MULTIPURPOSE MACHINE GUN RANGE

OPERATIONS, MAINTENANCE AND MONITORING PLAN

CAMP EDWARDS, MASSACHUSETTS

Prepared by:

Massachusetts National Guard
Environmental & Readiness Center
Bldg. 1204 West Inner Road
Camp Edwards, MA 02542

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ACRONYMS & ABBREVIATIONS

AEC	Army Environmental Command
AO	Administrative Order
ASP	Ammunition Supply Point
BMP	Best Management Practice
cm	Centimeter
CSM	Conceptual Site Model
DoD	Department of Defense
DODIC	Department of Defense Identification Code
DPT	Director of Plans and Training
EMC	Environmental Management Commission
EPA	US Environmental Protection Agency
E&RC	Environmental and Readiness Center
FCC	Facility Category Code
FE	Facilities Engineering
HEPA	High-Efficiency Particulate Air
HMWMP	Hazardous Material and Waste Management Plan
IAGWSP	Impact Area Groundwater Study Program
IED	Improvised Explosive Device
Kg	Kilogram
L	Liter
m	Meter
MAARNG	Massachusetts Army National Guard
MassDEP	Massachusetts Department of Environmental Protection
MCL	Maximum Contaminant Level
MMCL	Massachusetts Maximum Contaminant Level
mg	Milligram
MIS	multi-increment sample
MMR	Massachusetts Military Reservation
NGB	National Guard Bureau
OMMP	Operations, Maintenance and Monitoring Plan

ACRONYMS & ABBREVIATIONS

P2	Pollution Prevention
RFMSS	Range Facility Management Support System
RSO	Range Safety Officer
SACON	Shock Absorbing Concrete
SAR	Small Arms Range
TCLP	Toxicity Characteristic Leaching Procedure
ug	Microgram
USAEC	US Army Environmental Command
XRF	X-ray Fluorescent

1.0 INTRODUCTION

Camp Edwards is an important training center for National Guard, Reserve Components, US Coast Guard, and law enforcement agencies throughout the northeastern United States. Located on Cape Cod, Camp Edwards contains threatened and endangered wildlife species, prime wildlife habitat, archeological sites, and culturally sensitive areas. Moreover, the Camp sits on top of the Sagamore lens, a sole-source drinking water aquifer for Upper Cape Cod. The northern 15,000 acres of Camp Edwards, the Upper Cape Water Supply Reserve/Training Area, are located within the recharge area of the aquifer.

Camp Edwards is committed to excellence in environmental protection, training, readiness, and management of training sites. Training facilities available at Camp Edwards include small arms ranges (SARs), training areas, a tactical training base, counter-Improvised Explosive Device (IED) lanes, land navigation courses, battle positions, observation posts, and maneuver roads and trails. These facilities support a variety of training activities that include small arms marksmanship. In particular, the SARs and practice grenade ranges support training and qualification in basic infantry skills with small arms weapons systems, including pistols, rifles, machine guns, and shotguns. The Massachusetts Army National Guard (MAARNG) will seek to continuously improve upon training practices that protect the future of the surrounding ecosystem, the aquifer, and maintain a viable ready military force.

1.1 Purpose

The purpose of this document is to provide an Operation, Maintenance and Monitoring Plan (OMMP) for the live fire Multipurpose Machine Gun Range (MPMG) range on Camp Edwards. The OMMP identifies the operations and management practices that MAARNG will implement at the MPMG. This plan identifies Best Management Practices (BMPs) that allow the employment of small arms (SAR) at Camp Edwards (Figure 1-1) in a manner that:

- Meets current and future training requirements, and
- Employs maximum feasible use of pollution prevention (P2) strategies to protect the Upper Cape Water Supply Reserve, which is managed as a Massachusetts Department of Environmental Protection (MassDEP) Zone II for public water supplies.

This plan is in concert with range management envisioned in the Camp Edwards Pollution Prevention Overview (Small Arms Range Supplement) (SAR P2 Overview) (MAARNG 2007) and is designed to be approved by the Environmental Management Commission (EMC) in accordance with the Environmental Performance Standards (EPSs). The potential pathways for migration of and potential receptors to contaminants from the ranges include surface and subsurface soils, surface water, groundwater, and air. Environmental management and P2 BMPs are selected and analyzed based on their ability to disrupt the pathways to potential receptors. The plan addresses the use of copper ammunition at the SARs on Camp Edwards.

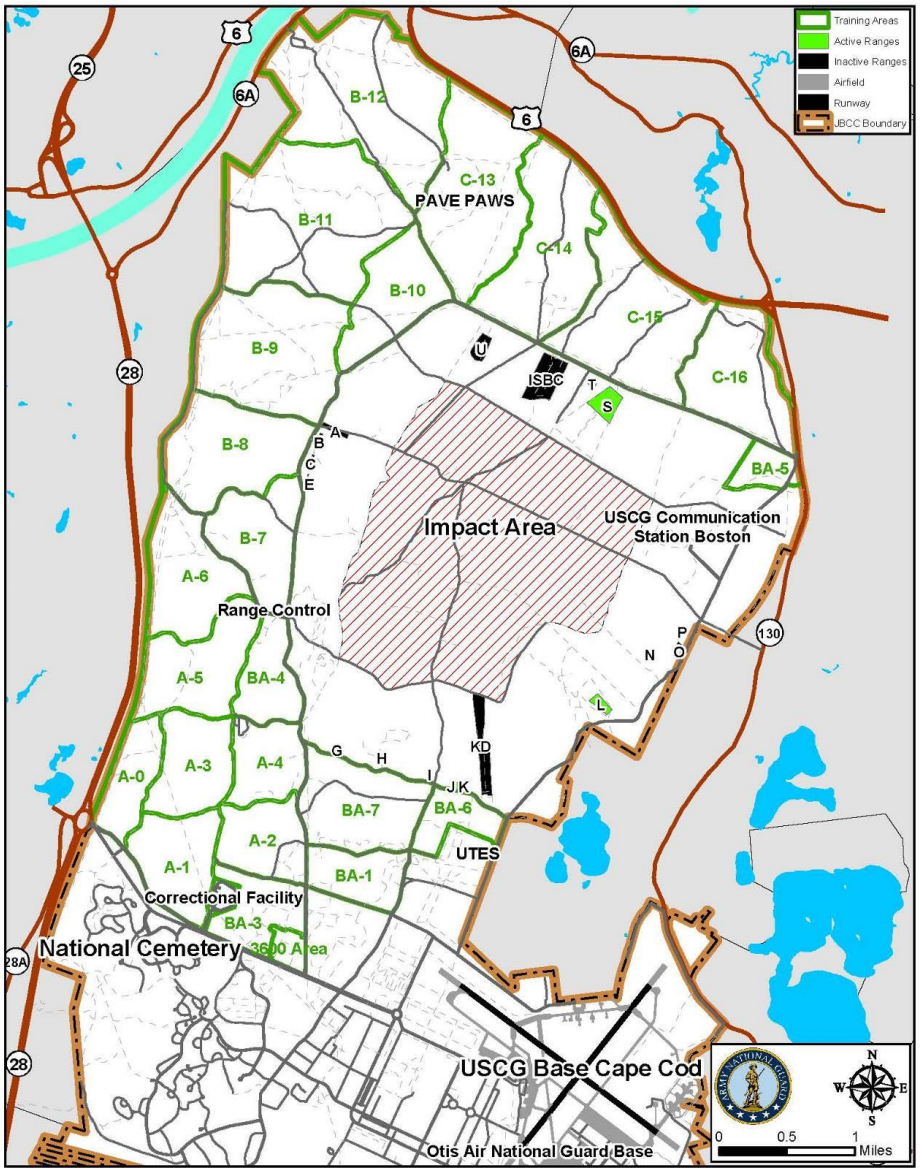

Figure 1-1. Camp Edwards Small Arms Ranges

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1.2 Scope

This OMMP is limited to the operation and use of approved small arms on Camp Edwards at the MPMG. It supports the use of the MPMG to meet current and anticipated requirements for small training exercises at Camp Edwards for military and civilian law enforcement users.

Although this plan identifies specific BMPs for the management of metals to sustain operations at ranges, the scope of the BMPs addressed is not limited to typical environmental management options. It also includes BMPs for safe and efficient administration, use, management, and maintenance. The BMPs recommended in this plan are based on range-specific conditions and are not intended to apply to all ranges at Camp Edwards or on other Army or Department of Defense (DoD) installations or ranges.

1.3 Primary Environmental Driver

For MAARNG to continue effective small arms training, a significant legal driver defines the path forward: Chapter 47 of the Acts of 2002, and its associated Environmental Performance Standards (EPSs) dated 6 April 2017. To fulfill the requirements of this legal driver, range specific OMMPs using the maximum feasible use of pollution prevention technologies are developed to prevent the migration of pollution to groundwater and other sensitive natural resources.

Chapter 47 of the Acts of 2002 codified the EPSs in a Memorandum of Agreement, ensuring permanent protection of the drinking water supply and wildlife habitats in the Reserve/Training Area while allowing compatible military training. It created the Environmental Management Commission (EMC) to oversee compliance with, enforcement of, and modifications to the EPSs and environmental laws and regulations within the Reserve/Training Area.

Range Control will coordinate training activities with environmental cleanup programs, the Impact Area Groundwater Study Program (Safe Drinking Water Act Site) and the Air Force Civil Engineer Center (Super Fund Site), working within the training area of Camp Edwards so that unnecessary loss of clean up or training time is avoided.

1.3.1 A Conceptual Site Model (CSM)

A CSM is a description of a site and its environment based on existing knowledge. It is used to develop site-specific hypotheses regarding the location and movement of environmental pollutants and any potential interaction (exposures) with humans and other environmental resources. The basic components of a CSM are the source, pathway, and receptor.

The SAR CSM evaluates exposure pathways for which BMPs must be selected and implemented to protect human health and the environment. The CSM supports the feasibility evaluation of BMPs such as alternative ammunition, projectile containment systems, and managed earthen berms. This CSM evaluates theoretical sources, pathways, and receptors of contaminants assuming no such BMPs are in place.

Figure 1-2 provides a pictorial representation of the general CSM for theoretical metals migration from a SAR with no BMPs in place. The pictorial CSM also depicts theoretical exposure via multiple media and mechanisms. It is used to identify the potential migration and exposure pathways for which BMPs must be developed, implemented, and continuously evaluated for effectiveness. Descriptions of potential sources, pathways, and receptors are provided in the following sections.

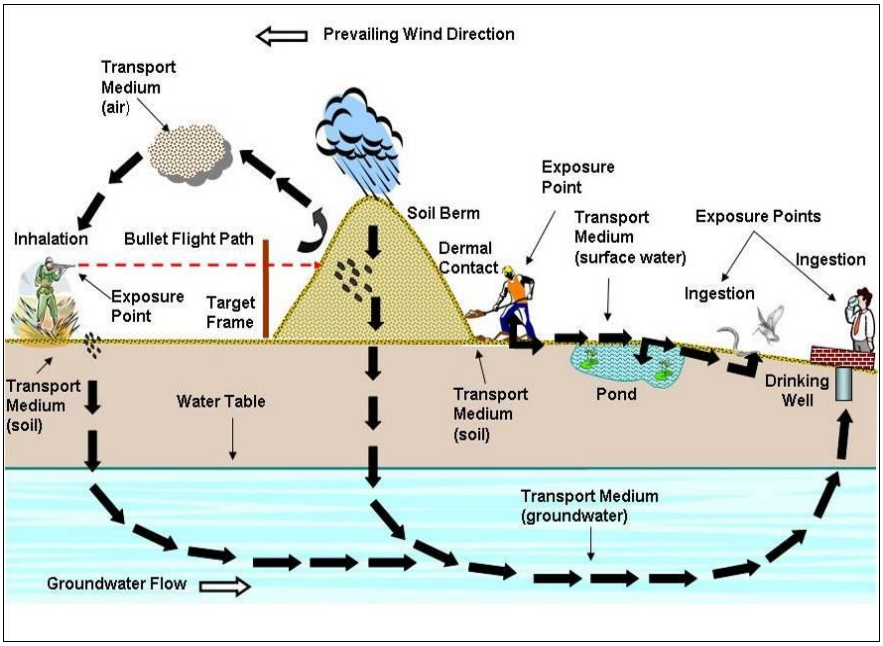

Figure 1-2. Pictorial a general CSM for a SAR with no BMPs in place

Based on the CSM, evaluations of SAR P2 BMPs conducted in the SAR P2 Overview, and the current assessment of training and management at the Ranges. The backstop and auxiliary berms provide a positive BMP for small arms training with copper ammunition as the projectiles can be contained and collected in accordance with EPS 19. As such, the MAARNG will continue to satisfy the EPSs to employ "maximum feasible use" of P2 technologies by:

- Implementing a system of range upgrades and BMPs that will either sever potential migration and exposure pathways or monitor environmental conditions to confirm that pathways remain incomplete.
- Implementing a "contain, maintain, and monitor" approach to Range BMPs that will include redundant methods to prevent pollution (e.g., bullet containment, metals removal, environmental monitoring) and methods to assess the effectiveness (e.g., inspections, sampling) of each system in each environmental media (e.g., soil and groundwater).

