U.S. Army Corps of Engineers
Omaha District

Final Technical Project Planning Memorandum
Cold Springs Precision Bombing Range
FUDS ID F10OR0172

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

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Final Technical Project Planning Memorandum

Site Inspection
Cold Springs Precision Bombing Range
Formerly Used Defense Site
FUDS ID F10OR0172

Military Munitions Response Program

Documentation for Technical Project Planning Meeting
Hermiston, Oregon
Held April 19, 2007

Hosted by U.S. Army Corps of Engineers

Prepared by Shaw Environmental, Inc.

September 2007

Concurrences

USACE Omaha Design Center	_____ John Miller
USACE Seattle District	_____ Mike Nelson
Oregon Department of Environmental Quality	_____ David Anderson
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Preliminary Assessment/Site Inspection Report Summary

ABBREVIATIONS AND ACRONYMS

µg/L	microgram(s) per liter
AOC	area of concern
ASR	Archives Search Report
bgs	below ground surface
CSM	Conceptual Site Model
DoD	U.S. Department of Defense
DQO	Data Quality Objective
EPA	U.S. Environmental Protection Agency
FS	Feasibility Study
ft	feet
FUDS	Formerly Used Defense Site
HRS	Hazard Ranking System
IEP	Important Ecological Places
lb	pound
MC	munitions constituents
MEC	munitions and explosives of concern
mm	millimeter
MRSPP	Munitions Response Site Prioritization Protocol
NBEC	nitrogen-based explosive compound
NDAI	No Department of Defense Action Indicated
ODEQ	Oregon Department of Environmental Quality
PA/SI	Preliminary Assessment/Site Inspection
PCB	polychlorinated biphenyl
PRG	Preliminary Remediation Goals
SAP	Sampling and Analysis Plan
Shaw	Shaw Environmental, Inc.
SI	Site Inspection
SQL	sample quantitation limit
SSWP	Site-Specific Work Plan
T&E	threatened and endangered
TAL	Target Analyte List
TPP	Technical Project Planning
USACE	U.S. Army Corps of Engineers
UTL	upper tolerance limit
UXO	unexploded ordnance

Administrative Information

This 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 this 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 Cold Springs Precision Bombing Range was conducted on April 19, 2007, at the Hermiston Conference Center located in Hermiston, Oregon. Representatives from the U.S. Army Corps of Engineers (USACE) - Omaha Design Center, USACE - Seattle District, the Oregon Department of Environmental Quality (via conference call), and Shaw Environmental, Inc. (Shaw) were in attendance. In addition, a stakeholder representative of Royale Columbia Farms was in attendance. A separate public meeting was held in the evening of April 19, 2007, which was attended by stakeholder representatives of Stahl Hutterian Brethren. A site tour was not conducted as part of this meeting.

This TPP Memorandum documents discussions from 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;
- **Worksheets:** includes the Site Information Worksheet, Draft Munitions Response Site Prioritization Protocol (MRSPP) Data Gaps, and Hazard Ranking System (HRS) Data Gaps; and
- **Attachment A – Preliminary Assessment/Site Inspection (PA/SI) Summary:** provides summary analytical tables and sample locations for the Cold Springs Precision Bombing Range FUDS Preliminary Assessment/Site Inspection Report (Weston, 2005a).

Technical Project Planning Meeting
Summary of Agreements

The TPP Meeting for the Cold Springs Precision Bombing Range FUDS was held on April 19, 2007 at the Hermiston Conference Center located in Hermiston, Oregon. In attendance were representatives of the following:

- USACE - Omaha Design Center,
- USACE - Seattle District,
- Oregon Department of Environmental Quality (ODEQ) (via conference call),
- Shaw, and
- Royale Columbia Farms.

Shaw reviewed site information and presented a summary of the proposed SI approach for the Cold Springs Precision Bombing Range, addressing MEC reconnaissance and MC sampling. The CSM presented characterized the site as consisting of one AOC, a former Bombing Range. ODEQ was in general agreement with the approach and the decision rules that were developed. ODEQ may provide further review and comments on the approach and decision rules as documented in this TPP Memorandum and eventually in the Site-Specific Work Plan (SSWP) for the FUDS. Key agreements reached at the meeting included:

Area of Concern: The AOC (Bombing Range) as presented in the *Archives Search Report* (ASR) (USACE, 1997) was agreed upon.

Reconnaissance Objectives: The TPP team agreed that the SI would include reconnaissance activity to:

- Confirm site conditions and land usage,
- Confirm the CSM,
- Select optimal sample locations (biased toward evidence of MEC, if observed), and
- Observe evidence of MEC and munitions history.

MC Sampling: The TPP team agreed in principle that sampling for MC is appropriate for the site. ODEQ agreed that analysis of the samples for explosives and metals was appropriate. It was also agreed that the results of the *Preliminary Assessment/Site Inspection* (PA/SI) *Report* (Weston, 2005a) will be used to the extent possible to characterize the site.

Background Sampling: The TPP team agreed in principle that background sampling for the site is appropriate.

- ODEQ suggested reviewing the PA/SI Report (Weston, 2005a) to determine if any data could be used for background.

- Ten background surface soil samples and one background sediment sample would be analyzed for Target Analyte List (TAL) metals.

Screening Values: ODEQ indicated at a previous TPP Meeting for the Kingsley Firing Range Annex that the U.S. Environmental Protection Agency (EPA) Region 9 residential soil and tap water Preliminary Remediation Goals (PRGs) for human health screening values have not been updated for a number of years. Therefore, ODEQ requested that EPA Region 6 PRGs be used for evaluation. The Region 6 PRGs will also be used for screening at Cold Springs Precision Bombing Range.

Other Stakeholders: Landowners were present at the TPP meetings and were provided the right-of-entry request documentation. Landowners will be provided an opportunity to review this TPP Memorandum and other documents pertaining to the site. Landowner-provided information with respect to site history, site conditions, land use, or other information relevant to the SI will be shared with the TPP team.

The USACE - Seattle District indicated that they would contact the Confederated Tribes of the Umatilla Indian Reservation regarding the planned investigation.

Site: Cold Springs Precision Bombing Range

Location: Hermiston, Oregon

USACE District: Seattle

TPP #1 Meeting Location: Hermiston Conference Center. Hermiston, Oregon

TPP #1 Meeting Date: April 19, 2007

AGENDA

Monday April 19, 2007

- **Convene at Hermiston Conference Center**
  - **Introductions**
  - **Review Site Inspection Objectives**
    - **Goals, Objectives, and Roles & Responsibilities**
    - **Site Inspection Process**
    - **TPP Process**
    - **Review of Background Information**
- **Technical Project Planning Discussion**

- **Public Meeting (evening)**

Technical Project Planning Meeting Attendees

Name	Organization
Greg Juul	Royale Columbia Farms
Mike Nelson	USACE-Seattle
Anthony Searls	Shaw
Dale Landon	Shaw
Mark Daugherty	Umatilla Chemical Depot BRAC Coordinator (public)
John Miller	USACE-Omaha
John Stahl	Stahl Hutterian Brethren
Stephen Stahl	Stahl Hutterian Brethren

1.0 Site Inspection Objectives

1.1 Goal

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

1.2 Objectives

- Determine if the site requires further response action under Comprehensive Environmental Response, Compensation, and Liability Act of 1980 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 samples are below background or below risk-based action levels.
  - Determine the potential need for initiation of the Remedial Investigation/Feasibility Study (FS) if:
    - Evidence of MEC identified or
    - Concentrations of MC in site media exceed background and risk-based action levels.
  - Determine the potential need for a removal action based on risk to site users from MEC.
  - Provide sufficient data for the EPA to complete the HRS.
  - Evaluate the FUDS using the MRSPP.

1.3 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.

1.4 Site Inspection Process

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

1.5 Technical Project Planning Process

- Conduct TPP Meeting(s)* with key organizations and stakeholders;
- Identify stakeholder(s) 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.

* A second TPP meeting will be held after the draft final SI Report has been submitted for review in order to discuss the results and recommendations of the SI.

2.0 Background Information

Historical information contained in this package was obtained from the ASR (USACE, 1997) and the ASR Supplement (USACE, 2004) for the Cold Springs Precision Bombing Range. In addition, information obtained from the *Cold Springs Precision Bombing Range FUDS Preliminary Assessment/Site Inspection Report* (Weston, 2005a) prepared for the EPA was used in the preparation of this document.

2.1 Site Name and Location

The former Cold Springs Precision Bombing Range or Cold Springs Bombing Range, identification number F10OR0172, is located approximately 9 miles east of the city of Hermiston in Umatilla County, Oregon (Figure 1).

2.2 Range Inventory

The Cold Springs Precision Bombing Range is included in the Military Munitions Response Program Inventory in the *Defense Environmental Programs Annual Report to Congress Fiscal Year 2006* (DoD, 2006) with range information as follows:

Range Name	Range Identification	Approximate Area (acres)	UTM Coordinates (meters)
Bombing Target	F10OR017201R01	649	X: 336657.83 Y: 5079463.67

Coordinates are in Universal Transverse Mercator, Zone 11, NAD 83

The ASR (USACE, 1997) indicates that the entire area of the Cold Springs Precision Bombing Range FUDS is approximately 2,622.08 acres, while the ASR Supplement (USACE, 2004) indicates the area of the Bombing Target is 649 acres (Figure 2). The range area is a circle with a radius of 3,000 feet (ft), the standard configuration for a practice bombing range.

2.3 Property History

The information presented in the following sections is primarily obtained from the ASR (USACE, 1997), the ASR Supplement (USACE, 2004), and the PA/SI (Weston, 2005a).

2.3.1 Historical Military Use

- Land was acquired via purchase and leased in December 1941 and January 1942, by the Army (a total of 2,622.08 acres) for use as a precision bombing range for target practice.
- Site was used by several assigned military units for day and night training missions, including a squadron (the B-24 Bomber and the C-45 Cargo Aircraft) stationed at the Walla Walla Army Air Field.
- Three plotting and spotting towers, a pump house, and well were the only improvements to the site.

