U.S. Army Corps of Engineers
Omaha District

Technical Project Planning
Meeting Package
Bruneau Precision Bombing Range No. 2
FUDS ID F10ID0141

Site Inspections at Multiple Sites, NWO Region
Formerly Used Defense Sites, Military Munitions Response Program

Contract No. W912DY-04-D-0010
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ABBREVIATIONS AND ACRONYMS

ºF	degrees Fahrenheit
AOC	area of concern
AAF	Army Airfield
ASR	Archives Search Report
bgs	below ground surface
BLM	Bureau of Land Management
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CSM	Conceptual Site Model
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
DOI	Department of the Interior
DQO	Data Quality Objective
DWMA	Drinking Water Mapping Application
EPA	Environmental Protection Agency
ft	feet
FUDS	Formerly Used Defense Site
GGR	Ground Gunnery Range
GP	General Purpose
GPS	Global Positioning System
HE	high explosives
HRS	Hazard Ranking System
IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department Fish and Game
INPR	Inventory Project Report
lb	pound
MC	munitions constituents
MEC	munitions and explosives of concern
MMRP	Military Munitions Response Program
MRSPP	Munitions Response Site Prioritization Protocol
NAD83	1983 North American Datum
NDAI	No Department of Defense Action Indicated
PA	Preliminary Assessment
PBR	Precision Bombing Range
RAC	Risk Assessment Code
RI/FS	Remedial Investigation/Feasibility Study
Shaw	Shaw Environmental, Inc.
SHPO	State Historic Preservation Office
SI	Site Inspection
SSWP	Site-Specific Work Plan
SDWIS	Safe Drinking Water Information System
TNT	2,4,6-trinitrotoluene
TPP	Technical Project Planning
USACE	U.S. Army Corps of Engineers
UXO	unexploded ordnance

1.0 Administrative Information

The Technical Project Planning (TPP) Memorandum is one in a series of documents used during the Site Inspection (SI) process to document the information collected and processes used to evaluate Formerly Used Defense Sites (FUDS) for the possible presence of munitions and explosives of concern (MEC) and/or munitions constituents (MC). TPP Meeting information provided in the Memorandum reflects both the original version of information shared with meeting participants, as well as changes/updates to site-specific information obtained during the TPP Meeting.

The TPP Meeting for the former Bruneau Precision Bombing Range (PBR) No. 2 will be conducted on April 24, 2007 at the Idaho Department Environmental Quality (IDEQ) offices located in Boise, ID. Representatives from the U.S. Army Corps of Engineers (USACE) – Omaha Design Center and Seattle WA, the IDEQ, and Shaw Environmental, Inc. (Shaw) will be in attendance. By agreement with the USACE, landowners will not be present at this meeting. A separate meeting with landowners may be held in the future. A windshield site tour may be conducted as part of this meeting if time allows.

The TPP Memorandum documents discussions for the TPP meeting and includes the sections described below:

- **Administrative Information:** includes meeting logistics and the list of attendees;
- **Site Inspection Objectives:** provides the goal and objectives of the SI, roles and responsibilities, the SI process, and the TPP process;
- **Background Information:** includes site and project history, area physical setting, a summary of previous environmental work, and an introduction to the areas of concern (AOCs) addressed by the SI;
- **Conceptual Site Model (CSM):** used to identify environmental attributes, potential human and ecological receptors in the area's environment, and the relationships between these factors;
- **Proposed Sampling Scheme:** used to describe the type and quantity of samples to be taken, and the analytical methods to be used for characterizing the AOC;
- **TPP Notes and Data Quality Objectives (DQOs):** used to capture project and site-specific information as discussed during the TPP Meeting to ensure the necessary and appropriate information is shared among meeting participants, and that meeting participants concur with the identified goal, objectives, and approach used to complete the SI process; and
- **Worksheets:** includes the Site Information Worksheet, Draft Munitions Response Site Prioritization Protocol (MRSPP) Data Gaps, and Hazard Ranking System (HRS) Data Gaps.

2.0 Site Inspection Objectives

2.1 Goal

The USACE is conducting SIs of FUDS properties to determine if any munitions and MEC or related MC are present on property formerly owned or leased by the U.S. Department of Defense (DoD).

2.2 Objectives

- Determine if the site requires further response action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) due to the presence of MEC or MC.
- Collect minimum information needed to:
  - Eliminate a site from further consideration if:
    - No evidence of MEC and
    - Concentrations of MC in site media are below background or below risk-based screening levels.
  - Determine the potential need for initiation of the Remedial Investigation/Feasibility Study (RI/FS) if:
    - Evidence of MEC identified or
    - Concentrations of MC in site media exceed background and risk-based screening levels.
  - Determine the potential need for Time Critical Removal Action or Non-Time Critical Removal Action based on risk to site users from MEC.
  - Provide sufficient data for the U.S. Environmental Protection Agency (EPA) to complete the HRS.
  - Evaluate the FUDS using the MRSPP.

2.3 Roles & Responsibilities

- USACE: Acts as the executing agency for the DoD with regard to the FUDS program. In this role, the USACE has decision making authority and is responsible for ensuring work is conducted in accordance with applicable USACE and federal guidance. Additionally, USACE coordinates and works with project team members to meet needs expressed by regulatory agencies and stakeholders.
- Regulatory Agency: Participates in planning of SI activities to ensure the project meets applicable state standards and requirements.
- Property Owner(s): Provides available and pertinent information about the area, provides insight on current and anticipated future land uses for the property, and participates in project team discussions.

- Shaw: As a contractor to the USACE, conducts work on behalf of the USACE, provides TPP materials, makes site information available to the project team through a web-based information portal, and conducts and reports SI activities.

2.4 Site Inspection Process

- Data review,
- TPP,
- Site-Specific Work Plan (SSWP),
- SI field activities – reconnaissance, sampling, and analysis, and
- SI Report.

2.5 Technical Project Planning Process

- Conduct TPP meetings* with key organizations and stakeholders;
- Identify stakeholders concerns;
- Identify all AOCs for this SI;
- Review site information;
- Verify current and anticipated future land use;
- Develop CSM;
- Identify data gaps;
- Plan how to address data gaps;
- Develop DQOs for meeting SI requirements; and
- Concur on SI field work approach.

* Second TPP meeting to be determined by team members during the 1st TPP meeting.

3.0 Background Information

3.1 Site Name and Location

The former Bruneau PBR No. 2 consisted of 2,552.20 acres of land located in Owyhee County, Idaho, 7 miles southwest of Bruneau, Idaho and 22 miles southwest of Mountain Home Air Force Base, Idaho (Figure 1). The property is located in Sections 2 and 3 of Township 7 South, Range 4 East, and Sections 34 and 35 of Township 6 South, Range 4 East. The site layout is shown on Figure 2.

The former range is also referred to as

- Bruneau PBR No. 2;
- Mountain Home Army Airfield (AAF);
- Mountain Home PBR No. 2; and
- Mountain Home Air Force Range No. 2.

3.2 Range Inventory

The Bruneau PBR No. 2 is included in the Military Munitions Response Program (MMRP) Inventory in the *Fiscal Year 2005 Defense Environmental Programs Annual Report to Congress* (DoD, 2005a).

Bruneau PBR No. 2 is included in the MMRP Inventory in the *Defense Environmental Programs Fiscal Year 2005 Annual Report to Congress* (DoD, 2005a) with range information as follows:

Range Name	Range ID	Range Total (acres)	UTM Coordinates (meters)
Bombing Range	F10ID014101R01	**649**	X 584880.30 Y 4743790.10

Coordinates for the ranges are in UTM Zone 11N, NAD 83.

The "**Bombing Range**" is represented as a 3,000-foot radius circle with the bombing target at the center of the circle. According to studies cited in the Archive Search Report (ASR) Supplement, 99% of the bombs dropped on the PBR should have landed with 3,000 feet (ft) of the bombing target.

3.3 Property History

The land that Bruneau PBR No. 2 occupied was originally undeveloped rangeland that belonged to the Department of the Interior (DOI). After the land was declared excess, it was relinquished to the DOI, Bureau of Land Management (BLM), who conveyed most of the usable land to private owners through the Desert Land Act. Two hundred forty acres were retained and are currently under the control of the BLM. The majority of the land is used for agricultural

purposes. There are homesteads with farming buildings within 2 miles of the property. Cattle guards and fences inhibit access to the property but do not prevent it.

3.3.1 Historical Military Use

The land that Bruneau PBR No. 2 occupied was originally undeveloped rangeland that belonged to the DOI. The Army Air Corps started construction of Mountain Home AAF in November 1942. Construction was completed in August 1943. The War Department indicated a need for the property in June 1943, and in September 1943, acquired the land from the DOI for use as Mountain Home PBR No. 2.

In 1946, Mountain Home AAF became a sub-base of Walla Walla AAF in Idaho and Petersen Field in Colorado. After creation of the U.S. Air Force, the property became known as Bruneau PBR No. 2.

The site was used as a "practice bombing range" by various Bombardment Groups such as the 467th, 490th, and the 494th. Aerial photographs show that the bombing range had a target center consisting of concentric circles, with each circle approximately 200 ft larger in diameter than preceding circle, out to a final diameter of 1000 ft. Construction at the range consisted of: earth-filled emplacements confined by planks for 10-foot tall identifying squares, circles, and symbols; and a 30- by 30-foot target center, lath construction, painted white. No other improvements were made to the range during the range's existence

The property was declared excess in November 1953 and relinquished to the BLM in November 1955.

3.3.2 Munitions Information

According to the ASR Supplement (USACE, 2004) the MEC used at Bruneau PBR No. 2 included:

- 100- pound (lb) general purpose (GP) (AN-M30)
- 100- lb practice bombs (M38A2)
- spotting charges (M1A1)
- bomb tail fuzes (AN-M100 Series),
- bomb nose fuzes (AN-M103A1), and
- .50 caliber cartridges.

The old-series GP bomb is a relatively thin-cased bomb with parallel sidewalls, and a tapered aft section. Both nose and tail fuzes are used for a majority of operations. Approximately 50 percent of the complete weight of the round is its explosive filler of Amatol 50-50, 2,4,6-trinitrotoluene (TNT), Tritonal or Composition B.

The GP and M-series bombs of 100-lb weight have the same dimensions. The weight of the case is 42.1 lbs and the fins weigh between 5.6 to 17.5 lbs. The filler is 50/50 amatol, 2,4,6-TNT, or Tritonal. Percentage of filler is approximately 49 percent.

The AN-M30 GP bomb is fuzed in the nose with the AN-M103 fuze and in the tail with the ANM100A2 fuze. The alternate fuzes that were used as substitutes or for special purposes are the M103, M118, or M119 nose fuzes, and the M112, M100, M106, or its modifications, or the ANM100A1 tail fuzes

The M38A2 practice bomb simulated a GP bomb of the same size. It was constructed of light sheet metal, approximately 22 gauge, formed by rolling a rectangular sheet of metal into the form of a cylinder approximately 8 inches in diameter, and spot-welding the seam. The rounded nose was pressed from the same metal, as was the tail, which was formed in the shape of a cone. The spotting charge was assembled in a sleeve at the base of the bomb, within the fin box. Authorized spotting charges were the M1A1, M3, and M5.

3.4 Physical Setting

Bruneau PBR No. 2 is located in the Snake River Plain, approximately 4 miles south of the Strike Reservoir which is situated on the Snake River.

3.4.1 Topography and Vegetation

Topography at the site is flat with gorges and gullies. The ground surface at the site gently slopes to the east and southeast. Elevation at the site ranges from 2,700 ft in the southeast corner to 2,800 ft in the northeast corner.

3.4.2 Surface Water

Bruneau PBR No. 2 is centered over Halfway Gulch. Runoff from the gulch generally flows east into Little Valley, which is orientated southwest to northeast. From Little Valley, runoff flows into Jacks Creek, which flows southwest to northeast through Little Valley. Jacks Creek flows into the Bruneau River, which is located southeast of the Bruneau Arm of the Strike Reservoir.

Halfway Gulch is identified as a ephemeral stream and likely only flows during storm events. The channel of Halfway Gulch may have been recently altered due to agricultural activities.

3.4.3 Sensitive Environments

The USFWS indicated that the bald eagle may nest or winter in the area of Bruneau PBR No. 2. The Idaho Department Fish and Game (IDFG) Conservation Data Center indicates three species may occur within one mile of the range. The status of threatened or endangered species in the area of Bruneau PBR No. 2 is shown in the table below.

Class	Status	Common Name	Scientific Name

Federal	Threatened	Bald Eagle	*Haliaeetus leucocephalus*
State	Protected – Non-Game Species	Ferruginous Hawk	*Buteo regalis*
State	Unprotected Non-Game Species	Woodhouse's toad	*Bufo woodhousii*
State	Species of Concern	Groundsnake	*Sonora semiannulata*

According to the 2004 Preliminary Assessment (PA), there are no significant historic or archaeological sites in the vicinity of Bruneau PBR No.2.

3.4.4 Climate

Bruneau PBR No. 2 is located in an area where the climate is highly variable. In general, winter weather is cloudy and unsettled. There are frequent periods of persistent wind from the southwest that result in mild temperatures, and but there are also a few periods where temperatures stay below freezing and approach or fall below zero degrees. During the winter, measurable amounts of precipitation fall on about one-third of the days. Continuous home heating is generally not needed until mid-October generally ceases around the beginning of June. Intermittent heating may continue until July.

The Bruneau area averages approximately 8.4 inches per year.

Temperatures warm gradually in the spring, and normally spring months are the wettest and windiest of the year. Sustained winds of 20 to 30 miles per hour for days at a time are not unusual. Summer temperatures start out mild but by July and August may reach into the 90's. Long periods of extremely hot temperatures are uncommon. Summer nights are generally cool with average temperatures in the 50's. Fall is characterized by mild days and cool nights. The first cold wave does not generally occur until late December.

3.5 Geologic and Hydrogeologic Setting

3.5.1 Bedrock Geology

The former Bruneau Precision Bombing Range No. 2 is located in the Malheur-Boise section of the High Lava Plains subprovince in the Columbia Intermontane physiographic province. The High Lava Plan subprovince is a crescent-shaped belt, convex to the south that extends from the Teton Mountains on the east to the Cascade Mountains on the west.

The Malheur-Boise is the lowest in altitude of the three sections that make up the High Plains Lava. The Malheur-Boise composed of lavas interbedded with fluviatile and lacustrine sediments. The interbedding of weak and strong beds has resulted in considerable erosion and

stream dissection. Plain-like expanses do exist, but they are the exception, not the rule. Numerous mesa-like tracts occur where Quaternary basalts cap the lacustrine sediments.

Unconsolidated deposits along stream valleys consist of sand and gravel that form productive aquifers. The thickness of the deposits along present stream valleys commonly is less than 250 ft.

3.5.2 Overburden Soils

Soil at Bruneau PBR No.2 consist is a silty sandy. The soil is very deep and well drained. The runoff is slow to medium, the permeability is moderately rapid, and the available water capacity is high. The hazard of water erosion is slight and wind erosion is high

3.5.3 Hydrogeology

Bruneau PBR. No.2 is underlain by discontinuous volcanic- and sedimentary-rock aquifers. The volcanic rocks that comprise these aquifers consist of silicic volcanic rocks. The sedimentary rocks consist primarily of semi consolidated sand and gravel eroded from volcanic rocks. The permeability of the various rocks that compose the aquifer is extremely variable. Interflow zones and faults of basaltic lava flows; fractures of tuffaceous, welded silicic volcanic rocks; and interstices in coarse ash, sand and gravel mostly yield less than 100 gallons per minute. Where major faults are present, the rocks commonly contain geothermal water under confined conditions.

Little is known about the hydrogeologic characteristics of the aquifers underlying the site, because there is little demand for groundwater. Depth to groundwater in the site vicinity ranges from approximately 300 to 500 ft below the surface (bgs). The water in the aquifers tends to flow north towards the Snake River, and is generally of a good enough quality for any use.

There are several wells that flow at the ground surface directly to the east of the site. These artesian wells are drilled into aquifers where the potentiometric surface is greater than the land surface.

3.6 Population and Land Use

3.6.1 Nearby Population

Bruneau, Idaho is the town located closest to the Bruneau PBR No. 2; however, there are no U.S. Census data available for the town. However, Bruneau PBR No. 2 is located in Owyhee County, Idaho, and there are U.S. Census data for the county. Owyhee County, Idaho has a population of 11,073, and a population density of 1.4 persons present per square mile (U.S. Census, 2000).

3.6.2 Land Use

The land that Bruneau PBR No. 2 occupied was originally undeveloped rangeland that belonged to the DOI. After the land was declared excess, it was relinquished to the BLM, who conveyed most of the usable land to private owners through the Desert Land Act. Two hundred forty acres

were retained and are currently under the control of the BLM. The majority of the land is used for agricultural purposes. There are homesteads with farming buildings within 2 miles of the property. Cattle guards and fences inhibit access to the property but do not prevent it. Parcel ownership is shown on Figure 3.

3.6.3 Area Water Supply

The EPA Safe Drinking Water Information System (SDWIS) Drinking Water Mapping Application (DWMA) indicates that there are no groundwater drinking wells within 4 miles of the former Bruneau PBR No. 2. The DWMA indicates the nearest drinking water well is more than 6 miles from the range.

The USGS National Water Information System indicates that there are eight other groundwater wells within 4 miles of the range. It is assumed these wells are used for irrigation and/or stock watering since they are not listed in the SDWIS DWMA.

The Idaho Department of Water Resources identifies the presence of two domestic water wells within the boundary of the AOC and a total of four domestic wells within the property boundary of the FUDS.

3.7 Previous Investigations for MC and MEC

Two Certificates of Clearance were issued for Bruneau PBR No. 2 by Headquarters, 2700th Explosive Ordnance Disposal Squadron, McClellan Air Force Base, California.

- The first was issued 17 September 1954. A total of 2,600 man-hours were spent and 52,000 lbs of scrap metal were recovered. The only explosives that were recovered were 400 lbs of black powder that came from the spotting charges. The report recommended that the southern half of Section 3, T7S, R4E be restricted to surface use only.
- The second was issued 24 July 1964 for the restricted use portion specified for the 1954 Certificate of Clearance. A total of 576 man-hours were spent and 500 lbs of inert ordnance residue were recovered, and piled in a central location on the range for future disposition. No hazardous items were recovered.

The USACE Walla Walla District completed an initial Inventory Project Report (INPR) in November 1988 (USACE, 1988)

A reevaluation of the 1988 INPR was completed August 2003. The 1988 INPR stated that the site had been used as a precision bombing range and 0.50 caliber gunnery range, and that locals had reported finding bomb debris and 0.50 caliber rounds. The INPR did not rule out the use of bombs containing high explosives. The 1988 INPR site determined that the site was eligible under DERP as a FUDS and assigned a RAC score of 4 to the range.

On August 24, 2004, a site inspection was conducted at the target. The site inspection was part of the 2004 PA that USACE was conducting at the range. The purpose of the site inspection was to collect sufficient field evidence to determine the potential for MEC and MC. The inspection

was limited to visual, non-intrusive methods. No evidence of MEC debris was observed on the surface at the target site.

In December 2004, a PA was completed at the range. The 2004 PA was conducted by USACE, St. Louis District, and compiled information collected historical documents, interviews, and site visits. The purpose of the 2004 PA was to determine MEC were present. The 2004 PA found that there was a potential for MEC at Bruneau PBR No. 2. According to the 2004 PA, historical evidence indicated that practice bombs and .50 caliber ammunition had been used at the range, and that there was the possibility high explosives had been used as well. The report concluded that the sort of cratering seen in a 1950 aerial photograph could not be attributed solely to the use of practice bombs. In addition, there were reports that over the years, landowners had found live and expended 0.50 caliber rounds on the range. The report concluded that the historic presence of 0.50 caliber rounds at the range, and the presence of ranges in the vicinity with strafing ranges, indicated that the range may have been mistakenly used for strafing. The PA assigned a RAC score of 3 to the site.

The ASR Supplement was issued in November 2004. The risk assessment assigned a RAC score of 3 for the Bruneau PBR No. 2.

An Archive Search Report does not appear to have been completed for this range.

3.8 Other Land Uses that May Have Contributed to Contamination

Agricultural chemicals (e.g., fertilizers and pesticides) may contains contain or breakdown to low levels of explosive compounds such as nitrobenzene.

3.9 Summary of Previous Investigations

- **MEC** - 400 lbs of black powder that came from the spotting charges were found and removed during a site clearance conducted in 1954. No MEC was found during a second site clearance conducted in 1964.
- Live 0.50-caliber rounds have been found on the range as reported by landowners.
- Known use or suspected use of MEC on the former Bruneau PBR No. 2 consists of:
  - 100-lb general purpose (GP) (AN-M30)
  - 100-pound (lb) practice bombs (M38A2)
  - spotting charges (M1A1)
  - bomb tail fuzes (AN-M100 Series),
  - bomb nose fuzes (AN-M103A1), and
  - .50 caliber cartridges.

- **MC** - No analytical sampling has been conducted at the former range. Therefore the presence of MC in site media is unknown.

4.0 Conceptual Site Model – Bombing Range AOC

4.1 Overview

A site-specific CSM summarizes available site information and identifies relationships between exposure pathways and associated receptors. A CSM is used to determine the data types necessary to describe site conditions and quantify receptor exposure, and discusses the following information:

- Current site conditions and future land use;
- Potential contaminant sources (e.g., lead projectiles in an impact berm);
- Affected media;
- Governing fate and transport processes (e.g., surface water runoff and/or groundwater migration);
- Exposure media (i.e., media through which receptors could contact site-related contamination);
- Routes of exposure (e.g., inhalation, incidental ingestion, and dermal contact); and
- Potential human and/or representative ecological receptors at the exposure point. Receptors likely to be exposed to site contaminants are identified based on current and expected future land uses.

The CSM is evaluated for completeness and further developed as needed through TPP meetings and additional investigation. A graphic representation of a typical precision bombing range CSM is shown on Figure 4.

4.2 Background

4.2.1 History of use

The former Bruneau was used as a precision bombing range from September 1943 to November 1955. The land was relinquished to the BLM in November 1955. The BLM has since conveyed most of the usable land to private owners through the Desert Land Act. The land has been and is currently used for agriculture and cattle grazing.