This approach will include:

- Managing metals at their source through containment and having a process for removal and recycling of projectiles.
- Monitoring potential migration pathways, such as surface soil, sub surface soils, and groundwater to evaluate whether contaminants are being transported.

- Implementing monitoring and maintenance BMPs to sustain the conditions that limit metals mobility. For example, monitoring the condition of the backstop and auxiliary berms, storm water management, maintaining healthy vegetation to prevent soil erosion, maintaining windbreaks to limit windborne metals transport, maintaining soil pH as conditions dictate to minimize corrosion, dissolution, and mobility of metals in the environment.

The BMPs selected and described in this OMMP will support the use of small arms on Camp Edwards in a manner that meets training requirements while protecting human health and the environment. As environmental conditions or the understanding of conditions change, it may become necessary to add or modify management actions. All such modifications to training activities or management actions will be fully coordinated with the EMC.

2.0 TRAINING DESCRIPTION

The MAARNG will conduct marksmanship training on the MPMG using DoD issued ammunition. Familiarization, zeroing, and marksmanship training may include the use of the M16 and M4 rifles and the M249 light machine gun with 5.56mm ammunition, the M240 machine gun with 7.62mm ammunition and in the future if approved the M60 machine gun and the M110 sniper rifle using 50cal ammunition. There is an Approved Munitions List for Camp Edwards that is coordinated and approved with the EMC's Environmental Officer (EO). All ammunition used on the ranges at CE must be authorized by Range Control.

Tracer ammunition will not be used without prior coordination and approval from Range Control. Armor piercing rounds, incendiary rounds, frangible rounds, plastic rounds, tungsten-based rounds, and ammunition for weapons systems other than those approved for use at the MPMG are PROHIBITED.

Other governmental agencies such as law enforcement, Federal Bureau of Investigation, and Drug Enforcement Administration may be able to acquire and use solid copper ammunition to satisfy training requirements. Any copper ammunition proposed for use by outside agencies must be approved by Range Control and notification of its initial use must be made to the EMC. This alternative ammunition will be contained, managed, and monitored in the same manner as the standard issue service ammunition at such time that it is approved for use.

2.1 Use Procedures and Restrictions

Camp Edwards Regulation TAGMA PAM (TAG Pamphlet) 350-2, an expanded range regulation for Camp Edwards, outlines extensive rules and procedures for the ranges and training lands on Camp Edwards. It notes that, "Users are to minimize environmental disturbance to protect the ecosystem as well as preserve the long-term value of our training site." Applicable subsections of this manual that apply to all ranges are:

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- Section 2-3, Safety and Environmental Briefing
- Section 2-5, Ammunition, Demolition, and Pyrotechnics Restrictions
- Chapter 3, Environmental Considerations
- General Training and Environmental Protection Approvals and Conditions

Range Control personnel are well-versed with this regulation and educate Range Safety Officers (RSOs) during the scheduling and issuance of ranges to using units. Camp Edwards personnel oversee and assist the training conducted on ranges and evaluates whether training is conducted in accordance with operational, safety, and environmental requirements.

Before occupying a Range, the unit must designate an RSO who will receive a safety briefing. The briefing informs units of the installation's restricted areas, misfire and malfunction procedures, communication procedures, and environmental considerations. Procedures related to environmental protection include:

- Weapons cleaning and breakdown will only occur within the covered mess and is prohibited to occur on the range floor.
- Cleaning/lubricating/preservative compound (CLP) and other weapons maintenance, cleaners, and lubricants will be used in a manner that minimizes the potential for spills and release to the

environment. When CLP containers are not in use, dependent upon their size, they will be kept on the soldier's person; or, when not in use these containers will have their lids on and should be placed in an appropriate secondary container like a drip pan or 5-gallon bucket. An appropriate container is one that will contain the product when the original container is compromised and/or if spilled.

- If cleaning materials are used on the range such as rags, patches, and other cleaning materials, they will be thrown away into a separate plastic trash bag inside of an issued 5-gallon bucket labeled Waste Weapons cleaning material. This bucket will then be inspected by Range Control and disposed of at the Satellite Accumulation Point by a trained Range Control employee.
- Units will use portable latrines.
- Conservation of ammunition will be enforced; "burning off" ammunition is not authorized. All rounds being fired down range must be in conjunction with a firing table.
- Soldiers will expend all ammunition from the designated firing positions within the firing lanes downrange to the targets.
- No weapons will be discharged:
    - Without permission from the Range Safety Officer; or,
    - Across firing lanes
- Portable barricades will be authorized with review and approval to ensure line of sight is maintained.
- The Range Control Officer (or authorized designee) will conduct periodic inspections of Ranges while they are operational to ensure that all users are following all applicable regulations, BMPs, SOPs, and safety requirements.
- Ensure that training is conducted in accordance with applicable procedures.

2.2 Training Capacity and Utilization

MAARNG will track and report the actual amount of munitions fired on the ranges annually. The following information will be collected each time the ranges are in use: total number of personnel trained, the weapon systems used, the type of munition, and the number of rounds expended (Appendix A, Training Facility Utilization Form). Each form will be turned in to Range Control at the end of the training day. This information will be included in the annual State of the Reservation Report.

Specific Requirement: *Range users will complete the Training Facility Utilization Form (Appendix A) and return it to Range Control at the end of the training day.*

3.0 ROLES AND RESPONSIBILITIES

To implement this OMMP, Camp Edwards will involve a team of professionals to manage training operations, facility maintenance, and environmental protection functions.

3.1 Training Site Commander

The Training Site Commander is responsible for the overall operation of Camp Edwards to include the immediate supervision, control, coordination, and safety of all Camp Edwards facilities and promotion of mission compatible and environmentally sustainable uses of Camp Edwards resources.

3.2 Director of Plans and Training

The Director of Plans and Training (DPT) at Camp Edwards is the primary advisor to the Training Site Commander on all matters concerning the safe, efficient utilization of Camp Edwards training facilities. Within the overall responsibility for Range Control operations, the DPT will:

- Identify and program for range modernization, operations, and maintenance requirements based on training load and doctrine; and
- Include requirements within the OMMPs for planning and budgeting actions as appropriate for sustainable ranges.
- Provide review, comments, and approval of the OMMPs.

3.3 Range Control Officer

The Range Control Officer is the primary representative of the Training Site Commander at Range Control and, as such, will:

- Coordinate range modernization requirements and oversee range modernization projects.
- Control access to ranges.
- Schedule and issue ranges to using units and clear/close out units upon completion of range use.
- Coordinate operation of ranges and oversee using units while training on Camp Edwards ranges.
- Enforce applicable guidance and regulations, range standard operating procedures, and safety requirements.
- Conduct periodic inspections of range conditions and identify requirements for repair and maintenance.
- Coordinate the repair of damage to range facilities (e.g., bullet containment systems).
- Collect Training Facility Utilization Reports from using units.
- Maintain range utilization, inspection, repair, and maintenance records.
- Coordinate necessary maintenance on Ranges to include:
    - Periodic metals removal.
    - Repair of damaged range facilities; and,
    - Repair of erosion damage to firing points, target areas, berm, and other range areas.
- Coordinate necessary maintenance on all training support facilities on ranges (e.g., bleachers, parking areas, buildings).

3.4 Environmental and Readiness Center

The Environmental and Readiness Center (E&RC) is the primary representative for the Training Site Commander to aid in implementing sustainable environmental management requirements. To support the

sustainment of small arms training at Camp Edwards in accordance with regulatory and legal requirements, the E&RC will:

- Be available to the DPT and Range Control Officer to oversee or review implementation of P2 or pollution control BMPs.
- Coordinate with the Range Control Officer and Facilities Engineering to support the recovery, management, recycling, or disposal of metals from ranges in accordance with DoD guidance and federal and state solid waste regulations, as applicable.
- Conduct periodic reviews of range OMMPs.
- Conduct quarterly reviews of required documentation per the OMMP.
- Coordinate with relevant MAARNG personnel, both full-time and part-time, to conduct periodic inspections of the ranges to ensure compliance with the BMPs.
- Coordinate required environmental sampling and monitoring on ranges; and
- Ensure coordination with the EMC and other appropriate federal, state, and local environmental and resource protection agencies to monitor small arms operations.

3.5 Ammunition Supply Point

Camp Edwards Ammunition Supply Point (ASP) is responsible for the care and storage of all munitions on the training base. The ASP is responsible for the issuing and turn in of all munitions and associated debris.

- Ensure that units firing on the Ranges draw only approved munitions for the range.
- Coordinate with Range Control on range utilization by reviewing the weekly Range Bulletin.

3.6 Sustainable Range Program

The purpose of the program is to ensure internal coordination and communication on all proposed training venues and to ensure compliance with the Camp Edwards MPMG OMMP. The Sustainable Range Program meets monthly or as determined by the Camp Edwards DPT or Administrative Officer.

The Sustainable Range Program includes:

- Camp Edwards Plans and Training Officer
- Range Control Officer in Charge (OIC)
- Facility Engineering OIC
- Environmental & Readiness Center Representative
- Integrated Training Area Management Program Manager
- Environmental Management Commission
- Additional staff as needed.

In regard to the small arms ranges, standing agenda items will include:

- Review of upcoming reporting requirements.
- Assessment of range management.
- Review and update of OMMP Plan.
- Analyze upcoming and proposed training events.

The Sustainable Range Program Coordinator, DPT, will brief the Camp Edwards Commander, who in turn will present issues at the monthly Chief of Staff (CoS) Call, Joint Force Headquarters, Massachusetts National Guard. As needed, the CoS will then elevate any issue to The Adjutant General's Office.

4.0 RANGE OPERATIONS

This section provides administrative guidance for the operation of ranges that is consistent with the purpose of this document. As such, guidance was developed to be implementable, protective of human health and the environment, and to be cost effective.

4.1 Range Access

The ranges are on Camp Edwards, a secure site, and gated. Trespassers are prohibited and hunting activities are not authorized on the Ranges unless otherwise authorized by Camp Edwards.

4.2 Range Scheduling

The ranges may be used for weekend training, inactive duty training, or during the two–weeklong annual training periods of MAARNG units. The ranges may also be utilized by law enforcement when authorized by Camp Edwards and Range Control. Deploying and Annual Training units have the first priority for scheduling training areas and ranges over Individual Duty Training and civilian requests. Per TAGMA PAM 350-2, Range Control schedules use of ranges based upon written input received from using units. Civilian agencies and units forward a written request to "Commander Camp Edwards, ATTN: Range Control" or use the Range Facility Management Support System (RFMSS) Program stating the dates and facility desired. The written request must include the anticipated number of personnel or other users occupying and using the range, the types of weapons to be used, the types of ammunition to be used (by DODIC), and estimated amounts of ammunition to be expended. A master schedule is available for viewing electronically via the RFMSS Program. To avoid conflicts, co-use of a previously scheduled area will be confirmed only after Camp Edwards Operations and Range Control receive written consent from the originally scheduled unit or agency.

4.3 Issuing and Clearing the Range

A unit representative will sign out a range from Range Control prior to occupation or use. Units must confirm the information provided at the time the range was scheduled (e.g., numbers of users, weapons, and ammunition). Each unit will receive a Range usage packet, which will include a Weekly Range Bulletin. This bulletin indicates training facilities scheduled, airspace requirements, local restrictions, and other information pertinent to units training at Camp Edwards. Commanders are responsible for distribution to subordinate units and appropriate personnel.

Specific Requirement: *Prior to occupation, or immediately thereafter, Range Control personnel, along with a unit representative, will inspect the range and report any deficiencies immediately to Range Control (Section 4.1).*

Camp Edwards Range Control personnel will conduct safety and environmental awareness briefings to designated Officers in Charge and RSOs prior to issuing the range. The briefing will cover the requirements of this document as well as requirements of TAGMA PAM 350-2, Range Safety and Trainers Guide, and safety requirements from applicable weapons manuals, field manuals, and technical manuals.

Upon completion of range firing, units will police their brass, ammunition containers, and packaging. Using units remove expended cartridge casings from the range, visually inspect them to remove any live rounds, and turn over the expended casings to the ASP. Other range residue such as weapons-cleaning materials and trash generated on the range will be collected on-site in a waste receptacle issued by Range

Control upon check-in. The waste receptacle will be returned to Range Control upon checkout. Range Control will establish a satellite accumulation point for wastes generated from weapons cleaning. Upon accumulation of 55 gallons of such waste, it will be disposed of per the Camp Edwards Hazardous Material and Waste Management Plan (HMWMP) and in compliance with state and federal solid and hazardous waste management regulations.