- Site used from 1942 to 1946 as a practice bombing range using only M38A2 100-pound (lb) practice bombs filled with sand or flour.
- Site was declared surplus in October 1946 by the Army.
- Site was disposed of in August 1947.
- The ASR (USACE, 1997) reported that a document dated November 19, 1947, indicated "The lands have been examined and have been cleared of all explosives or explosive objects reasonably possible to detect by visual inspection."

2.3.2 Munitions Information

- Historical records indicate that the site was only used for M38A2 100-lb practice bombs with spotting charges.
- One landowner dug up a 37-millimeter (mm) point detonating artillery round. The ASR (USACE, 1997) suggests that it is not related to site activities.

2.3.3 Ownership History

- Private parties owned the land prior to the Army. The land was used for grazing of livestock.
- Army acquired the site in 1942, 310.36 acres was obtained from the Department of Interior and 2,311.72 acres were leased from private parties.
- In October 1946, the Army declared the property surplus.
- The property was disposed of in August 1947.
- The property is currently used for irrigated farming.
- Current owners are (Figure 3, "Bombing Target"):
  - Stahl Hutterian Brethren (parcels 001 and 002)
  - Royale Columbia Farms (parcels 003, 004, and 005)

2.4 Physical Setting

2.4.1 Topography and Vegetation

- Located in the Columbia Basin Subprovince of the Columbia Intermountain Physiographic province.
- Primary landscape feature is high plain desert with low-lying vegetation. The entire bombing range is hilly (USACE, 1997). Slopes can range from 12 to 25 percent.
- The site is located at an elevation of approximately 750 ft.
- The site is currently used for irrigated farming.
- There is a small landing strip north of the site, with a northeast-southwest orientation.
- An underground pipeline crosses the FUDS site.

2.4.2 Surface Water

- The Cold Springs Bombing Range is drained by an unnamed canyon tributary that drains to Despain Gulch.
- Despain Gulch flows northwest from the site into the Cold Springs Reservoir.
- Only intermittent streams exist at the site (Figure 4, "Surface Water Drainage").

2.4.3 Sensitive Environments

- The ASR (USACE, 1997) states that threatened or endangered species are known to be found in the vicinity of Cold Springs Bombing Range (Figure 5, "Sensitive Receptor Locations").
- The U.S. Fish and Wildlife Service indicated the following federally protected species may be found in the vicinity of the Cold Springs Bombing Range:
  - Bald eagle (threatened)
  - Ferruginous hawk (candidate)
  - Loggerhead shrike (candidate)
  - Snake River Chinook salmon (threatened)
  - Snake River sockeye salmon (endangered)
  - Interior redband trout (candidate)
  - Pacific western big-eared bat (candidate)
  - Laurence's milk-vetch (candidate)
  - Hepatic monkeyflower (candidate)
  - Columbia cress (candidate)
- The Oregon National Heritage Program indicated the following state-threatened and endangered species occur in the vicinity of the site:
  - Bald eagle (threatened)
  - Ferruginous hawk
  - American white pelican
  - Washington ground squirrel
- Additional information will be acquired from the Oregon Department of Fish and Wildlife and the U.S. Fish and Wildlife Service.
- Table 1, "Army Checklist for Important Ecological Places," presents the Army's checklist for Important Ecological Places (IEPs). Based on the above information, Cold Springs Precision Bombing Range is considered an IEP.

2.4.4 Climate

- Precipitation is seasonal with an average of only 10 percent of the rainfall occurring between July and September. The average total precipitation is 8.92 inches (www.census.gov).
- The average annual maximum and minimum temperatures are 65.5 degrees Fahrenheit and 40 degrees Fahrenheit, respectively (www.census.gov).
- Prevailing wind direction is from the southeast.
- Average annual snowfall is about 10 inches (www.census.gov).

2.5 Geologic and Hydrogeologic Setting

2.5.1 Bedrock Geology

Bedrock beneath Cold Springs Precision Bombing Range consists of basaltic rocks of the Columbia River Basalt Group created from a thick sequence of volcanic flows that erupted between 12 and 17.5 million years ago. Groundwater occurs in interflow zones between individual lava flows.

2.5.2 Overburden Soils

- Surface layer (0 to 8 inches) is pale brown fine sandy silty clay
- Subsoil (8 to 28 inches) is light brownish gray, very fine, sandy silty clay
- Substratum (31 inches thick) is composed of light brownish, gray silty, sandy clay
- Permeability is rapid in upper zone but moderate in lower zone

2.5.3 Hydrogeology

- A shallow unconfined aquifer occurs in the alluvial sediments of the lower Umatilla Basin
- The principal water-producing zones of the alluvial aquifer occur in deposits of coarse sand and gravel
- Multiple confined aquifers occur in the underlying basalt flows
- The alluvial and shallowest basalt aquifers are the main sources of domestic water
- Regional flow in the alluvial aquifer is to the northwest
- Flow directions vary in the underlying basalt.

2.6 Population and Land Use

2.6.1 Nearby Population

- The site is located 9 miles east of the city of Hermiston, Oregon in Umatilla County.
- The population density within 2 miles of the FUDS is approximately 12.8 persons per square mile. There are approximately 14,657 residents residing in Hermiston per 2005 Bureau of Census (www.census.gov) population estimates.

2.6.2 Land Use

- Current land use is for grazing and irrigated farming.
- An underground gas pipeline is located just west of the target site.

2.6.3 Area Water Supply

- Groundwater is used for domestic drinking water, irrigation of agricultural crops, livestock watering, and industrial purposes.
- Domestic wells are located within 4 miles of the site (Figure 6, “Groundwater Wells Within 4-Mile Radius”).
- The Cold Springs Precision Bombing Range FUDS is located in the northeastern corner of the Lower Umatilla Basin Groundwater Management Area. This area was declared a

Groundwater Management Area by the ODEQ in 1990 when groundwater sampling in the 1980s demonstrated high nitrate concentration across the basin. This was attributed to irrigated agriculture, land application of food processing waste, livestock operations, domestic sewage, and military activities. Perchlorate was added as a contaminant of concern starting with the 2003 sampling event. A separate PA/SI was conducted by Weston concurrently for the North Morrow Perchlorate Study Area.

2.7 Previous Investigations for MC and MEC

- An ASR was issued in June 1997. The ASR documented that the Cold Springs Precision Bombing Range was used for practice bombing using the M38A2, practice bombs (USACE, 1997). Numerous M38MA2 remnants littered the northern and southern slopes of the target area. No intact spotting charges were found. There is no historical evidence that the range was ever used for gunnery practice.
- A former landowner indicated that he buried a large quantity of the unearthed practice bombs in the eastern portion of irrigation circle #22. Another landowner indicated he found the greatest concentration of practice bombs at irrigation circle #16.
- A 37-mm projectile was recovered by a landowner from the immediate area of the range (within what is currently irrigation circle #20). This finding was considered an abnormality since records indicate the range was used exclusively for bombing.
- The munitions used at the Cold Spring Precision Bombing Range and the associated MC are shown on Table 2, "Potential MEC and MC Cold Springs Precision Bombing Range."
- During June and July 1944, numerous fires were reportedly caused by dropping of M38A2 practice bombs by units on training missions.
- Historical documentation revealed problems with accidental bomb releases during the month of May 1945:
  - One of the accidental bomb releases was due to an erroneous release by the lead bombardier of a six ship formation. The 15 released bombs were located and disposed of.
  - The second accidental release was the result of improperly adjusted bomb rack controls. The exact location of the bombs was not determined.
- On May 17, 1995, personnel from the USACE St. Louis District conducted a site visit. The team met with Mr. John Walchli, a long-time resident and lessee (USACE, 1995a). Mr. Walchli informed the team of numerous discoveries of practice bomb remnants he made, and that he buried a large quantity of that material in the eastern portion of irrigation circle #22. Additionally, he showed the site inspection team a live 37-mm, point detonating artillery round, which he unearthed in approximately 1975 from irrigation circle #20. Markings indicated it was a M55A1 practice round; however, it had a M56 fuze (which is highly explosive and point-detonating). The round was likely dropped from a P-39 aircraft. The team also met with Harold Nakamo (representative for Makami Farms). Mr. Nakamo indicated the greatest concentration of bomb remnants he observed was at irrigation circle #16 (USACE, 1995b).

- An ASR Supplement was completed in 2004 and indicated one range, the Bombing Target (USACE, 2004).

2.8 Other Land Uses that May Have Contributed to Contamination

- Other than farming and grazing activities, there are no known sources for contamination

2.9 Other Investigations

- A PA/SI was conducted by Weston for the EPA in 2004. Field sampling was conducted in December 2004 and the PA/SI report was issued to the EPA on April 25, 2005 (Weston, 2005a). The following summarizes the PA/SI:
  - Soil, sediment, surface water, and groundwater samples were collected at potentially contaminated source areas and from areas that may have been contaminated by the migration of contaminants from their respective sources and analyzed to characterize the potential sources (i.e., the target area).
  - Contaminants of concern included TAL metals, nitrogen-based explosive compounds (NBECs), and perchlorate.
  - A total of 26 characterization samples were collected and analyzed.
  - Three surface soil and three subsurface soil samples were collected at the bombing target in an area with the most concentrated practice bomb debris.
  - One soil sample was collected from the inside of a bomb casing located at the bombing target.
  - One soil sample was collected from the caliche soil located northwest of the bombing target. Perchlorate may occur naturally in caliche soil.
  - Seven surface water and six sediment samples were collected from various downstream locations.
  - Five groundwater samples were collected from privately owned domestic wells located within 3 to 9 miles from the Bombing Target.
  - Additionally, one surface soil, sediment, and surface water background samples were collected.
  - All samples were analyzed for TAL metals, NBECs, and perchlorate (Method 314.0). Additionally, all surface water and groundwater samples were also analyzed for perchlorate by EPA Method 8321A-modified. Five surface water samples also were analyzed for pesticides and polychlorinated biphenyls (PCBs).
  - For groundwater, the metals were not significantly above background. Perchlorate was detected in three of the five samples (0.25 to 1.2 micrograms per liter [µg/L]). NBECs were not detected.
  - For sediments, metals were detected above background levels. Perchlorate and NBECs were not detected.
  - For surface water, metals were detected above background. Perchlorate was detected in all seven samples at concentrations raging from 0.035 µg/L to 12 µg/L. NBECs and pesticides/PCBs were not detected.

