

in a table for each piece of equipment and totals the estimated fuel requirement at the bottom of the table.

STUDENT ROLE: Students will observe the instructor and follow along with the example in the student handout. Students are encouraged to ask questions.

INSTRUCTOR(S) ROLE: The instructor will draw a table on the dry erase board. Fill in the formula at the top of the table and list all equipment from the example in the table.

1. **Safety Brief:** There are no safety concerns.
2. **Supervision & Guidance:** Students will perform each step as it is completed by the instructor. Ensure students are recording their data.
3. **Debrief:** Now that you've seen the process, you can complete the "What Have You Learned" problem in the book.

(ON SLIDE #35)

EXAMPLE: Estimate the total petroleum oil lubricant (POL) required for two graders (120M) with an estimated fuel consumption of 1,248 gals for 13 days of operations. The graders will be working 12hrs per day.

STEP #1

.02 X *1,248* EST FUEL NEEDED = ***24.96* OR *25* GALS OF 30 WT *OE***

STEP #2

.005 X *1,248* EST FUEL NEEDED = ***6.24* OR *7* GALS OF 90 WT *GO***

STEP #3

$$\frac{\text{EST METER HOURS}}{8} \text{ X } .25 = 9.75 \text{ OR } 10 \text{ POUNDS OF GREASE}$$

2 GRADER X *12* HR/DAY X *13* # OF DAYS = ***312* EST METER HRS**

INTERIM TRANSITION: You have just walked through the process of estimating fuel. Now, solve the "What Have You Learned" problem in the student handout.

(ON SLIDE #36)

INSTRUCTOR NOTE
Introduce the following practical application.

PRACTICAL APPLICATION (2). (30 MIN) Have the students complete the "What Have You Learned" problem in the student handout to estimate the total POL required for 3- loaders (624KR) with a estimated fuel consumption of 3,500 gals, and 2 tractors (420EIT) with fuel consumption of 1,200 gals. The equipment will be working for 8 days at 7 hrs per day.

PRACTICE: Students will solve the "What Have You Learned" problem in the student handout for practice using the fuel estimation formula. Upon completion review the practical application with the students.

PROVIDE-HELP: Observe the students and answer questions.
1. Safety Brief: No safety concerns for this exercise.
2. Supervision & Guidance: Be sure to follow the step by step directions covered in your student outline along with the instructor's supervision.
3. Debrief: Are there any questions or comments about estimating POL requirements for various equipment. Accurate estimations for POL requirements, as with fuel, will ensure a successful mission by saving time, money and effort by ordering appropriate amounts of POL's, and effort and space required to transport unused POL's back to your shop.

WHAT HAVE YOU LEARNED

PROBLEM: Estimate the total POL required for 3- loaders (624KR) with a estimated fuel consumption of 3,500 gals, and 2 tractors (420EIT) with fuel consumption of 1,200 gals. The equipment will be working for 8 days at 7 hrs per day.

(ON SLIDE #37)

3 TRAMS (624KR)

.02 X 3,500 EST FUEL NEEDED = 70 GALS OE

.005 X 3,500 EST FUEL NEEDED = 17.5 OR 18 GALS OE

3 TRAMS X 7 HRS/DAY X 8 DAYS = 168 EST METER HRS

EST METER HRS

$$\frac{168}{8} \quad \text{X .25} = 5.25 \text{ OR } 6 \text{ LBS GAA}$$

(ON SLIDE #38)

2 420E IT

.02 X 1,200 EST FUEL NEEDED = 24 GALS OF OE

.005 X 1,200 EST FUEL NEEDED = 6 GALS OF GO

2 420E X 7 HR/DAY X 8 DAYS = 112 EST METER HRS

EST METER HRS

$$\frac{112}{8} \quad \text{X .25} = 3.5 \text{ OR } 4 \text{ LBS GAA}$$

(ON SLIDE #39)

	10WT	30WT	40WT	50WT	80WT / 90WT	GAA		
624KR	**70**	**70**			**18**	**6**		
ATC 50								
120M								
563E								
621G								
1150E								
1155E								
MCT								
420EIT	**24**	**24**			**6**	**4**		
TOTALS	**94**	**94**			**24**	**10**		

INTERIM TRANSITION: Now that we have covered the formula for determining POL requirements. Now let's take a look at estimating for water consumption.