4.2.2 Munitions and Associated MC

Ordnance	Description	Filler	Munitions Constituents
100-lb General Purpose (GP) Bomb (AN-M30)	The old-series GP bomb is a relatively thin-cased bomb with parallel sidewalls, and a tapered aft section. Both nose and tail fuzes are used for a majority of operations.	Approximately 50 percent of the complete weight of the round consists of explosives.	TNT (2,4,6-trinitrotoluene), 50/50 Amatol and TNT, Amatol (ammonium nitrate and TNT mixture), Tritonal (TNT and aluminum powder mixture).
100-lb Practice Bomb (M38A2)	Light sheet metal (approximately 22 gauge), with sand and spotting charge.	Sand.	Metals from steel.
Spotting Charge, (M1A1)	Large can, 11.18 inches long by 3.43 inches diameter; 28-gauge blank shotgun shell primer.	3 lbs black powder (produced flame & white smoke).	Black powder (potassium nitrate, sulfur, charcoal), Anthracene, Hexachlorethane.
Bomb Tail Fuze (AN-M100 Series)	Located in tail section of GP bomb. Initiation of the igniters and fuzes results from impact or impact inertia requiring a force to cause the firing pin to strike a primer/detonator.		Minute quantities of lead azide, lead thiocyanate, lead styphnate, mercury-fulminate, black powder, lead chromate, silicon, barium, manganese, sulfur, red lead oxide.
Bomb Nose Fuze (AN-M103A1)	Located in nose section of GP bomb. Initiation of the igniters and fuzes results from impact or impact inertia requiring a force to cause the firing pin to strike a primer/detonator.		
Small Arms (.50-caliber)	Lead or steel core with metal jacket	Single- or double-based powder, tracer composition.	Nitrocellulose, nitroglycerin; Lead, copper, antimony, zinc; Perchlorate (in .50-caliber tracer rounds).

4.2.3 Previous MEC Finds

- Spotting charges (removed)
- Live 0.50 caliber munitions

4.2.4 Previous MC Sample Results

- No sampling for MC has been conducted at the range

4.2.5 Current and Future Land Use

- The land currently comprising the former Bruneau PBR No. 2 is used for agricultural purposes, specifically livestock grazing and grain production.
- Use of the range for agricultural purposes will likely continue into the foreseeable future.
- Barbed wire fencing controls livestock but not human movement

4.2.6 Ecological Receptors

- Mammals and birds.

4.3 MEC Evaluation

- Potential MEC within the bombing range consists of:
  - Practice bombs with spotting charges (spotting charges not associated with sensitive fuze);
  - GP bombs with high explosives (HE) (explosives not burned or detonated from impact); and
  - Small arms 0.50 caliber munitions.
- Small arms ammunition present a very low risk because small arms rarely contain explosive projectiles and a deliberate effort must be applied (using tool resembling a firing pin) to a very specific and small point (the primer) to make the round function.
- The M38A2 100-lb practice bomb poses a low risk attributed to the attached spotting charge. The M38A2 100-lb practice bomb is 47.5 inches long and is designed to simulate a general-purpose bomb of the same size (Figure 4-2). The spotting charge was designed to detonate on impact to mark the location of the practice bomb on the target range. Spotting charges used with the M38A2 100-lb practice bomb consisted of either the M1A1 or M3. The spotting charge produces a flash of flame and smoke for observation of bombing accuracy.
- Intact spotting charges, either the M1A1 or M3, are unlikely to be found. The force of impact with the ground and subsequent rusting of the charge and igniter would likely render the spotting charge inoperable. Spotting charges observed on other recently investigated PBRs were deformed to a degree from impact. The igniters were often bent or broken off of the spotting charge. Rust was visible on all surfaces of the spotting charges. For the spotting charge to function it would have had to remain sealed through time and its container not have rusted through or been damaged by impact with the ground.

- Tampering with an intact spotting charge that contains unaltered black powder could result in bodily harm. Hammering or attempts to disassemble the black-powder filled canister may result in explosion resulting from shock or friction. An exploding spotting charge could cause burns, injury (possibly severe), and/or blinding.
- Evidence (craters) exists for the use of GP bombs containing HE on the bombing range. Range clearance reports do not state findings evidence of GP bombs. There is no record of ordnance clearance, decontamination, or dedudding for the range for GP bombs. Therefore, unexploded 100-lb HE bombs may be present below the surface of the cultivated and uncultivated areas of range area. Unexploded ordnance, if present, may migrate toward land surface through repeated frost cycles or agricultural activities.
- The initiation of the igniters and fuzes associated with the GP bombs is by impact or impact inertia requiring a force to cause the firing pin to strike a primer/detonator. The bomb fuzes can have a delay functioning.
- The GP bomb fuze may be caused to function by being tampered with, or being struck with farming equipment, causing the HE demolition bomb to detonate causing death, severe injury, blinding, and/or severe property damage.
- The overall risk of injury from potential GP bombs at this site in considered moderate, based on a munitions history indicating the use of GP demolition bombs with HE, indirect evidence of HE demolition bomb use on the range (craters), and range clearance documentation. It is noted that the site is used for agricultural activities, and that no incidents with MEC have been recorded in over 60 years since the range was used.

4.4 MC Pathway Evaluation

4.4.1 Terrestrial Pathway

4.4.1.1 Sources of MC

- MC is derived from the use of practice bombs with spotting charges, GP practice bombs with HE, and small caliber ammunition as detailed in Section 4.2.2.
- Approximately 99 % of the MC would have been initially deposited within 3,000 of the target center.
- The PBR has not previously been sampled or analyzed for MC.

4.4.1.2 Migration Pathway

- Soil is the primary medium of concern because of possible MC was initial introduced to the soil. The soil also serves as a secondary source of potential air, surface water, or groundwater contamination.
- Explosive compounds may have degraded over time.
- Agricultural activities may have contributed to the migration of MC:
  - Soil mixing and
  - Irrigation and fertilization of land may promote degradation and dispersion of MC.
- Wind and rain may be dispersed MC.

4.4.1.3 Land use and access

- Land currently and is expected to be used in the future for agriculture and livestock grazing.

4.4.1.4 Human Receptors

- The potential routes of human exposure to contaminated soil are dermal contact, ingestion, and inhalation of soil particulates during intrusive work.
- Potential receptors include ranch workers, agricultural workers, landowners, hunters, and trespassers.
- Terrestrial pathway is complete for human exposure to MC.

4.4.1.5 Ecological Assessment

- The Bruneau PBR No. 2 is not considered an important ecological place or sensitive environment (Table 1).
- The USFWS indicated that the bald eagle may nest or winter in the area Bruneau PBR No. 2. The Idaho Department Fish and Game (IDFG) Conservation Data Center indicates three species may occur within one mile of the range. The status of threatened or endangered species in the area of Bruneau PBR No. 2 is shown in the table below.

Class	Status	Common Name	Scientific Name
Federal	Threatened	Bald Eagle	*Haliaeetus leucocephalus*
State	Protected – Non-Game Species	Ferruginous Hawk	*Buteo regalis*
State	Unprotected Non-Game Species	Woodhouse's toad	*Bufo woodhousii*
State	Species of Concern	Groundsnake	*Sonora semiannulata*

- The potential routes of pets, livestock, and wildlife exposure to contaminated soil are dermal contact, ingestion, and inhalation.
- Potential receptors include livestock and wildlife
- Terrestrial pathway is complete for ecological exposure to MC.

4.4.2 Surface Water/Sediment Pathway

4.4.2.1 Sources of MC

- MC impacted soils on the Bruneau PBR No. 2 could migrate to Halfway Gulch located to the north, south and east of the range.
- Halfway Gulch is an ephemeral stream.
- Sampling and analysis of surface water or sediment samples from Halfway Gulch has not been conducted.

4.4.2.2 Migration Pathway

- Migration would occur during storm events intense enough to cause surface runoff.
- The area averages 8.4 inches per year. As a result, surface runoff and flow within Halfway Gulch rarely occur.
- Runoff from the Halfway Gulch flows easterly into Little Valley Creek which discharges to C J Strike Reservoir approximately 10 miles downstream. This reservoir is located on the Bruneau River.
- Explosive compounds may have degraded over time.

4.4.2.3 Surface water use and access

- Surface water within the area of Bruneau is not used because it is ephemeral. Agricultural activities and domiciles utilize groundwater within the area.

4.4.2.4 Human Receptors

- The potential routes of human exposure to contaminated surface water and sediment include dermal contact, ingestion, and inhalation. Actual exposure to surface water would rarely occur because the environment is so dry that that surface water is ephemeral in nature. Sediment exposure would be similar to exposure to surface soils.
- Potential human receptors include ranch workers, agricultural workers, landowners, hunters, and trespassers.
- The surface water exposure pathway is incomplete for human exposure to MC because of the environment is so dry that surface water is ephemeral in nature.

4.4.2.5 Ecological Assessment

- The potential routes of livestock and wildlife (including aquatic organisms) exposure to contaminated surface water and sediment include dermal contact, ingestion, and inhalation. Primary exposure is assumed to be sediment and not surface water because of the environment is so dry that surface water is ephemeral in nature.
- Potential receptors include livestock and wildlife (including aquatic organisms).
- Surface water pathway is incomplete for ecological exposure to MC because the environment is so dry that surface water is ephemeral in nature.
- The sediment exposure pathway is complete for livestock and wildlife (including aquatic organisms).

4.4.3 Groundwater Pathway

4.4.3.1 Sources of MC

- Impacted soils on the Bruneau PBR No. 2 are the primary source of MC, and sediments are a secondary source of MC.
- Groundwater within the area has not been sampled for MC constituents.

4.4.3.2 Migration Pathway

- There is possibility that MC have migrated to groundwater; however:
  - Metals and explosive compounds have generally low solubilities;

- Depth to groundwater within the area is 300 to 500 ft below ground surface (bgs); and
- Surface soils are a mixture of sands, silts, and clays, and silts and clays readily inhibit the movement of metals and explosives.

- Irrigation of the current range area may promote the movement of MC to groundwater.
- Groundwater flows northerly within the area.

4.4.3.3 *Groundwater use and access*

- Groundwater within the area is used for domestic, agricultural, and livestock/ranching purposes.
- The Idaho Department of Water Resources identifies the presence of two domestic water wells within the boundary of the AOC and a total of four domestic wells within the property boundary of the FUDS.

4.4.3.4 *Human Receptors*

- Potential human receptors include ranch workers, agricultural workers, and landowners
- The potential routes of human exposure to contaminated water include dermal contact, ingestion, and inhalation.
- Human exposure to groundwater is considered complete primarily because domestic wells are present in the range AOC.

4.4.4 Air Pathway

4.4.4.1 Sources of MC

- Impacted soils on the Bruneau PBR No. 2 are the primary source and sediments as secondary source of airborne MC.

4.4.4.2 Migration Pathway

- The MC are considered non-volatile. Exposure to air born MC would be from MC impacted dust.
- Agricultural activities on the range area actively promote the growth of vegetation which would limit dust production.

4.4.4.3 Human Receptors

- The potential routes of human exposure to MC contaminated dust are by dermal contact, ingestion, and inhalation.
- The air pathway is consider incomplete due to active vegetative growth on the range, non-volatility of the MC, and exposure to the air pathway is considered in the human health screening values.

4.5 CSM Summary/Data Gaps

Evaluation of the CSM indicates the following known conditions or data gaps

Pathway	Presence of MEC	Presence of MC	Notes
Soil	Spotting charges found during site clearance; .50 caliber rounds reported by site owners; indirect evidence of GP bomb use (craters)	Unknown.	Two site clearances have been conducted. The area is currently used for agricultural purposes. Findings of MEC (besides small caliber) have not been reported by land owners
Sediment	Unknown	Unknown	No previous analytical work has been conducted.
Surface water	Unknown	Unknown	
Groundwater	NA	Unknown	
Air	NA	NA	Air not considered viable pathway

5.0 Proposed Field Investigation

The proposed field investigation is presented below. The actual investigative approach will be defined in detail in a SSWP that will be submitted to IDEQ and other stakeholders for review. The SSWP will reference technical details including sampling and analytical methods that are described in the *Type I Work Plan, Site Inspections at Multiple Sites* (Shaw, 2006), prepared by Shaw and submitted to USACE as final in February 2006.

5.1 Reconnaissance

A visual reconnaissance of the AOC (bombing range) and surrounding area will be performed prior to any sampling. Although MEC is not expected to be present on the land surface, a magnetometer-assisted (Schonstedt), visual inspection will be conducted by a qualified unexploded ordnance (UXO) technician. Special attention will be given to any draws or craters within the area. A global positioning system (GPS) will be used to record discovered MEC, MD, and sample point locations. Digital photographs will be taken to document significant features.

5.2 Sampling

A summary of the proposed sampling is presented in Table 2. Human health and ecological screening levels are presented in Tables 3-8.

5.2.1 Soils

Eight surface soil samples will be collected within the target center adjacent to MEC or MD concentrated areas. Four surface soil samples will be obtained from the center of the former bombing range and one from each quadrant surrounding the bombing range center. The exact locations of these samples will be determined during the site inspection based on the visual identification of MEC or MD. All samples will be analyzed for explosives and nitroglycerine.

Surface soil samples will be collected at a depth of approximately 0 to 2 inches bgs. Surface soil samples will be composite samples (7-point, wheel pattern with a 2-foot radius). No subsurface samples are planned.

5.2.2 Sediment

Two sediment samples will be collected from Halfway Gulch at a location upgradient and downgradient of the bombing range AOC. The exact locations of these samples will be determined during the site inspection. It is assumed that Halfway Gulch will be dry, therefore, sediment samples will be collected in the same manner as described above for the soil samples. All samples will be analyzed for explosives and nitroglycerine.

5.2.3 Background Sampling

Explosives are the only analytes to be analyzed as part of the SI. Background sampling for explosives is not necessary since explosive compounds would not occur naturally at or around the bombing range.

6.0 TPP and Development of Data Quality Objectives

- The USACE TPP process is a four-phase process:
  - Identify the current project,
  - Determine data needs,
  - Develop data collection options, and
  - Finalize data collection program.
- The purpose of TPP is to develop DQOs that document how the project makes decisions.
- DQOs are intended to capture project-specific information such as the intended data use(s), data needs, and how these items will be achieved.
- Information captured through DQOs will be used as a benchmark for determining whether identified objectives are met.

TPP Phases

Phase I: Identify the Current Project

Question: Is there any person or organization missing from this Team?

Question: Are there any other AOCs to be identified?

Question: Are there additional concerns or issues from landowners or other stakeholders regarding the Bombing Range site?

Question: Are there any administrative or stakeholder concerns or constraints that would prevent site inspection activities from going forward on the decision path for this site?

Phase II: Determine Data Needs

Question: Are there any other pertinent documents relating to the site available?

Question: Are there any other site aspects/information that should be considered?

Question: Do team members concur with the CSM?

- **Are any data missing?**
- **What is the nature of needed data?**
- **What data gaps would additional data meet for making a decision about the site?**
- **Are there any considerations/constraints that need to be addressed for collecting additional data?**

Phase III: Develop Data Collection Options

Question: Based on the desired decision endpoints and information known to date, what additional information is needed to reach a determination of No DoD Action Indicated (NDAI) or further action?

Question: Are the stakeholders in agreement with the sampling approach program?

Question: Are the stakeholders in agreement with the proposed approach for collecting background data?

Phase IV: Finalize Data Collection Program

Background data

Background data will not be obtained for explosives. Background sampling for explosives is not necessary since explosive compounds would not occur naturally at or around the bombing range.

Human Health Screening Level Risk Assessment

Sample results that exceed background will be compared to screening values. Site will be considered NDAI for MC if site results do not exceed screening values (depending also on ecological evaluation).

What concentrations of potential contaminants of concern (metals and explosives) lead to decision end-points for human health (see Human Health Screening Level Tables)?

Question: Are these the correct standards to be applied as screening values for human health risk assessment?

Ecological Screening Level Risk Assessment

The USACE has defined a process for conducting screening level ecological risk assessment (SLERA). A determination is first made whether the site qualifies as an Important Ecological Place (IEP). A second determination is made whether the site is managed for ecological purposes. If neither criterion is met then a SLERA is not required and the process is limited to making observations during the site visit of any acute effects to flora and fauna that may be related to MC. If the site does qualify as an IEP or is managed for ecological purposes, site results that exceed background will be compared to ecological screening values. The site will be considered NDAI for MC if site results do not exceed screening values (depending also on human health evaluation) (see Ecological Screening Level Tables).

Question: Does the site qualify as an IEP?

Question: Is the site managed for ecological purposes?

Question: If the site is an IEP or is managed for ecological purposes, what concentrations of potential contaminants of concern (explosives) lead to decision end-points for ecological risks?

Question: Are these the correct standards to be applied as screening values for ecological risk assessment?

Other Sampling Issues

Question: Are there any additional sampling and analysis methodologies needed for all team members to arrive at a decision end-point?

Question: Given the additional sampling and analysis methodologies, are there impacts to the project schedule that need to be accommodated?

7.0 Proposed Data Quality Objectives

Upon agreement at the TPP meeting, the following decision rules will be applied with regard to MC sampling results:

- Below risk-based screening levels = NDAI;
- Above risk-based screening levels and background = RI/FS.

The following expanded project objectives are proposed:

Objective 1: Determine if the site requires additional investigation or can be recommended for NDAI based on the presence or absence of MEC.

DQO #1 – Utilizing trained UXO personnel and handheld magnetometers, a visual search will be conducted searching for physical evidence to indicate the presence of MEC, (e.g. MEC on the surface, MD, craters, soil discoloration indicative of explosives. The visual search will consist of the bombing range AOC and surrounding area. The following decision rules will apply:

- The following reconnaissance results would support a recommendation for further action with respect to MEC:
  - Direct evidence is found of the presence of MEC (from historical records or SI activities), or evidence of potential MEC that is inconsistent with the bombing range CSM (e.g. use of munitions other than practice and GP bombs).
  - Direct evidence of MEC is not found, but abundant MD is identified suggesting a potential for the presence of MEC.
- The following reconnaissance results would support a recommendation for NDAI with respect to MEC:
  - Direct evidence of MEC is not found; MD is isolated and consistent with the Bombing Range CSM.
  - No evidence of MEC, MD, or magnetic anomalies is identified.
- If there is indication that site users are exposed to MEC hazard, the site will be recommended for a removal action.

Objective 2: Determine if the site requires additional investigation or can be recommended for NDAI based on the presence or absence of MC above screening values.

DQO#2 – Soil and sediment, and surface water samples will be collected and analyzed for explosives. Analytical results will be compared to screening values for human health and ecological risk assessment, and to background values for naturally occurring substances. Any detection of explosive compounds will be considered above background. The following decision rules will apply:

- If sample results do not exceed background, the site will be recommended for NDAI relative to MC.
- If sample results that exceed background are less than human health and ecological screening values, the site will be recommended for NDAI relative to MC.
- If sample results exceed both human health screening values and background values, the site will be recommended for additional investigation.
- If sample results that exceed background exceed ecological screening values but not human health screening values, additional evaluation of the data will be conducted in conjunction with the stakeholders to determine if additional investigation is warranted.

Objective 3: Obtain data required for HRS scoring.

Data required for HRS scoring are identified in the HRS Data Gaps worksheet.

Objective 4: Obtain data required for MRSPP ranking.

Data required for MRSPP ranking are identified in the MRSPP worksheet.

Next Steps

- Shaw will prepare the TPP Memorandum and distribute for concurrence.
- Shaw will prepare the SSWP for review and comment.
- Shaw will collect samples.
- Shaw will prepare the SI Report.
- Conduct 2nd TPP meeting to review SI findings and finalize recommendations.

Figures

DRAWING NUMBER: Bruneau_001_fig1_1_SiteLocation_TPP

OFFICE	DRAWN BY	
CEN	J. Lillis	3/26/07

560000 570000 580000 590000 600000 610000

4770000 4760000 4750000 4740000 4730000 4720000

Rabbit Creek
Corder Creek
Catherine Creek
Castle Creek
Cloudburst Gulch
Garbutt Wash
Foremans Reservoir
Grand View Irrig Distr Canal
High Line Canal
Low Line Canal
Middle Line Canal
Jack Creek
Canyon Creek
Mountain Home AFB
Canal Drain
Lamereton West Side Canal
East Side Canal
Rattlesnake Creek
Flying H Pond
Tom Pond
Dry Creek
Grand View
Grand View Irrf Dist Canal
Shoofly Canal
Snake River
Ditch
Crane Falls Lake
Birch Creek
Mc Keeth Wash
Castle Creek
Twentymile Gulch
Vinson Wash
Bruneau River
Indian Cove Lake
Wilkins Gulch
C J Strike Reservoir
Bruneau Dunes State Park
Dunes Lake
Browns Gulch
Browns Creek
Buckaroo Ditch
South Side Canal
Bruneau River
Mc Keeth Creek
Twentymile Gulch
Poison Creek
Poison Gulch
Vinson Wash
Little Valley Creek
Hot Spring Canal
Buckaroo Ditch
Loveridge Gulch
West Fork Browns Creek
Halfway Gulch
Little Jacks Creek
Shoofly Creek
Lone Juniper Creek
Snow Creek
West Fork Shoofly Creek
Little Horse Basin Gap
Big Horse Basin Gap
Big Jacks Creek
Deadman Gulch
Sugar Creek
Hot Creek
Crowbar Gulch
Browns Creek
Rattlesnake Creek
Broken Wagon Flat Reservoir
Big Draw
Miller Water
Battle Creek

Legend

- Bruneau PBR Property Boundary
- Bruneau PBR Areas of Concern

NOTES:
1) Site Property Boundaries were derived from the Bruneau PBR ASR Supplement.
2) This property is located within the C. J. Strike Reservoir Watershed.

N

0 2 4 8 Miles

REFERENCE/PROJECTION: State Plane NAD 83 UTM Zone 11N

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FIGURE 1

SITE LOCATION

BRUNEAU PBR

Shaw® Shaw Environmental, Inc.

DRAWING NUMBER: Bruneau_002_fig1_2_SiteLayout_TPP

DRAWN BY: J. Lillis 3/26/07

OFFICE: CEN

Bombing Range

Halfway Gulch

Gulch

Halfway

Little Valley Creek

582000.000000 583500.000000 585000.000000 586500.000000 588000.000000

4747000.000000 4745500.000000 4744000.000000 4742500.000000 4741000.000000

Legend

- Bruneau PBR Installation Boundary
- Bruneau PBR Areas of Concern

Groundwater Wells

- Domestic
- Irrigation
- Stockwater

NOTES:

1) AOC Boundaries were derived from the Bruneau PBR ASR Supplement.
2) Groundwater well data were obtained from Idaho Dept. of Water Resources (http://www.idwr.idaho.gov/gisdata/new%20data%20download/wells.htm).
3) This property is located within the C. J. Strike Reservoir Watershed.
4) Topographic map was obtained from USGS Terra Server; it is dated June 20, 1998.

N

0 1,000 2,000 4,000 Feet

REFERENCE/PROJECTION: State Plane NAD 83 UTM Zone 11N

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FIGURE 2

SITE LAYOUT

BRUNEAU PBR

Shaw® Shaw Environmental, Inc.

583500 584000 584500 585000 585500 586000 586500

4744500 4744000 4743500 4743000 4742500 4742000

DRAWING NUMBER: Bruneau_003_fig1_3_AOC_BRNG_TPP

DRAWN BY: J. Lillis 3/26/07

OFFICE: CEN

010 011 012 015 018 017 016 028 024 005 004 001 025 026 006 002 031 030 007 003 032 019 008 009 021 023 020 022

Halfway Gulch

Bombing Range

Legend

- Bruneau PBR Installation Boundary
- Bruneau PBR Areas of Concern
- Taxlot Parcel

Groundwater Wells

- Domestic
- Irrigation

NOTES:

1) AOC Boundaries were derived from the Bruneau PBR ASR Supplement.
2) Groundwater well data were obtained from Idaho Dept. of Water Resources (http://www.idwr.idaho.gov/gisdata/new%20data%20download/wells.htm).
3) This property is located within the C. J. Strike Reservoir Watershed.
4) Aerial Photo was obtained from USGS Terra Server; it is dated June 20, 1998.