- For soils, metals were detected above background. Perchlorate was detected in one sample (SS-CB001) at 0.83 milligrams per kilogram. NBECs were not detected.

- Based on the human health and ecological targets, the PA/SI determined that the groundwater, surface water, and soil pathways were the only potentially significant pathways associated with the Cold Springs Precision Bombing Range (Weston, 2005a).

3.0 Conceptual Site Model – Bombing Target

3.1 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., metals and explosives from bombs).
- 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).
- 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.

3.2 Background

The CSM is based on information presented in the ASR (USACE, 1997) and ASR Supplement (USACE, 2004). The ASR references a 1949 photograph that presents a description of the bombing target as follows:

> "A large and very distinct bulls eye target with three rings. Radiating out from the middle ring are four straight lines, at 90 degree angles to each other. There are two tick marks on each line; these are marked at equal distances along the straight line. Outside of the circles and in the north east quadrant is a marking of an Arabic number 4. There are black dots in the area; these appear to be wells. Some are within the circles and some are just outside the circles. There do not seem to be any craters in the vicinity of the site. About 1,250 ft south of the bull's eye target is a very small squatty target or marker. It has an elliptical outer ring with a white center. The elliptical shape is oriented in an east-west direction. From the center are two lines, ninety degrees to each other and radiating to the outer circle."

Figure 3 presents a layout of the bombing target.

3.2.1 History of Use

- Precision bombing range for night and day training missions.

- Army erected a three-tower target in 1942.
- Historical records indicate the range was used for M38A2 practice bombs (however, a 37-mm live artillery round was unearthed by a landowner).
- Figure 7 illustrates the conceptual site model for the Bombing Target at the Cold Springs Precision Bombing Range.

3.2.2 Munitions and Associated MC

Area of Concern	Munitions	Munitions Constituents
Bombing Range	Practice Bomb, 100-pound (M38A2)	Sheet metal (chromium, iron, copper, lead, manganese, and nickel)
	Spotting Charge (M1A1)	Black powder (potassium nitrate, sulfur, and charcoal)
	Spotting Charge (M3)	Black smoke mixture, black powder (potassium nitrate, sulfur, and charcoal)
	Spotting Charge (M4)	FS smoke
	37-mm Practice Projectile (M55A1)	Steel (chromium, iron, copper, lead, manganese, and nickel)
	Fuze (M56)	Tetryl, lead, aluminum

3.2.3 Previous MEC Finds

- A 37-mm point detonating artillery round was unearthed by a landowner in 1975. However, the ASR (USACE, 1997) indicates that this was likely an isolated occurrence since the site was exclusively used for bombing activities.

3.2.4 Previous MC Sample Results

- A field sampling investigation of the Cold Springs Precision Bombing Range was conducted by Weston in December 2004. A draft PA/SI Report was issued to the EPA – Region 10 on April 25, 2005, presenting the results of the December sampling effort (Weston, 2005a).
- All source samples were analyzed for inorganics, perchlorate, and NBECs.
  - Laboratory results indicated arsenic, barium, chromium, cobalt, copper, lead, manganese, nickel, silver, vanadium, and zinc are present above their sample quantitation limit (SQL).
  - NBECs were not detected above SQLs and perchlorate was detected at 0.83 milligrams per kilogram at one source sample location (collected of surface soil at the center of the Bombing Target).
- Groundwater samples were collected from five domestic wells and analyzed for inorganics, perchlorate, and NBECs. None of the wells are located within the Bombing Target area of concern. However, two of the five wells are located within the 4-mile target distance limit.

- Laboratory results indicated barium, chromium, copper, manganese, vanadium, and zinc are present above their SQLs.
- Perchlorate (by EPA Method 8321A-modified) was detected in three samples ranging from 0.25 to 1.2 µg/L, which is below the DoD action level of 24 parts per billion. Perchlorate (by EPA Method 314.0) was nondetect for all five samples.
- NBECs were not detected above SQLs.

- Sediment target samples were analyzed for inorganics, perchlorate, and NBECs.
  - Inorganics were present above their respective SQLs.
  - Perchlorate and NBECs were not detected above SQLs.
- Surface water samples were analyzed for inorganics, perchlorate, NBECs, pesticides, and PCBs.
  - Inorganics were present above their respective SQLs.
  - Perchlorate (by EPA Method 314.0) was detected in two of seven surface water samples at 3.63J and 12.0 µg/L. Perchlorate (by EPA Method 8321A-modified) was detected in all seven samples, ranging from 0.035 to 1.1 µg/L.
  - NBECs and pesticides/PCBs were not detected above SQLs.
- One background soil sample (SS-BK001) was collected north of Cold Springs and one co-located set of sediment (SD-BK001) and surface water (SW-BK001) samples were collected from Cold Springs on Royal Columbia Farms property (PA/SI Summary, Figure 3-2) (Weston, 2005a). The soil sample was analyzed for target analyte list metals, NBECs, and perchlorate (Method 314.0). The sediment and surface water samples were analyzed for metals, pesticides/PCBs, perchlorate Method 314.0 for sediment and surface water), and NBECs. Additionally, the surface water sample was also analyzed for perchlorate by Method 8321A-modified. Perchlorate was detected in the background sediment sample from Method 314.0 (7.68 µg/L) and Method 8321A-modified (7.6 µg/L).
- Based on the human health and ecological targets identified in the PA/SI (Weston, 2005a), it was determined that the groundwater, surface water, and soil pathways were the only potentially significant pathways associated with the site. Due to the limited number of soil concentrations above background values, it is unlikely that the air migration pathway would significantly contribute to the site HRS score.
- A separate PA/SI was conducted by Weston (2005a) concurrently for the North Morrow Perchlorate Study Area (Weston, 2005b). Both PA/SI documents share some of the same concerns, including the potential presence of perchlorate in groundwater and surface water.

3.2.5 Current and Future Land Use

- Site is privately owned.
- Currently the site is mainly being used for irrigated farming, this should continue into the future.

3.2.6 Ecological Receptors

- This FUDS does qualify as an IEP because the habitat is known to be used by state and/or federal designated or proposed designated endangered or threatened species.

3.3 MEC Evaluation

- Only documented use was from 1942 to 1946 as a practice bombing range using M38A2 100-lb practice bombs with spotting charges.
- The M38A2 practice bomb is a sand-filled or flour-filled bomb.
- The spotting charge contained black powder or a smoke mixture.
- Historical evidence indicates munitions debris litters the site. No MEC from the practice bombs.
- A practice 37-mm practice projectile with a nonstandard point detonating sensitive fuze was found by a landowner approximately 1975. No other MEC or munitions debris associated with the 37-mm has been reported.
- The site is currently privately owned and is used for irrigated farming and occasionally for livestock grazing.
- There is restricted access to the site, since it is privately owned.
- The population density is less than 100 people per square mile.
- There are approximately 25 occupied buildings within a 2-mile radius of the site.

3.3.1 MEC Evaluation/Investigation Needed

- Visual field reconnaissance of the target area and irrigation circle #20 (where the projectile was discovered) will be conducted by a qualified unexploded ordnance (UXO) technician with the aid of a hand-held magnetometer.

3.4 MC Evaluation

- Munitions debris (i.e., 100-lb practice bombs with spotting charge) in the site soils.
- One 37-mm point detonating artillery round was found by a landowner in approximately 1975. This item does not fit with the CSM and may have been an isolated occurrence of something dropped from an airplane.
- Figure 7 illustrates the CSM for the Bombing Target and potential pathways of MC contamination.
- The site is currently privately owned and is used for irrigated farming and livestock grazing.
- There is restricted access to the site.
- The population density is less than 100 people per square mile.
- There are less approximately 25 occupied buildings within a 2-mile radius of the site.

3.4.1 Overview of Pathways

Affected media and potential pathways for MC include:

- Soil—Soil is the primary medium of concern due to the presence of munitions debris (i.e., 100-lb practice bombs with spotting charges) and possibly MC in the soil resulting from

the discharge of munitions into the bombing range. The soil also serves as a secondary source of air contamination.

- Sediment—Sediment may be potentially affected by surface water runoff from impacted soil areas.
- Surface Water—The Cold Springs Bombing Range is drained by Despain Gulch and several small tributaries. Surface runoff to water bodies within the AOC is considered a complete pathway. Water and sediment within the water body provide potential exposure to MC. Surface water presents a possible completed pathway between MC and receptor.
- Groundwater—According to the ASR (USACE, 1997), groundwater at the site is not easily obtained. During the PA/SI (Weston, 2005a) five groundwater wells were sampled. Three of the five wells detected perchlorate ranging from 0.25 µg/L to 1.2 µg/L. However, only two of the five wells are located within the 4-mile radius of the target area. Of those two wells, only one well detected perchlorate (0.30 µg/L) below the DoD action level of 24 µg/L. Additionally, the well is screened from 375 to 720 ft below ground surface (bgs). Groundwater presents a possible completed pathway between MC and receptor, but is not a realistic pathway due to the depth of the groundwater.
- Air—Air is a possible completed pathway through inhalation of contaminated soil particles. The prevailing wind direction is from the southeast. Blowing dust from the target could mobilize soil particles. The pathway is considered to be complete.
- An analysis of exposure pathways and receptors for MEC is provided in Table 3, "MEC and MC Exposure Pathway Analysis."

3.4.2 Terrestrial Pathway

3.4.2.1 Sources of MC

- The PA/SI (Weston, 2005a) samples detected metals above background concentrations.
- MC from the spotting charges could include black powder, black smoke mixture, and FS smoke. MC from the 37-mm projectile fuze could include aluminum, lead, and Tetryl. Metals from bomb bodies (chromium, iron, copper, lead, manganese, and nickel).
- The ASR indicates that aerial photography shows the bombing target located near irrigation tract #16 (USACE, 1997). This is a hill, which drops off into a small canyon on the north, south, and west sides.
- The greatest concentration of practice bomb remnants was found in the vicinity of irrigation tracts #16 and #22.
- The 37-mm artillery round was located in an area believed to be irrigation tract #20.