Specific Requirement: *When the range is cleared by Range Control all units must provide a copy of their score sheets from each firing order.*

Specific Requirement: *All units/organizations using a Range will complete a Training Facility Utilization Report (Appendix A).* This report summarizes the training activities conducted on the range and includes: the weapons systems, the type and amount of ammunition, the firing lanes that were used, and the types of vehicles present on the range. The report is provided to Range Control.

Specific Requirement: *After policing their brass and related range residue, Range Control personnel along with a unit representative will inspect the range using the Live Fire Range Inspection Form (Appendix B).* This form includes a review of the general order and condition of the facility, a visual check of erosion and vegetation on the range, and a visual inspection of the range berms. Blank copies of both of these forms will be included in the check-in packet distributed at Range Control. Upon clearing a range, each unit/organization will submit the completed reports to Range Control. The Range Control Officer or authorized designee will be available to answer any questions that arise during the visual inspection, but it is the unit/organization's responsibility to complete the range inspection. Once the range is inspected and cleared by Range Control personnel, via signature on the inspection forms, the unit or organization representative will report to Range Control returning any packets or equipment issued and to close out the hand receipt prior to clearing the range.

4.4 Oversight of Training Operations

Per Section 5.3, the Range Control Officer is responsible for oversight of Range operations. The Range Control Officer issues and clears ranges. He/she is the main point of contact for using units for range communications, usage requirements, and conflict resolution. The Range Control Officer will monitor all units on the Ranges to support compliance with this OMMP and TAGMA PAM 350-2. The Range Control Officer will schedule all required monitoring described in Section 11 and all maintenance described in Section 9.0.

Range Control will manage the ranges in accordance with this OMMP. The Range Control OIC is responsible for the distribution and implementation of this OMMP. The purpose of this plan is to provide policies, procedures and guidelines to all Camp Edwards Range Control Soldiers on how to properly inspect, manage and repair systems on each range. The Range Control Non-Commissioned Officer in Charge (NCOIC) will review and train the Unit NCOIC on the implementation and use of this plan. Drill Team NCOIC's will then train their assigned personnel upon assignment to Range Control. Newly assigned personnel will conduct on the job training with trained personnel. All Range Control Team Soldiers will review this OMMP.

Specific Requirement: *In the event that it is determined that any users of this OMMP are unable to comply with any part of this OMMP then the Range Control OIC must be notified within 24 hours upon this determination.*

The MAARNG environmental personnel will conduct site inspections at the request of Camp Edwards and/or EMC in order to provide support and guidance for environmental protection at the Ranges. The EMC agencies may inspect, announced or unannounced, the ranges and/or units for compliance with the OMMP.

Specific Requirement: *The EMC will be notified of range use through either the Range Control Weekly Range bulletin or email if range use was not posted in the bulletin.*

All personnel, including civilians, will contact Range Control before entering a Range. If conducting a range visit while the range is operational the environmental personnel will first identify themselves to the Officer or NCOIC when entering the range.

5.0 RANGE DESCRIPTION

The ranges at Camp Edwards will primarily be used in support of training with M16 and M4 rifles, the M249, M240 and the M9 Pistol. Lima range at Camp Edwards is used for practice grenade training using the M320 and the M203 40mm grenade launcher.

The following is a description of Enhanced Performance Round (EPR) ammunition and the MPMG range at Camp Edwards.

5.1 Enhanced Performance Round (EPR) Range

EPR ranges are those ranges, including the MPMG Range, that employ the use of the Enhanced Performance Round (M855A1) firing into a managed earthen berm. The EPR is a lead-free projectile round that consists of a steel penetrator, copper jacket and copper slug (Figure 5-1).

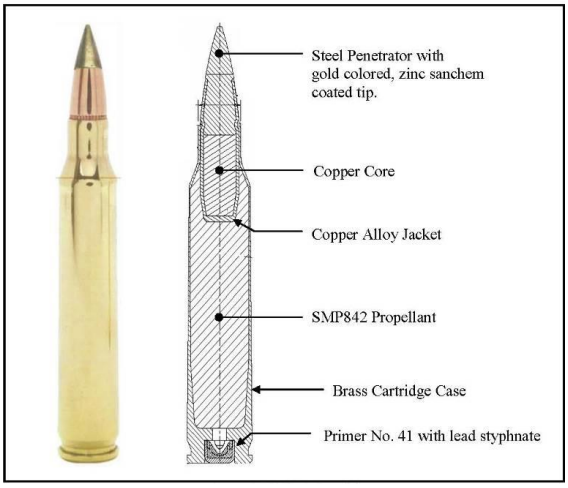

Figure 5-1. Enhanced Performance Round (M855A1)

The EPR round is a higher energy round that requires backstop berms to be enhanced in their construction to account for greater wear and tear. For the EPR ranges at Camp Edwards berm construction is as follow: SIT frontal berms, auxiliary berms, and backstop berms on the EPR ranges are constructed of sand and gravel sub-base, silty-sand base and vegetated topsoil material. A 36-inch layer of select fill sand and/or silty-sand (1/4-inch minus) is placed on the sand and gravel sub-base with a minimum of an additional 4 inches of vegetated topsoil (1/4-inch minus) covering the entire "berm". The sizes of the frontal, auxiliary, and backstop berms are dependent upon the existing site topography and in accordance with a conducted LOS. All berm material, except for the topsoil, is properly compacted and the topsoil is vegetated to maintain slope stability and longevity of the berm.

5.1.1 Multi-Purpose Machine Gun Range

In 2020-2022 the Massachusetts Army National Guard (MAARNG) has proposed to construct and operate a Multi-Purpose Machine Gun (MPMG) Range at Camp Edwards on the current Known Distance

(KD) Range (Figure 5-2). The new MPMG Range, including associated range facilities, would be constructed within established training areas and on an existing range footprint. Ground-disturbing activities would expand the existing KD Range that presently covers approximately 92 acres. The proposed MPMG Range improvements would expand the range another 90 acres. As of January 2021, the Multi-Purpose Machine Gun Range (MPMG) is in the National Environmental Policy Act process and Massachusetts Environmental Policy Act has been completed. If the project is approved, construction would begin in the federal fourth quarter of 2021.

The MPMG Range would include 8 firing lanes and would train and test soldiers on the skills necessary to zero, detect, identify, engage, and defeat targets. The primary weapons use on this range will be the M240, M249 machine guns and in the future if approved the M60 machine gun and the M110 Sniper Rifle.

As required, environmental monitoring protocols for the MPMG have been developed, coordinated, and approved by the EMC EO (see Section 9.0).

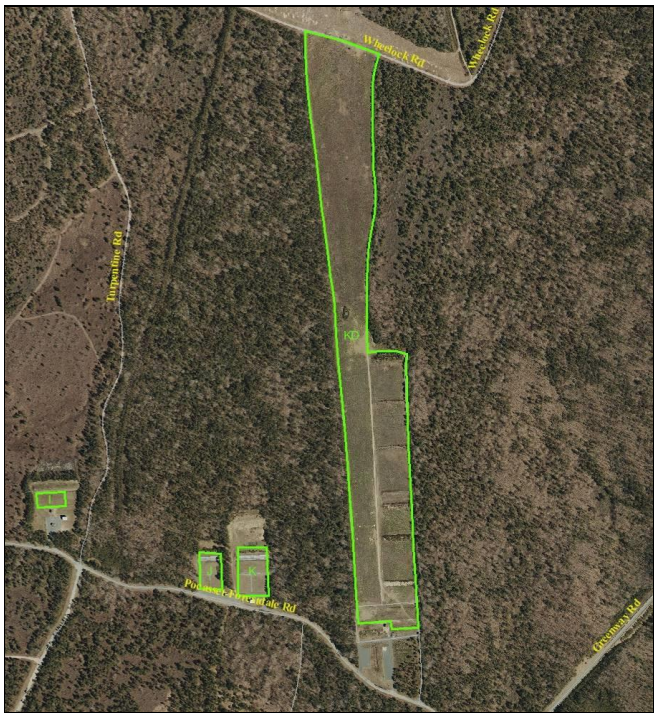

Figure 5-2. Current (2019) KD Range and Proposed Location of the Camp Edwards Multi-Purpose Machine Gun Range

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6.0 RANGE INSPECTIONS

The ranges will be inspected to ensure that pollution prevention and mitigation measures remain in place and are in good working order to ensure that environmental protection measures on the ranges remain operational. This section describes the different types of range inspections and the inspection frequency required. A form for each inspection is provided in the Appendices of this plan. Range Control maintains the inspection forms for administrative record keeping. Each type of inspection is described below and summarized in Table 6-1.

6.1 Live Fire Range Inspection Form (Pre and Post Range Inspection/Clearance)

This inspection form (Appendix B) is used for pre- and post-firing inspections, detailed inspections, and water level checks. The pre inspection will acquaint the range users with the facilities and the expectations associated with range use. The post inspection will ensure any change in range condition during unit use is documented for RCs awareness. The inspection will include the firing line, range floor, target line, and other important features of the ranges. The target frames/holders/lifters, firing positions, shed, and range tower must be in adequate condition to support unit training requirements. The detailed inspection will ensure all range structures, functional components, pollution prevention measures, and surrounding conditions are in acceptable condition for live fire. Range Control and range users will note the condition of each of these features and any specific deficiencies in need of repair.

Specific Requirement: *Each time a range is used for live firing, a pre- and post-range use inspection will be conducted by Range Control accompanied by the NCOIC or person in charge of the group using the range. The form provided in Appendix B will be used to document the pre- and post-range firing inspections and to note any changes or discrepancies. The report will be turned in to Range Control at the end of the training day.*

6.2 Detailed Range Inspections

Range Control and or the EMC will conduct Detailed Range Inspections. This inspection will aid in determining if pollution prevention measures remain in place and are in good working order and to ensure that environmental conditions on the ranges are not degrading. This inspection will occur as dictated by range conditions as reported on Live Fire Range Inspection Forms, after significant weather events, as requested by the EMC, but at least once a quarter through the Training Year. The form provided in Appendix B will be used to document the detailed range inspections.

Specific Requirement: *Detailed Range Inspections will be completed at a minimum of once a quarter and within **2 business days** of significant storm events.*

6.3 Unannounced Inspections

The EMC may conduct unannounced independent inspections of a range. All personnel, including regulatory personnel, must check in with Range Control prior to visiting the ranges. If inspections occur during range use, the inspector should identify themselves to the person in charge at the range and follow all safety procedures and requirements of the range users. The EMC may complete the form provided in Appendix B to document the inspections and provide the form to Range Control for inclusion in the inspection record.

Specific Requirement: *To ensure that all deficiencies identified during an inspection are addressed, Camp Edwards will provide a formal response to inspections reports submitted by the EMC.*

Table 6-1. Summary of Inspections

Frequency	Type of Inspection	Responsible office	Activity	Form to be used
Pre- and Post-Firing Inspection	Inspection of general range conditions and pollution prevention and mitigation measures	Range Control OIC or with person in charge of range users	Range Control and the range users inspect the range together before and after use, note any changes	Live Fire Range Inspection Form (Appendix B)
Detailed Quarterly and Significant Storm Event Inspection	Detailed inspection of Range	Range Control	Detailed inspection of Range to determine if any maintenance is required	Live Fire Range Inspection Form (Appendix B)
Unannounced Inspection	Visual inspection of range conditions, observe training	MAARNG or EMC	MAARNG or EMC visit the site after checking in with Range Control. Camp Edwards responds to inspection findings within 5 business days	Live Fire Range Inspection Form, (Appendix B)

7.0 RANGE MAINTENANCE AND MANAGEMENT

Camp Edwards will conduct periodic maintenance on the ranges to ensure system features and pollution prevention measures remain in adequate condition to support training requirements and to ensure that the BMPs function as intended. To the maximum extent possible, maintenance will be conducted during off-peak training periods. Preventative maintenance will be conducted as needed, regardless of other maintenance schedules.

When complete, all maintenance and repairs noted as needed during all inspections will be documented using the Range Maintenance Form (Appendix C) then filed in the maintenance log at Range Control.

All maintenance and field work conducted at the ranges will be conducted in accordance with a health and safety plan that specifically addresses the potential risks associated with metals exposure at the ranges (Appendix E, Executive Summary Industrial Hygiene Evaluation for Lead Camp Edwards, Bourne, MA, 20-21 October 2008)

7.1 Erosion

Erosion is the displacement of soil by wind or water or any movement in response to gravity or human activity. Most ranges are generally flat, apart from the range berms. The potential causes of erosion on the ranges is a lack of vegetation, animal disturbance, and human activity and disturbance. Eroded areas will be repaired and, if necessary, to prevent reoccurrence, measures will be taken to stabilize the soil. Should an area of significant erosion of a berm serving as a projectile backstop be identified, repairs will be made as soon as feasible. Should such erosion be identified immediately prior to a firing event, the lane, lanes, or range impacted will not be used until repairs are made. Range specific erosion requirements will be discussed below in Section 8.