0 500 1,000 2,000 Feet

REFERENCE/PROJECTION: State Plane NAD 83 UTM Zone 11N

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FIGURE 3

PARCEL OWNERSHIP MAP

BRUNEAU PBR

Shaw® Shaw Environmental, Inc.

XREF Files: IMAGE Files: airplane.jpg
File: N:\cad\DWG\116188-FUDS\116188SJ-a79.dwg Layout: Layout1 User: Karen.Black Apr 09, 2007 - 10:24am

OFFICE	DRAWN BY		DRAWING NUMBER
SJ	K. Black	4-9-07	116188SJ-A79

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FIGURE 4

CONCEPTUAL SITE MODEL
PRECISION BOMBING RANGE

BRUNEAU PRECISION BOMBING RANGE

Shaw® Shaw Environmental, Inc.

Tables

Table 1
Army Checklist for Important Ecological Places [a]
Bruneau PBR No. 2

	Criteria	Yes / No	Comments
1	Locally important ecological place identified by the Integrated Natural Resource Management Plan, BRAC Cleanup Plan or Redevelopment Plan, or other official land management plans	☐ / ☐	
2	Critical habitat for Federal designated endangered or threatened species	☐ / ☐	
3	Marine Sanctuary	☐ / ☐	
4	National Park	☐ / ☐	
5	Designated Federal Wilderness Area	☐ / ☐	
6	Areas identified under the Coastal Zone Management Act	☐ / ☐	
7	Sensitive Areas identified under the National Estuary Program or Near Coastal Waters Program	☐ / ☐	
8	Critical areas identified under the Clean Lakes Program	☐ / ☐	
9	National Monument	☐ / ☐	
10	National Seashore Recreational Area	☐ / ☐	
11	National Lakeshore Recreational Area	☐ / ☐	
12	Habitat known to be used by Federal designated or proposed endangered or threatened species	☐ / ☐	
13	National preserve	☐ / ☐	
14	National or State Wildlife Refuge	☐ / ☐	
15	Unit of Coastal Barrier Resources System	☐ / ☐	
16	Coastal Barrier (undeveloped)	☐ / ☐	
17	Federal land designated for protection of natural ecosystems	☐ / ☐	
18	Administratively Proposed Federal Wilderness Area	☐ / ☐	
19	Spawning areas critical for the maintenance of fish/shellfish species within river, lake, or coastal tidal waters	☐ / ☐	
20	Migratory pathways and feeding areas critical for maintenance of anadromous fish species within river reaches or areas in lakes or coastal tidal waters in which fish spend extended periods of time	☐ / ☐	
21	Terrestrial areas utilized for breeding by large or dense aggregations of animals	☐ / ☐	
22	National river reach designated as Recreational	☐ / ☐	
23	Habitat known to be used by state designated endangered or threatened species	☐ / ☐	
24	Habitat known to be used by species under review as to its Federal endangered or threatened status	☐ / ☐	
25	Coastal Barrier (partially developed)	☐ / ☐	
26	Federally designated Scenic or Wild River	☐ / ☐	
27	State land designated for wildlife or game management	☐ / ☐	
28	State-designated Scenic or Wild River	☐ / ☐	
29	State-designated Natural Areas	☐ / ☐	
30	Particular areas, relatively small in size, important to maintenance of unique biotic communities	☐ / ☐	
31	State-designated areas for protection or maintenance of aquatic life	☐ / ☐	
32	Wetlands	☐ / ☐	
33	Fragile landscapes, land sensitive to degradation if vegetative habitat or cover diminishes	☐ / ☐	

a – Based on EPA, 1990, 55 FR 51624, Table 4-23 – Sensitive Environments Rating Values, Dec. 14, 1990; EPA, 1997, ERAGS, Exhibit 1-1 List of Sensitive Environments

Table 2
Proposed Sampling Approach
Bruneau PBR No. 2

AOC	Location to be Sampled	Number of Samples	Media to be Sampled			Contaminants of Concern		MEC Survey to be Conducted?	Comments
			Surface Soil	Sediment	Surface Water	Explosives/Nitroglycerine			
						Soil/Sed	Water		
1	Bombing Range	10	8	2	0	10	0	Yes	Four surface soil samples will be obtained from the center of the former bombing range and one from each quadrant surrounding the bombing range center. Two sediment samples will be collected from Halfway Gulch at a location upgradient and downgradient of the bombing range AOC
	Background	0	0	0	0	0	0	Yes	No background sampling proposed.
Sample Totals		**10**	**8**	**2**	**0**	**10**	**0**		
Quality Control Samples						1	0		
Total Samples to be Analyzed						**11**	**0**		

AOC = Areas of Concern

Surface soil and sediment samples are composite samples (7-point, wheel pattern with 2-foot radius).

Table 3

Human Health Screening Criteria for Soil/Sediment at Idaho Sites[a]

Analyte	Abbreviation	CAS No.	Region 9 Human Health Screening Values				Idaho IDTL for Soil[d] (mg/kg)
			Residential PRG[b] (mg/kg)	Industrial PRG[b] (mg/kg)	SSLs[c] DAF=1 (mg/kg)	SSLs[c] DAF=20 (mg/kg)	
Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	121-82-4	4.4	16			
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	HMX	2691-41-0	3,100	31,000			
2,4,6-Trinitrotoluene	2,4,6-TNT	118-96-7	16	57			0.0134
1,3,5-Trinitrobenzene	1,3,5-TNB	99-35-4	1,800	18,000			
1,3-Dinitrobenzene	1,3-DNB	99-65-0	6.1	62			
2,4-Dinitrotoluene	2,4-DNT	121-14-2	0.72[e]	2.5[e]	0.00004	0.0008	0.00029
2,6-Dinitrotoluene	2,6-DNT	606-20-2	0.72[e]	2.5[e]	0.00004	0.0008	0.00021
2-Amino-4,6-dinitrotoluene	2-Am-DNT	35572-78-2	12	120			
2-Nitrotoluene	2-NT	88-72-2	0.88	2.2			
3-Nitrotoluene	3-NT	99-08-1	730	1,000			
4-Amino-2,6-dinitrotoluene	4-Am-DNT	19406-51-0	12	120			
4-Nitrotoluene	4-NT	99-99-0	12	30			
Nitrobenzene	NB	98-05-3	20	100	0.007	0.1	0.0218
Nitroglycerin	NG	55-63-0	35	120			
Methyl-2,4,6-trinitrophenylnitramine	Tetryl	479-45-8	610	6,200			
Pentaeryltritol tetranitrate	PENT	78-11-5					
Aluminum	Al	7429-90-5	76,000	100,000			
Antimony	Sb	7440-36-0	31	410	0.30	5	4.77
Arsenic	As	7440-38-2	0.39	1.6	1	29	0.39[f]
Barium	Ba	7440-38-2	5,400	67,000	82	1,600	896
Beryllium	Be	7440-41-7	150	1,900	3	63	1.63
Cadmium	Cd	7440-43-9	37	450	0.4	8	1.35
Calcium	Ca	7440-70-2					
Chromium	Cr	7440-47-3	210[g]	450[g]	2[g]	38[g]	7.9[h]
Cobalt	Co	7440-48-4	900	1,900			
Copper	Cu	7440-50-8	3,100	41,000			921
Iron	Fe	7439-89-6	23,000	100,000			5.76[f]
Lead	Pb	7439-92-1	400	800			49.6
Magnesium	Mg	7439-95-4					
Manganese	Mn	7439-96-5	1,800	19,000			223
Molybdenum	Mo	7439-98-7	390	5,100			
Nickel	Ni	7440-02-0	1,600	20,000	7	130	59.1
Potassium	K	7440-09-7					
Selenium	Se	7782-49-2	390	5,100	0.3	5	2.03
Silver	Ag	7440-22-4	390	5,100	2	34	0.189

Table 3

Human Health Screening Criteria for Soil/Sediment at Idaho Sites[a]

Analyte	Abbreviation	CAS No.	Region 9 Human Health Screening Values				Idaho IDTL for Soil[d] (mg/kg)
			Residential PRG[b] (mg/kg)	Industrial PRG[b] (mg/kg)	SSLs[c] DAF=1 (mg/kg)	SSLs[c] DAF=20 (mg/kg)	
Sodium	Na	7440-23-5					
Strontium	Sr	7440-24-6	47,000	100,000			
Thallium	Tl	7440-28-0	5.2	67			1.55
Titanium	Ti	7440-32-6	100,000	100,000			
Vanadium	V	7440-62-2	78	1,000	300	6,000	
Zinc	Zn	7440-66-6	23,000	100,000	620	12,000	886
Zirconium	Zr	7440-67-7					
Mercury	Hg	7439-97-6	23	310			0.0051
Phosphorus (white)	WP or P_4	7723-14-0	1.6	20			

DAF = Dilution Attenuation Factor
PRG = Preliminary Remediation Goal
SSL = Soil Screening Level
IDTL = Initial Default Target Level

mg/kg = milligrams per kilogram.
mg/L = milligrams per liter.

[a] If laboratory cannot meet any of the preferred QLs with routine SW 846 methodology (as supported by MDLs that are no greater than 1/3 QL), laboratory's QL must be identified in laboratory submittal as failing to meet the QL. Some screening values cannot be obtained with routine methodology to the QL. In those cases, the QL achievable with a routine SW 846 methodology would be accepted.

[b] PRGs from Region 9 PRG Table dated October 2004 and addendum dated 28 December 2004, based on single chemical.

[c] SSLs from Region 9 PRG Table dated October 2004 and revision note dated 28 December 2004.

[d] Idaho Initial Default Target Levels for Soil from *Idaho Risk Evaluation Manual* , Appendix A, dated July 2004, based on single chemical. In addition, values are based on groundwater protection via soils leaching to groundwater unless otherwise noted.

[e] Carconogenic DNT mixture values used if more conservative than noncarcinogenic isomer-specific values.

[f] Based on surficial soil.

[g] Based on total chromium.

[h] Based on chromium VI.

[i] Based on iron oxide.

Table 4

Human Health Screening Criteria for Surface Water at Idaho Sites[a]

			Region 9 Tap Water PRG[b] (µg/L)	Federal Ambient Water Criteria for Consumption of:		Idaho Surface Water Standards	
				Water and Organism[c] (µg/L)	Organism Only[c] (µg/L)	Water and Organism[d] (µg/L)	Organism Only[d] (µg/L)
Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	121-82-4	0.61				
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	HMX	2691-41-0	1,800				
2,4,6-Trinitrotoluene	2,4,6-TNT	118-96-7	2.2				
1,3,5-Trinitrobenzene	1,3,5-TNB	99-35-4	1,100				
1,3-Dinitrobenzene	1,3-DNB	99-65-0	3.6				
2,4-Dinitrotoluene[e]	2,4-DNT	121-14-2	0.099	0.11	3.4	0.11	9.1
2,6-Dinitrotoluene[e]	2,6-DNT	606-20-2	0.099				
2-Amino-4,6-dinitrotoluene	2-Am-DNT	35572-78-2	7.3				
2-Nitrotoluene	2-NT	88-72-2	0.049				
3-Nitrotoluene	3-NT	99-08-1	120				
4-Amino-2,6-dinitrotoluene	4-Am-DNT	19406-51-0	7.3				
4-Nitrotoluene	4-NT	99-99-0	0.66				
Nitrobenzene	NB	98-05-3	3.4	17	690[i]	17	1,900
Nitroglycerin	NG	55-63-0	4.8				
Methyl-2,4,6-trinitrophenylnitramine	Tetryl	479-45-8	360				
Pentaeryltritol tetranitrate	PETN	78-11-5					
Aluminum	Al	7429-90-5	36,000				
Antimony	Sb	7440-36-0	15	5.6	640	14	4,300
Arsenic	As	7440-38-2	0.045	0.018	0.14	50[f]	50[f]
Barium	Ba	7440-38-2	2,600	1,000[h]			
Beryllium	Be	7440-41-7	73	g			
Cadmium	Cd	7440-43-9	18	g			
Calcium	Ca	7440-70-2					
Chromium[i]	Cr	7440-47-3	110	g			
Cobalt	Co	7440-48-4	730	g			
Copper	Cu	7440-50-8	1,500	1,300[j]			
Iron	Fe	7439-89-6	11,000	300[h]			
Lead	Pb	7439-92-1					
Magnesium	Mg	7439-95-4					
Manganese	Mn	7439-96-5	880	50[h]	100[h,k]		

Table 4

Human Health Screening Criteria for Surface Water at Idaho Sites[a]

			Region 9 Tap Water PRG[b] (µg/L)	Federal Ambient Water Criteria for Consumption of:		Idaho Surface Water Standards	
				Water and Organism[c] (µg/L)	Organism Only[c] (µg/L)	Water and Organism[d] (µg/L)	Organism Only[d] (µg/L)
Mercury	Hg	7439-97-6	11			0.14[f]	0.15[f]
Molybdenum	Mo	7439-98-7	180				
Nickel	Ni	7440-02-0	730	610	4,600	610[f]	4600[f]
Potassium	K	7440-09-7					
Selenium	Se	7782-49-2	180	170[g]	4,200		
Silver	Ag	7440-22-4	180				
Sodium	Na	7440-23-5					
Strontium	Sr	7440-24-6	22,000				
Thallium	Tl	7440-28-0	2.4	0.24	0.47	1.7	6.3
Titanium	Ti	7440-32-6	150,000				
Vanadium	V	7440-62-2	36				
Zinc	Zn	7440-66-6	11,000	7,400[j]	26,000[j]		
Zirconium	Zr	7440-67-7					
Phosphorus (white)	WP or P_4	7723-14-0	0.73				

PRG = Preliminary Remediation Goal
µg/L = micrograms per liter

[a] If laboratory cannot meet these QLs with routine SW 846 methodology (as supported by MDLs that are no greater than 1/3 QL), laboratory's QL must be identified in laboratory submittal as failing to meet the QL. Some screening values cannot be obtained with routine methodology to the QL.

[b] Region 9 PRG Table dated October 2004 and revision note dated 28 December 2004, based on single chemical.

[c] National Recommended Water Quality Criteria, U.S. Environmental Protection Agency, Office of Water, 2006. These constituents are considered priority pollutants unless indicated otherwise.

[d] Surface Water Standards from Idaho Risk Evaluation Manual, Table 3-5, dated July 2004, based on single chemical.

[e] Carcinogenic DNT mixture values used if more conservative than noncarcinogenic isomer-specific values.

[f] Value is based on dissolved form of chemical.

[g] A more stringent MCL has been issued by EPA. Refer to drinking water regulations (40 CFR 141).

[h] The constituent is a non-priority pollutant.

[i] Total chromium values used if available.

[j] The organoleptic effect criterion is more stringent than the value for priority toxic pollutants..

[k] Criterion for manganese is not based on toxic effects, but rather is intended to minimize objectionable qualities, such as laundry stains, and objectionable taste in beverages.

Table 5
Human Health Screening Criteria for Groundwater at Idaho Sites[a]

			Region 9 Tap Water PRG[b] (µg/L)	Federal Drinking Water Criteria MCLs[c] (µg/L)	Idaho IDTL for Groundwater[d] (µg/L)
Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	121-82-4	0.61		
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	HMX	2691-41-0	1,800		
2,4,6-Trinitrotoluene	2,4,6-TNT	118-96-7	2.2		1.86[f]
1,3,5-Trinitrobenzene	1,3,5-TNB	99-35-4	1,100		
1,3-Dinitrobenzene	1,3-DNB	99-65-0	3.6		
2,4-Dinitrotoluene	2,4-DNT	121-14-2	0.099[e]		0.0822[f]
2,6-Dinitrotoluene	2,6-DNT	606-20-2	0.099[e]		0.0822[f]
2-Amino-4,6-dinitrotoluene	2-Am-DNT	35572-78-2	7.3		
2-Nitrotoluene	2-NT	88-72-2	0.049		
3-Nitrotoluene	3-NT	99-08-1	120		
4-Amino-2,6-dinitrotoluene	4-Am-DNT	19406-51-0	7.3		
4-Nitrotoluene	4-NT	99-99-0	0.66		
Nitrobenzene	NB	98-05-3	3.4		5.21[f]
Nitroglycerin	NG	55-63-0	4.8		
Methyl-2,4,6-trinitrophenylnitramine	Tetryl	479-45-8	360		
Pentaeryltritol tetranitrate	PETN	78-11-5			
Aluminum	Al	7429-90-5	36,000	50[g]	
Antimony	Sb	7440-36-0	15	6	6
Arsenic	As	7440-38-2	0.045	10	10
Barium	Ba	7440-38-2	2,600	2,000	2,000
Beryllium	Be	7440-41-7	73	4	4
Cadmium	Cd	7440-43-9	18	5	5
Calcium	Ca	7440-70-2			
Chromium III (Total)[h]	Cr	7440-47-3	110	100	
Chromium VI	Cr	7440-47-3			31.3[f]
Cobalt	Co	7440-48-4	730		
Copper	Cu	7440-50-8	1,500	1,000[g] 1,300[i]	1,300
Iron	Fe	7439-89-6	11,000	300[g]	3,130[f]
Lead	Pb	7439-92-1		15[i]	15
Magnesium	Mg	7439-95-4			
Manganese	Mn	7439-96-5	880	50[g]	250[f]
Mercury	Hg	7439-97-6	11	2	2
Molybdenum	Mo	7439-98-7	180		
Nickel	Ni	7440-02-0	730		209[f]
Potassium	K	7440-09-7			
Selenium	Se	7782-49-2	180	50	50
Silver	Ag	7440-22-4	180	100[g]	52.1[f]
Sodium	Na	7440-23-5		20,000[j]	
Strontium	Sr	7440-24-6	22,000		
Thallium	Tl	7440-28-0	2.4	2	2

Table 5
Human Health Screening Criteria for Groundwater at Idaho Sites[a]

			Region 9 Tap Water PRG[b] (µg/L)	Federal Drinking Water Criteria MCLs[c] (µg/L)	Idaho IDTL for Groundwater[d] (µg/L)
Titanium	Ti	7440-32-6	150,000		
Vanadium	V	7440-62-2	36		
Zinc	Zn	7440-66-6	11,000	5,000[g]	3,130[f]
Zirconium	Zr	7440-67-7			
Phosphorus (white)	WP or P_4	7723-14-0	0.73		

MCL = Maximum Contaminant Level

PRG = Preliminary Remediation Goal

µg/L = micrograms per liter

IDTL = Initial Default Target Level

[a] If laboratory cannot meet these QLs with routine SW 846 methodology (as supported by MDLs that are no greater than 1/3 QL), laboratory's QL must be identified in laboratory submittal as failing to meet the QL. Some screening values cannot be obtained with routine methodology to the QL.

[b] Region 9 PRG Table dated October 2004 and revision note dated 28 December 2004, based on single chemical.

[c] Primary MCL from the 2004 Edition of the Drinking Water Standards and Health Advisories, dated Winter 2004, is listed unless otherwise indicated.

[d] Idaho Initial Default Target Levels for Groundwater from Idaho Risk Evaluation Manual, Appendix A, dated July 2004, based on a single chemical. Values are based on MCLs unless otherwise noted.

[e] Carcinogenic DNT mixture values used if more conservative than noncarcinogenic isomer-specific values.

[f] IDTL is risk-based.

[g] Secondary MCL from the 2004 Edition of the Drinking Water Standards and Health Advisories, dated Winter 2004.

[h] Total chromium values used if appropriate. Otherwise, value for chromium VI is used.

[i] Action level from the 2004 Edition of the Drinking Water Standards and Health Advisories, dated Winter 2004.

[j] Value from the 2004 Edition of the Drinking Water Standards and Health Advisories, dated Winter 2004, Drinking Water Advisory Table.