_____

_____

_____

(ON SLIDE #40)

c. **WATER CONSUMPTION:** There are two categories to estimate for water consumption.

(1) Potable water: Fresh water that is used for drinking, personnel hygiene, laundry, and showers.

(2) Non-Potable water: Fresh water that is used for soil preparation / dust control and equipment.

(Note: Salt water can be used in some circumstances, however, salt water will cause equipment to rust more rapidly and may have adverse effects on soil preparation, particularly if combine with admix chemicals.)

(ON SLIDE #41)

TABLE #2 WATER CONSUMPTION GAL. PER PERSON/DAY OR EQUIPMENT/DAY

USES	***HOT***	***TEMPERATE***	***COLD***
DRINKING	3.0	1.5	2.0
LAUNDRY	2.1	2.1	2.1
SHOWERS	1.0	1.0	1.0
PERSONNAL HYGEINE	1.7	1.7	1.7
SOIL PREPARATION	1.0 GAL/SQ.YD	1.0 GAL/SQ.YD	1.0 GAL/SQ.YD
EQUIPMENT	1.0	1.0	1.0

NOTE: INFORMATION TAKEN FROM FM 101-10-1 TABLE 2-5 AND FM 5-434 TABLE 11-1. ***LAUNDRY TOTALS ARE BASED ON 1 LAUNDRY EXCHANGE/WEEK AND 1 SHOWER/DAY. THESE ARE MINIMAL USAGE REQUIREMENTS.***

(ON SLIDE #42)

FORMULAS

FOR SOIL PREPARATION AND DUST CONTROL (NON POTABLE WATER)

	X		X		=
TOTAL COMPACTED SQ YD (SQ.Y)	X	1 GAL/SQ YD	X	1.10 WASTE	= GALS REQ

(ON SLIDE #43)

FOR EQUIPMENT (*NON POTABLE WATER)*

	X	X	X	=
# OF EQUIPMENT	X 1 GAL/DAY	X EST DAYS	X 1.10 WASTE	= GALS REQ

(ON SLIDE #44)

SHOWERS *(POTABLE WATER)*

	X	X	X	=
# OF PERSONNEL	X TABLE 2	X # OF DAYS	X 1.10 WASTE	= GALS REQ

(ON SLIDE #45)

LAUNDRY *(POTABLE WATER)*

	X	X	X	=
# OF PERSONNEL	X TABLE 2	X # OF DAYS	X 1.10 WASTE	= GALS REQ

(ON SLIDE #46)

PERSONNAL HYGEINE *(POTABLE WATER)*

	X	X	X	=
# OF PERSONNEL	X TABLE 2	X # OF DAYS	X 1.10 WASTE	= GALS REQ

(ON SLIDE #47)

DRINKING WATER *POTABLE WATER*

	X	X	X	=
# OF PERSONNEL	X TABLE 2	X DAYS	X 1.10 WASTE	= GALS REQ

INTERIM TRANSITION: You have seen how to estimate for the various water consumptions. Now, follow along with the instructor's demonstration.

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_____
_____

(ON SLIDE #48)

INSTRUCTOR NOTE
Introduce the following demonstration.

DEMONSTRATION (3): (10 MIN) Have the students follow along as you (the instructor) demonstrates how to put the formula in a table for water requirements of each usage type.

STUDENT ROLE: Students will observe the instructor and follow along with the example in the student handout. Students are encouraged to ask questions.

INSTRUCTOR(S) ROLE: The instructor will use the dry erase board to formulate each equation as a display for the students to read and understand.

1. **Safety Brief:** There are no safety concerns.
2. **Supervision & Guidance:** Students will perform each step as it is completed by the instructor. Ensure students are recording their data.
3. **Debrief:** Now that you've seen the process, you can complete the "What Have You Learned" problem in the book.

EXAMPLE: Estimate the water consumption for 250 personnel working for 28 days in a hot climate. Each marine will take four showers and have their laundry cleaned four times during the 28-day operation. Compute the water requirement for 50 vehicles. You will be working on a road that is 4,000' long and 28' wide from ditch to ditch.