7.2 Vegetative Cover and Windbreaks

Healthy vegetative cover prevents erosion and provides organic material that can aid in reducing metals mobility. Camp Edwards will plant, as needed, a Natural Resource Office-approved seed mix to provide vegetative cover on berm areas and range floors. To establish proper vegetative cover on the ranges all seeding and planting should occur early spring and or fall (April and/or October) as conditions permit.

Forested buffers, serving as natural windbreaks and noise abatement, will be maintained around the ranges. Camp Edwards will trim tree limbs on the range boundaries. Any diseased or dead trees may be removed, as advised by the MAARNG's Natural Resource Program/Environmental Office.

7.3 Fire (Range Fire) Management

Ranges should be managed to reduce the potential for wildfire. Mitigation measures that can be taken include keeping the range floor and berms consistently mowed, vegetation management at range boundaries, i.e., thinning trees and understory, and keeping clear access for range maintenance and emergency vehicles. Tracers will not be used without approval from Range Control and notification to JBCC FD and the Wildland Fire Program Coordinator at Camp Edwards.

If a range is to be used during hazardous fire conditions, i.e., Red Flag day's, then a fire engine and qualified engine operator / firefighter should be onsite during range operations or while the range is "hot".

Commented [MC4]: Jake and Joel what should be here?

Soldiers observing a fire on a range or in the Camp Edwards Training Area will immediately cease fire and contact Range Control giving a six-digit grid coordinate and/or a range or training area designation if possible. Do not leave the scene of a fire until given permission by Range Control or if providing for safety. No one will go down range on any range or enter the impact area to fight fires without the approval of Range Control.

7.4 Storm Water Management

Stormwater is water that flows over the ground when it rains or snows. When precipitation falls on vegetated areas, most of the water soaks into the ground rather than running over its surface. When precipitation falls on impervious surfaces, such as driveways, sidewalks, and streets, it can't soak into the ground, so it runs over the surface. This run-off either flows directly into a waterbody or storm drain, which eventually discharges into a stream or other water body. As stormwater runs over the ground, it picks up pollutants, such as fertilizer and heavy metals, and carries these things as it flows into discharge areas. These pollutants can contaminate drinking water supplies, fish and wildlife habitat, and swimming facilities. Stormwater can also cause erosion and flooding problems. For the ranges at Camp Edwards stormwater is not a significant management issue as most precipitation runs off and is absorbed into the environment as sheet flow. Range-specific stormwater requirements will be discussed below in Sections 8.

7.5 Soil pH

Lead styphnate and antimony sulfide are components of the propellant primer in the bullet cartridges that are used on the ranges. Therefore, concentrations of lead and antimony may accumulate on the range floor over time, especially near the firing line that can be impacted by soil pH As of 2017, lead and antimony concentrations near the firing lines of other ranges remain at background concentrations after approximately 10 years of use. However, with machine guns being used on the proposed MPMG Range periodic firing line monitoring for Antimony, Copper, and Lead will take place.

When pH levels, a measure of acidity, are near neutral (6 to 8.5), the corrosion and solubility of lead and other metals is minimized, and solid lead remains relatively unavailable for migration through the soil. Therefore, neutral pH in soil will help prevent lead migration on the ranges. pH levels above 8.5 or below 5.5 tend to increase the potential for lead and antimony solubility and migration.

The soils at Camp Edwards have a pH range from 5.5-8. This pH range along with soil type at Camp Edwards serve to limit metals mobility through soil with depth. If monitoring should show a trending increase or an action level exceedance of metals (antimony, copper, and lead) the pH of the soils will be measured as an investigation measure. Soil pH will be taken when the ranges are soil sampled (see Section 9).

As per EMC/Science Advisory Council recommendations, further addition of lime has been suspended until further notice as it is possible to increase metal mobility by adjusting pH.

8.0 RANGE MAINTENANEC AND METRICS

Based on the results of inspections, monitoring, and impacts of use Camp Edwards will initiate maintenance actions as identified and in accordance with timelines outlined in this document.

Camp Edwards will conduct periodic maintenance on ranges with earthen backstop and auxiliary berms to ensure design features and pollution prevention measures remain in adequate condition to support training requirements and ensure that the BMPs (Capture and Containment) function as intended. The primary BMP of concern is the capture and containment of projectiles via earthen berm (SIT, backstop, and auxiliary berms). These berms must be maintained to be functional. Figure 8-1 shows an auxiliary berm that has ceased to function because of normal wear and tear, erosion, and lack of maintenance. To the maximum extent possible, standard maintenance will be conducted during off-peak training periods (between October and April). Preventative maintenance will be conducted as needed, regardless of other maintenance schedules. All maintenance and repairs conducted on the ranges will be documented using the Range Maintenance Form (Appendix C) and then filed in the maintenance log at Range +Control.

Commented [MC5]: Add picts of Sierra Range auxiliary berms

Make Fig 1 and this one Fig2

The condition of the bullet capture and containment systems (berms, and auxiliary berms) will be closely monitored, and necessary maintenance and repairs will be conducted in accordance with the metrics outlined below.

8.1 EARTHEN BERM MAINTENANCE AND METRICS

Managed earthen berms are used for projectile containment at the MPMG Range. Camp Edwards will conduct periodic maintenance on ranges with earthen backstop and auxiliary berms to ensure design features and pollution prevention measures remain in adequate condition to support training requirements and ensure that the BMPs (Capture and Containment) function as intended. The primary BMP of concern is the capture and containment of projectiles via earthen berm (SIT, backstop, and auxiliary berms). These berms must be maintained to be functional. Figure 8-1 shows an auxiliary berm that has ceased to function as a result of normal wear and tear, erosion, and lack of maintenance. To the maximum extent possible, standard maintenance will be conducted during off-peak training periods (between October and April). Preventative maintenance will be conducted as needed, regardless of other maintenance schedules. All maintenance and repairs conducted on the ranges will be documented using a Range Maintenance Form (Appendix C) and then filed in the maintenance log at Range Control.

Figure 8-1. Auxiliary berms 50-meter target line at Sierra Range, Camp Edwards, Massachusetts.

Figure 8-2. Auxiliary berm (facing up range-North) that has ceased to function as intended Sierra Range, Camp Edwards, Massachusetts.

8.1.1 Erosion

Of particular importance, erosion is a major concern at the copper only ranges with SIT, backstop, and auxiliary berms that must be maintained and monitored regularly to ensure BMP (berm) integrity. Erosion is the displacement of soil by wind or water or any movement of soil in response to gravity or human activity. Eroded areas will be repaired and, if necessary, to prevent reoccurrence, measures will be taken to stabilize the soil. A soil stock for SIT, backstop, and auxiliary berm maintenance should be available to avoid range down time.

Specific Requirement: *Should an area of significant erosion of a berm serving as a SIT, backstop, or auxiliary berm be identified, repairs will be made as soon as feasible. Should such erosion be identified immediately prior to a firing event, the lane or lanes impacted will not be used until repairs are completed.*

8.1.2 Storm Water

Stormwater is not a significant management issue at the MPMG range as most precipitation runs off and is absorbed into the environment as sheet flow.

Specific Requirement: *The drainage swales will be kept free of vegetation and the proper grade will be maintained to conduct surface water flow away from the ranges.*

8.1.3 Earthen Berm Periodic Metals Removal

The ultimate way to avoid metals, from projectiles, mobility in soil and water within the environment is by removing them from the receiving system or earthen berm. Periodic metals removal for the SARs on Camp Edwards will take place as active mitigation and management measure for the small arms ranges.

Specific Requirement: *The MAARNG will track projectiles fired per lane so that projectile loading within bullets pockets can be evaluated for potential fragmentation.*

For **the MPMG Range** the MAARNG will periodically remove projectiles from any identified projectile impact areas, in accordance with this document, as visual inspections identify concerns with the integrity of the berm and when ricochet and or fragmentation issues may become a concern. At the MPMG Range there may be an increased frequency of projectile metals removal due to the fact that the ranges will be used for machine gun fire.

Projectile pockets will be checked monthly to determine if fragmentation is occurring. Range Control will examine the projectile pockets for fragmentation each month in coordination with the E&RC and the EMC. As requested by the EMC, and in coordination with the E&RC and Range Control, select projectile pockets will be excavated by hand using a shovel to determine if fragmentation is occurring within the projectile pockets. If no firing occurs during a particular month no check will be conducted. The goal of this action is to determine the extent of time projectiles may remain in place with little to no projectile fragmentation. Fragmentation causes smaller particle size that translates to a larger overall surface area for water to make contact; therefore, there is a greater potential for metals leaching. In coordination with the EMC, the MAARNG will develop timelines and a plan for range projectile removal.

Commented [MC6]: We should restate or redefine this to be more accurate.

MAARNG or its representative will excavate and remove projectiles from berms and/or projectile impact areas with appropriate equipment to minimize environmental impact to the surrounding area. Material excavated from a range will be stockpiled in an agreed upon area, on or off site, for removal of projectile metals. The stockpiled material will then be screened using a 1/4-inch portable soil screener or compatible system that is effective in screening out the metal. After all stockpiled material has been screened for metals the recovered metal will be recycled appropriately. The screened soil will then be used to reshape/reconstruct the existing berms and/or projectile impact areas as needed.

The total mass of metals removed from the range will be compared with the total computed mass loading of bullets fired on the range from the Training Facility Utilization Reports (Appendix A). This comparison is indicative of the general efficiency with which the projectile removal process eliminates the source of metals (projectiles) on the ranges.

As processes are refined and information are determined it will be used in the range adaptive management program integrating pollution prevention, BMPs, and timing of projectile recovery and recycling.

Specific Requirement: *Prior to work beginning, contractors or in-house personnel conducting this work will coordinate with Range Control, the MAARNG Environmental Office, and the EMC to ensure that the proper environmental protections are in place.*

This process must be conducted with appropriate environmental and personal protections as required. At a minimum, secondary containment must be placed in all active work areas where metal removal will occur. Dust control must be considered during planning and implemented during removal actions as

determined by weather (wind) and removal operating conditions. Also, this process must not be conducted during precipitation events or high winds. While range maintenance is a necessary and ongoing process, major range maintenance activities will be designed, scheduled, and implemented so as to minimize or prevent interruption of training on the range during the peak training season (March through October).

Specific Requirement: *The MAARNG, along with the EMC, will inspect the berm(s) and any projectile impact areas annually to determine when the recovery of metals from the berms will be needed.*

The frequency of recovery of projectiles will depend on the condition of the range, i.e., when the berm is identified as needing to be repaired or reshaped, when the density of projectiles in the bullet pocket(s) suggest increased fragmentation or ricochet may occur, or there are other indicators that ricochet is occurring, such as spent rounds on the ground. Given the nature of the close grouping of shots when zeroing a weapon, the core of bullet pockets will likely need bullet removal sooner than the rest of the berm. It may also be the case that specific lanes and/or target lines will only need attention as opposed to a range wide action. Occasional ricochets that result in rounds landing outside of the containment berms is expected and every effort to minimize and correct these occurrences shall be taken.

Specific Requirement: *Projectiles will be removed after 500,000 rounds have been fired, or every 5 years, whichever is first, unless there is concurrence on an alternative schedule by the EMC.*

Commented [MC7]: Need to look at data for S Range, bullets fired and do some rough measurements of bullet density at several areas. We can then make a general timing determination.

Specific Requirement: *The MAARNG will notify the EMC of the scheduled work at least 2 business days prior to starting the scheduled work.*

9.0 ENVIRONMENTAL MONITORING

Of primary importance to sustainable ranges is the monitoring of environment to avoid potentially harmful impacts to habitat and groundwater. As coordinated with the EMC and required, Camp Edwards will monitor groundwater, , sub surface soils, and surface soils at the active ranges. Monitoring will occur in the summer or fall (August/September/October) and occur every three years for groundwater and soil. Samples will be analyzed for antimony, copper, lead, chloride, sulfate, calcium, magnesium, phosphate, potassium, sodium, pH, alkalinity, specific conductance, dissolved organic carbon and oxygen where appropriate for the media being sampled. The results will be used to track the accumulation of lead and antimony from the propellant primer formulation used in the bullets and those constituents that may make these metals more mobile in soil to determine when range maintenance activities are needed to protect the environment and promote range sustainability. All sampling conducted at the ranges will be done in accordance with a health and safety plan that specifically addresses the potential risks associated with lead/antimony exposure at the range (Appendix D).

Commented [MC8]: So inline with the Ad Hoc meeting the question is Do metals accumulate at the firing line due to propellant of bullets? So in reality monitoring is only needed at the firing line of machine gun ranges and not down range where copper bullets are being used. The data is there to support this idea. If lead antimony free primers come into play then this should be revisited.

Specific Requirement: *Camp Edwards and its sampling contractor will notify the EMC, at least **2 business days** in advance of any sampling event so that they can observe the sampling event and conduct split sampling if necessary.*

Figure 9-1 indicates the locations of groundwater monitoring wells and surface soil sampling areas on the range.

Commented [MC9]: Need MPMG image. Use modeling image.

Figure 9-1. Locations of groundwater monitoring wells surface soil sampling areas on the range.