3.4.2.2 Migration Pathway

- Wildlife in the area potentially may be exposed to MC through soil, sediment, and water pathways.
- Humans may come in contact with MC contamination through intrusive and nonintrusive work and recreational activities in areas where munitions debris may be present.

3.4.2.3 Land Use and Access

- Current land use is for irrigated farming and occasional livestock grazing, it is assumed this use will remain the same in the future
- The land is privately owned
- Access to the site is restricted

3.4.2.4 Human Receptors

- The most likely current and future human receptors at the site would be the landowners and any workers.

3.4.2.5 Ecological Assessment

- Site has been determined to be an IEP based on potential for threatened and endangered (T&E) to use the property.
- The potential T&E species are listed in Section 2.4.3.
- The pathway for ecological receptors is complete.

3.4.3 Surface Water/Sediment Pathway

- The Cold Springs Bombing Range is drained by intermittent drainage in Despain Gulch and several small tributaries. Surface runoff drainages within the AOC are considered a complete pathway. Sediment within the water body provides potential exposure to MC. Surface water and sediment present possible completed pathways between MC and receptor.

3.4.3.1 Sources of MC

- Metals (chromium, iron, copper, lead, manganese, and nickel). The PA/SI (Weston, 2005a) samples detected metals in sediment above background concentrations.

3.4.3.2 Migration Pathway

- Despain Gulch drains to Cold Springs Reservoir.

3.4.3.3 Surface Water Use and Access

- Irrigation.

3.4.3.4 Human Receptors

- Workers.

3.4.3.5 Ecological Assessment

- According to the ASR (USACE, 1997), one bird and two fish federal T&E species may be present in the vicinity of the site; one state T&E species may be in the vicinity of the site; and seven candidate federal T&E species may be present in the vicinity of the site.

3.4.4 Groundwater Pathway

According to the PA/SI (Weston, 2005a), five wells were sampled during the investigation. The groundwater sample design was based on the spatial relationship of the wells to the FUDS. There were no wells within the FUDS boundary. The shallow alluvial aquifer was targeted for sampling. The following wells were sampled:

- Sample GW-DW001 – Rameriz well 9.4 miles west of FUDS – (67 ft deep);
- Sample GW-DW002 – Messenger well 4.6 miles west of FUDS – (60 ft deep);
- Sample GW-DW003 – Stahl Hutterian well 3.3 miles S-SE of FUDS – (720 ft deep);
- Sample GW-DW004 – Hat Rock State Park 5.2 miles NW of FUDS – (17 ft deep); and
- Sample GW-DW005 – Schmittle well 4.2 miles NW of FUDS – (104 ft deep).

Based on the well log information presented in the PA/SI, it appears that all the wells were completed in the open-hole without well screens. All of the wells, except the Stahl Hutterian well, have static water levels consistent with and are completed within the alluvial aquifer. Of the five wells sampled, only three of the wells detected perchlorate ranging from 0.25 µg/L to 1.2 µg/L, which is below the DoD action level of 24 µg/L. Also one of the perchlorate detections (0.30 µg/L) was from the Stahl Hutterian well which has a static water level of 419 ft which is well below the shallow alluvial aquifer. The analytical results presented in the PA/SI are sufficient for use in this SI evaluation. Therefore, it is not recommended that another shallow groundwater sample be collected.

3.4.5 Air Pathway

- Air is a possible completed pathway through inhalation of contaminated soil particles. The prevailing wind direction is from the southeast. Exposure to the air pathway is considered in the human health screening values and is not assessed further here.

3.4.6 MC Evaluation/Investigation Needed

- One surface soil sample is planned from near the center of the bombing target in an area with a high concentration of practice bomb fragments (near irrigation circles #16 and #22). The sample would be analyzed for select metals (aluminum, chromium, iron, copper, lead, manganese, and nickel). The list is based on the expected metals from the munitions (bomb casing and fuze). Only black powder explosives were known to be used. During the TPP Meeting it was recommended, and agreed by the ODEQ, that the samples be analyzed for metals and explosives. However, after reviewing the results of the PA/SI (Weston, 2005a), which analyzed samples for NBECs and the fact that explosives were not used at the site, it is being recommended in this TPP Memorandum that samples not be analyzed for explosives.
- One surface soil sample will be collected outside the center of the bombing target area but within the FUDS in an area between crop circles, which have not been impacted by irrigation. The sample would be analyzed for select metals (aluminum, chromium, iron, copper, lead, manganese, and nickel) only
- One sediment sample will be collected in an area within and downgradient of the Bombing Target. The sample would be analyzed for select metals (aluminum, chromium, iron, copper, lead, manganese, and nickel).
- Ten background soil and one background sediment sample will also be collected. The samples would be analyzed for TAL metals.
- No surface water or groundwater samples will be collected from the Cold Springs Precision Bombing Range.
- No air samples will be collected from the Cold Springs Precision Bombing Range. Analytical results from soil samples can be used in the evaluation of the air pathway.

3.5 CSM Summary/Data Gaps

- The only indication of MEC was of a 37-mm practice projectile with a nonstandard point detonating sensitive fuze that was found near irrigation circle #20 by a landowner. However, this does not fit the site CSM and the ASR (USACE, 1997) indicates the occurrence to be an abnormality since the site was only used for bombing activities.
- MC from the spotting charges could include black powder, black smoke mixture, and FS smoke. Metals from bomb bodies could include chromium, iron, copper, lead, manganese, and nickel.
- Some sampling for MC has been completed as part of the PA/SI (Weston, 2005a). Perchlorate was detected in surface water and groundwater. Perchlorate was detected in one surface soil sample also. However, perchlorate has not been identified as MC in the munitions used at the FUDS. Results of the current status of data requirements with respect to MEC and MC for the Bombing Target located at the former Cold Springs Precision Bombing Range are summarized below.

Pathway	Presence of MEC	Presence of MC	Proposed Inspection Activities
Soil	Yes, 37-mm projectile discovered near irrigation circle #20; however, the ASR (USACE, 1997) indicates that this is not the result of site related activities. A high density of practice bomb debris has been found at irrigation circles #16, #20, and #22, and in the gulch between irrigation circles #16 and #22.	None. Surface and subsurface soil samples were collected during the PA/SI (Weston, 2005a).	Visual reconnaissance and surface soil sampling.
Sediment	None	None. Sediment samples were collected during the PA/SI (Weston, 2005a).	Sediment sampling.
Surface water	None	None. Surface water samples were collected during the PA/SI (Weston, 2005a).	No sampling.
Groundwater	None	None. Groundwater samples were collected from domestic wells during the PA/SI (Weston, 2005a).	No sampling.
Air	None	None	Included in evaluation of soil pathway.

Analytical data gathered during the PA/SI may (Weston, 2005a) may not fully meet the DQOs of the current SI (i.e., the analytical methodology, analyte list, and detection limits may, or may not, conform to the USACE Programmatic Sampling and Analysis Plan (SAP) (Shaw, 2006). Therefore, those analytical results previously collected are not interpreted with the sole purpose of making a determination that no further investigation is required. However, the previously collected data can be used reasonably to make a recommendation for no further action.

4.0 Proposed Field Investigation

The proposed field investigation and sampling to be conducted at the former Cold Springs Precision Bombing Range is detailed below and summarized in Table 4, "Proposed Sampling Approach, Cold Springs Precision Bombing Range." Sampling locations are presented on Figure 8, "Proposed Sampling Locations." The investigation approach will be defined in more detail in a SSWP that will be submitted to ODEQ 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 prepared by Shaw and submitted to USACE as final in February 2006 (Shaw, 2006).

4.1 Reconnaissance

A visual field reconnaissance survey by a trained, UXO Technician using a hand-held magnetometer will be performed within the Bombing Target and focusing particularly in the areas of high density of debris surrounding irrigations circles #16, #20, and #22, and the gulch that is located between circle #16 and circle #22 to assess the presence or absence of MEC and to document the current site conditions. Several meandering transects will be walked during which visual observations and magnetic anomalies will be noted. Transects will be recorded using a global positioning system, and appropriate features influencing the survey will be noted, such as vegetation density and type, topography, etc. If MEC is found, the qualified UXO technician will attempt to make a determination of the hazard, and appropriate notifications will be made as detailed in the Type I Work Plan, Site Inspections at Multiple Sites (Shaw, 2006) and SSWP. Digital photographs will be taken to document significant features. The visual reconnaissance survey will also aid in sample location selection and to allow the sampler to work safely.

4.2 Sampling

The proposed sampling approach is summarized in Table 4. A judgmental sampling approach will be used to select sample locations in areas determined by the CSM and/or field observations to potentially be impacted by MC.

4.2.1 Soil

Surface soil samples will be collected at a depth of approximately 0 to 6 inches below ground surface. Surface soil samples will be composite samples (7-point, wheel pattern with a 2-foot radius). No subsurface samples are planned.

One soil sample will be collected at the location of MEC or munitions debris in the vicinity of irrigation circles #16 and #22. If no MEC or munitions debris is located, a soil sample will be collected near the reported center of the bombing target at irrigation circle #16. The sample will be analyzed for select metals (aluminum, chromium, copper, iron, lead, manganese, and nickel).

One soil sample will be collected in an area south of irrigation circle #16 in an area not impacted by irrigation and farming activities. The sample will be analyzed for select metals (aluminum, chromium, iron, copper, lead, manganese, and nickel).

Three surface soil samples (SS-CB001 through SS-CB003) were collected at the Bombing Target area during the PA/SI (Figure 8) and analyzed for metals, NBECs, and perchlorate. Metals were detected above their SQLs but not in significant quantities compared to background soil values. Perchlorate and NBECs were not detected, except for one detection of perchlorate of

0.83 milligrams per kilogram in a surface soil sample (SS-CB001). Note that perchlorate has not been identified in any of the munitions used at the Cold Springs Precision Bombing Range and is not considered a potential MC.