Table 6
Selection of Ecological Soil Screening Toxicity Values for Constituents of Potential Ecological Concern
(Idaho Sites)

	SSLs (USEPA, 2005) [a]	ODEQ Level II Screening Level [b]	Proposed Benchmarks									Potential Bioaccumulative Constituent? [i]	Final Ecological Screening Value Soil [j]
	Lowest Value for Plants/Invertebrates, Mammals and Birds		Region 5 ESLs [c] (2003)	Region 7 [d]		Region 8 [e]		Region 10 [f]		Other Values: Talmage et al. (1999) [g] or LANL (2005) [h]			
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)		(mg/kg)		(mg/kg)		(mg/kg)			**(mg/kg)**
Metals/Inorganics													
Aluminum	Narrative	50	NVA	50	EPA-R4	NVA		50	EPA-R4	5.5	LANL		50
Antimony	0.27	5	0.142	0.27	SSL	0.27	SSL	0.27	SSL	0.05	LANL	Yes	0.27
Arsenic	18	10	5.7	18	SSL	18	SSL	18	SSL	6.8	LANL	Yes	18
Barium	330	85	1.04	330	SSL	330	SSL	330	SSL	110	LANL		330
Beryllium	21	10	1.06	21	SSL	21	SSL	21	SSL	2.5	LANL	Yes	21
Cadmium	0.36	4	0.00222	0.36	SSL	0.36	SSL	0.36	SSL	0.27	LANL	Yes	0.36
Calcium		NVA	NVA	NVA		NVA		NVA		NVA			NVA/Nutrient
Chromium (total)	26	0.4	0.4	26	SSL	26	SSL	26	SSL	2.3	LANL	Yes	26
Cobalt	13	20	0.14	13	SSL	13	SSL	13	SSL	13	LANL		13
Copper		50	5.4	60	ORNL	190	Dutch	60	ORNL	10	LANL	Yes	50
Iron	Narrative	10 mg/L	NVA	200	EPA-R4	NVA		200	EPA-R4	NVA			200
Lead	11	16	0.0537	11	SSL	11	SSL	11	SSL	14	LANL	Yes	11
Magnesium		NVA	NVA	440000	EPA-R4	NVA		440000	EPA-R4	NVA			NVA/Nutrient
Manganese		100	NVA	100	EPA-R4	NVA		100	EPA-R4	50	LANL		100
Mercury		0.1	0.1	0.00051	ORNL	0.00051	ORNL	0.00051	ORNL	0.013	LANL	Yes	0.1
Molybdenum		2	NVA	2	ORNL	2	ORNL	2	ORNL	NVA			2
Nickel		30	13.6	30	ORNL	30	ORNL	30	ORNL	20	LANL	Yes	30
Perchlorate		NVA	NVA	NVA		NVA		NVA		NVA			NVA
Phosphorus (white)		NVA	NVA	NVA		NVA		NVA		NVA			NVA
Potassium		NVA	NVA	NVA		NVA		NVA		NVA			NVA/Nutrient
Selenium		1	0.0276	0.21	ORNL	0.21	ORNL	0.21	ORNL	0.1	LANL	Yes	1
Silver		2	4.04	2	ORNL	2	ORNL	2	ORNL	0.05	LANL	Yes	2
Sodium		NVA	NVA	NVA		NVA		NVA		NVA			NVA/Nutrient
Strontium		32875	NVA	NVA		NVA		NVA		96	LANL		32875
Thallium		1	0.0569	1	ORNL	1	ORNL	1	ORNL	0.032	LANL	Yes	1
Titanium		1000	NVA	NVA		NVA		NVA		72	LANL		1000
Vanadium	7.8	2	1.59	7.8	SSL	7.8	SSL	7.8	SSL	0.025	LANL		7.8
Zinc		50	6.62	8.5	ORNL	8.5	ORNL	8.5	ORNL	10	LANL	Yes	50
Zirconium		97	NVA	NVA		NVA		NVA		NVA			97
PAHs													
1-Methylnaphthalene		NVA	NVA	NVA		NVA		NVA		NVA			2.5 (surrogate)
2-Methylnaphthalene		NVA	3.24	NVA		NVA		NVA		2.5	LANL		2.5
Acenaphthene		20	682	20	ORNL	20	ORNL	20	ORNL	0.25	LANL	Yes	20
Acenaphthylene		NVA	682	682	EPA-R4	NVA		682	EPA-R4	120	LANL	Yes	120
Anthracene		NVA	1480	0.1	EPA-R4	NVA		0.1	EPA-R4	210	LANL	Yes	210
Benzo(a)anthracene		NVA	5.21	5.21	EPA-R4	NVA		5.21	EPA-R4	3.0	LANL	Yes	3

Table 6
Selection of Ecological Soil Screening Toxicity Values for Constituents of Potential Ecological Concern
(Idaho Sites)

	SSLs (USEPA, 2005) [a]	ODEQ Level II Screening Level [b]	Proposed Benchmarks									Potential Bioaccumulative Constituent? [i]	Final Ecological Screening Value Soil [j]
	Lowest Value for Plants/Invertebrates, Mammals and Birds		Region 5 ESLs [c] (2003)	Region 7 [d]		Region 8 [e]		Region 10 [f]		Other Values: Talmage et al. (1999) [g] or LANL (2005) [h]			
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)		(mg/kg)		(mg/kg)		(mg/kg)			**(mg/kg)**
Benzo(a)pyrene		125	1.52	0.1	EPA-R4	NVA		0.1	EPA-R4	9.6	LANL	Yes	125
Benzo(b)fluoranthene		NVA	59.8	59.8	EPA-R4	NVA		59.8	EPA-R4	18	LANL	Yes	18
Benzo(k)fluoranthene		NVA	148	148	EPA-R4	NVA		148	EPA-R4	62	LANL	Yes	62
Benzo(g,h,i)perylene		NVA	119	119	EPA-R4	NVA		119	EPA-R4	24	LANL	Yes	24
Chrysene		NVA	4.73	4.73	EPA-R4	NVA		4.73	EPA-R4	2.4	LANL	Yes	2.4
Dibenz(a,h)anthracene		NVA	18.4	18.4	EPA-R4	NVA		18.4	EPA-R4	12	LANL	Yes	12
Dibenzofuran		0.002	NVA	NVA		NVA		NVA		6.1	LANL		0.002
Fluoranthene		NVA	122	0.1	EPA-R4	NVA		0.1	EPA-R4	22	LANL	Yes	22
Fluorene		30	122	122	EPA-R4	NVA		122	EPA-R4	4.1	LANL	Yes	30
Indeno(1,2,3-cd)pyrene		NVA	109	109	EPA-R4	NVA		109	EPA-R4	62	LANL	Yes	62
Naphthalene		10	0.0994	0.1	EPA-R4	NVA		0.1	EPA-R4	0.34	LANL		10
Phenanthrene		NVA	45.7	0.1	EPA-R4	NVA		0.1	EPA-R4	10	LANL	Yes	10
Pyrene		NVA	78.5	0.1	EPA-R4	NVA		0.1	EPA-R4	18	LANL	Yes	18
Explosive													
2,4-Dinitrotoluene		NVA	1.28	1.28	EPA-R4	NVA		1.28	EPA-R4	0.52	LANL		0.52
2,6-Dinitrotoluene		NVA	0.0328	0.0328	EPA-R4	NVA		0.0328	EPA-R4	0.37	LANL		0.37
2-Amino-4,6-Dinitrotoluene		NVA	NVA	NVA		NVA		NVA		2.1	LANL		2.1
4-Amino-2,6-Dinitrotoluene		NVA	NVA	NVA		NVA		NVA		0.73	LANL		0.73
1,3-Dinitrobenzene		NVA	0.655	0.655	EPA-R4	NVA		0.655	EPA-R4	0.073	LANL		0.073
HMX		NVA	NVA	NVA		NVA		NVA		27	LANL		27
Nitrobenzene		8	1.31	1.31	EPA-R4	NVA		1.31	EPA-R4	2.2	LANL		8
RDX		NVA	NVA	NVA		NVA		NVA		7.5	LANL		7.5
1,3,5-Trinitrobenzene		NVA	0.376	0.376	EPA-R4	NVA		0.376	EPA-R4	6.6	LANL		6.6
2,4,6-Trinitrotoluene		NVA	NVA	NVA		NVA		NVA		6.4	LANL		6.4
2-Nitrotoluene		NVA	NVA	NVA		NVA		NVA		2.0	LANL		2.0
3-Nitrotoluene		NVA	NVA	NVA		NVA		NVA		2.4	LANL		2.4
4-Nitrotoluene		NVA	NVA	NVA		NVA		NVA		4.4	LANL		4.4
Nitroglycerin		NVA	NVA	NVA		NVA		NVA		71	LANL		71
Tetryl		NVA	NVA	NVA		NVA		NVA		0.99	LANL		0.99
PETN		NVA	NVA	NVA		NVA		NVA		8600	LANL		8600

Note: No Idaho Ecological Screening Values available.
NVA: No value available

[a] U.S. Environmental Protection Agency, 2005, *Guidance for Developing Ecological Soil Screening Levels (Eco-SSLs)* , Office of Solid Waste and Emergency Response, Website version last updated March 15, 2005: http://www.epa.gov/ecotox/ecossl.

[b] Oregon Department of Environmental Quality Screening Level Values (December 2001).

[c] Ecological Screening Levels (ESLs), U.S.EPA Region V, August 2003.

[d] USEPA Region 7: Catherine Wooster-Brown (Eco Risk Assessor) recommends the following hierarchy: USEPA EcoSSLs; ORNL Effroymson values; USEPA Region 4 values; other published values.

Table 6
Selection of Ecological Soil Screening Toxicity Values for Constituents of Potential Ecological Concern
(Idaho Sites)

[e] USEPA Region 8: Dale Hoff (Eco Risk Assessor) recommends the following hierarchy: USEPA SSLs; Dutch Intervention Values or ORNL Effroymson values.

[f] USEPA Region 10: Joseph Goulet (Eco Risk Assessor) says Region 10 has no recommended hierarchy, therefore, values from the USEPA Region 7 Approach were used.

[g] Talmage, S.S., D.M. Opresko, C.J. Maxwell, C.J.E. Welsh, F.M. Cretella, P.H. Reno, and F.B. Daniel, 1999, Nitroaromatic Munition Compounds: Environmental Effects and Screening Values, **Rev. Environ. Contam. Toxicol.**

[h] Los Alamos National Laboratory (LANL), Eco Risk Database, Release 2.2, September 2005.

[i] Potential bioaccumulative constituents will be evaluated in more detail, as some screening values do not take into account bioaccumulation.
Potential bioaccumulative potential from: B*ioaccumulation and Interpretation for the Purposes of Sediment Quality Assessment: Status and Needs* (USEPA, 2000) and ODEQ EQSLVs (ODEQ, 2001).

[j] Final Screening Value selected using the following hierarchy (Jeff Fromm, Idaho Dept of Environmental Quality, pers comm 2/27/2007):
1. SSL Values Developed by USEPA (2005)
2. Oregon (2001) Values
3. Lower of LANL or ORNL Values
4. Other Available Values

EPA-R4=USEPA Region 4
LANL= Los Alamos National Laboratory
SSL=USEPA Eco Soil Screening Levels
Dutch=Dutch Intervention Values
ORNL= Oak Ridge National Laboratory Ecological PRGs (Efroymson et al)

Other References:

Efroymson, R.A., Suter II, G.W., Sample, B.E. and Jones, D.S., 1997. Preliminary Remediation Goals for Ecological Endpoints. Lockheed Martin Energy Systems, Inc. (ORNL) ES/ER/TM-162/R2.
Dutch Intervention Values:
Swartjes, F.A. 1999. R*isk-based Assessment of Soil and Groundwater Quality in the Netherlands: Standards and Remediation Urgency.* Risk Analysis 19(6): 1235-1249
The Netherlands Ministry of Housing, Spatial Planning and Environment's Circular on target values and intervention values for soil remediation http://www2.minvrom.nl/Docs/internationaal/S_I2000.pdf and Annex A: Target Values, Soil Remediation Intervention Values and Indicative Levels for Serious Contamination http://www2.minvrom.nl/Docs/internationaal/annexS_I2000.pdf were also consulted.

Table 7
Selection of Ecological Sediment Screening Toxicity Values for Constituents of Potential Ecological Concern
(Idaho Sites)

Parameter	ODEQ Screening Level Values [a] (mg/kg) Freshwater	Region 5 Ecological Screening Levels [b] (mg/kg)	EPA Region 7 [c] (mg/kg)		EPA Region 8 [d] (mg/kg)		EPA Region 10 [e] (mg/kg)		Other Ecological Screening Levels [f] (mg/kg)		Potential Bioaccumulative Constituent? [g]	Final Ecological Screening Value Sediment [h] (mg/kg)
Metals/Inorganics												
Aluminum	NVA	NVA	NVA		NVA		NVA		2.80E+02	LANL		2.80E+02
Antimony	3.00E+00	NVA	NVA		NVA		NVA		3.60E-01	LANL	Yes	3.00E+00
Arsenic	4.00E+00	9.79E+00	9.79E+00	MAC	9.79E+00	MAC	9.79E+00	MAC	1.20E+01	LANL	Yes	4.00E+00
Barium	NVA	NVA	NVA		NVA		NVA		4.80E+01	LANL		4.80E+01
Beryllium	1.22E+02	NVA	NVA		NVA		NVA		7.30E+01	LANL	Yes	1.22E+02
Cadmium	3.00E-03	9.90E-01	9.90E-01	MAC	9.90E-01	MAC	9.90E-01	MAC	3.30E-01	LANL	Yes	3.00E-03
Calcium	NVA	NVA	NVA		NVA		NVA		NVA			NVA
Chromium	3.70E+01	4.34E+01	4.34E+01	MAC	4.34E+01	MAC	4.34E+01	MAC	5.60E+01	LANL	Yes	3.70E+01
Cobalt	NVA	5.00E+01	NVA		NVA		NVA		2.30E+02	LANL		2.30E+02
Copper	1.00E+01	3.16E+01	3.16E+01	MAC	3.16E+01	MAC	3.16E+01	MAC	1.70E+01	LANL	Yes	1.00E+01
Iron	NVA	NVA	NVA		NVA		NVA		2.00E+01	LANL		2.00E+01
Lead	3.50E+01	3.58E+01	3.58E+01	MAC	3.58E+01	MAC	3.58E+01	MAC	2.70E+01	LANL	Yes	3.50E+01
Magnesium	NVA	NVA	NVA		NVA		NVA		NVA			NVA
Manganese	1.10E+03	NVA	NVA		NVA		NVA		7.20E+02	LANL		1.10E+03
Mercury	2.00E-01	1.74E-01	1.80E-01	MAC	1.80E-01	MAC	1.80E-01	MAC	1.80E-02	LANL	Yes	2.00E-01
Molybdenum	NVA	NVA	NVA		NVA		NVA		NVA			NVA
Nickel	1.80E+01	2.27E+01	2.27E+01	MAC	2.27E+01	MAC	2.27E+01	MAC	3.90E+01	LANL	Yes	1.80E+01
Perchlorate	NVA	NVA	NVA		NVA		NVA		NVA			NVA
Phosphorus	NVA	NVA	NVA		NVA		NVA		NVA			NVA
Potassium	NVA	NVA	NVA		NVA		NVA		NVA			NVA
Selenium	1.00E-01	NVA	NVA		NVA		NVA		1.00E+00	LANL	Yes	1.00E-01
Silver	4.50E+00	5.00E-01	1.80E+00	EPRG	1.80E+00	EPRG	1.80E+00	EPRG	1.00E+00	LANL	Yes	4.50E+00
Sodium	NVA	NVA	NVA		NVA		NVA		NVA			NVA
Strontium	NVA	NVA	NVA		NVA		NVA		1.70E+03	LANL		1.70E+03
Thallium	7.00E-01	NVA	NVA		NVA		NVA		4.40E-02	LANL	Yes	7.00E-01
Titanium	NVA	NVA	NVA		NVA		NVA		9.80E+01	LANL		9.80E+01
Vanadium	NVA	NVA	NVA		NVA		NVA		3.00E+01	LANL		3.00E+01
Zinc	3.00E+00	1.21E+02	1.21E+02	MAC	1.21E+02	MAC	1.21E+02	MAC	3.70E+01	LANL	Yes	3.00E+00
Zirconium	NVA	NVA	NVA		NVA		NVA		NVA			NVA
PAHs												
1-Methylnaphthalene	NVA	NVA	NVA		NVA		NVA		NVA			0.18 (surrogate)
2-Methylnaphthalene	NVA	2.02E-02	NVA		2.00E-02	ISQG	NVA		1.80E-01	LANL		1.80E-01
Acenaphthene	2.90E+02	6.71E-03	8.90E-02	EPRG	6.70E-03	ISQG	8.90E-02	EPRG	6.20E-01	LANL	Yes	2.90E+02

Table 7
Selection of Ecological Sediment Screening Toxicity Values for Constituents of Potential Ecological Concern
(Idaho Sites)

Parameter	ODEQ Screening Level Values [a] (mg/kg) Freshwater	Region 5 Ecological Screening Levels [b] (mg/kg)	EPA Region 7 [c] (mg/kg)		EPA Region 8 [d] (mg/kg)		EPA Region 10 [e] (mg/kg)		Other Ecological Screening Levels [f] (mg/kg)		Potential Bioaccumulative Constituent? [g]	Final Ecological Screening Value Sediment [h] (mg/kg)
Acenaphthylene	1.60E+02	5.87E-03	1.30E-01	EPRG	5.87E-03	ISQG	1.30E-01	EPRG	4.40E-02	LANL	Yes	1.60E+02
Anthracene	5.70E+01	5.72E-02	5.72E-02	MAC	5.72E-02	MAC	5.72E-02	MAC	3.90E-04	LANL	Yes	5.70E+01
Benzo(a)anthracene	3.20E+01	1.08E-01	1.08E-01	MAC	1.08E-01	MAC	1.08E-01	MAC	1.10E-01	LANL	Yes	3.20E+01
Benzo(a)pyrene	3.20E+01	1.50E-01	1.50E-01	MAC	1.50E-01	MAC	1.50E-01	MAC	3.50E-01	LANL	Yes	3.20E+01
Benzo(b)fluoranthene	NVA	1.04E+01	4.00E+00	EPRG	4.00E+00	EPRG	4.00E+00	EPRG	2.40E-01	LANL	Yes	4.00E+00
Benzo(k)fluoranthene	2.70E+01	2.40E-01	4.00E+00	EPRG	4.00E+00	EPRG	4.00E+00	EPRG	2.40E-01	LANL	Yes	2.70E+01
Benzo(g,h,i)perylene	3.00E+02	1.70E-01	6.30E+00	EPRG	6.30E+00	EPRG	6.30E+00	EPRG	2.90E-01	LANL	Yes	3.00E+02
Chrysene	5.70E+01	1.66E-01	1.66E-01	MAC	1.66E-01	MAC	1.66E-01	MAC	5.00E-01	LANL	Yes	5.70E+01
Dibenz(a,h)anthracene	3.30E+01	3.30E-02	3.30E-02	MAC	3.30E-02	MAC	3.30E-02	MAC	1.50E-02	LANL	Yes	3.30E+01
Dibenzofuran	5.10E+03	4.49E-01	4.20E-01	EPRG	4.20E-01	EPRG	4.20E-01	EPRG	NVA			5.10E+03
Fluoranthene	1.11E+02	4.23E-01	4.23E-01	MAC	4.23E-01	MAC	4.23E-01	MAC	2.90E+00	LANL	Yes	1.11E+02
Fluorene	7.70E+01	7.74E-02	7.74E-02	MAC	7.74E-02	MAC	7.74E-02	MAC	5.40E-01	LANL	Yes	7.70E+01
Indeno(1,2,3-cd)pyrene	1.70E+01	2.00E-01	8.37E-01	EPRG	8.37E-01	EPRG	8.37E-01	EPRG	7.80E-02	LANL	Yes	1.70E+01
Naphthalene	1.76E+02	1.76E-01	1.76E-01	MAC	1.76E-01	MAC	1.76E-01	MAC	4.70E-01	LANL		1.76E+02
Phenanthrene	4.20E+01	2.04E-01	2.04E-01	MAC	2.04E-01	MAC	2.04E-01	MAC	8.50E-01	LANL	Yes	4.20E+01
Pyrene	5.30E+01	1.95E-01	1.95E-01	MAC	1.95E-01	MAC	1.95E-01	MAC	5.70E-01	LANL	Yes	5.30E+01
Explosives												
RDX	NVA	NVA	NVA		NVA		NVA		1.30E-01	TAL		1.30E-01
HMX	NVA	NVA	NVA		NVA		NVA		4.70E-02	TAL		4.70E-02
1,3,5-Trinitrobenzene	NVA	NVA	NVA		NVA		NVA		2.40E-02	TAL		2.40E-02
1,3-Dinitrobenzene	NVA	8.61E-03	NVA		NVA		NVA		6.70E-02	TAL		6.70E-02
2,4-Dinitrotoluene	NVA	1.44E-03	NVA		NVA		NVA		2.90E-01	LANL		2.90E-01
2,6-Dinitrotoluene	NVA	3.98E-03	NVA		NVA		NVA		1.90E+00	LANL		1.90E+00
2,4,6-TNT	NVA	NVA	NVA		NVA		NVA		9.20E-01	TAL		9.20E-01
2-Amino-4,6,-Dintrotoluene	NVA	NVA	NVA		NVA		NVA		7.00E+00	LANL		7.00E+00
4-Amino-2,6,-Dintrotoluene	NVA	NVA	NVA		NVA		NVA		1.90E+00	LANL		1.90E+00
2-Nitrotoluene	NVA	NVA	NVA		NVA		NVA		5.60E+00	LANL		5.60E+00
3-Nitrotoluene	NVA	NVA	NVA		NVA		NVA		4.90E+00	LANL		4.90E+00
4-Nitrotoluene	NVA	NVA	NVA		NVA		NVA		1.00E+01	LANL		1.00E+01
Nitrobenzene	NVA	1.45E-01	NVA		NVA		NVA		3.20E+01	LANL		3.20E+01
Nitroglycerin	NVA	NVA	NVA		NVA		NVA		1.70E+03	LANL		1.70E+03
Tetryl	NVA	NVA	NVA		NVA		NVA		1.00E+02	LANL		1.00E+02
PETN	NVA	NVA	NVA		NVA		NVA		1.20E+05	LANL		1.20E+05

Table 7
Selection of Ecological Sediment Screening Toxicity Values for Constituents of Potential Ecological Concern
(Idaho Sites)

Note: No Idaho Ecological Screening Values available.
NVA = No Value Available

[a] Oregon Department of Environmental Quality Screening Level Values (December 2001).

[b] Ecological Screening Levels (ESLs), U.S.EPA Region V, August 2003.

[c] USEPA Region 7: Catherine Wooster-Brown (Eco Risk Assessor) recommends the following hierarchy: MacDonald Consensus Values (MacDonald, 2000); ORNL Effroymson values (ORNL, 19

[d] USEPA Region 8: Dale Hoff (Eco Risk Assessor) recommends the following hierarchy: MacDonald Consensus Values (MacDonald, 2000); Canadian ISQG values (CCME, 2003) or ORNL Effroymson values (ORNL, 1977).

[e] USEPA Region 10: Joseph Goulet (Eco Risk Assessor) says Region 10 has no recommended hierarchy, therefore, values from the USEPA Region 7 Approach were used.

[f] Talmage, S.S., D.M. Opresko, C.J. Maxwell, C.J.E. Welsh, F.M. Cretella, P.H. Reno, and F.B. Daniel (TAL), 1999, *Nitroaromatic Munition Compounds: Environmental Effects and Screening Va* **Rev. Environ. Contam. Toxicol**. or Los Alamos National Laboratory (LANL), Eco Risk Database, Release 2.2, September 2005.

[g] Potential bioaccumulative constituents will be evaluated in more detail, as some screening values do not take into account bioaccumulation.
Potential bioaccumulative potential from: B*ioaccumulation and Interpretation for the Purposes of Sediment Quality Assessment: Status and Needs* (USEPA, 2000) and ODEQ EQSLVs (ODE

[h] Final Screening Value selected using the following hierarchy:
1. No Idaho Values Available; Values Developed by Oregon Recommended (Bruce Wicherski, Idaho Dept of Environmental Quality, pers comm 2/23/2007)
2. USEPA Region State Located In (USEPA Region 10)
3. Lower of Talmage et al. [TAL] (1999) or LANL (2005) values.

Note: The Talmage [TAL] screening values assume 10% organic carbon in the sediment.

MAC=MacDonald Consensus Values
EPRGs=Oak Ridge National Laboratory Ecological PRGs
ISQGs=Canadian Interim Sediment Quality Guidelines
LANL=Los Alamos National Laboratory
TAL=Talmage et al (1999)

Other References:
Efroymson, R.A., et al., 1997, P*reliminary Remediation Goals* (EPRGs), ORNL, ES/ER/TM-162/R2,
Canadian Interim Sediment Quality Guidelines (ISQGs) Summary Table, CCME, December 2003.
MacDonald, D.D, C.G. Ingersoll and T.A. Berger, 2000, *Development and Evaluation of Consensus-Based Sediment Quality Criteria for Freshwater Ecosystems* , Archives of Environmental Contamination and Toxicology 39:20-31.