9.1 Data Reporting

Data validation will be completed at the Tier I and Tier II level for all data. Ten percent of the data will be validated at the Tier III level.

Specific Requirement: *Un-validated (i.e., draft) data will be forwarded to the regulatory agencies within **2 business days** of receipt by the MAARNG. The results of sampling will be compared to the action levels presented in Tables 9-1, 9-2, and 9-3 and any increase in concentrations will be noted in the results submittal. If an unexpected result exceeds an Action Level specified in Tables 9-1, 9-2, or 9-3, resampling may be conducted to confirm the result. Any concentrations exceeding the action levels will be noted in the results submittal and a proposed plan for re-sampling, if needed to confirm an exceedance, will be included pending data validation. Validated data will be forwarded to the regulatory agencies as soon as feasible within **7 business days** of receipt. Validated data is normally received by the MANG 4-6 weeks after sampling occurs.*

9.2 Groundwater

Figures 9-1 indicates the locations of the groundwater monitoring wells on the range. Two groundwater wells will be sampled on the MPMG; MW-474S will be sampled for GW representing the firing line (lanes 1 and 2) and MW 60 for GW representing the mid-range targets (lane 6). Samples from the two groundwater wells on the range will be taken annually for 5 years after the first year of training (2023) to establish a clear baseline of metals concentrations in groundwater beneath the active range. Using the baseline data and in coordination with the EMC EO an alternate sampling schedule can be established

thereafter. A down range monitoring well will be selected or established if the MPMG can expand to two lanes to 1500 meters in support of 50 caliber machine gun and sniper training.

Groundwater samples will be filtered and analyzed for antimony, copper, lead, chloride, sulfate, calcium, magnesium, phosphate, potassium, and sodium, by Method SW6020A, and pH, alkalinity, specific conductance, and dissolved organic carbon and oxygen.

Specific Requirement: *Filtered samples will be collected to determine if detected metals are dissolved in groundwater. The groundwater samples will be analyzed for antimony, copper, lead, chloride, sulfate, calcium, magnesium, phosphate, potassium, and sodium using method SW6020A, and pH, alkalinity, specific conductance, and dissolved organic carbon and oxygen.*

Typical well construction details of a groundwater monitoring well are shown below on Figure 9-2.

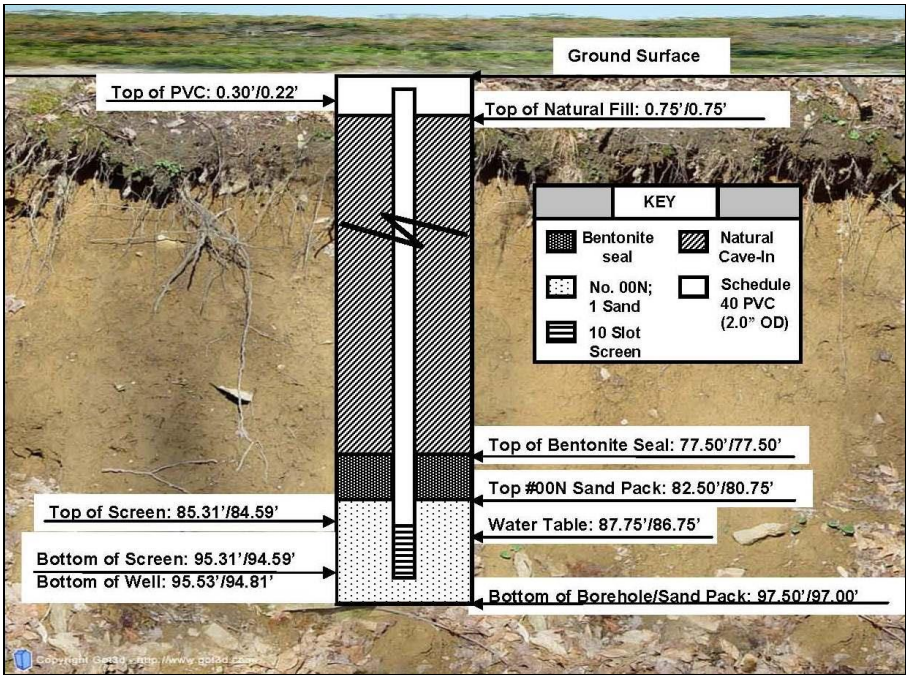


Figure 9-2. Groundwater Monitoring Well Typical Construction Details

9.3 Porewater (Lysimeters)

9.4 Surface Soil Sampling

Camp Edwards will sample surface soil on the range after the range is initially constructed to determine baseline soil conditions. There after the range will be sampled every three years with samples collected in August/September/ October. All samples will be analyzed for antimony, copper, lead, chloride, sulfate, calcium, magnesium, phosphate, potassium, sodium, pH and alkalinity. Figures 9-1 shows the locations of the soil sampling areas on the range.

A 100-point multi-increment sample (MIS) will be collected from a depth of 0-3 inches from each sample area according to Cold Regions Research & Engineering Laboratory (CRREL) recommendations. All samples are to be collected using a systematic random sampling method. As per CRREL recommendations, this requires dividing the sample area into exactly as many sub-areas as the number of increments required for the sample. One increment is collected from each sub-area. The same relative location should be used for each sub area. For example, if the center of the first sub-area is used to collect the first soil increment, the center of each following sub-area should also be used until the sample is complete. Samplers will use a plug extractor to systematically collect representative samples from each grid and will not concentrate samples in one portion of the sampling grid.

Two replicate samples, in addition to the primary sample, will also be collected for quality assurance purposes from the sample area closest to the firing line each time soil samples are collected from a range. Replicate samples should be collected in the same way as the primary sample, but from different locations within the sub-areas. Replicates can be collected at the same time if practical. Decontamination between replicates or between sub-areas is not necessary since all three samples are characterizing the same sample area. Decontamination is required before beginning to sample a different area. The relative percent difference (RPD) of the three samples will be calculated and the result will be included in the draft data submittal. If the RPD is greater than 25%, the soil sample collection protocols should be reconsidered to achieve better repeatability of the field sampling method. This could include either collecting more sub-samples in each sample to be analyzed or using smaller sample areas. Revised sampling methods will be determined in conjunction with the regulatory agencies.

Samples will be prepared for analysis using CRREL standard methods for mixing and drying. The samples will be ground to a fine powder prior to digestion. From these samples, 2 grams of homogenized soil will be removed and digested according to method 3050B Nitric Acid Digestion for Soils. The samples will be analyzed for copper, lead, and antimony using method SW6010B.

The results will be used to track the accumulation of lead and antimony from the propellant primer formulation used in the bullets and those constituents that may make these metals more mobile in soil to determine when range maintenance is needed to reduce the metals concentrations if necessary.

9.4.1 Sampling

Camp Edwards will sample surface soil as described by the methods above.

For the **MPMG Range** the firing line and range floor will be sampled as follows:

For the firing line a 100-point multi-increment soil sample (MIS sample) will be collected from soil in front of the firing line. The sample area will encompass the entire firing line and extend from the firing positions to 10 meters in front of the firing positions (Figure 9-1).

Commented [MC10]: Update to show soil sampling area.

A five-point composite sample will be collected in areas of the range floor where run off from berms could cause concentrations of copper to accumulate. The areas of highest deposition will likely be at the foot of the backstop berms. Therefore, 5-point composite samples will be collected at:

- The base of the 50-meter (bravo) backstop berm on Lane 4.
- At the base of the 100-meter backstop berm on Lane 6, and
- At the base of the 320-meter berm beneath the 150/300-meter bullet pocket associated with Lane 4.
- Or as jointly determined elsewhere on the range based on visual observations.

Commented [MC11]: Mike update with lanes and target distance.

- For the **MPMG**, Camp Edwards will sample surface soil on the range between the firing line and the toe of the first berm at lanes 1 and 5. Sampling type and timing is subject to change-based sampling results and coordination with the EMC EO. The range floor is divided into 6 sample areas each approximately ? square feet. The first sample area (SSMPMGRNG001) will begin at the firing line and subsequent areas will progress downrange to the berm (SSMPMGRNG006), Figure ?. A 100-point MIS will be collected from a depth of 0-3 inches from each sample area. Sampling locations will be coordinated with the EMC before sampling occurs.

Samples will be collected and screened using an XRF meter in the fall (August/September/October). Each sample area will measure approximately 3 feet by 3 feet and the 5 sub-samples will be collected to a depth of three inches. The sub-samples will be placed in a plastic bag and thoroughly mixed in the bag by hand. Any visible pieces of copper should be removed. Then, an XRF meter will be used to determine the copper concentration of the soil. Three readings will be taken in different parts of the sample and the average of the three readings will be used for comparison to the action levels specified in section 9.6.1 below to determine when range maintenance is needed.

Commented [MC12]: Check referenced section.

9.5 Subsurface Soil

If surface soil sampling shows an increasing trend or an exceedance of the OMMP action levels for soils, then subsurface split core soils sampling may be conducted as determined in coordination with EMC EO.

Range specific locations of subsurface soil sampling will be dictated by the range layout and be conducted in areas where metals are anticipated to accumulate. Subsurface soil will be sampled from selected areas on the backstop berm and at representative range floor locations.

Subsurface sampling will provide information regarding the movement of metals (antimony, copper, and lead) through soil with depth. All samples will be analyzed for antimony, copper, lead, chloride, sulfate, calcium, magnesium, phosphate, potassium, sodium, pH and alkalinity.

Samples will be collected using a 24- inch stainless steel split-barrel sampler that will be driven a total of 24 inches into the undisturbed materials. A 3- inch diameter split spoon should be used to increase the chances of sufficient volume recovery for sampling purposes. At times where samples are required from shallow depths (as is proposed) it may be more feasible to collect samples using a hand auger. If using a hand auger, a clean, 4- inch diameter hand auger shall be advanced to the top of the desired sample interval. Collect the sample with a stainless-steel trowel or sampling trier and place in a laboratory-cleaned glass container and labeled accordingly. To minimize the potential for cross-contamination, use dedicated stainless-steel trowels or sampling triers at each location. The cores will be analyzed at 6-inch intervals. The 6-inch samples will be removed and digested according to method 3050B Nitric Acid Digestion for Soils. The samples will be analyzed for copper, lead, and antimony using method SW6010B.

9.6 Triggers for Maintenance Actions

Based on the results of soil, subsurface soil, and groundwater monitoring described above, Camp Edwards will initiate maintenance actions to prevent or address identified constituents exceeding the standards set forth below. The need for range maintenance actions will be indicated by comparing soil, subsurface soil, and groundwater monitoring results to a series of action levels. It will also be based on any trend of increasing anion, chloride, sulfate, calcium, magnesium, phosphate, potassium, and sodium, concentration that may mobilize lead and antimony.

9.6.1 Surface Soil Action Levels

Surface soil action levels for lead, copper, and antimony are set using selected concentrations from the Massachusetts Contingency Plan. These values are not necessarily directly applicable to active small arms ranges, but they provide a framework for comparison to concentrations that are considered potentially hazardous in some situations. The action levels for surface soil are provided in Table 9-1.

Table 9-1. Surface Soil Metals Action Levels

Analyte	
Lead	6,000 mg/Kg
Antimony	300 mg/Kg
Copper	10,000 mg/Kg

mg/kg= milligrams per kilograms or ppm

Monitoring results will be compared to the Action Levels. If a result exceeding an Action Level was not expected or appears to be anomalous, the sample area can be re-sampled in duplicate with both samples analyzed to determine if the original result is representative of actual site conditions.

If an exceedance of the action levels is accepted or confirmed through resampling, the specific media, e.g., soil, in the applicable area will be removed and replaced so that the potential for migration of the contaminant is reduced. MAARNG will coordinate with the EMC EO to identify appropriate soil removal or other maintenance actions. Remediation or maintenance, if needed, will occur prior to the next training season. If the resampling demonstrates that the actual concentration does not exceed the Action Level, remediation or maintenance is not needed.

Soil Action Level Exceedance: Soil monitoring results will be compared to the Action Levels. If a result exceeding an Action Level was not expected or appears to be anomalous, the sample area can be re-sampled in duplicate with both samples analyzed to determine if the original result is representative of actual site conditions.

Specific Requirement: *Re-sampling, if needed, should occur within 1 month of receiving the original validated laboratory data, unless additional time is needed to secure funding and award contracts, at which time the EMC EO will be notified of the delay within 2 business days. Resampling with an XRF field instrument with applicable detection limits may be proposed as an alternative to supplement the soil sampling and laboratory analysis.*

If an exceedance of the action levels is accepted or confirmed through resampling, surface soil in the applicable area will be removed and replaced so that the potential for migration of the contaminant is reduced. MAARNG will coordinate with the EMC EO to identify appropriate soil removal or other maintenance actions. Soil excavation, if needed, should occur prior to the next training season. If the resampling demonstrates that the actual concentration does not exceed the Action Level, soil removal is not needed.