4.2.2 Sediment

Sediment samples will be collected from 0 to 2 inches in depth but will be discrete samples in order to retrieve material from specific, localized, water collection areas.

One sediment sample will be collected from a water collection area downgradient of the Bombing Target within a tributary of Despain Gulch. The sample will be analyzed for select metals (aluminum, chromium, copper, iron, lead, manganese, and nickel).

One sediment sample (SD-UT001) was collected in an unnamed tributary to Despain Gulch downgradient of the Bombing Target during the PA/SI (see Figure 8) and analyzed for metals, NBECs, and perchlorate. Metals were detected above their SQLs with some constituents significantly above their background sediment values. Perchlorate and NBECs were not detected.

4.2.3 Groundwater and Surface Water

No groundwater or surface water sampling is planned. Groundwater and surface water samples collected during the EPA s PA/SI (Weston, 2005a) are sufficient to meet data objectives.

4.3 Analyses

Soil samples will be analyzed for select metals (aluminum, chromium, copper, iron, lead, manganese, and nickel) by EPA SW-846 Method 6020A. Sediment samples will also be analyzed for the same metals by Method 6020A.

4.4 Background Sampling

Ten background soil and one background sediment sample will be collected. The composite soil sample locations will be determined in the field in areas that do not appear to have been impacted by past site operations. Samples will be collected from both irrigated farmland and from land not farmed. The background samples will be analyzed for TAL metals. The soil background samples will be used to develop a 95th upper tolerance limit (UTL) for comparison of metals soil concentrations from the range samples. If one or more of the range samples exceed the background threshold, the following tests may also be applied:

- A nonparametric comparison of the central tendencies or medians of the site and background distributions, using the Wilcoxon rank sum test (EPA, 1994, 2002, and 2006; U.S. Navy, 2002),
- A geochemical evaluation using correlation plots of trace element versus reference element concentrations (EPA, 1995; Myers and Thorbjornsen, 2004), for any element that fails either of the above two statistical tests.

One background surface soil sample (SS-BK001) was collected north of the FUDS boundary and analyzed for metals, NBECs, and perchlorate during the PA/SI. NBECs and perchlorate were not detected. Some metals were detected above their respective SQL. The background data collected by Shaw will be compared to the one PA/SI (Weston, 2005a) background sample to

determine if the results are comparative. If they are, the PA/SI background sample will be incorporated into Shaw data set for the 95th UTL calculations.

Additionally, one background sediment sample will be collected and analyzed for TAL metals. Since the body of background data is limited (i.e., sediment), the site-to-background comparison will be conducted according to guidance for SI activities and HRS scoring (EPA, 1992). Background concentrations for analytes are taken to be the maximum values observed in the limited background data set (EPA, 1995). A comparison is then made to determine if a hazardous substance in the media is "significantly above the background level" according to the HRS criteria (40 CFR Appendix A to Part 300, Table 2-3):

- If the sample measurement is less than or equal to the sample quantitation limit, no observed release is established.
- If the sample measurement is greater than or equal to the sample quantitation limit, then:
  - If the background concentration is not detected, an observed release is established when the sample equals or exceeds the sample quantitation limit.
  - If the background concentration equals or exceeds the detection limit, an observed release is established when the sample is three times or more above the background concentration.

Background threshold levels, for comparison to site data per the above HRS criteria, are three times the maximum detected background concentration. For analytes not detected in background samples, the background threshold is the SQL.

One background sediment sample, co-located with the surface soil sample location, was collected and analyzed for metals, NBECs, and perchlorate. NBECs and perchlorate were not detected. Some metals were detected above their respective SQL. The results from the Weston background and Shaw background samples will be compared to determine if the results agree.

5.0 Technical Project Planning 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
  - 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.

5.1 TPP Phases

Phase I: Identify the Current Project

1. Team members identified to date include: USACE – representatives from the Omaha Design Center and the Seattle District, Shaw as a USACE contractor, ODEQ, and the landowners.

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

   Yes. EPA Region 10 was notified but has not been attending the TPP meetings. The USACE will contact the Confederated Tribes of the Umatilla Indian Reservation.

2. The AOC identified is:

   - Bombing Target

   Question: Are there any other AOCs to be identified?

   None identified.

3. Based on information available about the site and shared through discussions with the USACE, are there concerns about this area that have been expressed by the ODEQ or EPA, as well as by landowners.

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

   No.

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?

No.

Phase II: Determine Data Needs

4. Existing site information includes an ASR and ASR Supplement both prepared by the USACE (1997 and 2004, respectively). In addition, a PA/SI was prepared for the EPA by Weston Solutions (2005a).

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

   No.

5. The site-specific approach for this SI involves collating and assessing available site information, to include site geology, hydrogeology, groundwater, surface water, ecological information, human use/access, and current and future land uses, as well as considering conduct of site inspection and sampling activities.

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

   No.

Based on site use, soil is the primary affected medium at the Cold Springs Precision Bombing Range. Sediment/surface water is a potential pathway of MC because intermittent streams at the site drain to Despain Gulch and several unnamed small tributaries. Air is also a potential pathway if soil particles become airborne. Groundwater is not a viable pathway due to the depth-to-groundwater. Considering current and future land use, primary receptors of any contaminants that may be present would most likely be workers and wildlife using the area.

Question: Do team members concur with the CSM?

Yes.

6. Technical considerations and/or constraints need to be identified and addressed before conducting any additional sampling, and would depend on the approach and additional data needs decided upon by team members.

   Questions:

   - **Are any data missing?**
   - *Check the background data in the PA/SI (Weston, 2005a) for applicability. Also review USGS data.*
   - **What is the nature of needed data?**

- *Background source data for metals.*

- **What data gaps would additional data meet for making a decision about the site?**

- *None.*

- **Are there any considerations/constraints that need to be addressed for collecting additional data?**

- *No.*

Phase III: Develop Data Collection Options

7. Proposed approach:

    1. Conduct surface reconnaissance with magnetometer focused within the Bombing Target.

    2. Find suitable soil background sample locations (10 total) and sample. Review PA/SI data for applicability of the results. Analyze for TAL metals.

    3. Find suitable sediment background sample location (one total) and sample. Analyze for TAL metals.

    4. Collect two composite surface soil samples and analyze for select metals (aluminum, chromium, copper, iron, lead, manganese, and nickel).

    5. Collect one discrete sediment sample from water collection area at one location downgradient of the Bombing Target. Analyze for select metals (aluminum, chromium, copper, iron, lead, manganese, and nickel).

    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?

    None Identified.

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

    Yes.

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

    Yes.

Phase IV: Finalize Data Collection Program

8. **Background data**.

Site sampling results will be compared to background concentrations (95 percent UTL will be calculated for soil metals samples). Site will be considered NDAI for MC if site results do not exceed background.

Question: What background data will be used for evaluation?

Background data will be collected as part of the field activities. Existing information from the PA/SI (Weston, 2005a) will be evaluated for applicability.

Are background data sets available from previous site studies?

Need to review PA/SI data for applicability (Weston, 2005a).

Are background data sets available from statewide studies?

Possible U.S. Geological Survey information; however, detection methods and analytical methods may not be appropriate.

If background data are to be collected as part of the SI, how many samples will be collected and what methods will be used to define the background range and compare to site sample results?

Ten surface soil samples and one sediment sample.

A comparison of site sample data to background data will be necessary to distinguish a munitions-related release from ambient conditions resulting from naturally occurring or anthropogenic sources. Where the body of background data includes sufficient samples (i.e., soil), a background threshold comparison of site concentrations to the background 95th UTL will be made. Media with limited background data (sediment) will use "significantly above background" criteria as applied for HRS.

9. **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?

Note: Oregon State standards are provided in Table 5, "Human Health Screening Criteria for Soil/Sediment at Oregon Sites." ODEQ requested that the EPA Region 9 PRGs be replaced with those from Region 6.

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

Yes.

10. **Ecological screening level risk assessment.**
The USACE has defined a process for conducting screening level ecological risk assessment. A determination is first made whether the site qualifies as an IEP. A second determination is made whether the site is managed for ecological purposes. If neither criterion is met, then a screening level ecological risk assessment 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).

Does the site qualify as an IEP?

Yes.

Is the site managed for ecological purposes?

No.

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

Note: Oregon State standards are provided in Table 6, "Selection of Ecological Soil Screening Toxicity Values for Constituents of Potential Ecological Concern (Oregon Sites)" and Table 7, "Selection of Ecological Sediment Screening Toxicity Values for Constituents of Potential Ecological Concern (Oregon Sites)."

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

Yes.

11. **Other sampling issues.**

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

TAL metals analysis for the background surface soil and sediment samples.

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

No.

6.0 Data Quality Objectives

As agreed at the TPP Meeting, the following decision rules will be applied with regard to MC sampling results:

- Above background and below risk-based screening levels equals NDAI
- Below background and below risk-based screening levels equals NDAI
- Above risk-based screening levels and background equals Remedial Investigation/FS

The following expanded project objectives have been developed.

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 reconnaissance will be conducted searching for physical evidence to indicate the presence of MEC, (e.g. MEC on the surface, munitions debris, craters, soil discoloration indicative of explosives. The visual search will consist of areas within the Bombing Target and specifically in the areas of irrigation circles #16, #20, and #22. 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 Target CSM (e.g., use of munitions containing high explosives).
    - Direct evidence of MEC is not found, but abundant munitions debris 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; munitions debris is isolated and consistent with the Bombing Range CSM.
    - No evidence of MEC, munitions debris, 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 background and screening values.

DQO #2 – Soil and sediment samples will be collected and analytical results will be compared to background. Results from previous investigations will also be included in the evaluation provided the analytical data meet data quality requirements developed for the SI. 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 background and human health screening values, the site will be recommended for additional investigation.
- If sample results that exceed background and 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

- USACE will obtain necessary rights-of-entry based on the proposed sampling locations.
- Shaw will prepare the draft and final TPP Memorandum and distribute for concurrence.
- Shaw will prepare the SSWP for review and comment.
- Shaw will publish the final SSWP once comments are resolved and incorporated.
- Shaw will conduct field work.
- Shaw will prepare the draft SI Report and submit for stakeholder review and comment.
- USACE/Shaw will schedule a second TPP Meeting to present findings of the SI.
- Shaw will publish the final SI.