Table 8
Selection of Ecological Surface Water Screening Toxicity Values for Constituents of Potential Ecological Concern
(Idaho Sites)

Parameter	IDEQ Screening Level Values[a] (mg/L) Freshwater	Region 5 Ecological Screening Levels[b] (mg/L)	EPA Region 7 [c] (mg/L)		EPA Region 8 [d] (mg/L)		EPA Region 10 [e] (mg/L)		Other Ecological Screening Values[f] (mg/L)		Potential Bioaccumulative Constituent? [g]	Final Ecological Value Surface Water [h] (mg/L)
Metals/Inorganics												
Aluminum	NVA	NVA	8.70E-02	AWQC	8.70E-02	AWQC	8.70E-02	AWQC	8.70E-02	LANL		8.70E-02
Antimony	NVA	8.00E-02	3.00E-02	EPRG	3.00E-02	Tier II	3.00E-02	EPRG	1.00E-01	LANL	Yes	3.00E-02
Arsenic	1.90E-01	1.48E-01	1.50E-01	AWQC	1.50E-01	AWQC	1.50E-01	AWQC	1.50E-01	LANL	Yes	1.90E-01
Barium	NVA	2.20E-01	4.00E-03	EPRG	4.00E-03	Tier II	4.00E-03	EPRG	3.80E-03	LANL		4.00E-03
Beryllium	NVA	3.60E-03	6.60E-04	EPRG	6.60E-04	Tier II	6.60E-04	EPRG	5.30E-03	LANL	Yes	6.60E-04
Cadmium (dissolved)	1.03E-03	1.50E-04	2.50E-04	AWQC	2.50E-04	AWQC	2.50E-04	AWQC	1.50E-04	LANL	Yes	1.03E-03
Calcium	NVA	NVA	NVA		NVA		NVA		NVA			NVA
Chromium (Cr-III) (dissolved)	1.78E-01	4.20E-02	7.40E-02	AWQC	7.40E-02	AWQC	7.40E-02	AWQC	7.70E-02	LANL	Yes	1.78E-01
Cobalt	NVA	2.40E-02	2.30E-02	EPRG	2.30E-02	Tier II	2.30E-02	EPRG	3.00E-03	LANL		2.30E-02
Copper (dissolved)	1.14E-02	1.58E-03	9.00E-03	AWQC	9.00E-03	AWQC	9.00E-03	AWQC	5.00E-03	LANL	Yes	1.14E-02
Iron	NVA	NVA	1.00E+00	AWQC	1.00E+00	AWQC	1.00E+00	AWQC	1.00E+00	LANL		1.00E+00
Lead (dissolved)	2.51E-03	1.17E-03	2.50E-03	AWQC	2.50E-03	AWQC	2.50E-03	AWQC	1.20E-03	LANL	Yes	2.51E-03
Magnesium	NVA	NVA	NVA		NVA		NVA		NVA			NVA
Manganese	NVA	NVA	1.20E-01	EPRG	1.20E-01	Tier II	1.20E-01	EPRG	8.00E-02	LANL		1.20E-01
Mercury (dissolved)	1.20E-05	1.30E-06	7.70E-01	AWQC	7.70E-01	AWQC	7.70E-01	AWQC	7.70E-04	LANL	Yes	1.20E-05
Molybdenum	NVA	NVA	3.70E-01	EPRG	3.70E-01	Tier II	3.70E-01	EPRG	NVA			3.70E-01
Nickel (dissolved)	1.57E-01	2.89E-02	5.20E-02	AWQC	5.20E-02	AWQC	5.20E-02	AWQC	2.80E-02	LANL	Yes	1.57E-01
Perchlorate	NVA	NVA	NVA		NVA		NVA		3.50E+01	LANL		3.50E+01
Phosphorus (white)	NVA	NVA	NVA		NVA		NVA		NVA			NVA
Potassium	NVA	NVA	NVA		NVA		NVA		NVA			NVA
Selenium	5.00E-03	5.00E-03	5.00E-03	AWQC	5.00E-03	AWQC	5.00E-03	AWQC	5.00E-03	LANL	Yes	5.00E-03
Silver	NVA	1.20E-04	3.60E-04	EPRG	3.60E-04	Tier II	3.60E-04	EPRG	3.60E-04	LANL	Yes	3.60E-04
Sodium	NVA	NVA	NVA		1.00E-02	CCME	NVA		NVA			NVA
Strontium	NVA	NVA	1.50E+00	EPRG	1.50E+00	Tier II	1.50E+00	EPRG	6.20E-01	LANL		1.50E+00
Thallium	NVA	1.00E-02	9.00E-03	EPRG	1.20E-02	Tier II	9.00E-03	EPRG	1.80E-02	LANL	Yes	9.00E-03
Titanium	NVA	NVA	NVA		NVA		NVA		7.00E+01	LANL		7.00E+01
Vanadium	NVA	1.20E-02	2.00E-02	EPRG	2.00E-02	Tier II	2.00E-02	EPRG	1.90E-02	LANL		2.00E-02
Zinc (dissolved)	1.05E-01	6.57E-02	1.20E-01	AWQC	1.20E-01	AWQC	1.20E-01	AWQC	6.60E-02	LANL	Yes	1.05E-01
Zirconium	NVA	NVA	1.70E-02	EPRG	1.70E-02	Tier II	1.70E-02	EPRG	NVA			1.70E-02
PAHs												
1-Methylnaphthalene	NVA	NVA	NVA		2.10E-03	Tier II	NVA		NVA			NVA
2-Methylnaphthalene	NVA	3.30E-01	NVA		NVA		NVA		2.00E-03	LANL		2.00E-03
Acenaphthene	NVA	3.80E-02	2.30E-02	EPRG	5.80E-03	CCME	2.30E-02	EPRG	2.30E-02	LANL	Yes	2.30E-02
Acenaphthylene	NVA	4.84E+00	NVA		NVA		NVA		3.00E-02	LANL	Yes	3.00E-02
Anthracene	NVA	3.50E-05	7.30E-04	EPRG	7.30E-04	Tier II	7.30E-04	EPRG	1.30E-06	LANL	Yes	7.30E-04
Benzo(a)anthracene	NVA	2.50E-05	2.70E-05	EPRG	2.70E-05	Tier II	2.70E-05	EPRG	2.70E-05	LANL	Yes	2.70E-05
Benzo(a)pyrene	NVA	1.40E-05	1.40E-05	EPRG	1.40E-05	Tier II	1.40E-05	EPRG	1.40E-05	LANL	Yes	1.40E-05
Benzo(b)fluoranthene	NVA	9.07E-03	NVA		NVA		NVA		3.00E-02	LANL	Yes	3.00E-02
Benzo(k)fluoranthene	NVA	NVA	NVA		NVA		NVA		3.00E-02	LANL	Yes	3.00E-02
Benzo(g,h,i)perylene	NVA	7.64E-03	NVA		NVA		NVA		3.00E-02	LANL	Yes	3.00E-02
Chrysene	NVA	NVA	NVA		NVA		NVA		3.00E-02	LANL	Yes	3.00E-02
Dibenz(a,h)anthracene	NVA	NVA	NVA		NVA		NVA		3.00E-02	LANL	Yes	3.00E-02

Table 8
Selection of Ecological Surface Water Screening Toxicity Values for Constituents of Potential Ecological Concern
(Idaho Sites)

Parameter	IDEQ Screening Level Values[a] (mg/L) Freshwater	Region 5 Ecological Screening Levels[b] (mg/L)	EPA Region 7 [c] (mg/L)		EPA Region 8 [d] (mg/L)		EPA Region 10 [e] (mg/L)		Other Ecological Screening Values[f] (mg/L)		Potential Bioaccumulative Constituent? [g]	Final Ecological Value Surface Water [h] (mg/L)
Dibenzofuran	NVA	4.00E-03	3.70E-03	EPRG	3.70E-03	Tier II	3.70E-03	EPRG	NVA			3.70E-03
Fluoranthene	NVA	1.90E-03	6.20E-03	EPRG	4.00E-05	CCME	6.20E-03	EPRG	6.10E-03	LANL	Yes	6.20E-03
Fluorene	NVA	1.90E-02	3.90E-03	EPRG	3.90E-03	Tier II	3.90E-03	EPRG	3.90E-03	LANL	Yes	3.90E-03
Indeno(1,2,3-cd)pyrene	NVA	4.31E-03	NVA		NVA		NVA		3.00E-02	LANL	Yes	3.00E-02
Naphthalene	NVA	1.30E-02	1.20E-02	EPRG	1.20E-02	Tier II	1.20E-02	EPRG	2.30E-02	LANL		1.20E-02
Phenanthrene	NVA	3.60E-03	6.30E-03	EPRG	4.00E-04	CCME	6.30E-03	EPRG	6.30E-03	LANL	Yes	6.30E-03
Pyrene	NVA	3.00E-04	NVA		2.50E-05	CCME	NVA		3.00E-02	LANL	Yes	3.00E-02
Explosives												
RDX	NVA	NVA	NVA		NVA		NVA		1.90E-01	TAL		1.90E-01
HMX	NVA	NVA	NVA		NVA		NVA		3.30E-01	TAL		3.30E-01
1,3-Dinitrobenzene	NVA	2.20E-02	NVA		NVA		NVA		2.00E-02	TAL		2.00E-02
1,3,5-Trinitrobenzene	NVA	NVA	NVA		NVA		NVA		1.00E-02	TAL		1.00E-02
2-Nitrotoluene	NVA	NVA	NVA		NVA		NVA		8.00E+00	LANL		8.00E+00
3-Nitrotoluene	NVA	NVA	NVA		NVA		NVA		9.60E+00	LANL		9.60E+00
4-Nitrotoluene	NVA	NVA	NVA		NVA		NVA		1.70E+01	LANL		1.70E+01
2,4-Dinitrotoluene	NVA	4.40E-02	NVA		NVA		NVA		3.10E-01	LANL		3.10E-01
2,6-Dinitrotoluene	NVA	8.10E-02	NVA		NVA		NVA		6.00E-02	LANL		6.00E-02
2-Amino,4,6-Dinitrotoluene	NVA	NVA	NVA		NVA		NVA		2.00E-02	TAL		2.00E-02
4-Amino-2,6-Dinitrotoluene	NVA	NVA	NVA		NVA		NVA		8.60E+00	LANL		8.60E+00
2,4,6-Trinitrotoluene	NVA	NVA	NVA		NVA		NVA		9.00E-02	TAL		9.00E-02
Nitrobenzene	NVA	2.20E-01	NVA		NVA		NVA		2.70E-01	LANL		2.70E-01
Nitroglycerin	NVA	NVA	NVA		NVA		NVA		4.30E+02	LANL		4.30E+02
PETN	NVA	NVA	NVA		NVA		NVA		2.60E+04	LANL		2.60E+04
Tetryl	NVA	NVA	NVA		NVA		NVA		5.80E+00	LANL		5.80E+00

Table 8
Selection of Ecological Surface Water Screening Toxicity Values for Constituents of Potential Ecological Concern
(Idaho Sites)

NVA = No Value Available

[a] Idaho Department of Environmental Quality, *Risk Evaluation Manual* , Final, July 2004, Fresh Water Standards, Criterion Continuous. Hardness of 100 mgL $CaCO_3$ assumed.

[b] Ecological Screening Levels (ESLs), U.S.EPA Region 5, August 2003.

[c] USEPA Region 7: Catherine Wooster-Brown (Eco Risk Assessor) recommends the following hierarchy: National Ambient Water Quality Criteria; ORNL Effroymson values (ORNL, 1977).

[d] USEPA Region 8: Dale Hoff (Eco Risk Assessor) recommends the following hierarchy: National Ambient Water Quality Criteria; Great Lakes Tier II Values; Canadian Environmental Quality Guidelines (CCME, 2003) or ORNL Effroymson values (ORNL, 1977).

[e] USEPA Region 10: Joseph Goulet (Eco Risk Assessor) says Region 10 has no recommended hierarchy, therefore, values from the USEPA Region 7 Approach were used.

[f] Talmage, S.S., D.M. Opresko, C.J. Maxwell, C.J.E. Welsh, F.M. Cretella, P.H. Reno, and F.B. Daniel (TAL), 1999, *Nitroaromatic Munition Compounds: Environmental Effects and Screening Values* , **Rev. Environ. Contam. Toxicol.**
Los Alamos National Laboratory (LANL), Eco Risk Database, Release 2.2, September 2005.

[g] Potential bioaccumulative constituents will be evaluated in more detail, as some screening values do not take into account bioaccumulation.
Potential bioaccumulative potential from: *Bioaccumulation and Interpretation for the Purposes of Sediment Quality Assessment: Status and Needs* (USEPA, 2000).

[h] Final Screening Value selected using the following hierarchy:
1. State Value (Idaho)
2. USEPA Region State Located In (USEPA Region 10)
3. Lower of Talmage et al. [TAL] (1999) or LANL (2005) values.

AWQC=National Ambient Water Quality Criteria
LANL= Los Alamos National Laboratory
Tier II=Great Lakes Tier II Water Quality Criteria
EPRGs=Oak Ridge National Laboratory Ecological PRGs
TAL=Talmage et al (1999)
CCME=Canadian Council of Ministers of the Environment, Environmental Quality Guidelines

Other References:
Efroymson, R.A., et al., 1997, P*reliminary Remediation Goals* (EPRGs), ORNL, ES/ER/TM-162/R2,
Canadian Environmental Quality Guidelines (for Freshwater) Summary Table, CCME, December 2003.
Great Lakes Tier II Values from Suter, G.W. and C.L. Tsao, 1996, *Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Rev* , ES/ER/TM-96/R2.
National AWQC from USEPA Water Quality Criteria Web Site: http://www.epa.gov/waterscience/criteria/wqcriteria.html

Draft Worksheets

Site Information Worksheet
MRSPP Data Gaps
HRS Data Gaps

Site Information Worksheet (in Progress)

Site: **Precision Bombing Range**

Project: **Bruneau PBR No. 2**

	Site Information Needed[a]	Suggested Means to Obtain Site Information	Potential Source(s) of Site Information	Responsible for Obtaining	Deadline for Obtaining Site Information
1					
2					
3					

Munitions Response Site Prioritization Protocol (MRSPP) Data Gaps (in progress)
32 CFR Part 179

Installation: **Bruneau PBR No. 2**
AOC: **Precision Bombing Range**
RMIS Range ID: **F10ID0141**

Module	Table No.	Table Description	Data Gap	Potential Source of Information to Fill Data Gap	No Data Gap	Description of Known Data
Explosive Hazard Evaluation (EHE)	1	Munitions Type			x	
	2	Source of Hazard			x	
	3	Location of Munitions			x	
	4	Ease of Access			x	
	5	Status of Property			x	
	6	Population Density	x	Update information in PA (US Census)		
	7	Population Near Hazard	x	Update information in PA (US Census)		
	8	Activities/Structures			x	
	9	Ecological and/or Cultural Resources	x	Update information in PA (USFWS & SHPO)		
	10	EHE Module Score	x	Evaluation pending filling of data gaps		
Chemical Warfare Materiel (CWM) Hazard Evaluation (CHE)	11	CWM Configuration			x	Historical evidence indicates that CWM are not present
	12	Sources of CWM			x	Historical evidence indicates that CWM are not present
	13	Location of CWM			x	Historical evidence indicates that CWM are not present
	14	Ease of Access			x	Historical evidence indicates that CWM are not present
	15	Status of Property			x	Historical evidence indicates that CWM are not present
	16	Population Density			x	Historical evidence indicates that CWM are not present
	17	Population Near Hazard			x	Historical evidence indicates that CWM are not present
	18	Activities/Structures			x	Historical evidence indicates that CWM are not present
	19	Ecological and/or Cultural Resources			x	Historical evidence indicates that CWM are not present
	20	CHE Module Score			x	Historical evidence indicates that CWM are not present
Health Hazard Evaluation (HHE)	21	HHE Factor Levels	x	Contaminant hazard evaluation pending analytical results		
	22	HHE Three-Letter Combination Levels	x	Contaminant hazard evaluation pending analytical results		
	23	HHE Module Ratings	x	Contaminant hazard evaluation pending analytical results		
	24	HHE Module Rating	x	Contaminant hazard evaluation pending analytical results		
MRS Priority	**25**	**MRS Priority (Based on Highest Hazard Evaluation Module Rating)**	**x**	**Evaluation pending filling of data gaps**		

To be completed by USACE once all data gaps are filled.

Bruneau PBR No. 2 HRS Data Gaps[a]

Item	Number	Comment – Missing Data Element
1	1.8	Confirm the latitude / longitude of potential source(s) and the accuracy of the information (in meters)
2		Source scale (i.e., 1:24,000, etc.)
3	1.12	Site Permits
4	2.4	Confirm if there are other NPL sites within 1 mile of the site
5	5.3	Population within 1 mile, within 4 miles
6	6	Water use (GW within 4 miles, SW within 15 miles)
7	6.1	Total drinking water population served
8	6.2	Type of drinking water supply system (GW or SW?)
9	6.3	Other water uses of GW within 4 miles
10	6.5	Surface water uses
11	6.6	Type of SW adjacent to (within 2 miles) of the site
12	8.1	Types of action(s) that have occurred at or near the site
13	8.2	Who did the action? (EPA, Private parties, other, etc.?)

[a]Information required to complete the MEC-HRS data collection form:

Attachments

MRSPP Worksheets
Munitions Technical Data Sheets

Table A

MRS Background Information

DIRECTIONS: Record the background information below for the MRS to be evaluated. Much of this information is available from DoD databases, such as RMIS. If the MRS is located on a FUDS property, the suitable FUDS property information should be substituted. In the MRS summary, briefly describe the UXO, DMM, or MC that are known or suspected to be present, the exposure setting (the MRS's physical environment), any other incidental non-munitions related contaminants found at the MRS (e.g., benzene, trichloroethylene), and any potentially exposed human and ecological receptors. Include a map of the MRS, if one is available.

Munitions Response Site (MRS) Name:	
Component:	
Installation/Property Name:	
Location (City, County, State):	
UTM Coordinates (NAD83):	
Site Name (RMIS ID):	
Project Name (Project No.):	
Date Information Entered/Updated:	
Point of Contact (Name/Phone):	

Project Phase ("X" only one):		**PA**		**SI**		**RI**		**FS**		**RD**
		RA-C		**RIP**		**RA-O**		**RC**		**LTM**

Media Evaluated ("X" all that apply):		**Groundwater (human receptor)**		**Sediment (human receptor)**
		Surface soil (human receptor)		**Surface water (ecological receptor)**
		Sediment (ecological receptor)		**Surface water (human receptor)**

MRS Summary

MRS Description: Describe the munitions-related activities that occurred at the installation, the dates of operation, and the UXO, DMM (by type of munition, if known) or munitions constituents (by type, if known) known or suspected to be present):

Description of Pathways for Human and Ecological Receptors:

Description of Receptors (Human and Ecological):

Table 1
EHE Module: Munitions Type Data Element Table

Directions: Below are eleven classifications of munitions and their descriptions. Annotate the score(s) that correspond with **all** munitions types known or suspected to be present at the MRS.

Note: The terms *practice munitions*, *small arms*, *physical evidence*, and *historical evidence* are defined in Appendix C of the MRSPP Primer (Draft, Dec 2005).

Classification	Description	Possible Score	Score
Sensitive	All UXO that are considered likely to function upon any interaction with exposed persons [e.g., submunitions, 40mm high-explosive (HE) grenades, white phosphorous (WP) munitions, high-explosive antitank (HEAT) munitions, and practice munitions with sensitive fuzes, but excluding all other practice munitions].	30	
	All hand grenades containing energetic filler.		
	Bulk primary explosives, or mixtures of these with environmental media, such that the mixture poses an explosive hazard.		
High explosive (used or damaged)	All UXO containing a high-explosive filler (e.g., RDX, Composition B), that are not considered "sensitive."	25	
	All DMM containing a high-explosive filler that have been damaged by burning or detonation, or deteriorated to the point of instability		
Pyrotechnic (used or damaged)	All UXO containing pyrotechnic fillers other than white phosphorous (e.g., flares, signals, simulators, smoke grenades).	20	
	All DMM containing pyrotechnic fillers other than white phosphorous (e.g., flares, signals, simulators, smoke grenades) that have been damaged by burning or detonation, or deteriorated to the point of instability.		
High explosive (unused)	All DMM containing a high-explosive filler that have not been damaged by burning or detonation, or are not deteriorated to the point of instability.	15	
Propellant	All UXO containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor).	15	
	All DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor) that are damaged by burning or detonation, or deteriorated to the point of instability		
Bulk secondary high explosives, pyrotechnics, or propellant	All DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor), that are deteriorated	10	
	Bulk secondary high explosives, pyrotechnic compositions, or propellant (not contained in a munition), or mixtures of these with environmental media such that the mixture poses an explosive hazard.		
Pyrotechnic (not used or damaged)	All DMM containing a pyrotechnic filler (i.e. red phosphorous), other than white phosphorous filler, that have not been damaged by burning or detonation, or are not deteriorated to the point of instability	10	
Practice	All UXO that are practice munitions that are not associated with a sensitive fuze.	5	
	All DMM that are practice munitions that are not associated with a sensitive fuze and that have not been damaged by burning or detonation, or are not deteriorated to the point of instability.		
Riot control	All UXO or DMM containing a riot control agent filler (e.g., tear gas).	3	
Small arms	All used munitions or DMM that are categorized as small arms ammunition [Physical evidence or historical evidence that no other types of munitions (e.g., grenades, subcaliber training rockets, demolition charges) were used or are present on the MRS is required for selection of this category.].	2	
Evidence of no munitions	Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	0	
MUNITIONS TYPE	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).		**0**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Munitions Type*** classifications in the space below.

Table 2

EHE Module: Source of Hazard Data Element Table

Directions: Below are eleven classifications describing sources of explosive hazards. Annotate the score(s) that correspond with **all** sources of explosive hazards known or suspected to be present at the MRS.

Note: The terms *former range* , *practice munitions* , *small arms* , *physical evidence* , and *historical evidence* are defined in Appendix C of the MRSPP Primer (Draft, Dec 2005).

Classification	Description	Possible Score	Score
Former range	The MRS is a former military range where munitions (including practice munitions with sensitive fuzes) have been used. Such areas include: impact or target areas, associated buffer and safety zones, firing points, and live-fire maneuver areas.	10	
Former munitions treatment (i.e. OB/OD) unit	The MRS is a location where UXO or DMM (e.g., munitions, bulk explosives, bulk pyrotechnic, or bulk propellants) were burned or detonated for the purpose of treatment prior to disposal.	8	
Former practice munitions range	The MRS is a former military range on which only practice munitions without sensitive fuzes were used.	6	
Former maneuver area	The MRS is a former maneuver area where no munitions other than flares, simulators, smokes, and blanks were used. There must be evidence that no other munitions were used at the location to place an MRS into this category.	5	
Former burial pit or other disposal area	The MRS is a location where DMM were buried or disposed of (e.g., disposed of into a water body) without prior thermal treatment.	5	
Former industrial operating facilities	The MRS is a location that is a former munitions maintenance, manufacturing, or demilitarization facility.	4	
Former firing points	The MRS is a firing point, where the firing point is delineated as an MRS separate from the rest of a former military range.	4	
Former missile or air defense artillery emplacements	The MRS is a former missile defense or air defense artillery (ADA) emplacement not associated with a military range.	2	
Former storage or transfer points	The MRS is a location where munitions were stored or handled for transfer between different modes of transportation (e.g., rail to truck, truck to weapon system).	2	
Former small arms range	The MRS is a former military range where only small arms ammunition was used [There must be evidence that no other types of munitions (e.g., grenades) were used or are present to place an MRS iinto this category.].	1	
Evidence of no munitions	Following investigation of the MRS, there is physical evidence that no UXO or DMM are present, or there is historical evidence indicating that no UXO or DMM are present.	0	
SOURCE OF HAZARD	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 10).		**0**

DIRECTIONS: Document any MRS-specific data used in selecting the **Source of Hazard** classifications in the space below.