9.6.2 Subsurface soil Action Levels

Subsurface soil Action Levels for lead, copper, and antimony are set using selected concentrations from the Massachusetts Contingency Plan. These values are not necessarily directly applicable to active small arms ranges, but they provide a framework for comparison to concentrations that are considered potentially hazardous in some situations. The action levels for subsurface soil are provided in Table 9-2.

Subsurface soil action levels for lead, copper, and antimony are set using selected concentrations from the Massachusetts Contingency Plan. These values are not necessarily directly applicable to active small arms ranges, but they provide a framework for comparison to concentrations that are considered potentially hazardous in some situations. The action levels for surface soil are provided in Table 9-1.

Soil Action Level Exceedance: Soil monitoring results will be compared to the Action Levels. If a result exceeding an Action Level was not expected or appears to be anomalous, the sample area can be re-sampled in duplicate with both samples analyzed to determine if the original result is representative of actual site conditions.

Specific Requirement: *Re-sampling, if needed, should occur within 1 month of receiving the original validated laboratory data, unless additional time is needed to secure funding and award contracts, at which time the EMC EO will be notified of the delay within **2 business days**. Resampling with an XRF field instrument with applicable detection limits may be proposed as an alternative to supplement the soil sampling and laboratory analysis.*

If an exceedance of the action levels is accepted or confirmed through resampling, surface and subsurface soil in the applicable area will be removed and replaced so that the potential for migration of the contaminant is reduced. MAARNG will coordinate with the EMC EO to identify appropriate soil removal or other maintenance actions. Soil excavation, if needed, should occur prior to the next training season. If the resampling demonstrates that the actual concentration does not exceed the Action Level, soil removal is not needed.

9.6.4 Groundwater Action Levels

Groundwater action levels are set equal to one half of the drinking water standard because a detection of range related metals in groundwater at these concentrations would indicate a potentially significant and unexpected occurrence and response actions should be taken before concentrations exceeding safe drinking water concentrations occur. Action levels for groundwater are provided in Table 9-3.

Table 9-3. Groundwater Action Levels

Analyte	
Lead	7.5 ug/L
Antimony	3 ug/L

Copper	650 ug/L

ug/L= micrograms per liter or ppb

Ground Water Action Level Exceedance: Detection of range related metals in groundwater at concentrations exceeding the Action Levels would be an unexpected occurrence. If a groundwater Action Level appears to be exceeded, the location of the detection may be resampled in duplicate to determine if the original result is representative of actual site conditions.

Specific Requirement: *Re-sampling should occur within **14 days or that determined by coordinating with the EMC EO** of receiving the original validated laboratory data unless additional time is needed to secure funding and award contracts, at which time regulatory agencies will be notified of the anticipated delay within **2 business days** and an alternate schedule will be proposed. If resampling indicates that the original result was not representative and the action level has not been exceeded, no further response is needed, and range use would continue.*

Groundwater concentrations at or above the Action Levels that have been confirmed by re-sampling require significant actions that may include a suspension of range use and reassessment of the pollution prevention program. In order to reduce contaminant sources and prevent further impact to the groundwater, the surface soil at the range may be removed and replaced. The extent of soil removal would be determined in conjunction with soil and subsurface soil sampling results. Additional investigation to determine the extent of soil removal may be appropriate. Soil excavation, if needed, should occur prior to the next training season. Response actions and further range use will be coordinated with the regulatory agencies.

10.0 NOTIFICATION AND REPORTING REQUIREMENTS

If not otherwise defined and the MAARNG determines or anticipates that it may not be able to comply with the specific requirements or metrics (including sampling, reporting, and range management) of the approved OMMP, the MAARNG will within **5 business days** of this determination notify EMC in writing and include any corrective action that has been taken to date. Where needed, within an additional **7 business days**, the MAARNG will submit a plan for approval for further addressing the potential deviation from the approved OMMP. Table 10-1 summarizes various notifications to the EMC as required by this OMMP. In the case of an immediate environmental threat (e.g., hazardous material or POL spill) standard protocols that are required by state and federal regulations and laws will be followed.

Contacts for Camp Edwards and the EMC are as follows:

Camp Edwards Contacts:

Range Control OIC: 508-968-5925 or 5926
Camp Edwards Administrative Officer 508-968-5885 or 5883
Camp Edwards Alternate Contact: Plans & Training officer 508-968-5888
E & RC Deputy Director 508-968-5154, Alternate contact: 508-968-5146

EMC Contact:

Len Pinaud
Acting Executive Director/Environmental Officer
Environmental & Management Commission
20 Riverside Drive
Lakeville, MA 02347
leonard.pinaud@state.ma.us
Camp Edwards: 508-968-5127
MassDEP Southeast District Office: 508-946-2871

Table 10-1. Summary Notification Requirements

If/Metric	Then/Notification Required
Any specific requirement or metric of this OMMP can't be completed, if not otherwise defined.	Notify the EMC within **5 business days** of any specific requirement or metric within the OMMP that can't be completed and any corrective action that has been taken to date. Within an additional **7 business days**, the MAARNG will submit a plan for approval for further addressing the potential deviation from the approved OMMP.
Live firing is scheduled on a range	The regulatory agencies will be notified in advance of range use through either the Range Control Weekly Range Bulletin or email if range use was not posted in the bulletin.

If/Metric	Then/Notification Required
Sampling of soil, pore water, or groundwater is scheduled	Notify regulatory agencies **2 business days** in advance of sampling.
Metals Removal	The MAARNG will notify the EMC of the scheduled work at least **2 business days** prior to start.

All environmental data collected on the ranges during the year will be reported within the State of the Reservation Report. The report will summarize all exceedances and discuss any re-sampling conducted. Any issues encountered during the year will also be discussed in the report.

To facilitate the periodic review and continual improvement of this plan and, in turn, the management of the ranges, MAARNG will document operations, monitoring, and maintenance. Table 10-2 identifies the records that MAARNG will maintain for the ranges. These records will be maintained as part of the permanent real property records of the site.

Table 10-2. Reporting Requirements

Record	Contents	Reporting Frequency	Responsible Office
Range Utilization Report	Summarized from the Range Utilization forms: Use days, Munitions expenditures by type, quantity, and using unit	Annually: State of the Reservation Report-January-February	Range Control
Environmental Data	Soil analytical results Groundwater analytical results Porewater analytical results	Within **7 business days** of receipt from lab	E&RC
State of the Reservation Report	As per Chapter 47 and the EPSs	Annual: January - February	E&RC

11.0 UPDATING BMPS AND THE OMMP

This OMMP should be considered a living document. Updates will be needed periodically as best management practices evolve, as the state of knowledge grows over time, and as training needs on the ranges change. Future evolution of the plan may involve significant re-writes or may be the sum of smaller incremental changes over time.

The updates should address three general questions:

- Are the BMPs functioning as intended?
- Are the assumptions used at the time of BMP selection still valid?
- Does new information indicate that the previously selected BMPs are no longer protective of the environment?

All proposed changes to this OMMP will be documented by both revising the document and providing new copies to all parties involved, or, in the case of relatively minor changes, by providing addendums as needed. When the OMMP is revised, it will be mentioned in the Annual *State of the Reservation Report*.

BIBLIOGRAPHY

Army Training Support Center (ATSC). 1998. Prevention of Lead Migration and Erosion from Small Arms Ranges. Produced by the USAEC.

Clausen, Jay L., Nic Korte, Benjamin Bostick, Benjamin Rice, Matthew Walsh, Andrew Nelson. May 4, 2007. Environmental Assessment of Lead at Camp Edwards, Massachusetts Small Arms Ranges. Prepared for Massachusetts Army National Guard.

Clemson University Extension 2007a. "Changing the pH of Your Soil," available at: http://hgic.clemson.edu/factsheets/hgic1650.htm.

Clemson University Extension 2007b. "Soil Testing," available at: http://hgic.clemson.edu/factsheets/hgic1652.htm.

Headquarters Department of the Army 2006. Guide to Army Real Property Category Codes, Pamphlet 415-28, 11 April.

Headquarters Department of the Army 1985. M249 Light Machine Gun in the Automatic Rifle Role, Field Manual 23-14.

MAARNG 2007. Small Arms Range Pollution Prevention Overview (Small Arms Range Supplement), January.

MAARNG 2006. Camp Edwards Regulation 385-63 Range Safety and Trainers Guide.

MAARNG 2003. Camp Edwards Regulation 350-1 Camp Edwards Civilian Use Manual.

Massachusetts DEP. Massachusetts Contingency Plan (MCP)

National Guard Bureau 1998. Small Arms Berm Maintenance Removal of Metallic Lead and Fixation of Leachable Lead.

STAPP™. 2006. STAPP™ Environmental Bullet Catcher, Operations and Maintenance Guide.

US Environmental Protection Agency. Safe Drinking Water Act Maximum Contaminant Levels (2007), available at: http://www.epa.gov/safewater/contaminants/index.html#listmcl

US Environmental Protection Agency, Information on the Toxic Effects of Various Chemicals and Groups of Chemicals (2007) available at: http://www.epa.gov/region5superfund/ecology/html/toxprofiles.htm#cu

Appendix A

Training Facility Utilization Report Form

CAMP EDWARDS TRAINING FACILITY UTILIZATION REPORT

This form will be completed by all units/ organizations conducting training at Camp Edwards IAW CE Reg 385-63

RETURN COMPLETED FORM TO RANGE CONTROL AT THE END OF EACH TRAINING DAY.

Unit:	**Facility / Training Area Used:**
Date of Training:	**POC Last Name, First Name, Rank:**
Type of Training:	**POC Cell Phone:**
Number of Personnel Trained:	**POC Email:**

VEHICLE UTILIZATION

Vehicle Type (M998, M1078, GSA ETC.)		**Vehicle Qty.**	
Vehicle Type (M998, M1078, GSA ETC.)		**Vehicle Qty.**	
Vehicle Type (M998, M1078, GSA ETC.)		**Vehicle Qty.**	
Vehicle Type (M998, M1078, GSA ETC.)		**Vehicle Qty.**	
UAV // UAS		**# of Sorties**	

RANGE FIRING – BLANK FIRING – UTM FIRING

Range OIC – Full Name & Rank:		**Range RSO – Full Name & Rank**:	
Range Occupied Time:	**Hot Time:**	**1st Round Down Range Time:**	**Range Cold Time:**
Weapons System:	**Ammunition DODIC:** (Located On Da 581)	**Number of Rounds Expended**:	**Number of Duds:**

AAR Comments:

POC Signature:	**Date:**

Appendix B

Live Fire Range Inspection Form

LIVE FIRE RANGE INSPECTION FORM

A. ADMINISTRATIVE DATA

Range_____ **Unit**_____ **Unit Observer**_____ **Pre Fire Date** _____

RC PRE Firing Inspector_____ **RC POST Firing Inspector**_____ **Post Fire Date** _____

Inspection: Pre Fire ☐ Post Fire ☐ Detailed Inspection ☐ Water Level Check ☐

Ammunition Use: Standard Issue (Lead) ☐ 40mm TP (B519) ☐ EPR M855A1 Lead Free (Copper) ☐ M228 (TP grenade fuse) ☐

CLP Bucket on Site ☐ **Lima Range: 40mm TP Debris Policed** (Intact Training Projectiles, Zinc Bodies, and other Debris) ☐

Hand Grenade Qualification Course: M69/M228 Debris Policed (Grenade Bodies, Fuses, and other Debris) ☐

B. GENERAL RANGE INSPECTION

(All range buildings, firing line and posts, range floor, targets and stands, and berm(s))

Pre Fire: Satisfactory: YES ☐ NO ☐ **Post Fire:** Satisfactory: YES ☐ NO ☐ **Detailed Inspection:** Satisfactory: YES ☐ NO ☐

Range Condition Details: Range Buildings, Firing Positions, Range Floor, Targets, Stands, Computers, and Backstop Berm(s):

Vegetation: Needs Mowing ☐ Dry (fire hazard) ☐ Dead Trees ☐ N/A ☐ **Erosion: None** ☐ **Moderate** ☐ **Severe** ☐

Are Drainage Areas Free of Debris (If no please describe in comments section)? YES ☐ NO ☐

Describe Repairs or Maintenance Needed: (location on range, lane(s), firing point, target, berm, etc.) NONE ☐

Are there Range Issues that would Prevent Firing? (If yes please describe) NONE ☐

C. STAPP™ SYSTEM INSPECTION

(NOTE: All unsatisfactory conditions must be explained in the comment section. If maintenance is required then a copy of this inspection must be given to the Range Control OIC, NCOIC, or fire desk IOT notify the OIC of the need for maintenance.)