(ON SLIDE #49)

STEP #1 SOIL PREPARATION (NON POTABLE WATER):

A: ESTIMATE THE SQ YD OF THE ROAD.

$$\frac{4{,}000'\text{L} \times 28'\text{ W}}{9} = \textbf{12,444.44 OR 12,445 SQ.YD}$$

Round Up

B: FORMULATE

12,445 SQ.YD. X 1 GAL X 1.10 WASTE = **13,689.50**

OR 13,690 GAL

(ON SLIDE #50)

STEP #2 EQUIPMENT (NON POTABLE WATER):

50 VEHICLES X 1 GAL/DAY X 28 DAYS X 1.10 WASTE = **1,540 GAL**

(ON SLIDE #51)

STEP #3 SHOWERS (POTABLE WATER):

SHOWERS 250 MEN X 1.0 (TABLE 2) X 4 DAYS X 1.10 WASTE = **1,100 GAL**

STEP #4 LAUNDRY (POTABLE WATER):

LAUNDRY 250 MEN X 2.1 (TABLE 2) X 4 DAYS X 1.10 WASTE = **2,310 GAL**

(ON SLIDE #52)

STEP #5 PERSONNAL HYGEINE (POTABLE WATER)

HYGEINE 250 MEN X 1.7(TABLE 2) X 28 DAYS X 1.10 WASTE = **13,090 GALS**

(ON SLIDE #53)

STEP #5 DRINKING WATER (POTABLE WATER):

250 MEN X 3 GAL/MAN X 28 DAYS X 1.10 WASTE = **23,100 GAL**

(ON SLIDE #54)

	POTABLE WATER	***NON POTABLE WATER***
SOIL PREPARATION		**13,690**
EQUIPMENT		**1,540**
LAUNDRY	**2,310**	
SHOWERS	**1,100**	
HYGEINE	**13,090**	
DRINKING WATER	**23,100**	
TOTAL	**39,600**	**15,230**

INTERIM TRANSITION: We have just completed the example problem for estimating water requirements. Now, practice what you have learned in this practical application.

_____
_____
_____

(ON SLIDE #55)

INSTRUCTOR NOTE

Introduce the following practical application.

PRACTICAL APPLICATION (3). (30 MIN) Have the students complete the "What Have You Learned" problem in the student handout to estimate the water consumption for 75 personnel working for 60 days in a hot climate. During the 60-day operation showers will go once a day and laundries will be done 1x/week. Compute the requirement for 25 vehicles. You will be moving 4,500 SQY.

PRACTICE: Students will solve the "What Have You Learned" problem in the student handout for practice using the fuel estimation formula. Upon completion review the practical application with the students.

PROVIDE-HELP: Observe the students and answer questions.
1. Safety Brief: No safety concerns for this exercise.
2. Supervision & Guidance: Be sure to follow the step by step directions covered in your student outline along with the instructor's supervision.
3. Debrief: Are there any questions or comments about estimating water requirements for equipment or personnel. Accurate estimations for water requirements will ensure a successful mission largely in part due to the medicinal effects of cleanliness and hydration, but also a better construction product through compaction efforts.

PROBLEM: Estimate the water consumption for 75 personnel working for 60 days in a hot climate. During the 60-day operation showers will go once a day and laundries will be done 1x/week. Compute the requirement for 25 vehicles.

Compacted road measurements are:
6,099' LONG

24' WIDE

10" HIGH

(ON SLIDE #56)

SOIL PREP

$$\frac{6{,}099' \text{ L} \times 24' \text{ W}}{9} = 16{,}264 \text{ SQ YD}$$

16,264 SQ YD X 1 GAL X 1.10 WASTE = 17,891 GALS

(ON SLIDE #57)

EQUIPMENT

25 VEHICLES X 1 GAL/DAY X 60 DAYS X 1.10 = 1,650 GALS

(ON SLIDE #58)

LAUNDRY

60 DAYS ÷ 7 DAYS = 8.57 ROUND DOWN TO 8 LAUNDRY DAYS

75 PERSONNEL X 2.1 GAL X 8 DAYS X 1.10 = 1,386 GAL

(ON SLIDE #59)

SHOWERS

75 PERSONNEL X 1 GAL X 60 DAYS X 1.10 = 4,950 GAL

(ON SLIDE #60)

PERSONAL HYGIENE

75 PERSONNEL X 1.7 GAL X 60 DAYS X 1.10 = 8,415 GAL

(ON SLIDE #61)

DRINKING

75 PERSONNEL X 3 GAL/MAN X 60 DAYS X 1.10 = 14,850 GALS

(ON SLIDE #62)

	POTABLE WATER	*NON POTABLE WATER*
SOIL PREPARATION		17,891
EQUIPMENT		1,650
LAUNDRY	1,386	
SHOWERS	4,950	
HYGEINE	8,415	
DRINKING WATER	14,850	

TOTAL	29,601	19,541

INTERIM TRANSITION: Are there any questions or comments concerning the practical application. Now we will look at a very simple formula for determining the required number of meals ready to eat (MREs) for an operation.