Table 3
EHE Module: Location of Munitions Data Element Table

Directions: Below are eight classifications of munitions locations and their descriptions. Annotate the score(s) that correspond with **all** locations where munitions are located or suspected of being found at the MRS.

Note: The terms *surface* , *subsurface* , *physical evidence* , and *historical evidence* are defined in Appendix C of the MRSPP Primer (Draft, Dec 2005).

Classification	Description	Possible Score	Score
Confirmed surface	Physical evidence indicates that there are UXO or DMM on the surface of the MRS. Historical evidence (e.g., a confirmed incident report or accident report) indicates there are UXO or DMM on the surface of the MRS.	25	
Confirmed subsurface, active	Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS, and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost, heat heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose UXO or DMM. Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost, heat heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose UXO or DMM.	20	
Confirmed subsurface, stable	Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS, and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause UXO or DMM to be exposed. Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS, and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause UXO or DMM to be exposed.	15	
Suspected (physical evidence)	There is physical evidence (e.g., munitions debris, such fragments, penetrators, projectiles, shell casings, links, fins), other than the documented presence of UXO or DMM, indicating that UXO or DMM may be present at the MRS.	10	
Suspected (historical evidence)	There is historical evidence indicating that UXO or DMM may be present at the MRS.	5	
Subsurface, physical constraint	There is physical or historical evidence indicating that UXO or DMM may be present in the subsurface, but there is a physical constraint (e.g., pavement, water depth over 120 feet) preventing direct access to the UXO or DMM.	2	
Small arms (regardless of location)	The presence of small arms ammunition is confirmed or suspected, regardless of other factors such as geological stability [There must be evidence that no other types of munitions (e.g., grenades) were used or are present at the MRS to place an MRS into this category.]	1	
Evidence of no munitions	Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	0	
LOCATION OF MUNITIONS	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 25).		**0**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Location of Munitions*** classifications in the space below.

Table 4
EHE Module: Ease of Access Data Element Table

Directions: Below are four classifications of barrier types that can surround an MRS and their descriptions. The barrier type is directly related to the ease of public access to any explosive materiel. Annotate the score that corresponds with the ease of access to the MRS.

Note: The term *barrier* is defined in Appendix C of the MRSPP Primer (Draft, Dec 2005).

Classification	Description	Possible Score	Score
No barrier	There is no barrier preventing access to any part of the MRS (i.e. all parts of the MRS are accessible).	10	
Barrier to MRS access is incomplete	There is a barrier preventing access to parts of the MRS, but not the entire MRS.	8	
Barrier to MRS access is complete but not monitored	There is a barrier preventing access to all parts of the MRS, but there is no surveillance (e.g., by a guard) to ensure that the barrier is effectively preventing access to all parts of the MRS.	5	
Barrier to MRS access is complete and monitored	There is a barrier preventing access to all parts of the MRS, and there is active, continual surveillance (e.g., by a guard, video monitoring) to ensure that the barrier is effectively preventing access to all parts of the MRS.	0	
EASE OF ACCESS	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 10).		**0**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ease of Access*** classification in the space below.

Table 5
EHE Module: Status of Property Data Element Table

Directions: Below are three classifications of the status of a property within the Department of Defense (DoD) and their descriptions. Annotate the score that corresponds with the status of property at the MRS.

Note: N/A

Classification	Description	Possible Score	Score
Non-DoD control	The MRS is at a location that is no longer owned by, leased to, or otherwise possessed or used by DoD. Examples are privately owned land or water bodies; land or water bodies owned or controlled by state, tribal, or local governments; and land or water bodies managed by other federal agencies.	5	
Scheduled for transfer from DoD control	The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD, and DoD plans to transfer that land or water body to the control of another entity (e.g., a state, tribal, or local government; a private party; another federal agency) within 3 years from the date the rule is applied.	3	
DoD control	The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD. With respect to property that is leased or otherwise possessed, DoD must control access to the MRS 24 hours per day, every day of the calendar year.	0	
STATUS OF PROPERTY	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).		**0**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Status of Property*** classification in the space below.

Table 6
EHE Module: Population Density Data Element Table

Directions: Below are three classifications of population density and their descriptions. Determine the population density per square mile in the vicinity of the MRS and annotate the score that corresponds with the associated population density.

Note: If an MRS is located in more than one county, use the largest population density value among the counties. If the MRS is within or borders a city or town, use the population density for the city or town, rather than that of the county.

Classification	Description	Possible Score	Score
> 500 persons per square mile	There are more than 500 persons per square mile in the county in which the MRS is located, based on US Census Bureau data.	5	
100 - 500 persons per square mile	There are 100 to 500 persons per square mile in the county in which the MRS is located, based on US Census Bureau data.	3	
< 100 persons per square mile	There are fewer than 100 persons per square mile in the county in which the MRS is located, based on US Census Bureau data.	1	
POPULATION DENSITY	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).		**0**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Density*** classification in the space below.

Table 7
EHE Module: Population Near Hazard Data Element Table

Directions: Below are six classifications describing the number of inhabited structures near the MRS. The number of inhabited buildings relates to the population near the hazard. Determine the number of inhabited structures within two miles of the MRS boundary and annotate the score that corresponds with the associated population near the known or suspected hazard.

Note: The term *inhabited structures* is defined in Appendix C of the MRSPP Primer (Draft, Dec 2005).

Classification	Description	Possible Score	Score
26 or more inhabited structures	There are 26 or more inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	5	
16 to 25 inhabited structures	There are 16 to 25 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	4	
11 to 15 inhabited structures	There are 11 to 15 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	3	
6 to 10 inhabited structures	There are 6 to 10 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	2	
1 to 5 inhabited structures	There are 1 to 5 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	1	
0 inhabited structures	There are no inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	0	
POPULATION NEAR HAZARI	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).		**0**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Near Hazard*** classification in the space below.

Table 8

EHE Module: Types of Activities/Structures Data Element Table

Directions: Below are five classifications of activities and/or inhabited structures near the hazard and their descriptions. Review the types of activities that occur and/or structures that are present within two miles of the MRS and annotate the score(s) that correspond with **all** the activities/structure classifications at the MRS.

Note: The term *inhabited structures* is defined in Appendix C of the MRSPP Primer (Draft, Dec 2005).

Classification	Description	Possible Score	Score
Residential, educational, commercial, or subsistence	Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with any of the following purposes: residential, educational, child care, critical assets (e.g., hospitals, fire and rescue, police stations, dams), hotels, commercial, shopping centers, playgrounds, community gathering areas, religious sites, or sites used for subsistence hunting, fishing, and gathering.	5	
Parks and recreational areas	Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with parks, nature preserves, or other recreational uses.	4	
Agricultural, forestry	Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with agriculture or forestry.	3	
Industrial or warehousing	Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with industrial activities or warehousing.	2	
No known or recurring activities	There are no known or recurring activities occurring up to two miles from the MRS's boundary or within the MRS's boundary.	1	
TYPES OF ACTIVITIES/STRUCTURES	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).		**0**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Types of Activities/Structures*** classifications in the space below.

Table 9

EHE Module: Ecological and/or Cultural Resources Data Element Table

Directions: Below are four classifications of ecological and/or cultural resources and their descriptions. Review the types of resources present and annotate the score that corresponds with the ecological and/or cultural resource classifications at the MRS.

Note: The terms *ecological resources* and *cultural resources* are defined in Appendix C of the MRSPP Primer (Draft, Dec 2005).

Classification	Description	Possible Score	Score
Ecological and cultural resources present	There are both ecological and cultural resources present on the MRS.	5	
Ecological resources present	There are ecological resources present on the MRS.	3	
Cultural resources present	There are cultural resources present on the MRS.	3	
No ecological or cultural resources present	There are no ecological resources or cultural resources present on the MRS.	0	
ECOLOGICAL AND/OR CULTURAL RESOURCES	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).		**0**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ecological and/or Cultural Resources*** classification in the space below.

Table 10

Determining the EHE Module Rating

DIRECTIONS:

1. From Tables 01 - 09, record the data element scores in the **Score** boxes to the right.

2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.

3. Add the three **Value** boxes and record this number in the **EHE Module Total** box below.

4. Identify the appropriate range for the **EHE Module Total** at right.

5. Identify the **EHE Module Rating** that corresponds to the range selected and record this rating in the **EHE Module Rating** box at the lower right corner of this table.

NOTE: An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
Explosive Hazard Factor Data Elements			
Munitions Type	Table 01	0	0
Source of Hazard	Table 02	0	
Accessibility Factor Data Elements			
Location of Munitions	Table 03	0	0
Ease of Access	Table 04	0	
Status of Property	Table 05	0	
Receptor Factor Data Elements			
Population Density	Table 06	0	0
Population Near Hazard	Table 07	0	
Types of Activities/Structures	Table 08	0	
Ecological and/or Cultural Resources	Table 09	0	
EHE MODULE TOTAL			**0**

EHE Module Total	EHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected Explosive Hazard
EHE MODULE RATING	

Table 11

CHE Module: CWM Configuration Data Element Table

Directions: Below are seven classifications of CWM configuration and their descriptions. Annotate the score(s) that correspond to **all** CWM configurations known or suspected to be present at the MRS.

Note: The terms *CWM/UXO*, *CWM/DMM*, *physical evidence*, and *historical evidence* are defined in Appendix C of the MRSPP Primer (Draft, Dec 2005).

Classification	Description	Possible Score	Score
CWM, explosive configuration either UXO or damaged DMM	The CWM known or suspected of being present at the MRS is (a) explosively configured CWM that are UXO (i.e. CWM/UXO), or (b) explosively configured CWM that are DMM (i.e. CWM/DMM) that have been damaged.	30	
CWM mixed with UXO	The CWM known or suspected of being present at the MRS are explosively configured CWM/DMM that have not been damaged, or nonexplosively configured CWM/DMM, or CWM not configured as a munition, that are commingled with conventional munitions that are UXO.	25	
CWM, explosive configuration that are undamaged DMM	The CWM known or suspected of being present at the MRS are explosively configured CWM/DMM that have not been damaged.	20	
CWM, not explosively configured or CWM, bulk container	The CWM known or suspected of being present at the MRS is (a) nonexplosively configured CWM/DMM, or (b) bulk CWM/DMM (e.g., ton container).	15	
CAIS K941 and CAIS K942	The CWM/DMM known or suspected of being present at the MRS is CAIS K941(toxic gas set M-1) or CAIS K942 (toxic gas set M-2/E11).	12	
CAIS (chemical agent identification sets)	Only CAIS, other than CAIS K941 and K942, are known or suspected of being present at the MRS.	10	
Evidence of no CWM	Following investigation, the physical evidence indicates that CWM are not present at the MRS, or the historical evidence indicates that CWM are not present at the MRS.	0	
CWM CONFIGURATION	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).		**0**

DIRECTIONS: Document any MRS-specific data used in selecting the ***CWM Configuration*** classifications in the space below.

Table 12

CHE Module: Sources of CWM Data Element Table

Directions: Below are eleven sources of CWM hazards and their descriptions. Review these classifications and annotate the score(s) that correspond with **all** the sources of CWM hazards known or suspected to be present at the MRS.

Note: The terms *CWM/UXO* , *CWM/DMM* , *surface* , *subsurface* , *physical evidence* , and *historical evidence* are defined in Appendix C of the MRSPP Primer (Draft, Dec 2005).

Classification	Description	Possible Score	Score
Live-fire involving CWM	The MRS is a former military range that supported live-fire of explosively configured CWM and the CWM/UXO are known or suspected of being present on the surface or in the subsurface.	10	
	The MRS is a former military range that supported live-fire with conventional munitions, and CWM/DMM are on the surface or in the subsurface commingled with conventional munitions that are UXO.		
Damaged CWM/DMM surface or subsurface	There are damaged CWM/DMM on the surface or in the subsurface at the MRS.	10	
Undamaged CWM/DMM surface	There are undamaged CWM/DMM on the surface at the MRS.	10	
CAIS/DMM surface	There are CAIS/DMM on the surface.	10	
Undamaged CWM/DMM subsurface	There are undamaged CWM/DMM in the subsurface at the MRS.	5	
CAIS/DMM subsurface	There are CAIS/DMM in the subsurface at the MRS.	5	
Former CA or CWM Production Facilities	The MRS is a facility that formerly engaged in production of CA or CWM, and CWM/DMM is suspected of being present on the surface or in the subsurface.	3	
Former Research, Development, Testing, and Evaluation (RDT&E) facility using CWM	The MRS is at a facility that formerly was involved in non-live-fire RDT&E activities (including static testing) involving CWM, and there are CWM/DMM suspected of being present on the surface or in the subsurface.	3	
Former Training Facility using CWM or CAIS	The MRS is a location that formerly was involved in training activities involving CWM and/or CAIS (e.g., training in recognition of CWA, decontamination training) and CWM/DMM or CAIS/DMM are suspected of being present on the surface or in the subsurface.	2	
Former Storage or Transfer Points of CWM	The MRS is a former storage facility or transfer point (e.g., intermodal transfer) for CWM.	1	
Evidence of no CWM	Following investigation, the physical evidence indicates that CWM are not present at the MRS, or the historical evidence indicates that CWM are not present at the MRS.	0	
SOURCES OF CWM	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 10).		**0**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Sources of CWM*** classifications in the space below.

Table 13

CHE Module: Location of CWM Data Element Table

Directions: Below are seven classifications of CWM locations and their descriptions. Review these locations and annotate the score(s) that correspond with **all** locations where CWM are located or suspected of being found at the MRS.

Note: The terms *surface* , *subsurface* , *physical evidence* , and *historical evidence* are defined in Appendix C of the MRSPP Primer (Draft, Dec 2005).

Classification	Description	Possible Score	Score
Confirmed surface	Physical evidence indicates that there are CWM on the surface of the MRS.	25	
	Historical evidence (e.g., a confirmed incident report or accident report) indicates there are CWM on the surface of the MRS.		
Confirmed subsurface, active	Physical evidence indicates the presence of CWM in the subsurface of the MRS, and the geological conditions at the MRS are likely to cause CWM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost, heat heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS, are likely to expose CWM.	20	
	Historical evidence indicates that CWM are located in the subsurface of the MRS and the geological conditions at the MRS are likely to cause CWM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost, heat heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS, are likely to expose CWM.		
Confirmed subsurface, stable	Physical evidence indicates the presence of CWM in the subsurface of the MRS, and the geological conditions at the MRS are not likely to cause CWM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities, at the MRS, are not likely to cause CWM to be exposed.	15	
	Historical evidence indicates that CWM are located in the subsurface of the MRS, and the geological conditions at the MRS are not likely to cause CWM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause CWM to be exposed.		
Suspected (physical evidence)	There is physical evidence, other than the documented presence of CWM, indicating that CWM may be present at the MRS.	10	
Suspected (historical evidence)	There is historical evidence indicating that CWM may be present at the MRS.	5	
Subsurface, physical constraint	There is physical or historical evidence indicating that CWM may be present in the subsurface, but there is a physical constraint (e.g., pavement, water depth over 120 feet) preventing direct access to the CWM.	2	
Evidence of no CWM	Following investigation of the MRS, there is physical evidence that there is no CWM present, or there is historical evidence indicating that no CWM are present.	0	
LOCATION OF CWM	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 25).		**0**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Location of CWM*** classifications in the space below.

Table 14
CHE Module: Ease of Access Data Element Table

Directions: Below are four classifications of barrier types that can surround an MRS and their descriptions. The barrier type is directly related to the ease of public access to any CWM. Annotate the score that corresponds with the ease of access to the MRS.

Note: The term *barrier* is defined in Appendix C of the MRSPP Primer (Draft, Dec 2005).

Classification	Description	Possible Score	Score
No barrier	There is no barrier preventing access to any part of the MRS (i.e. all parts of the MRS are accessible).	10	
Barrier to MRS access is incomplete	There is a barrier preventing access to parts of the MRS, but not the entire MRS.	8	
Barrier to MRS access is complete but not monitored	There is a barrier preventing access to all parts of the MRS, but there is no surveillance (e.g., by a guard) to ensure that the barrier is effectively preventing access to all parts of the MRS.	5	
Barrier to MRS access is complete and monitored	There is a barrier preventing access to all parts of the MRS, and there is active continual surveillance (e.g., by a guard, video monitoring) to ensure that the barrier is effectively preventing access to all parts of the MRS.	0	
EASE OF ACCESS	**DIRECTIONS:** Record **<u>the single highest score</u>** from above in the box to the right (maximum score = 10).		**0**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ease of Access*** classification in the space below.

Table 15
CHE Module: Status of Property Data Element Table

Directions: Below are three classifications of the status of a property within the Department of Defense (DoD) and their descriptions. Annotate the score that corresponds with the status of property at the MRS.

Note: N/A

Classification	Description	Possible Score	Score
Non-DoD control	The MRS is at a location that is no longer owned by, leased to, or otherwise possessed or used by DoD. Examples are privately owned land or water bodies; land or water bodies owned or controlled by state, tribal, or local governments; and land or water bodies managed by other federal agencies.	5	
Scheduled for transfer from DoD control	The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD, and DoD plans to transfer that land or water body to the control of another entity (e.g., a state, tribal, or local government; a private party; another federal agency) within 3 years from the date the rule is applied.	3	
DoD control	The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD. With respect to property that is leased or otherwise possessed, DoD controls access to the property 24 hours per day, every day of the calendar year.	0	
STATUS OF PROPERTY	**DIRECTIONS:** Record **<u>the single highest score</u>** from above in the box to the right (maximum score = 5).		**0**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Status of Property*** classification in the space below.

Table 16

CHE Module: Population Density Data Element Table

Directions: Below are three classifications of population density and their descriptions. Determine the population density per square mile in the vicinity of the MRS and annotate the score that corresponds with the associated population density.

Note: If an MRS is located in more than one county, use the largest population density value among the counties. If the MRS is within or borders a city or town, use the population density for the city or town, rather than that of the county.

Classification	Description	Possible Score	Score
> 500 persons per square mile	There are more than 500 persons per square mile in the county in which the MRS is located, based on US Census Bureau data.	5	
100 - 500 persons per square mile	There are 100 to 500 persons per square mile in the county in which the MRS is located, based on US Census Bureau data.	3	
< 100 persons per square mile	There are fewer than 100 persons per square mile in the county in which the MRS is located, based on US Census Bureau data.	1	
POPULATION DENSITY	**DIRECTIONS:** Record **<u>the single highest score</u>** from above in the box to the right (maximum score = 5).		**0**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Density*** classification in the space below.

Table 17

CHE Module: Population Near Hazard Data Element Table

Directions: Below are six classifications describing the number of inhabited structures near the MRS. The number of inhabited buildings relates to the population near the hazard. Determine the number of inhabited structures within two miles of the MRS boundary and annotate the score that corresponds with the associated population near the known or suspected hazard.

Note: The term *inhabited structures* is defined in Appendix C of the MRSPP Primer (Draft, Dec 2005).

Classification	Description	Possible Score	Score
26 or more inhabited structures	There are 26 or more inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	5	
16 to 25 inhabited structures	There are 16 to 25 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	4	
11 to 15 inhabited structures	There are 11 to 15 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	3	
6 to 10 inhabited structures	There are 6 to 10 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	2	
1 to 5 inhabited structures	There are 1 to 5 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	1	
0 inhabited structures	There are no inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	0	
POPULATION NEAR HAZARD	**DIRECTIONS:** Record **<u>the single highest score</u>** from above in the box to the right (maximum score = 5).		**0**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Near Hazard*** classification in the space below.

Table 18

CHE Module: Types of Activities/Structures Data Element Table

Directions: Below are five classifications of activities and/or inhabited structures near the hazard and their descriptions. Review the types of activities that occur and/or structures that are present within two miles of the MRS and annotate the score(s) that correspond with **all** the activities/structure classifications at the MRS.

Note: The term *inhabited structures* is defined in Appendix C of the MRSPP Primer (Draft, Dec 2005).

Classification	Description	Possible Score	Score
Residential, educational, commercial, or subsistence	Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with any of the following purposes: residential, educational, child care, critical assets (e.g., hospitals, fire and rescue, police stations, dams), hotels, commercial, shopping centers, playgrounds, community gathering areas, religious sites, or sites used for subsistence hunting, fishing, and gathering.	5	
Parks and recreational areas	Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with parks, nature preserves, or other recreational uses.	4	
Agricultural, forestry	Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with agriculture or forestry.	3	
Industrial or warehousing	Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with industrial activities or warehousing.	2	
No known or recurring activities	There are no known or recurring activities occurring up to two miles from the MRS's boundary or within the MRS's boundary.	1	
TYPES OF ACTIVITIES/STRUCTURES	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).		**0**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Types of Activities/Structures*** classifications in the space below.

Table 19

CHE Module: Ecological and/or Cultural Resources Data Element Table

Directions: Below are four classifications of ecological and/or cultural resources and their descriptions. Review the types of resources present and annotate the score that corresponds with the ecological and/or cultural resource classifications at the MRS.

Note: The terms *ecological resources* and *cultural resources* are defined in Appendix C of the MRSPP Primer (Draft, Dec 2005).

Classification	Description	Possible Score	Score
Ecological and cultural resources present	There are both ecological and cultural resources present on the MRS.	5	
Ecological resources present	There are ecological resources present on the MRS.	3	
Cultural resources present	There are cultural resources present on the MRS.	3	
No ecological or cultural resources present	There are no ecological resources or cultural resources present on the MRS.	0	
ECOLOGICAL AND/OR CULTURAL RESOURCES	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).		**0**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ecological and/or Cultural Resources*** classification in the space below.

Table 20

Determining the CHE Module Rating

DIRECTIONS:

1. From Tables 11 - 19, record the data element scores in the **Score** boxes to the right.

2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.

3. Add the three **Value** boxes and record this number in the **CHE Module Total** box below.

	Source	Score	Value
CWM Hazard Factor Data Elements			
CWM Configuration	Table 11	0	0
Sources of CWM	Table 12	0	
Accessibility Factor Data Elements			
Location of CWM	Table 13	0	0
Ease of Access	Table 14	0	
Status of Property	Table 15	0	
Receptor Factor Data Elements			
Population Density	Table 16	0	0
Population Near Hazard	Table 17	0	
Types of Activities/Structures	Table 18	0	
Ecological and/or Cultural Resources	Table 19	0	
CHE MODULE TOTAL			**0**

4. Identify the appropriate range for the **CHE Module Total** at right.

5. Identify the **CHE Module Rating** that corresponds to the range selected and record this rating in the **CHE Module Rating** box at the lower right corner of this table.