7.0 References

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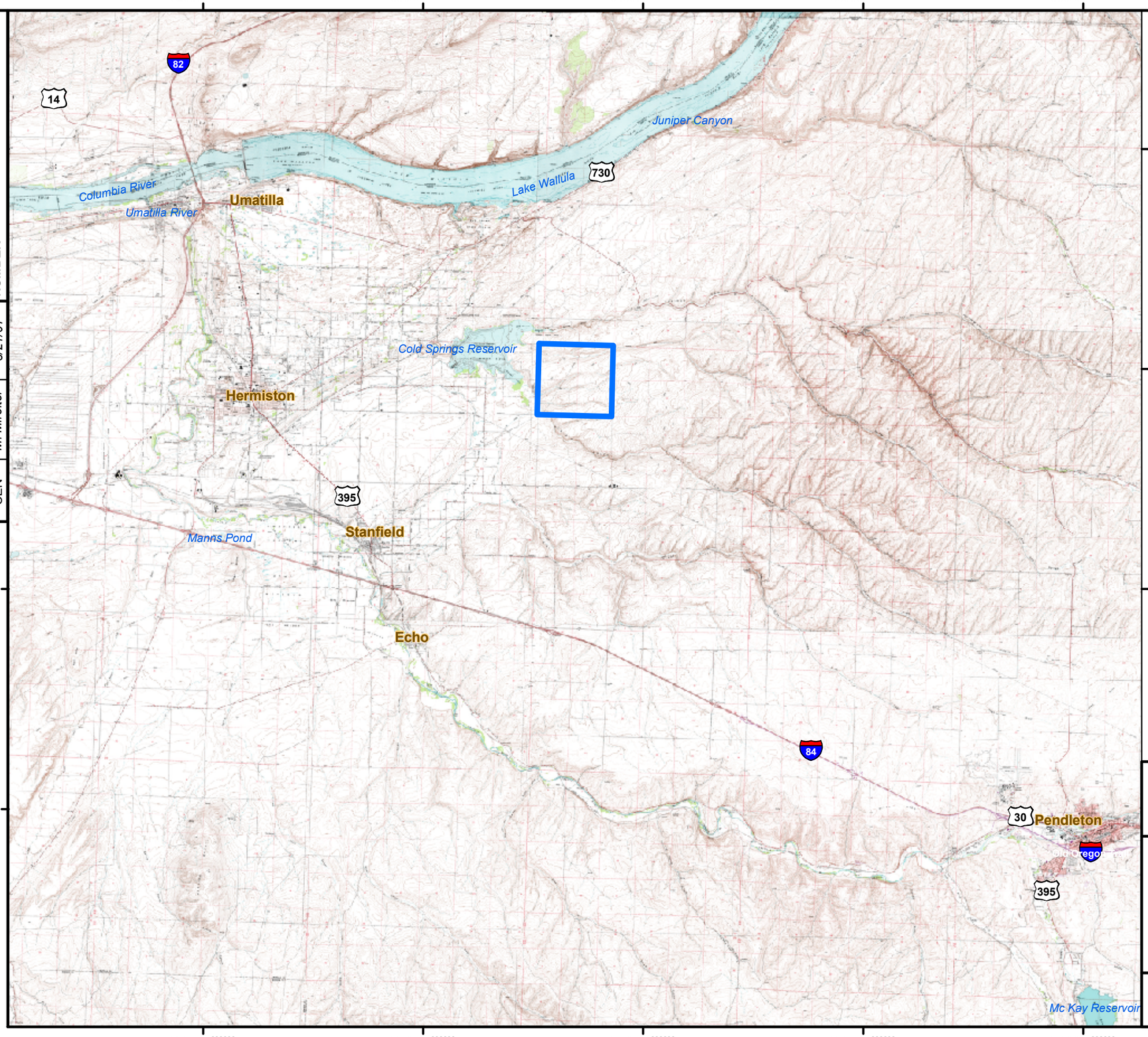
Figures



Legend

Cold Springs Bombing Range FUDS Boundary

NOTES:
1) FUDS boundary was derived from the Cold Springs Bombing Range ASR Supplement.
2) This property is located within the Umatilla Watershed.
3) Topo map (Umatilla County) obtained from the U.S. Department of Agriculture, Service Center Agencies, 1999.

N

0 1.5 3 6 Miles

REFERENCE/PROJECTION: NAD 83 UTM Zone 11N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

FIGURE 1

SITE LOCATION

COLD SPRINGS PRECISION BOMBING RANGE

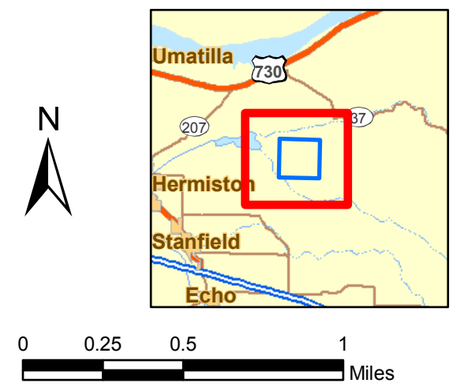
Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
CEN	M. Mireiter	3/21/07	Coldsprings_001_fig1_SiteLocation_TPP

Legend

- Cold Springs Bombing Range FUDS Boundary
- Range Included in the MMRP Range Inventory

NOTES:
1) FUDS boundary and range boundaries were derived from the Cold Springs Bombing Range ASR Supplement.
2) Aerial photo (Umatilla County) obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project, 2005.



REFERENCE/PROJECTION: NAD 83 UTM Zone 11N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

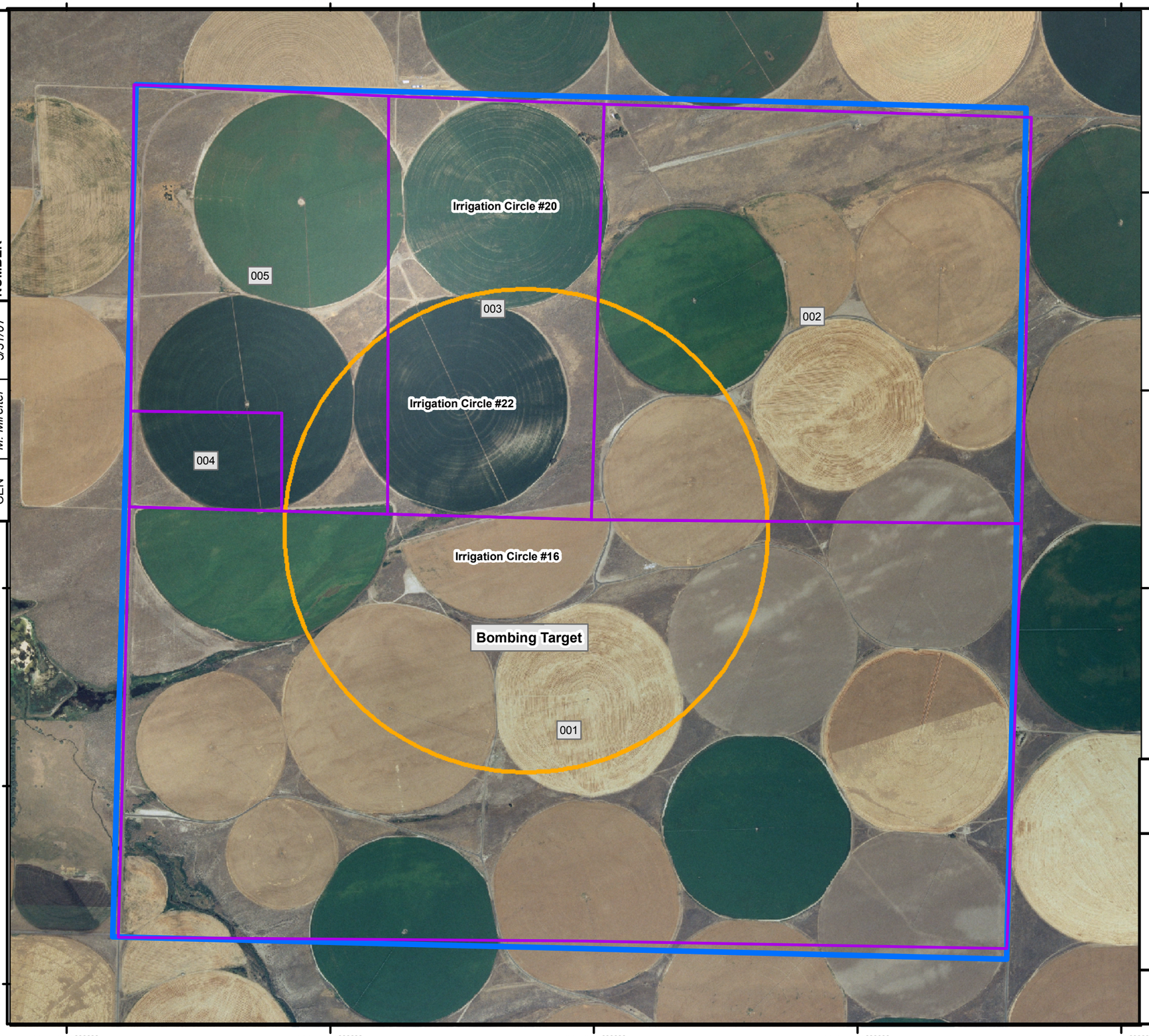
FIGURE 2

SITE LAYOUT

COLD SPRINGS PRECISION BOMBING RANGE

Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
CEN	M. Mireiter	5/31/07	Coldsprings_002_fig2_SiteLayout_TPP



Legend

- Cold Springs Bombing Range FUDS Boundary
- Range Included in the MMRP Range Inventory
- Taxlot Parcel

NOTES:
1) FUDS and range boundaries were derived from the Cold Springs Bombing Range ASR Supplement.
2) Aerial photo (Umatilla County) obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project, 2005.