_____

_____

_____

(ON SLIDE #63)

d. **Estimating for Meals Ready To Eat (MRE)**

(1) MRE's are the most common form of sustenance for troops in the field. Estimating for meals will ensure enough food for Marines while conducting field operations and are easy to transport.

(ON SLIDE #64)

FORMULA FOR MEALS READY TO EAT

PERSONNEL X 3 MEALS/DAY X NUMBER OF DAY = TOTAL NUMBER OF MEALS

TOTAL NUMBER OF MEALS ÷ 12 TO A CASE = TOTAL NUMBER OF CASES.

(ON SLIDE #65)

EXAMPLE: The unit's size is 175 personnel. Working 60 days, determine the quantity of meal ready-to-eat, by the cases.

(ON SLIDE #66)

175 PERSONNEL X 3 MEALS/DAY X 60 DAYS = **31,500** TOTAL NUMBER OF MEALS

TOTAL NUMBER OF MEALS 31,500 ÷ 12 TO A CASE = **2,625** TOTAL NUMBER OF CASES

(ON SLIDE #67)

PROBLEM: The unit's size is 30 personnel. Working 20 days, determine the quantity of meal ready-to-eat, by the cases.

(ON SLIDE #68)

- **30 PERSONNEL X 3 MEALS/DAY X 20 DAYS = 1800 TOTAL MEALS**
- **1,800 TOTAL MEALS / 12/CASE = 150 CASES**

INTERIM TRANSITION: We have just finished covering logistical estimations. Now, complete practical application worksheets 1, 2, and 3

_____
_____
_____

(ON SLIDE #69)

INSTRUCTOR NOTE
Introduce the following practical application.

PRACTICAL APPLICATION (4). (2 HRS 30 MIN) Have the students complete the worksheets #1,2,and 3. These worksheets are an accumulation of all logistical estimations for fuel consumption, POL, water usage, and MRE's.

PRACTICE: Students will complete the worksheet assignments.

PROVIDE-HELP: Observe the students and answer questions.
1. Safety Brief: No safety concerns for this exercise.
2. Supervision & Guidance: Observe the students, answer questions, and give guidance.
3. Debrief: Are there any questions or comments about estimating for logistical requirements. Accurate estimations ensures mission accomplishment, builds confidence in leaders through successful planning, and raises moral by providing logistical support to your Marines in forms of plenty of chow, drinking water, and showers.

(ON SLIDE #70)

TRANSITION: Are there any questions or comments concerning logistical estimations? If not I have some questions for you.

_____
_____
_____

OPPORTUNITY FOR QUESTIONS:

1. QUESTIONS FROM THE CLASS

2. QUESTIONS TO THE CLASS:

Q. What must be determined before POL consumption can be estimated?

A. Estimated fuel consumption

Q. What are the two classifications of water?

A. Potable and Non-potable

(ON SLIDE #71)
SUMMARY **(5 MIN)**

During this period of instruction, we have covered how to estimate for fuel, potable water, non-potable water, petroleum, oils, and lubricants, and meals. Accurate estimations for these essential items ensures mission accomplishment, builds junior Marines confidence in leaders through successful planning, and raises moral by providing logistical support to your Marines in the form of chow, drinking water, and showers and also allows for the equipment to continue running effectively throughout the project construction.

INSTRUCTOR NOTE
Ensure to collect all IRF's and safety questionnaires handed out.

(BREAK – 10 Min)

REFERENCES:

MCRP 4-11A, Vol 1 CSS Field Reference Guide

FM 5-434 Earthmoving Operations

FMFM 4-4 Engineer Operations

FM 5-34 Engineering Field Data

MCRP 4-11-8A Marine Corps Field Feeding Program

FM 5-430-00-1 Planning and Design of roads, airfields, and heliports in the theater of operations- Road Design

FM 101-10-1 Staff Officer's Field Manual