NOTE: An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

CHE Module Total	CHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected CWM Hazard
CHE MODULE RATING	

Table 21

HHE Module: Groundwater Data Element Table

Contaminant Hazard Factor (CHF)

Directions: Record the **maximum concentrations** of all contaminants in the MRS's groundwater and their **comparison values** (from Appendix B, Relative Risk Site Evaluation (RRSE) Primer, Summer 1997 - Revised) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard present in the groundwater, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Contaminant [CAS No.]	Maximum Concentration (µg/L)	Comparison Value (µg/L)	Ratios
		Total from Table 27	
		Sum the Ratios	

CHF Scale	CHF Value
CHF > 100	H (High)
100 > CHF >2	M (Medium)
2 > CHF	L (Low)

CHF = ∑ ([Max Conc of Contaminant] / [Comparison Value for Contaminant])

CONTAMINANT HAZARD FACTOR	Directions: Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

Directions: Annotate the value that corresponds most closely to the groundwater migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the groundwater is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in groundwater has moved only slightly beyond the source (i.e. tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the groundwater to a potential point of exposure (possibly due to geological structures or physical controls).	L

MIGRATORY PATHWAY FACTOR	Directions: Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

Directions: Annotate the value that corresponds most closely to the groundwater receptors at the MRS.

Classification	Description	Value
Identified	There is a threatened water supply well downgradient of the source and the groundwater is a current source of drinking water or source of water for other beneficial uses such as irrigation/agriculture (equivalent to Class I or IIA aquifer).	H
Potential	There is no threatened water supply well downgradient of the source and the groundwater is currently or potentially usable for drinking water, irrigation, or agriculture (equivalent to Class I, IIA, or IIB aquifer).	M
Limited	There is no potentially threatened water supply well downgradient of the source and the groundwater is not considered a potential source of drinking water and is of limited beneficial use (equivalent to Class IIIA or IIIB aquifer, or where perched aquifer exists only).	L

RECEPTOR FACTOR	Directions: Record **the single highest value** from above in the box to the right (maximum value = H).	
Place an "X" in the box to the right if there is no known or suspected Groundwater MC Hazard		

Table 22

HHE Module: Surface Water - Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

Directions: Record the **maximum concentrations** of all contaminants in the MRS's surface water and their **comparison values** (from Appendix B, Relative Risk Site Evaluation (RRSE) Primer, Summer 1997 - Revised) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard present in the surface water, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Contaminant [CAS No.]	Maximum Concentration (µg/L)	Comparison Value (µg/L)	Ratios
		Total from Table 27	
		Sum the Ratios	

CHF Scale	CHF Value	
CHF > 100	H (High)	CHF = $\sum$ ([Max Conc of Contaminant] / [Comparison Value for Contaminant])
100 > CHF >2	M (Medium)	
2 > CHF	L (Low)	

CONTAMINANT HAZARD FACTOR	Directions: Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

Directions: Annotate the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e. tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L

MIGRATORY PATHWAY FACTOR	Directions: Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

Directions: Annotate the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L

RECEPTOR FACTOR	Directions: Record **the single highest value** from above in the box to the right (maximum value = H).	

Place an "X" in the box to the right if there is no known or suspected Surface Water (Human Endpoint) MC Hazard	

Table 23

HHE Module: Sediment - Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

Directions: Record the **maximum concentrations** of all contaminants in the site's sediment and their **comparison values** (from Appendix B, Relative Risk Site Evaluation (RRSE) Primer, Summer 1997 - Revised) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard for human endpoints present in the sediment, select the box at the bottom of the table.

Note: N/A

Contaminant [CAS No.]	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
		Total from Table 27	
		Sum the Ratios	

CHF Scale	CHF Value
CHF > 100	H (High)
100 > CHF >2	M (Medium)
2 > CHF	L (Low)

CHF = ∑ ([Max Conc of Contaminant] / [Comparison Value for Contaminant])

CONTAMINANT HAZARD FACTOR	Directions: Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

Directions: Annotate the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e. tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	Directions: Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

Directions: Annotate the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	Directions: Record **the single highest value** from above in the box to the right (maximum value = H).	

Place an "X" in the box to the right if there is no known or suspected Sediment (Human Endpoint) MC Hazard

Table 24

HHE Module: Surface Water - Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

Directions: Record the **maximum concentrations** of all contaminants in the MRS's surface water and their **comparison values** (from Appendix B, Relative Risk Site Evaluation (RRSE) Primer, Summer 1997 - Revised) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard for ecological endpoints present in the surface water, select the box at the bottom of the table.

Note: Use either dissolved or total metals analyses.

Contaminant [CAS No.]	Maximum Concentration (µg/L)	Comparison Value (µg/L)	Ratios
		Total from Table 27	
		Sum the Ratios	

CHF Scale	CHF Value	
CHF > 100	H (High)	CHF = $\sum$ ([Max Conc of Contaminant] / [Comparison Value for Contaminant])
100 > CHF >2	M (Medium)	
2 > CHF	L (Low)	

CONTAMINANT HAZARD FACTOR	Directions: Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

Directions: Annotate the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e. tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L

MIGRATORY PATHWAY FACTOR	Directions: Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

Directions: Annotate the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L

RECEPTOR FACTOR	Directions: Record **the single highest value** from above in the box to the right (maximum value = H).	

Place an "X" in the box to the right if there is no known or suspected Surface Water (Ecological Endpoint) MC Hazard	

Table 25

HHE Module: Sediment - Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

Directions: Record the **maximum concentrations** of all contaminants in the MRS's sediment and their **comparison values** (from Appendix B, Relative Risk Site Evaluation (RRSE) Primer, Summer 1997 - Revised) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard for ecological endpoints present in the sediment, select the box at the bottom of the table.

Note: N/A

Contaminant [CAS No.]	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
		Total from Table 27	
		Sum the Ratios	

CHF Scale	CHF Value
CHF > 100	H (High)
100 > CHF >2	M (Medium)
2 > CHF	L (Low)

CHF = $\sum$ ([Max Conc of Contaminant] / [Comparison Value for Contaminant])

CONTAMINANT HAZARD FACTOR	Directions: Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

Directions: Annotate the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e. tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L

MIGRATORY PATHWAY FACTOR	Directions: Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

Directions: Annotate the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L

RECEPTOR FACTOR	Directions: Record **the single highest value** from above in the box to the right (maximum value = H).	

Place an "X" in the box to the right if there is no known or suspected Sediment (Ecological Endpoint) MC Hazard	

Table 26

HHE Module: Surface Soil - Data Element Table

Contaminant Hazard Factor (CHF)

Directions: Record the **maximum concentrations** of all contaminants in the MRS's surface soil and their **comparison values** (from Appendix B, Relative Risk Site Evaluation (RRSE) Primer, Summer 1997 - Revised) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard present in the surface soil, select the box at the bottom of the table.

Note: N/A

Contaminant [CAS No.]	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
		Total from Table 27	
		Sum the Ratios	

CHF Scale	CHF Value
CHF > 100	**H (High)**
100 > CHF >2	**M (Medium)**
2 > CHF	**L (Low)**

CHF = $\sum$ ([Max Conc of Contaminant] / [Comparison Value for Contaminant])

CONTAMINANT HAZARD FACTOR	Directions: Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

Directions: Annotate the value that corresponds most closely to the surface soil migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface soil is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface soil has moved only slightly beyond the source (i.e. tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface soil to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L

MIGRATORY PATHWAY FACTOR	Directions: Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

Directions: Annotate the value that corresponds most closely to the surface soil receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface soil to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface soil to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface soil to which contamination has moved or can move.	L

RECEPTOR FACTOR	Directions: Record **the single highest value** from above in the box to the right (maximum value = H).	
Place an "X" in the box to the right if there is no known or suspected Surface Soil MC Hazard		

Table 27

HHE Module: Supplemental Contaminant Hazard Factor Table

Contaminant Hazard Factor (CHF)

Directions: **Only use this table if there are more than five contaminants present at the MRS.** This is a supplemental table designed to hold information about contaminants that do not fit in the previous tables. Indicate the **media** in which these contaminants are present. Then record all **contaminants**, their **maximum concentrations** and their **comparison values** (from Appendix B, Relative Risk Site Evaluation (RRSE) Primer, Summer 1997 - Revised) in the table below. Calculate and record the **ratio** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** for each medium on the appropriate media-specific tables.

Note: For human exposures to groundwater and surface water, use dissolved, rather than total, metals analyses when both are available. Remember not to add ratios from different media.

Media	Contaminant [CAS No.]	Maximum Concentration	Units	Comparison Value	Units	Ratios
Surface soil			mg/kg		mg/kg	
Surface soil			mg/kg		mg/kg	
Surface soil			mg/kg		mg/kg	
Surface soil			mg/kg		mg/kg	
Surface soil			mg/kg		mg/kg	
Surface soil			mg/kg		mg/kg	
Surface soil			mg/kg		mg/kg	
Surface soil			mg/kg		mg/kg	
Surface soil			mg/kg		mg/kg	
Surface soil			mg/kg		mg/kg	
Surface soil			mg/kg		mg/kg	
Surface soil			mg/kg		mg/kg	
Surface soil			mg/kg		mg/kg	
Surface soil			mg/kg		mg/kg	
					SUBTOTAL FOR SURFACE SOIL	**0**
Sediment			mg/kg		mg/kg	
Sediment			mg/kg		mg/kg	
Sediment			mg/kg		mg/kg	
Sediment			mg/kg		mg/kg	
Sediment			mg/kg		mg/kg	
Sediment			mg/kg		mg/kg	
Sediment			mg/kg		mg/kg	
Sediment			mg/kg		mg/kg	
Sediment			mg/kg		mg/kg	
Sediment			mg/kg		mg/kg	
Sediment			mg/kg		mg/kg	
Sediment			mg/kg		mg/kg	
					SUBTOTAL FOR SEDIMENT	**0**
Surface water			µg/L		µg/L	
Surface water			µg/L		µg/L	
Surface water			µg/L		µg/L	
Surface water			µg/L		µg/L	
Surface water			µg/L		µg/L	
Surface water			µg/L		µg/L	
Surface water			µg/L		µg/L	
Surface water			µg/L		µg/L	
Surface water			µg/L		µg/L	
Surface water			µg/L		µg/L	
Surface water			µg/L		µg/L	
Surface water			µg/L		µg/L	
Surface water			µg/L		µg/L	
					SUBTOTAL FOR SURFACE WATER	**0**
Groundwater			µg/L		µg/L	
Groundwater			µg/L		µg/L	
Groundwater			µg/L		µg/L	
Groundwater			µg/L		µg/L	
Groundwater			µg/L		µg/L	
Groundwater			µg/L		µg/L	
Groundwater			µg/L		µg/L	
Groundwater			µg/L		µg/L	
Groundwater			µg/L		µg/L	
Groundwater			µg/L		µg/L	
Groundwater			µg/L		µg/L	
Groundwater			µg/L		µg/L	
Groundwater			µg/L		µg/L	
					SUBTOTAL FOR GROUNDWATER	**0**

Table 28

Determining the HHE Module Rating

DIRECTIONS:

1. Record the letter values (H, M, L) for the **Contaminant Hazard**, **Migration Pathway**, and **Receptor Factors** for the media (from Tables 21 - 26) in the corresponding boxes below.
2. Record the media's three-letter combinations in the **Three-Letter-Combination** boxes below (three-letter combinations are arranged from Hs to Ms to Ls).
3. Using the reference provided below, determine each medium's rating (A - G) and record the letter in the corresponding **Media Rating** box below.

Medium (Source)	Contaminant Hazard Factor Value	Migratory Pathway Factor Value	Receptor Factor Value	Three-Letter Combination (Hs-Ms-Ls)	Media Rating (A - G)
Table 21 - Groundwater					
Table 22 - Surface Water (Human Endpoint)					
Table 23 - Sediment (Human Endpoint)					
Table 24 - Surface Water (Ecological Endpoint)					
Table 25 - Sediment (Ecological Endpoint)					
Table 26 - Surface Soil					
			HHE MODULE RATING		

DIRECTIONS (Continued):

4. Select the single highest **Media Rating** (A is the highest; G is the lowest) and enter the letter in the **HHE Module Rating** box below.

HHE Ratings (for reference only)	
HHH	A
HHM	B
HHL	C
HMM	
HML	D
MMM	
HLL	E
MML	
MLL	F
LLL	G

NOTE: An alternative module rating may be assigned when a module letter rating is used when more information is needed to score one or more media, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

Alternative Module Ratings
Evaluation Pending
No Longer Required
No Known or Suspected MC Hazard

Table 29

MRS Priority

DIRECTIONS: In the chart below, enter the letter **rating** for each module recorded in Table 10 (EHE), Table 20 (CHE), and Table 28 (HHE). Enter the corresponding numerical **priority** for each module. If information to determine the module rating is not available, choose the appropriate alternative module rating. The MRS priority is the single highest priority; record this number in the **MRS or Alternative Priority** box at the bottom of the table.

NOTE: An MRS assigned Priority 1 has the highest relative priority; an MRS assigned Priority 8 has the lowest relative priority. Only an MRS with CWM known or suspected to be present can be assigned Priority 1; an MRS that has CWM known or suspected to be present cannot be assigned Priority 8.

EHE Rating	Priority	CHE Rating	Priority	HHE Rating	Priority
		A	1		
A	2	B	2	A	2
B	3	C	3	B	3
C	4	D	4	C	4
D	5	E	5	D	5
E	6	F	6	E	6
F	7	G	7	F	7
G	8			G	8
Evaluation Pending		Evaluation Pending		Evaluation Pending	
No Longer Required		No Longer Required		No Longer Required	
No Known or Suspected Explosive Hazard		No Known or Suspected CWM Hazard		No Known or Suspected MC Hazard	

Reference Table 10:		Reference Table 20:		Reference Table 28:	
EHE Module Rating	**Priority**	**CHE Module Rating**	**Priority**	**HHE Module Rating**	**Priority**

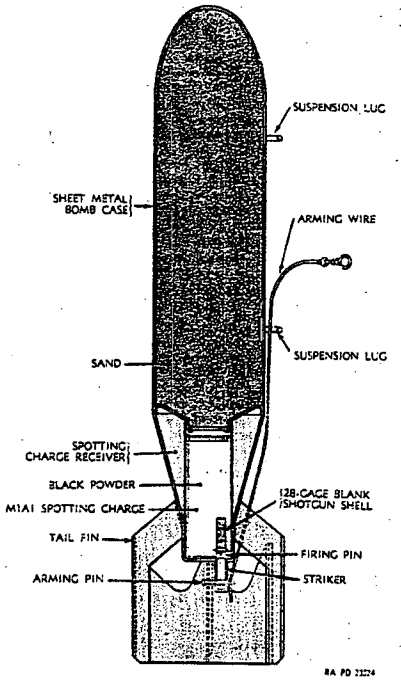
MRS or Alternative Priority	

APPENDIX E

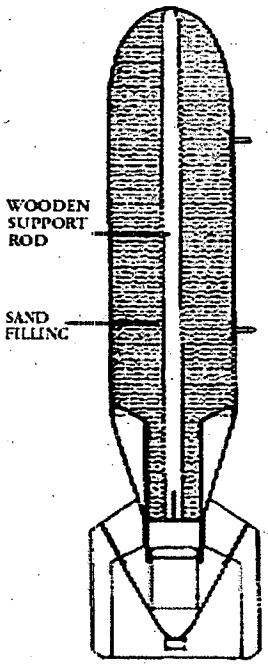
ORDNANCE TECHNICAL DATA SHEETS

Munitions Technical Data Sheets

BOMB, PRACTICE, 100 POUND, M38A2



with M1A1 spotting charge



with M5 spotting charge

Description. This bomb simulates a General Purpose bomb of the same size. It is constructed of light sheet metal, approximately 22-gage, formed by rolling a rectangular sheet of metal into the form of a cylinder approximately 8 inches in diameter, and spot-welding the seam. The rounded nose is pressed from the same metal, as is the tail, which is formed in the shape of a cone. The tail portion ends in box type fins, which are welded to the cone. Inside of the smaller end of the conical tail section is welded the spotting charge receiver. The spotting charge is assembled in a sleeve at the base of the bomb, within the fin box. Authorized spotting charges are the M1A1, M3, and M5. When using the M5 spotting charge a wooden support rod is installed in the bomb. Two suspension lugs are bolted to the bomb body during fabrication. The Suspension Band M1 is provided for single suspension. The band is a separate component. The over-all length of the bomb body is 47.5 inches. When empty, the bomb body weighs approximately 14 pounds. When completely loaded with sand and spotting charge, the weight of the bomb is approximately 100 pounds.

Over-all length.....47.5 inches
Diameter.....8.13 inches
Weight empty.....15.7 pounds
Weight sand loaded & spotting charge.....100 pounds

References:

Complete Round Chart #5981, 1 January 1940
TM 9-1904, *Ammunition Inspection Guide*, March 1944
NAVSEA OP 1664 Volume 2, *U.S. Explosive Ordnance*, 28 May 1947

M5 Spotting Charge. The spotting charge consists of a glass bottle filled with FS smoke mixture. An ordinary bottle cap seals the mixture. The bottle is held to the Practice Bomb M38A2 by a wire twisted around the neck of the bottle and attached to the tail vanes. The charge assembly weighs 2.54 pounds.

SUMMARY OF PROPELLANT, EXPLOSIVES & PYROTECHNICS (PEP)

SPOTTING CHARGE, M1A1 (1938-1945)

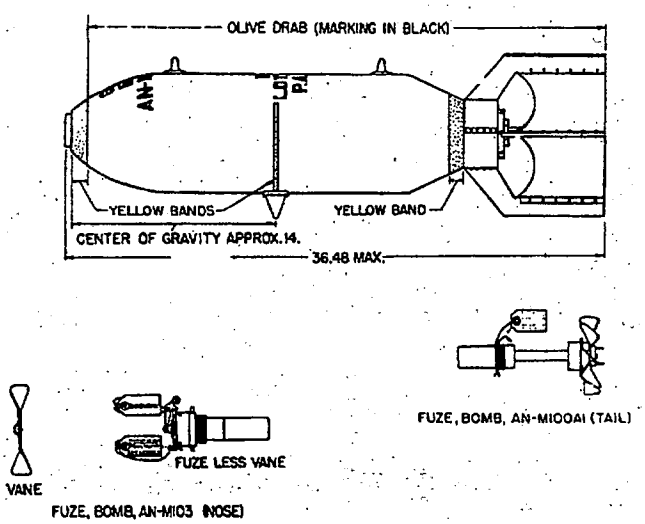
COMPONENT	PEP	QUANTITY
Percussion primer in 28-gage blank shotgun shell	Primer mix (approximate proportions) • Potassium chlorate (53%) • Lead thiocyanate (25%) • Antimony sulfide (17%) • TNT, Grade III (5%)	[less than 1 grain *]
Propellant in 28-gage blank shotgun shell	Smokeless powder -- Pyrocellulose (Nitrocellulose with 12.6% nitrogen):	Approximately 12-17 grains
Spotting charge	Black powder: • Potassium nitrate (74%) • Charcoal (15.6%) • Sulfur (10.4%)	3 pounds

* 15.4 GRAINS = 1 GRAM; 7,000 GRAINS = 1 POUND

REFERENCES:

TM 9-1904, *Ammunition Inspection Guide*, 2 March 1944
NAVSEA OP 1664 Volume 2, *U.S. Explosive Ordnance*, 28 May 1947

BOMB, GENERAL PURPOSE (GP), 100-POUND, AN-M30

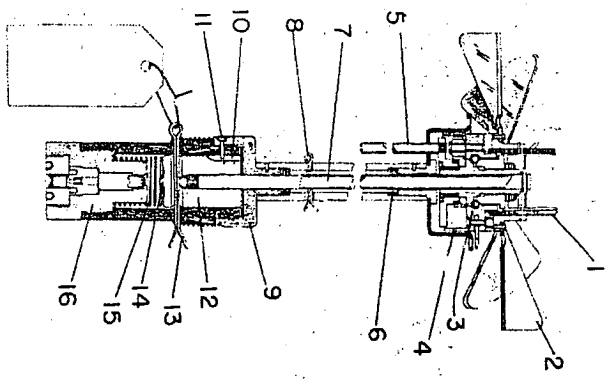


Description. The GP and newer M series bombs of 100-pound weight have the same dimensions. The GP is distinguishable from the M-series by the fact that it has a base plug in the tail and a single suspension lug in addition to two Army lugs. General purpose bombs are a relatively thin-cased bomb with an ogival nose, parallel sidewalls, and a tapered aft section. It uses both the box type and conical type fin assembly. The box-type fin assembly is secured to the aft end of the bomb with a fin locknut, while the conical-type fin assembly is secured to the bomb body by means of a support tube. The two Army lugs are 14 inches apart, each 7 inches from the center of gravity. The single suspension lug is on the center of gravity 14 inches behind the nose. The weight of the case is 42.1 pounds and the fins weigh between 5.6 to 17.5 pounds. The filler is 50/50 amatol, TNT, or Tritonal. Percentage of filler is approximately 49 percent. The AN-M30 Bomb is fuzed in the nose with the AN-M103 Fuze and in the tail with the AN-M100A2 Fuze. Alternate fuzes that may be used as substitutes or for special purposes are the M103, M118, or M119 Nose Fuzes, and the M112, M100, M106, or its modifications, or the AN-M100A1 Tail Fuzes.

Length, assembled bomb	
Fin assembly AN-M103A1	40.26 inches
Fin assembly M135	54.2 inch
Diameter	8.18 inch
Weight of Filler	
TNT	57 pound
Amatol	54 pound
Tritonal	62 pound
Fuze:	
Nose	AN--M103, M103, M118, M119
Tail	AN-M103, M112, M100, M106, AN-M100A1
Painting and Markings	Olive drab with black stencil, 2 yellow bands (1aft, 1 center)

REFERENCES: TM 9-1904, *Ammunition Inspection Guide*, 2 March 1944, TM 9-1325-200, *Bombs and Bomb Components*, April 1966

Fuze, Bomb, Tail, AN-M100 Series



Description: The tail fuzes in the AN-M100 series are of the mechanical impact type. These fuzes are used in general purpose (GP) high explosive bombs, fragmentation bombs and some chemical bombs. There are three fuzes in the series: AN-M100, AN-M101 and AN-M102, each of which has modifications (e.g. AN-M101A1). These fuzes are identical except for the length of the arming stem and minor changes such as numbers of threads. They are made of cadmium-plated steel and brass parts. The explosives are contained within the M14 primer detonator, which has four versions, depending upon the delay desired.

Functioning: As the vanes (eight or four) rotate, a pinion gear revolves around a stationary gear. After 100 to 150 revolutions, the fuze is armed; after 720 revolutions, the arming stem is unscrewed from the striker block; and after 1200 revolutions, the arming stem, vanes and gear assembly fly off, leaving the striker held only by a creep spring. Upon impact, the striker is driven into the primer detonator by inertia. The fuze can be pre-armed for dive-bombing and sometimes is pre-armed at the factory.