Range: Juliet ☐ Kilo ☐	YES	NO	N/A
Tarp cover on and secured?			
Does the tarp cover need to be repaired?			
Are there penetration holes/rips in the STAPP™ cover greater than 1.5 inches in length?			
Are there rubber granules visible through top cover?			
Are there failed seams on the STAPP™ cover greater than 5 inches in length?			
Are there failed seams greater than one inch in length on the bottom 1 foot of the top cover?			
Is there any significant settling (or bulging) of rubber granular material that exceeds 4 inches in depth (or height) over a length of 4 feet?			
Is there ponding of water on the top cover?			
Is water leaking from the STAPP™ system (*If yes please describe in comments section*)?			
Is the lumber support frame in good condition?			
Has the STAPP™ system side of the toe berm boxes been penetrated by projectiles (*Notify RC OIC or NCOIC if projectiles have passed through the rear of the toe berm boxes).*			
Do the toe boxes and bags fully cover and protect the base of the STAPP™ system?			

Is there more than 15cm of water within the STAPP™ system? YES ☐ NO ☐ Current Depth _____
(Through the water port if 15cm or higher, then pumping is required.) Gallons Pumped _____

*(An **internal inspection** is to be completed during metals removal, regrind replacement or at any time the bottom liner is exposed. See IOMMP section regarding STAPP system internal inspection)*

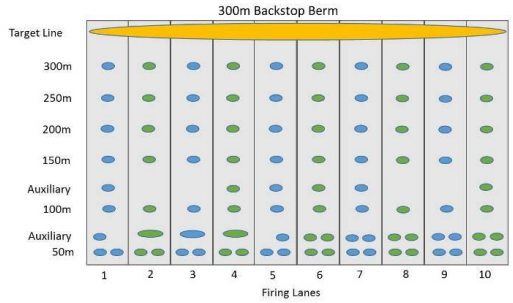
RANGE BERM INSPECTIONS Range (*check one*)**:** Echo ☐ India ☐ Sierra ☐ Tango ☐

Berm(s): Frontal ☐ Auxiliary ☐ Side ☐ Backstop ☐

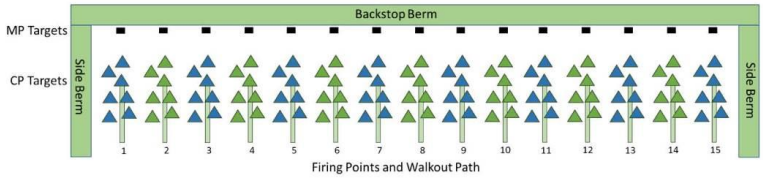
Lane Number(s)_____ **Target Line(s)** _____

Comments for Repair and Maintenance (Include location, firing point, lane number, target line, berm.)

For Sierra Range: Use graphic to mark location of maintenance needed.



For Echo Range: Use graphic to mark location of maintenance needed.



For Environmental Management Commission Use Only:

ALL MAINTENANCE NEEDS TO BE COMPLETED WITHIN 72 HOURS OF INSPECTION!

Appendix C

Range Maintenance Form

Range Maintenance Form

(To be completed each time range maintenance is conducted. Ensure form is signed and filed at Range Control)

Start Date _____ **End Date** _____

Range *(circle one)*: Echo HG Course Juliet Kilo Lima
India Sierra Tango

Lane Number(s) _____ **Target Line(s)** _____

Check all that apply and describe maintenance conducted in the comment section.

Firing Line ☐ **Range Floor** ☐ **Target Lines** ☐

Berm: Frontal ☐ Auxiliary ☐ Side ☐ Backstop ☐

Target: Frames ☐ Boots ☐ Lifters ☐

STAPP™ System

Tarp ☐ Top Cover ☐ Seams ☐

Support Frame ☐ Toe Berm Boxes ☐ Other ☐

If "Other" please describe:

STAPP™ System Water Level: Gallons Pumped _____ Current Depth _____

Comments and/or Maintenance Conducted not addressed above: *(example: pH testing, seeding, etc.)*

Printed Name and Signature_____

Appendix D

Industrial Hygiene Evaluation for Lead

NATIONAL GUARD BUREAU
ARMY NATIONAL GUARD
REGION NORTH INDUSTRIAL HYGIENE OFFICE
ATTN: NGB-ARS-IHNE
301-IH OLD BAY LANE
HAVRE DE GRACE, MD 21078

NGB-ARS-IHNE (40-5f) 4 February 2009

EXECUTIVE SUMMARY
INDUSTRIAL HYGIENE EVALUATION FOR LEAD
CAMP EDWARDS
BOURNE, MA
20-21 OCTOBER 2008

1. PURPOSE. The purpose of the industrial hygiene survey was to evaluate the Camp Edwards Outdoor Firing Range for occupational health and safety concerns related to lead resulting from STAPP EBC Inc. Environmental Bullet Stop System repair operations.

2. CONCLUSIONS. Occupational health risks at the Camp Edwards Range associated with STAPP System repair were well controlled. Implementation of the recommendations in this report will enhance regulatory compliance and contribute to the healthfulness of the work environment of the Range.

3. FINDINGS AND RECOMMENDATIONS.

a. STAPP System Repair.

(1) Air Sampling and Personal Protective Equipment. The results of air sampling for the two personnel met standards for lead, however, additional air sampling is recommended to further validate these findings. Personal protective equipment (PPE) is not required based on the findings of this survey but is still recommended if employees desire its use. **(RAC 4)**

(2) Surface Lead Dust Contamination. Even though none of the six surface swab samples found detectable levels of lead, the potential still exists for surface contamination. Consider rinsing the surface of the STAPP System with water prior to repair to assist in removing any lead dust. **(RAC 5)**

(3) Personal Hygiene. Prohibit drinking and eating at range work areas unless personnel are able to wash exposed skin to reduce the risk of accidental ingestion of lead. **(RAC 4)**

b. Additional Question. During the survey, an additional question was posed regarding the use of Ultimate Training Munitions (UTM™) 2328 Marking Compound. The Material Safety Data Sheet (MSDS) for the product listed melamine as a component of the co-polymer of the pigment and personnel were concerned citing recent news reports of the health risks from melamine contaminated food products imported from China. The melamine in the marking compound is combined with formaldehyde to form a melamine resin which is a very durable thermosetting plastic used in a variety of common household products. The MSDS states that it is harmless to skin and eyes when cold and when ingested in small doses. Like other plastic products, it will release formaldehyde if burned. The marker cartridges are a clear zinc case with aluminum socket holding a steel ball and marking wax. Lead and zinc oxide dust may be produced in small quantities from the primer when the weapon is fired (the same as any 'blank' or real ammunition primer). Follow MSDS warnings for use of Ultimate Training Munitions (UTM™) 2328 Marking Compound to include its use in well ventilated areas and with appropriate safety equipment. **(RAC 4)**

NATIONAL GUARD BUREAU
ARMY NATIONAL GUARD
REGION NORTH INDUSTRIAL HYGIENE OFFICE
ATTN: NGB-ARS-IHNE
301-IH OLD BAY LANE
HAVRE DE GRACE, MD 21078

1. REFERENCES.

a. Department of Defense Instruction (DoDI) 6055.1, Department of Defense (DoD) Safety and Occupational Health (SOH) Program, 19 August 1998.

b. Title 29 Code of Federal Regulations, Part 1910, 2008 Edition, Occupational Safety and Health Standards, Occupational Safety and Health Administration (OSHA).

2. PURPOSE. The purpose of the industrial hygiene survey was to evaluate the Camp Edwards Outdoor Firing Range for occupational health and safety concerns related to lead resulting from STAPP EBC Inc. Environmental Bullet Stop System repair operations.

3. GENERAL.

a. Survey Personnel. This survey was conducted 20-21 October 2008 by Cynthia Harrison, Industrial Hygienist from the United States Army Center for Health Promotion and Preventive Medicine-North (USACHPPM–North), Fort George G. Meade, Maryland. SFC Ruben Cora, Occupational Health/Industrial Hygiene Technician from the Massachusetts Army National Guard (MAARNG) assisted with the survey.

b. Risk Assessment Codes (RACs). RACs are assigned to recommendations to help quantify risks to personnel and to aid in the establishment of funding priorities for corrective actions. Health RACs are determined by using the RAC table from the DODI 6055.1 (reference 1a). This table is provided in Appendix A of this report.

c. Background.

(1) The STAPP EBC Inc. Environmental Bullet Stop System is a rubber 'sandwich' built onto the side of an existing soil berm. The ballistic enters through top layer of self healing rubber which is intended to keep moisture from entering the system. Recycled rubber material approximately the size of BB's is in the middle and the thickness of the layer varies based on the intended ammunition. A

bottom layer of rubber is placed against the soil berm and if designed and installed properly, should stay undamaged and prevent lead from leaching into the soil.

(2) Lead dust is produced from the abrasion of bullets as they pass through the gun barrel and lead residues remain on shell casings. Four range personnel perform repairs on the STAPP System as needed. This industrial hygiene survey was requested to evaluate the potential for personnel performing this operation to be exposed to airborne concentrations of lead dust above published standards.

d. Photographs are provided in Appendix B.

4. FINDINGS AND DISCUSSION.

a. STAPP System Repair.

(1) Repair Procedure. From regular use, holes were created that were too large for the 'self healing' rubber to prevent moisture intrusion. This type of damage required patching (see Appendix B, Photographs B-1 and B-2). Moisture and ultraviolet (UV) radiation damage required re-sealing and patching of the overlapping strips of the top layer of rubber (see Appendix B, Photographs B-3 and B-4). For both repairs, personnel used a Ryobi™ and/or Porter Cable™ orbital sander to remove any previous adhesive and 'rough' the surface in preparation for new adhesive application.

(2) Personnel Protective Equipment (PPE). Because the potential exposure to lead dust had not been evaluated, the two personal performing repairs were provided protective equipment. Disposable N95, 3M Model 8210, standard particulate respirators, tyvek® coveralls, disposable nitrile gloves, and safety glasses were donned for STAPP System repairs.

(3) Air Sampling for Lead. Air sampling for lead was performed on two persons during STAPP System repair. Results were calculated as an 8 hour time weighted average (TWA_8) in micrograms per cubic meter of air ($\mu g/m^3$) and compared to the Action Level (AL) and Permissible Exposure Limit (PEL) published in the 29 CFR 1910.1025 (reference 2). The results met standards and are presented in Table 1.

Table 1. Results of Air Sampling for Lead.

EMPLOYEE EXPOSURE	ACTION LEVEL	PERMISSIBLE EXPOSURE LIMIT	SAMPLING RESULTS	CALCULATED TWA_8	MET STANDARD ?
Employee 1 Lead (Day 1)	30 $\mu g/m^3$	50 $\mu g/m^3$	<6.7 $\mu g/m^3$	<3.1 $\mu g/m^3$	Yes
Employee 2 Lead (Day 1)	30 $\mu g/m^3$	50 $\mu g/m^3$	<6.4 $\mu g/m^3$	<3.0 $\mu g/m^3$	Yes
Employee 1 Lead (Day 2)	30 $\mu g/m^3$	50 $\mu g/m^3$	<6.2 $\mu g/m^3$	<3.0 $\mu g/m^3$	Yes
Employee 2 Lead (Day 2)	30 $\mu g/m^3$	50 $\mu g/m^3$	<6.2 $\mu g/m^3$	<3.0 $\mu g/m^3$	Yes
BLANK	N/A	N/A	<3.0 $\mu g/m^3$	N/A	N/A

(4) The Occupational Safety and Health Administration (OSHA) Lead Standard. The 29 CFR 1910.1025 outlines requirements for personal protective equipment (PPE), housekeeping, hygienic facilities, medical surveillance, and employee information and training (reference 1b). Many of the requirements of this standard are dependent on whether any personnel are exposed above the Action Level (30 $\mu g/m^3$ TWA_8). Neither of the personnel sampled were exposed above the action level so this operation does not appear to create unacceptable airborne concentration of lead. However, additional air sampling is recommended to further validate the findings of this survey.

(5) Surface Lead Dust Contamination. The 29 CFR 1910.1025, Paragraph (h)(1) states that surfaces shall be maintained as free as practicable of accumulations of lead (reference 1b). LeadCheck™ Swabs were used as a screening tool to determine if lead was present on the surface of the STAPP System around the area where the personnel would be performing repairs. The minimum detection limit of the swabs is 2 micrograms (μg). Six samples were collected and no detectable lead was found on any of the six. Appendix B, Photograph B-5 shows two of the samples alongside the positive 'control'. The absence of lead on the surface greater than 2 μg was likely because of wind, rain, and snow blowing and rinsing it away.

(6) Personal Hygiene. Even though air and surface sampling results did not indicate a significant presence of lead, working on the range bullet collection systems may still expose personnel to lead on surfaces. The 29 CFR 1910.142, Paragraph (g)(2) states that no employee shall be allowed to consume food or beverages in any area exposed to a toxic material (reference 1b). Drinking and eating must be prohibited at range work areas. Personal must wash exposed skin

prior to eating, drinking, chewing gum, smoking, and applying make up to reduce the risk of accidental ingestion of lead.

b. Additional Question. During the survey, an additional question was posed regarding the use of Ultimate Training Munitions (UTM™) 2328 Marking Compound. The Material Safety Data Sheet (MSDS) for the product listed melamine as a component of the co-polymer of the pigment and personnel were concerned citing recent news reports of the health risks from melamine contaminated food products imported from China. The melamine in the marking compound is combined with formaldehyde to form a melamine resin which is a very durable thermosetting plastic used in a variety of common household products. The MSDS states that it is harmless to skin and eyes when cold and when ingested in small doses. Like other plastic products, it will release formaldehyde if burned. The marker cartridges are a clear zinc case with aluminum socket holding a steel ball and marking wax. Lead and zinc oxide dust may be produced in small quantities from the primer when the weapon is fired (the same as any 'blank' or real ammunition primer). For this reason the ammunition should always be used in well ventilated areas.