N

0 625 1,250 2,500 Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 11N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

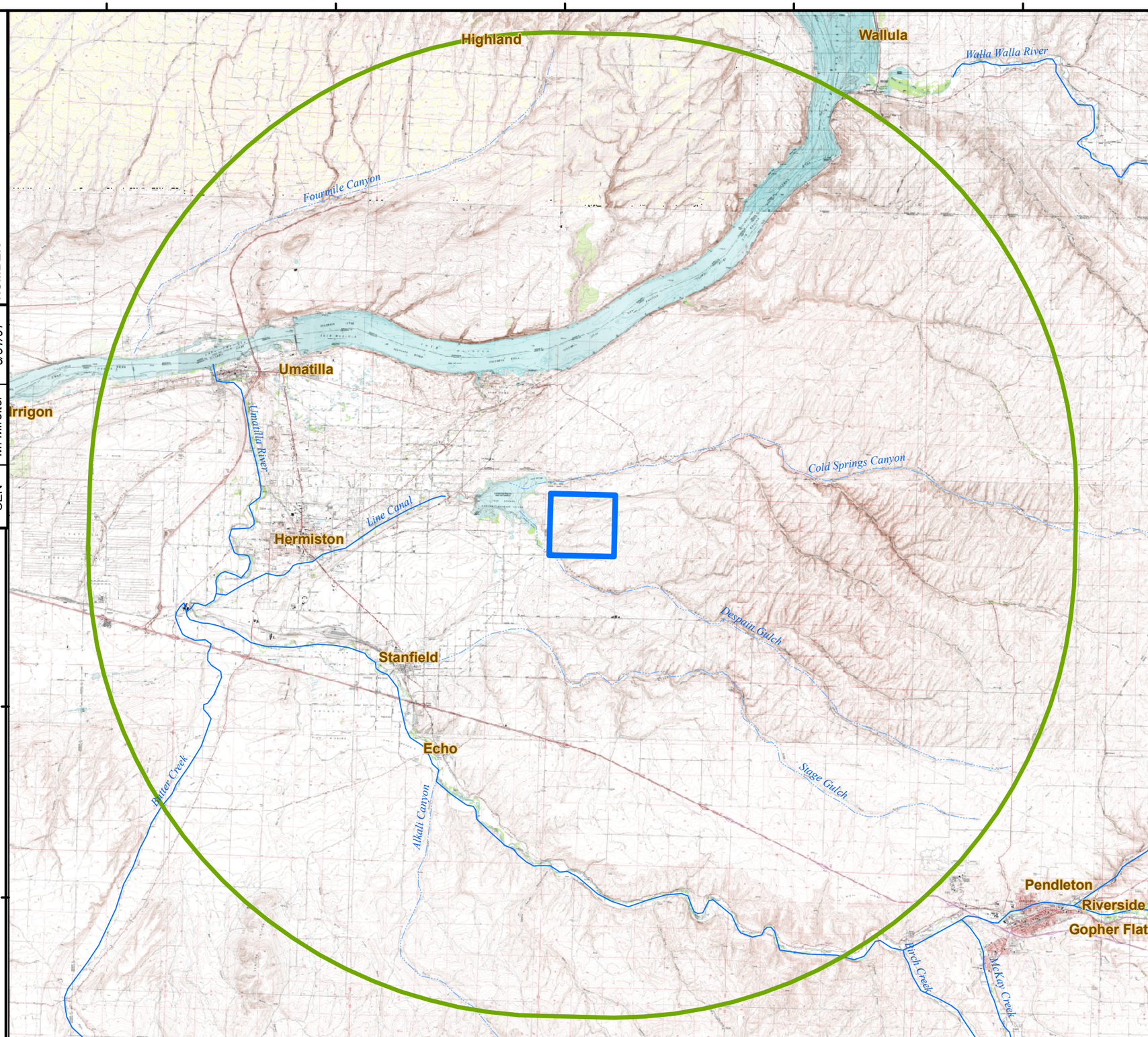
FIGURE 3

BOMBING TARGET

COLD SPRINGS PRECISION BOMBING RANGE

Shaw Environmental, Inc.

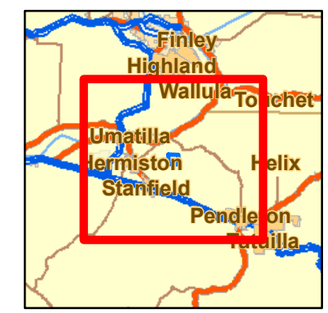
DRAWING NUMBER	DRAWN BY		OFFICE
Coldsprings_003_fig3_BTrg_TPP	M. Mireiter	5/31/07	CEN



Legend

- Cold Springs Bombing Range FUDS Boundary
- 15-Mile Radius From Cold Springs Bombing Range FUDS Boundary
- Stream
- Intermittent Stream
- Canal

NOTES:
1) FUDS boundary was derived from the Cold Springs Bombing Range ASR Supplement.
3) Topo map (Umatilla and Benton Counties) obtained from the U.S. Department of Agriculture, Service Center Agencies, 1999.



N

0 1.5 3 6 Miles

REFERENCE/PROJECTION: NAD 83 UTM Zone 11N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

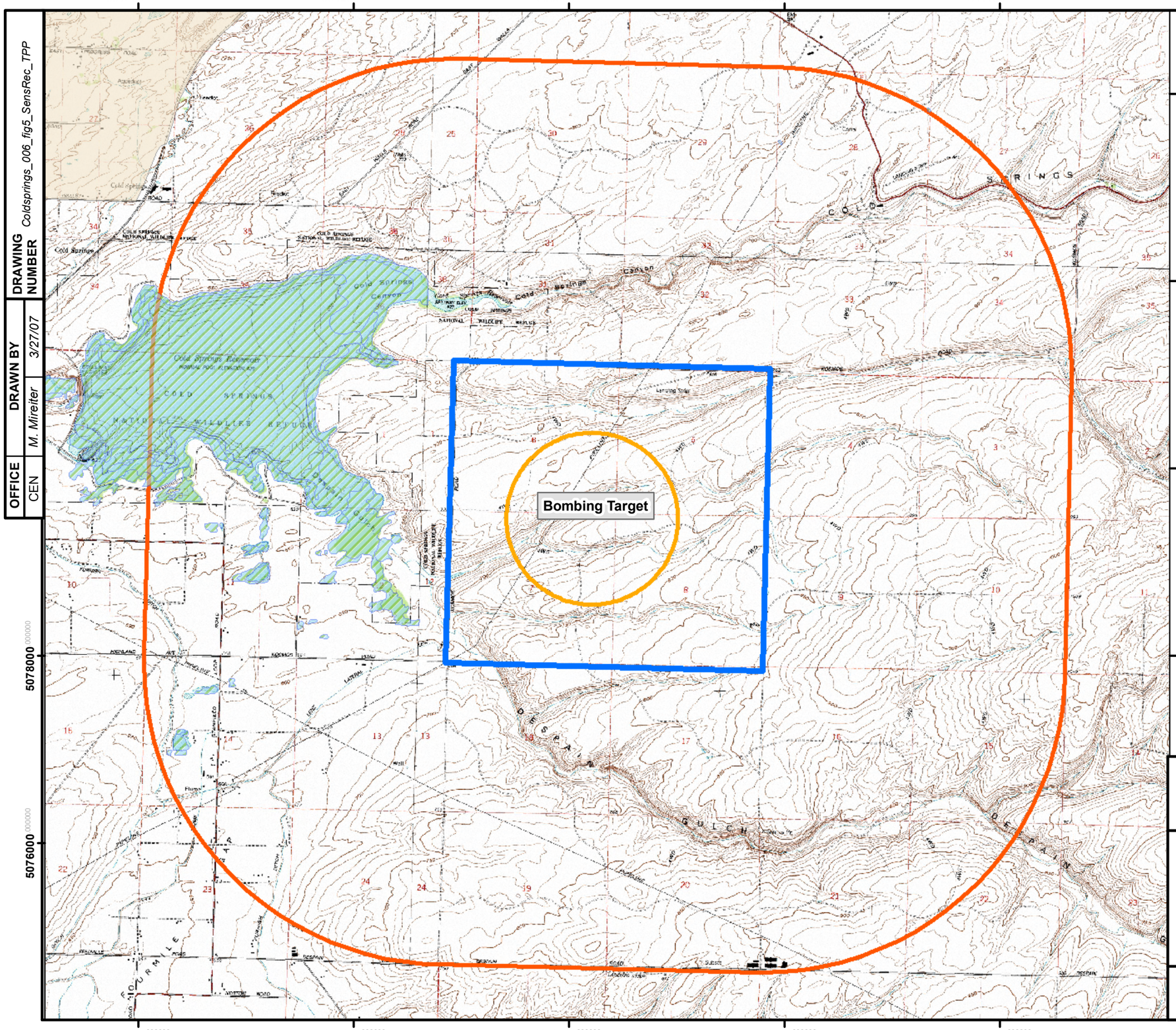
FIGURE 4

SURFACE WATER DRAINAGE

COLD SPRINGS BOMBING RANGE

Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
CEN	M. Mireiter	5/31/07	Coldsprings_004_fig4_SurfaceWater_TPP



DRAWING NUMBER: Coldsprings_006_fig5_SensRec_TPP

DRAWN BY: M. Mireiter 3/27/07

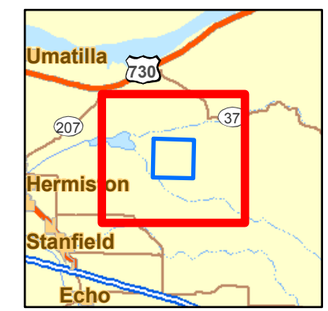
OFFICE: CEN

Legend

- Cold Springs Bombing Range FUDS Boundary
- 2-Mile Radius From Cold Springs Bombing Range FUDS Boundary
- Range Included in the MMRP Range Inventory
- Wetland Area
- Park

NOTES:

1) FUDS boundary and range boundaries were derived from the Cold Springs Bombing Range ASR Supplement.
2) Wetlands data obtained from the U.S. Fish and Wildlife Service, 200605, NWIDBA.CONUS_wet_poly: Classification of Wetlands and Deepwater Habitats of the United States. U.S. Department of the Interior, Fish and Wildlife Service, Washington, DC. FWS/OBS-79/31., U.S. Fish and Wildlife Service, Branch of Habitat Assessment, Washington, D.C.
3) There are no schools, churches, hospitals, etc. within 2 miles of the Cold Springs Bombing Range FUDS boundary.
4) Topo map (Umatilla County) obtained from the U.S. Department of Agriculture, Service Center Agencies, 1999.