Overall Length ..... 9.26", 12.26" or 16.26" (M100, M101, M102)
Diameter ..... Body – 2.3", Vanes – 5"
Firing Action ..... Impact inertia
Firing Delay ..... Interchangeable 0.01, 0.025, 0.1 and 0.024 seconds
Primer detonator ..... M14 primer detonator

Summary of Propellant, Explosives & Pyrotechnics (PEP)

Fuze, Bomb, Tail, AN-M100 Series (1940 – circa 1968)

COMPONENT	PEP	QUANTITY
Fuze, Bomb, Tail, AN-M100 series	Primer Detonator, M14 (non-delay), consisting of:	
	Primer, Percussion, M39A1: • Lead thiocyanate (38.13%) • Potassium chlorate (37.05%) • Ground glass (10.45%) • Barium nitrate (8.68%) • TNT (5.69%)	.4 grains
	Relay charge, Lead azide	.95 grains
	Detonator, M17:	
	1. Intermediate charge, Lead azide	4.08 grains
	2. Detonator, Tetryl	1.23 grains
	OR	
	Primer Detonator, M14 (.025 second delay), consisting of:	
	Primer, Percussion, M39A1: • Lead thiocyanate (38.13%) • Potassium chlorate (37.05%) • Ground glass (10.45%) • Barium nitrate (8.68%) • TNT (5.69%)	.4 grains
	Charge, delay, black powder: • Potassium nitrate (74%) • Charcoal (15.6%) • Sulfur (10.4%)	.15 grains
	Fuse powder: • Potassium nitrate (70%) • Sulfur (16%) • Coal (14%)	1.3 grains

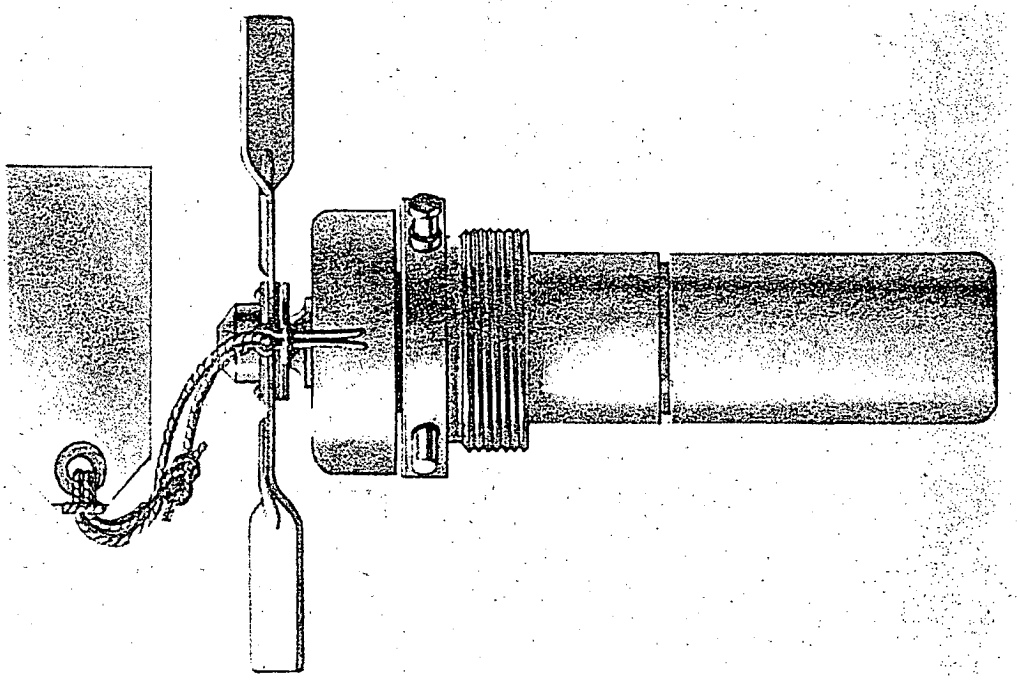
	M6 Relay charge, Lead azide **OR** Primer Detonator, M14 (.025 second delay), consisting of:	.95 grains
	Primer, Percussion, M39A1: • Lead thiocyanate (38.13%) • Potassium chlorate (37.05%) • Ground glass (10.45%) • Barium nitrate (8.68%) • TNT (5.69%)	.4 grains
	Charge, delay, black powder: • Potassium nitrate (74%) • Charcoal (15.6%) • Sulfur (10.4%)	46.2 grains
	Charge, igniter, black powder:	.8 grains
	Charge, lower, Tetryl	1.27 grains
	Charge, upper, Lead azide	3.86 grains

* 15.4 grains = 1 gram; 7,000 grains = 1 pound

References:

TM 9-1984, *Disposal of Allied Bombs and Fuzes*, 12 November 1942
TM 9-1904, *Ammunition Inspection Guide*, 2 March 1944
OP 1280, *Aircraft Bombs*, 17 February 1945
OP 1664, *U.S. Explosive Ordnance*, 28 May 1947
Complete Round Charts, Book III, *Bombs, Pyrotechnics, Grenades, Mines, Rockets, JATOS, Demolition Material & Miscellaneous Items of Ammunition*, 15 October 1959
TM 9-1325-200/NAVWEPS OP 3530/TO 1-1-28, *Bombs and Bomb* Components, 29 April 1966
US Army Defense Ammunition Center's "MIDAS" web site

Fuze, Bomb, Nose, AN-M103A1



Description: The Nose Fuze AN-M103A1 is an impact fuze of the arming-vane type and has mechanical delay arming. It is used in all of the AN-series of general purpose bombs. It can be set for instantaneous or 0.1-second delay action by means of an external setting pin. When shipped, the pin is in the deep slot or delay position. To set for instantaneous action, lift the pin, rotate one quarter-turn, and drop it into shallow slot. The fuze is safe for dive bombing and for take-offs and landings anywhere, including decks of carriers.

Overall Length .....7.23 inches
Weight .....3.7 pounds
Firing Action .....Impact
Firing Delay .....0.1 second

Summary of Propellant, Explosives & Pyrotechnics (PEP)

Fuze, Bomb, Nose, AN-M103A1 (1940 – circa 1968)

COMPONENT	PEP	QUANTITY
Fuze, Bomb, Nose, AN-M103	Detonator, M20: 3. Lower charge, Tetryl	2.47 grains
	4. Intermediate charge, Lead azide	2.24 grains
	5. Upper charge, Primer mix: • Potassium chlorate (33.4%) • Antimony sulfide (33.3%) • Lead azide (28.3%) • Carborundum (5%)	.73 grains
	Primer, Percussion, M39A1: 1. Primer mix: • Lead thiocyanate (38.13%) • Potassium chlorate (37.05%) • Ground glass (10.45%) • Barium nitrate (8.68%) • TNT (5.69%)	.4 grains
	2. Charge, closing cup, Tetryl	2.3 grains
	3. Charge, delay, black powder: • Potassium nitrate (74%) • Charcoal (15.6%) • Sulfur (10.4%)	1.01 grains
	4. Charge, ignition, black powder	.16 grains
	5. Charge, relay, Lead azide	.98 grains
	6. Pellet, booster, Tetryl	825 grains

* 15.4 grains = 1 gram; 7,000 grains = 1 pound

REFERENCES:

TM 9-1984, *Disposal of Allied Bombs and Fuzes*, 12 November 1942

TM 9-1904, *Ammunition Inspection Guide*, 2 March 1944

OP 1280, *Aircraft Bombs*, 17 February 1945

OP 1664, *U.S. Explosive Ordnance*, 28 May 1947

Complete Round Charts, Book III, *Bombs, Pyrotechnics, Grenades, Mines, Rockets, JATOS, Demolition Material & Miscellaneous Items of Ammunition*, 15 October 1959

TM 9-1325-200/NAVWEPS OP 3530/TO 1-1-28, *Bombs and Bomb* Components, 29 April 1966

US Army Defense Ammunition Center's "MIDAS" web site

CARTRIDGE, CALIBER .50

General. In general, a small-arms cartridge is identified as an assembly of a cartridge case, primer, a quantity of propellant within the cartridge case, and a bullet or projectile. Blank cartridges are sealed with paper closure disks in lieu of bullets. Dummy cartridges are composed of a cartridge case and a bullet.

Case. The cartridge case for all U.S. caliber .50 rounds is made of brass, although some foreign-made cases are steel.

Propellant. Cartridges are loaded with varying weights of propellant. This is to impart sufficient velocity to the projectile to obtain the required ballistic performance. These propellants are usually of the single base (nitrocellulose) type. The propellant grain configuration may be cylindrical with a single, lengthwise perforation, spheroid (ball) or flake. Most propellants are coated with a deterrent (to assist in controlling the rate of combustion) and with a final coating of graphite (to facilitate flow of propellant and eliminate static electricity in loading cartridges). The IMR 4814 propellant is a single-base type originally produced by DuPont and known as improved military rifle powder. It is composed of nitrocellulose with traces of diphenylamine and potassium sulfate added.

Primer. Cartridges contain percussion primer. The percussion primer of brass or gliding metal cup that contains a pellet of sensitive explosive material secured by a paper disk and a brass anvil. Most primers loaded after 1950 were non-corrosive and contain lead styphnate.

Bullets.

Ball. The bullet consists of three parts: a gliding metal jacket, a soft steel core, and a point filler of antimony-lead alloy. The bullet is unpainted.

Tracer. The bullet is the similar to the M1 with the addition of a tracer and igniter composition. The tip is painted orange.

Blank. No bullet

Incendiary. The bullet consists of four parts: a gliding metal jacket, a hollow steel cylindrical core, an incendiary composition, and a lead base filler. The tip is painted light blue.

Armor-Piercing. The bullet consists of three parts: a gliding metal jacket, a tungsten-chrome steel core, and a point filler of lead hardened with antimony. The tip is painted black.

Armor-Piercing Incendiary. The bullet is similar to the armor-piercing bullet, except that the point filler is incendiary mixture instead of lead. The tip is painted aluminum.

Armor-Piercing Incendiary Tracer. The bullet consists of a hard steel core with compressed pyrotechnic mixture in the cavity in the base of the core, The core is covered by a gliding-metal jacket with incendiary mixture between the core point and jacket. The tip is painted aluminum and red

Dummy. The complete cartridge is inert. The cartridge case is tin-coated, has three holes drilled in the side and an empty primer pocket. The bullet may be tin-coated.

High Pressure Test. The cartridge case is distinguished from other cartridges by the tinned cartridge case. The bullet consists of a gliding metal jacket and a core made up of 2 slugs, a front and rear slug.

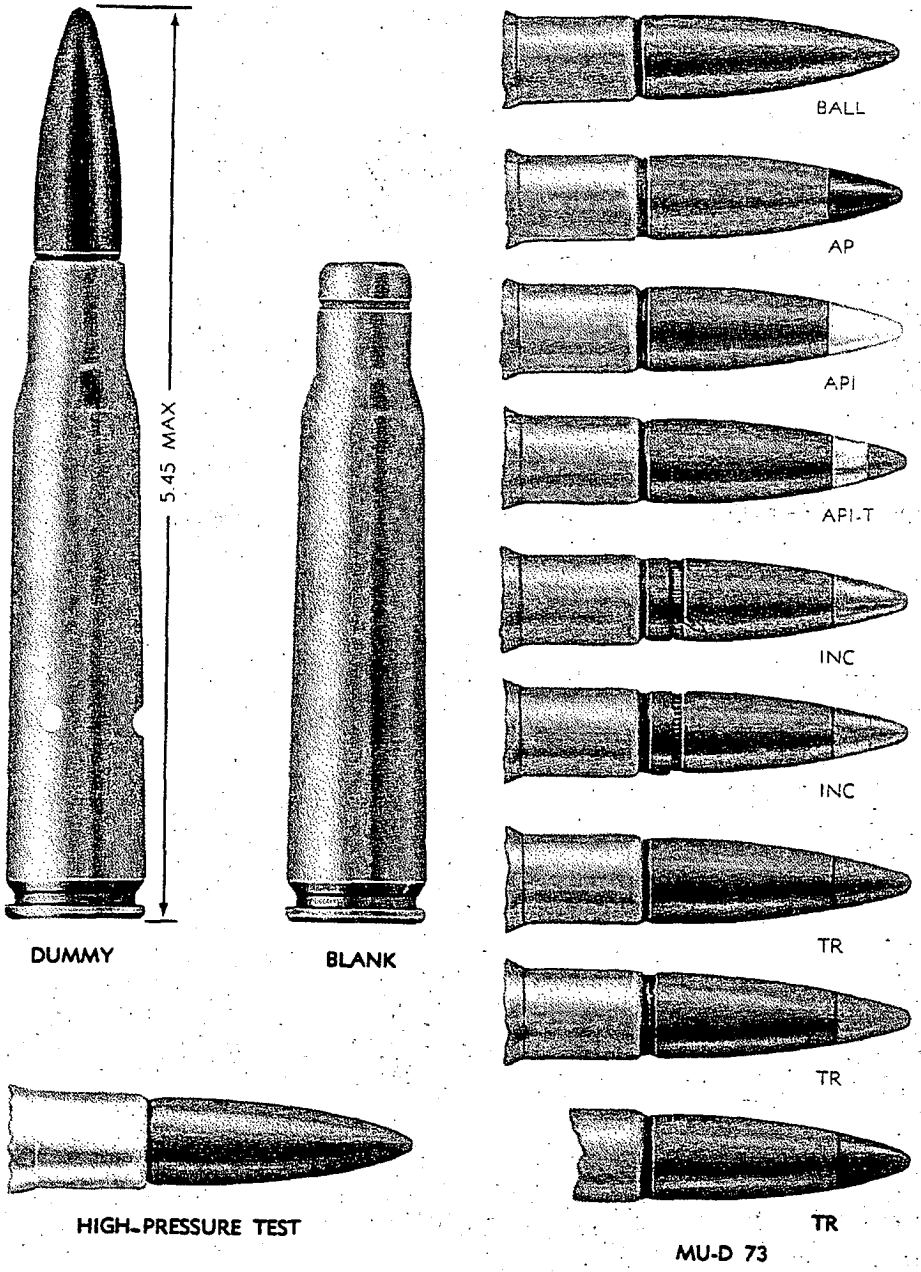


Figure 3-9. Caliber .50 cartridges.

Historical Notes. The caliber .50 military cartridge (known commercially as the .50 BMG or Browning Machine Gun) was adopted by the U.S. Army in 1923 for the M2 heavy machine gun, and later for the M3 aircraft machine gun and the more recent M85 machine gun. It is still in service today. The original M1923 loading used an 803-grain bullet. It was found to be too heavy and by 1934 it was replaced with the M1 Ball cartridge that used a 753-grain bullet. By

World War II, the M2 Ball cartridge was loaded with a 711-grain bullet (nominal). The current M33 Ball cartridge utilizes a 688-grain bullet.

SUMMARY OF PROPELLANT, EXPLOSIVES & PYROTECHNICS (PEP)

CARTRIDGE, CALIBER .50, BALL, M1 (1934-1940)

COMPONENT	PEP	QUANTITY
Percussion primer No. 28	Primer composition FA90A: • Potassium chlorate (50.5%) • Lead thiocyanate (23.8%) • PETN, Class B (14.2%) • Antimony sulfide (11.4%) • [remainder is gum solution]	1.9 grains *
Propellant	Smokeless powder -- (Nitrocellulose with (13.15-13.25% nitrogen):	240 grains
Bullet	Mild steel core with lead-antimony point filler and cupro-nickel jacket	753 grains (total): • Core, 405 grains • Jacket, 266 grains • Point filler, 82 grains

CARTRIDGE, CALIBER .50, AP, M1 (1934-1940)

COMPONENT	PEP	QUANTITY
Percussion primer No. 28	Primer composition FA90A: • Potassium chlorate (50.5%) • Lead thiocyanate (23.8%) • PETN, Class B (14.2%) • Antimony sulfide (11.4%) • [remainder is gum solution]	1.9 grains
Propellant	Smokeless powder -- (Nitrocellulose with (13.15-13.25% nitrogen):	240 grains
Bullet	Crome-tungsten steel core with lead-antimony point filler and cupro-nickel jacket	753 grains (total): • Core, 413 grains • Jacket, 266 grains • Point filler, 82 grains

CARTRIDGE, CALIBER .50, AP, M2 (WWII-ONWARD)

COMPONENT	PEP	QUANTITY
Percussion primer No. 28	Primer composition FA90A: • Potassium chlorate (50.5%) • Lead thiocyanate (23.8%) • PETN, Class B (14.2%) • Antimony sulfide (11.4%) • [remainder is gum solution]	1.9 grains
OR Percussion primer No. 50M (currently listed in MIDAS)	Primer composition 5061W: • Barium Nitrate (43%) • Lead styphnate (38%) • Antimony sulfide (9%) • Calcium silicide (8%) • Tetracene (2%)	2.25 grains
Propellant	Smokeless powder -- (Nitrocellulose with (13.15-13.25% nitrogen):	250 grains
OR Propellant (currently listed in MIDAS)	WC 860 • Nitrocellulose (78.67%) • Nitroglycerine (9.5%) • Dibutylphthalate (8%) • Diphenylamine (1.13%) • Calcium carbonate (1%) • Potassium Nitrate (.8%) • Sodium sulfate (.5%) • Graphite (.4%)	235 grains
Bullet	Crome-tungsten steel core with lead-antimony point filler and cupro-nickel jacket	718 grains (total): • Core, 410 grains • Jacket, 253 grains • Point filler, 56 grains

CARTRIDGE, CALIBER .50, BALL, M2 (WWII-ONWARD)

COMPONENT	PEP	QUANTITY
Percussion primer No. 28	Primer composition FA90A: • Potassium chlorate (50.5%) • Lead thiocyanate (23.8%) • PETN, Class B (14.2%) • Antimony sulfide (11.4%) • [remainder is gum solution]	2 grains

OR Percussion primer No. 50M (currently listed in MIDAS)	Primer composition 5061W: • Barium Nitrate (43%) • Lead styphnate (38%) • Antimony sulfide (9%) • Calcium silicide (8%) • Tetracene (2%)	2.25 grains
Propellant	Smokeless powder -- Nitrocellulose (13.15-13.25% nitrogen). Later loadings used IMR 4895: • Nitrocellulose (91.18%) • Dinitrotoluene (7.0% • Diphenylamine (.87%) • Potassium sulfate (.55%) • Graphite (.4%)	250 grains
OR Propellant (currently listed in MIDAS)	WC 860 • Nitrocellulose (78.67%) • Nitroglycerine (9.5%) • Dibutylphthalate (8%) • Diphenylamine (1.13%) • Calcium carbonate (1%) • Potassium Nitrate (.8%) • Sodium sulfate (.5%) • Graphite (.4%)	235 grains
Bullet	Mild steel core with lead-antimony point filler and cupro-nickel jacket	711.5 grains (total): • Core 402 grains • Jacket 253 grains • Point filler 56.5 grains

CARTRIDGE, CALIBER .50, TRACER, M1 (1940-ONWARD)

COMPONENT	PEP	QUANTITY
Percussion primer No. 28	Primer composition FA90A: • Potassium chlorate (50.5%) • Lead thiocyanate (23.8%) • PETN, Class B (14.2%) • Antimony sulfide (11.4%) [remainder is gum solution]	2 grains
OR Percussion primer No. 50M (currently listed in MIDAS)	Primer composition 5061W: • Barium Nitrate (43%) • Lead styphnate (38%) • Antimony sulfide (9%) • Calcium silicide (8%) • Tetracene (2%)	2.25 grains

COMPONENT	PEP	QUANTITY
OR Percussion primer No. 35 (currently listed in MIDAS as an alternate)	Primer composition FA958: • Barium Nitrate (39%) • Lead styphnate (28%) • Antimony sulfide (12%) • Aluminum powder (10%) • PETN (8%) • Tetracene (3%)	1.9 grains
Propellant	Smokeless powder -- Nitrocellulose (13.15-13.25% nitrogen) Later loadings used IMR 4895: • Nitrocellulose (91.18%) • Dinitrotoluene (7.0% • Diphenylamine (.87%) • Potassium sulfate (.55%) • Graphite (.4%)	50 grains
OR Propellant (currently listed in MIDAS)	IMR 5010 • Nitrocellulose (89.92%) • Dinitrotoluene (8.25%) • Diphenylamine (.88%) • Potassium sulfate (.55%) • Graphite (.4%)	240 grains
Bullet	Lead-antimony core with cupro-nickel jacket	685 grains (total): • Core, 207 grains • Jacket, 408 grains • Tracer, approx. 70 grains
Igniter composition (for tracer)	I-276: • Barium peroxide (83.98%) • Magnesium powder (15%) • Zinc stearate (1.02%)	11 grains
Tracer composition	R-256-3 (red): • Strontium nitrate (33.3%) • Strontium peroxide (26.7%) • Magnesium powder (26.7%) • Calcium resinate (7.3%) • Strontium oxalate (5%)	60 grains
OR Igniter composition for tracer (listed in MIDAS as an alternate)	I-276: • Barium peroxide (81.94%) • Magnesium powder (15%) • Calcium resinate (1.78%) • Zinc stearate (.85%)	10 grains

COMPONENT	PEP	QUANTITY
OR Tracer composition (listed in MIDAS as an alternate)	R-256-2 (red): • Strontium nitrate (31.18%) • Magnesium powder (25.63%) • Strontium peroxide (24.66%) • Calcium resinate (7.90%) • Polyvinyl chloride (5.98%) • Strontium oxalate (4.63%)	60 grains

CARTRIDGE, CALIBER .50, INCENDIARY, M1 (WWII-ONWARD)

COMPONENT	PEP	QUANTITY
Percussion primer No. 28	Primer composition FA90A: • Potassium chlorate (50.5%) • Lead thiocyanate (23.8%) • PETN, Class B (14.2%) • Antimony sulfide (11.4%) • [remainder is gum solution]	2 grains
OR Percussion primer No. 50M (currently listed in MIDAS)	Primer composition 5061W: • Barium Nitrate (43%) • Lead styphnate (38%) • Antimony sulfide (9%) • Calcium silicide (8%) • Tetracene (2%)	2.25 grains
Propellant	• Smokeless powder -- Nitrocellulose (13.15-13.25% nitrogen).	250 grains
OR Propellant (currently listed in MIDAS)	WC 860 • Nitrocellulose (78.67%) • Nitroglycerine (9.5%) • Dibutylphthalate (8%) • Diphenylamine (1.13%) • Calcium carbonate (1%) • Potassium Nitrate (.8%) • Sodium sulfate (.5%) • Graphite (.4%)	233 grains
Bullet	Lead-antimony slug, steel tubular dowel and incendiary mixture encased by cupro-nickel jacket	633 grains (total): • Slug, 137 grains • Tubular dowel, 227 grains • Jacket, 235 grains • incendiary mix, 34 grains

Incendiary mix	IM-11 • Barium nitrate (50%) • Magnesium powder (25%) • Aluminum powder (25%)	34 grains

*15.4 grains = 1 gram; 7,000 grains = 1 pound

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