5. CONCLUSIONS. Occupational health risks at the Camp Edwards Range associated with STAPP System repair were well controlled. Implementation of the recommendations in this report will enhance regulatory compliance and contribute to the healthfulness of the work environment of the Range.

6. RECOMMENDATIONS.

a. STAPP System Repair.

(1) Air Sampling and Personal Protective Equipment. The results of air sampling for the two personnel met standards, however, additional air sampling is recommended to further validate these findings. Personal protective equipment (PPE) is not required based on the findings of this survey but is still recommended if employees desire its use (reference 1b). **(RAC 4)**

(2) Surface Lead Dust Contamination. Even though none of the six samples found detectable levels of lead, the potential still exists for surface contamination. Consider rinsing the surface of the STAPP System with water prior to repair to assist in removing any lead dust (sound work practice). **(RAC 5)**

(3) Personal Hygiene. Prohibit drinking and eating at range work areas unless personnel are able to wash exposed skin to reduce the risk of accidental ingestion of lead (reference 1b). **(RAC 4)**

b. Additional Question. Follow MSDS warnings for use of Ultimate Training Munitions (UTM™) 2328 Marking Compound to include its use in well ventilated areas and with appropriate safety equipment (sound work practice). **(RAC 4)**

7. ADDITIONAL ASSISTANCE. Point of contact for this action and other industrial hygiene related topics is Ms. Shirley Chapman, Regional Industrial Hygienist, (410) 942-0273, ext 3.

CYNTHIA S HARRISON
Industrial Hygienist

APPROVED BY:

SHIRLEY A. CHAPMAN
NGB Regional Industrial Hygienist

APPENDIX A
DERIVING RISK ASSESSMENT CODES (RACs) FOR HEALTH HAZARDS

1. HEALTH HAZARD SEVERITY CODE (HHSC). Using the following procedures to assess points, determine the health hazard severity category (HHSC). The HHSC reflects the magnitude of exposure to a physical, chemical, or biological agent and the medical effects of exposure.

a. Exposure Points Assessed

AER POSSIBLE?	***Exposure Conditions***			
	< AL	**Occasionally > AL Always < OEL**	**> AL < = OEL**	**> OEL**
NO	0	3	5	7
YES	1-2	4	6	8

AER = Alternate exposure route, such as skin absorption, ingestion.
AL = Action level, DoD component threshold that triggers surveillance actions, such as microWatts/cm^2, dB, parts per million.
OEL = Occupational Exposure Limit, DoD exposure limit, such as Threshold Limit Value and Permissible Exposure Limit.

b. Medical Effects Points Assessed.

Condition	***Points***
No medical effect, such as nuisance noise and nuisance odor	0
Temporary reversible illness requiring supportive treatment, such as eye irritation and sore throat	1-2
Temporary reversible illness with a variable but limited period of disability, such as metal fume fever	3-4
Permanent, non-severe illness or loss of capacity, such as permanent hearing loss	5-6
Permanent, severe, disabling irreversible illness or death, such as asbestosis and lung cancer	7-8

c. Determine the HHSC by totaling the points assessed and using the following guide:

Total Points (sum of A and B, above)	*HHSC*
13-16	I
9-12	II
5-8	III
0-4	IV

2. ILLNESS PROBABILITY CODE (IPC). Using the following guides to assess points, determine the IPC for health hazards. The IPC is a function of the duration of exposure and the number of exposed personnel.

a. Duration of Exposure Points Assessed

Type of *Exposure*	*Exposure Duration*		
	1-8 hr/wk	> 8hr/wk, not continuous	Continuous
Irregular, intermittent	1-2	4-6	-
Regular, periodic	2-3	5-7	8

b. Number of Exposed Personnel Points Assessed

Number of Exposed Personnel	*Points*
<5	1-2
5 to 9	3-4
10 to 49	5-6
>49	7-8

c. Determine the IPC for health hazards by totaling the points assessed and using the following guide:

Total Points (sum of A and B, above)	IPC
14-16	A
10-13	B
5-9	C
<5	D

3. Determine the RAC for health hazards by using the following matrix to measure health hazard severity and mishap probability factors.

HEALTH HAZARD SEVERITY CODE	ILLNESS PROBABILITY CODE			
	A	B	C	D
I	1	1	2	3
II	1	2	3	4
III	2	3	4	5
IV	3	4	5	5

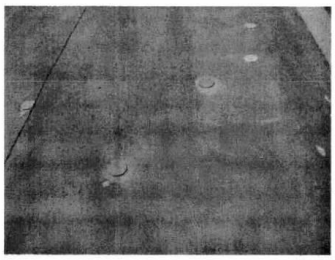
From Table 2 of Department of Defense Instruction 6055.1, Department of Defense Occupational Safety and Health Program, 19 August 1998 (reference 1).

4. RAC DESCRIPTOR

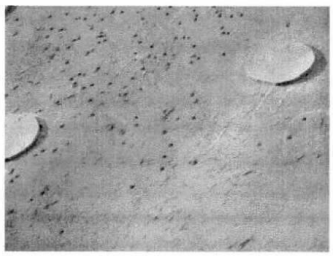
RAC	DESCRIPTOR
1	CRITICAL
2	SERIOUS
3	MODERATE
4	MINOR
5	NEGLIGIBLE

NGB-ARS-IHNE
SUBJECT: Industrial Hygiene Evaluation for Lead, Camp Edwards, Bourne, Massachusetts, 20-21 October 2008

APPENDIX B
PHOTOGRAPHS

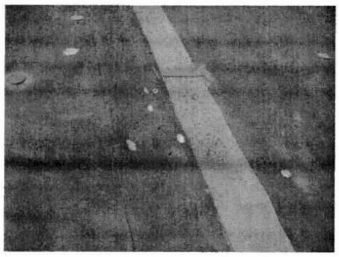


Photograph B-1: Patches Applied to Top Surface of System.

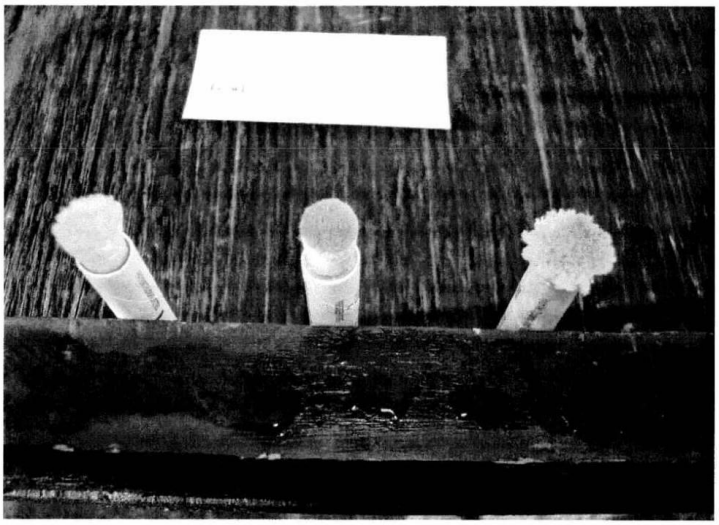


Photograph B-2: Patches Applied to Top Surface of System.

Photograph B-3: Overlapping Sheet of Top Layer of Rubber That Needs to be Re-Sealed.



Photograph B-4: Patched Overlapping Sheets of Rubber.



Photograph B-5: Two Negative Samples and Positive Control Sample for Surface Lead.

MEDICAL RECORD – SUPPLEMENTAL MEDICAL DATA
For use of this form, see AR 40-66; the proponent agency is the Office of The Surgeon General.

REPORT TITLE	OTSG APPROVED (Date)
WORKERS' OCCUPATIONAL WORKSITE SAMPLING DATA RECORD	

DIRECTORATE Camp Edwards, Range Office, Massachusetts **BLDG/ROOM** Outdoor Firing Range
SPECIAL STUDY/REPORT NUMBER
JOB DESCRIPTION/SERIES Range Operations Specialist
SAMPLING DATE 20 and 21 October 2008

EXPOSURE MONITORED	TYPE SAMPLE*	ACTION LIMIT	PERMISSIBLE EXPOSURE LIMIT	SAMPLING RESULTS	CALCULATED TWA	EXPOSURE CATEGORY**
Lead (Inorganic)	P	30 µg/m^3	50 µg/m^3	<6.7, <6.2 µg/m^3	<3.1, <3.0 µg/m^3	3

µg/m^3 - micrograms per cubic meter of air

*TYPE OF SAMPLE: G=General Area Sample
P=Personal Sample Collected in the Breathing Zone of the Worker.
R=Personal Sample Collected on another worker, but representative of expected exposure for this worker.

**EXPOSURE CATEGORY
3. Measured Exposure levels are below action limit and permissible exposure limit.
2. Measured Exposure levels are above the action limit but below permissible exposure limit: See Comments.
1. Measured Exposure levels are at or above permissible exposure limits: See Comments.

COMMENTS: Refer to the special study report referenced for details of work, sampling, and results.

PREPARED BY (Signature & Title)	DEPARTMENT/SERVICE/CLINIC	DATE
Cynthia S. Harrison Cynthia S. Harrison, Industrial Hygienist	INDUSTRIAL HYGIENE DIVISION, USACHPPM-NORTH	**4 February 2009**

PATIENT'S IDENTIFICATION (*For typed or written entries give: Name --last, first, Middle; grade; date; hospital or medical facility*)				
NAME: Cabral, Mark Anthony		HISTORY/PHYSICAL		FLOW CHART
SSN: 013-62-4189		OTHER EXAMINATION OR EVALUATION		OTHER (SPECIFY)
UNIT PHONE NO:		DIAGNOSTIC STUDIES		TREATMENT

DA FORM 4700 1 MAY 78

PRIVACY ACT STATEMENT

AUTHORITY: 5 U.S.C., Section 301; 10 U.S.C., Section 3013
PURPOSE: This form is used to store patient information in an automated computer system; retrieval of information is by the patient's SSN and is required to properly record Occupational Worksite Hazard Exposure Sampling Data.
DISCLOSURE: Personal information on this form is given on a voluntary basis. Failure to provide this information, however, may result in failure to obtain proper medical surveillance healthcare.

MEDICAL RECORD – SUPPLEMENTAL MEDICAL DATA
For use of this form, see AR 40-66; the proponent agency is the Office of The Surgeon General.

REPORT TITLE	OTSG APPROVED (Date)
WORKERS' OCCUPATIONAL WORKSITE SAMPLING DATA RECORD	

DIRECTORATE Camp Edwards, Range Office **BLDG/ROOM** Outdoor Firing Range
SPECIAL STUDY/REPORT NUMBER
JOB DESCRIPTION/SERIES Range Maintenance
SAMPLING DATE 20 and 21 October 2008

EXPOSURE MONITORED	TYPE SAMPLE*	ACTION LIMIT	PERMISSIBLE EXPOSURE LIMIT	SAMPLING RESULTS	CALCULATED TWA	EXPOSURE CATEGORY**
Lead (Inorganic)	P	30 µg/m^3	50 µg/m^3	<6.4, <6.2 µg/m^3	<3.0, <3.0 µg/m^3	3

µg/m^3 - micrograms per cubic meter of air

*TYPE OF SAMPLE: G=General Area Sample
P=Personal Sample Collected in the Breathing Zone of the Worker.
R=Personal Sample Collected on another worker, but representative of expected exposure for this worker.

**EXPOSURE CATEGORY
3. Measured Exposure levels are below action limit and permissible exposure limit.
2. Measured Exposure levels are above the action limit but below permissible exposure limit: See Comments.
1. Measured Exposure levels are at or above permissible exposure limits: See Comments.

COMMENTS: Refer to the special study report referenced for details of work, sampling, and results.

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Cynthia S. Harrison Cynthia S. Harrison, Industrial Hygienist	INDUSTRIAL HYGIENE DIVISION, USACHPPM-NORTH	**4 February 2009**

PATIENT'S IDENTIFICATION (*For typed or written entries give: Name –last, first, Middle; grade; date; hospital or medical facility*)				
NAME: Davis III, Thomas Kenneth		HISTORY/PHYSICAL		FLOW CHART
SSN: 591-36-4011		OTHER EXAMINATION OR EVALUATION		OTHER (SPECIFY)
UNIT PHONE NO:		DIAGNOSTIC STUDIES		TREATMENT

DA FORM 4700 1 MAY 78

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