N

0 1,750 3,500 7,000 Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 11N

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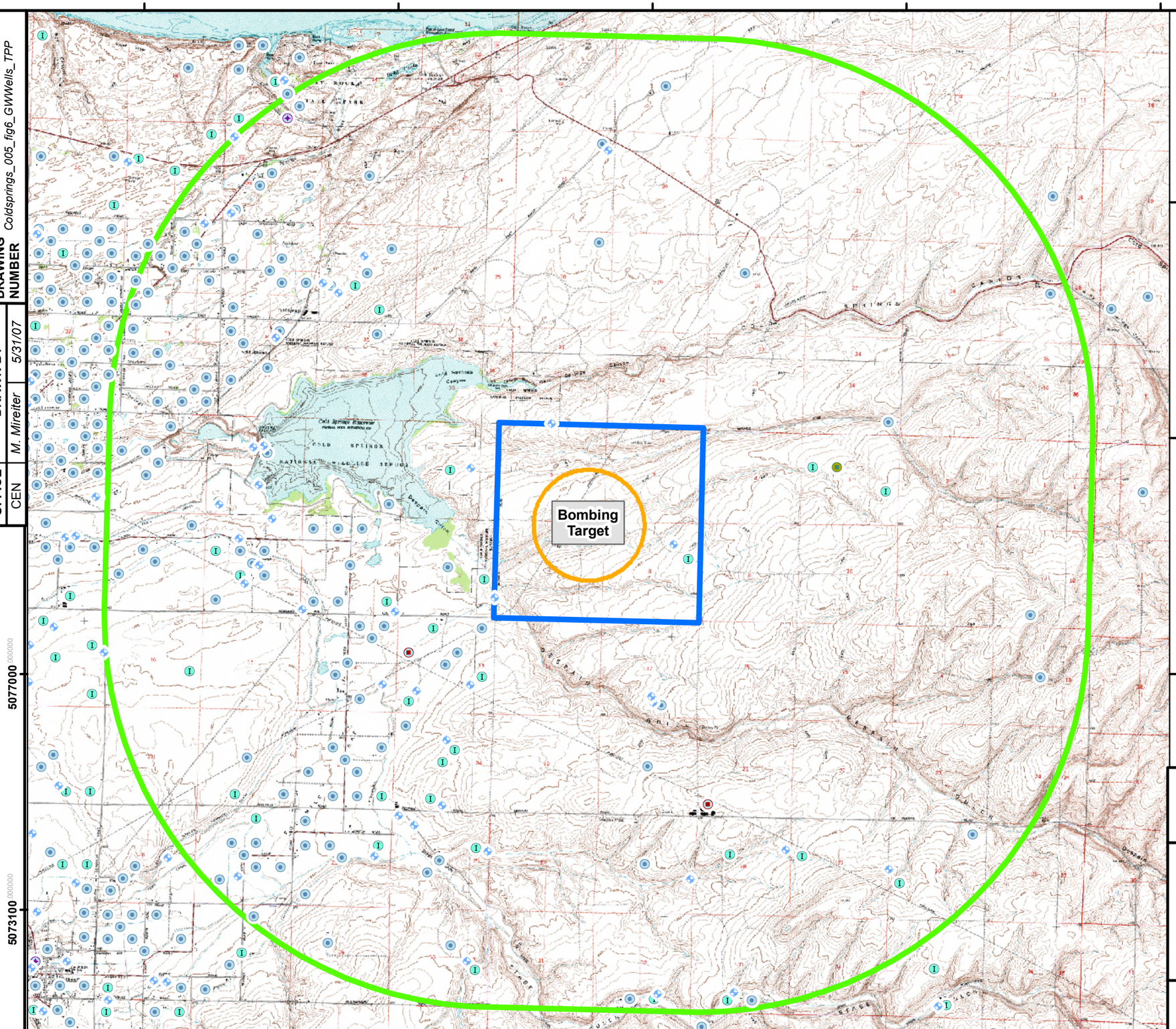
OMAHA DESIGN CENTER

FIGURE 5

SENSITIVE RECEPTOR LOCATIONS

COLD SPRINGS BOMBING RANGE

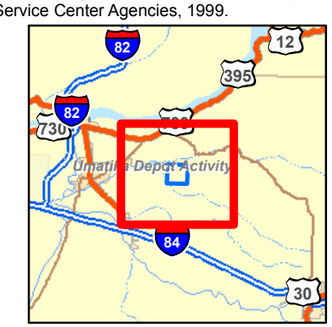
Shaw Environmental, Inc.



Legend

- Cold Springs Bombing Range FUDS Boundary
- 4-Mile Radius From Cold Springs Bombing Range FUDS Boundary
- Range Included in the MMRP Range Inventory
- Domestic Well
- Industrial Well
- Livestock Well
- Irrigation Well
- USGS Monitoring Well

NOTES:
1) FUDS and range boundaries were derived from the Cold Springs Bombing Range ASR Supplement.
2) USGS well information obtained from the US Geological Survey.
3) Non-USGS groundwater well information obtained from the State of Oregon, Water Resources Department. Wells are plotted in the center of either the Township/Range/Section, Townwnship/Range/Section/Quarter, or Township/Range/Section/Quarter/Quarter depending on available well data.
4) Topo map (Umatilla County) obtained from the U.S. Department of Agriculture, Service Center Agencies, 1999.



N

0 0.5 1 2 Miles

REFERENCE/PROJECTION: NAD 83 UTM Zone 11N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

FIGURE 6

GROUNDWATER WELLS WITHIN 4-MILE RADIUS

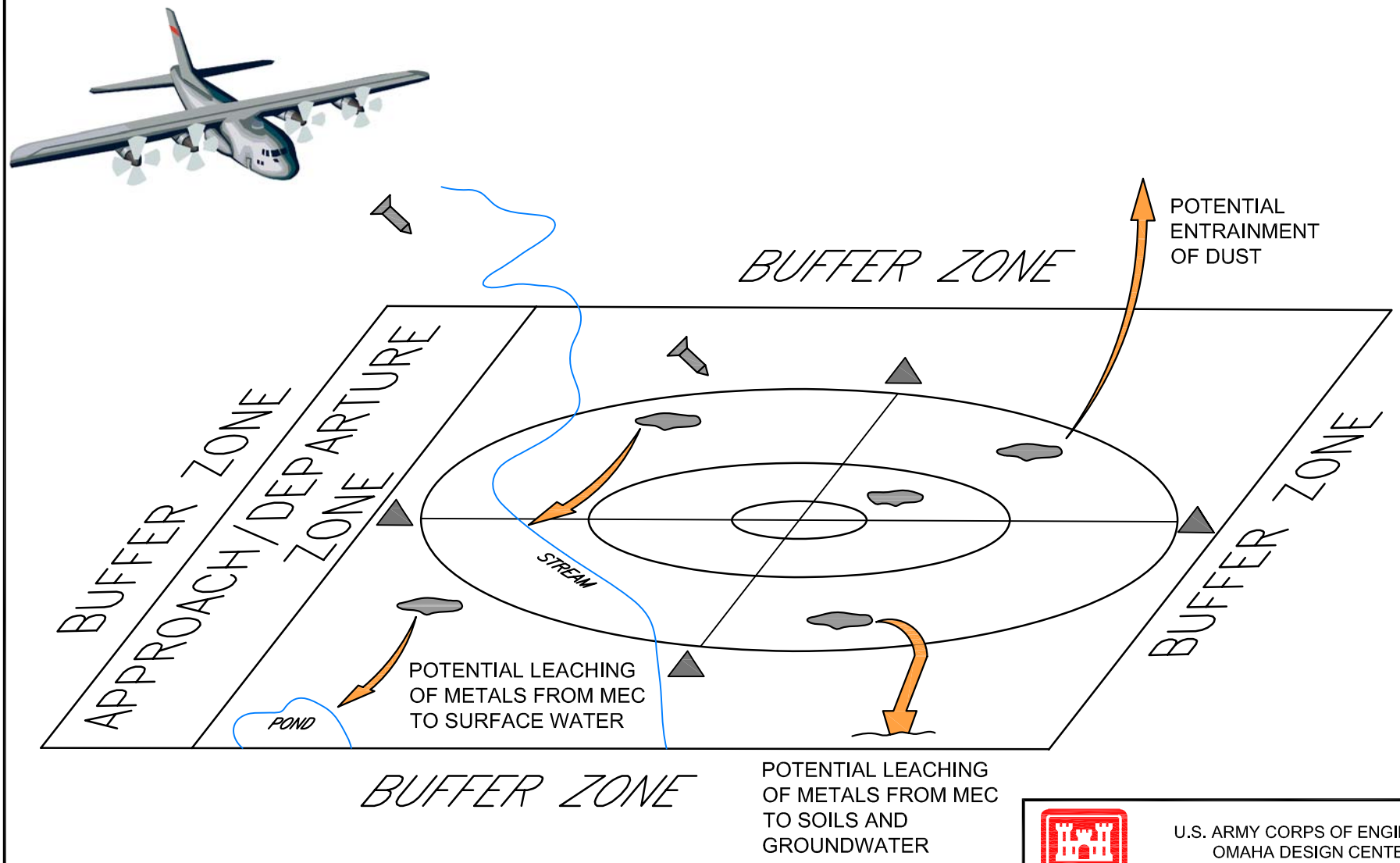
COLD SPRINGS PRECISION BOMBING RANGE

Shaw Environmental, Inc.

DRAWING NUMBER	DRAWN BY		OFFICE
Coldsprings_005_fig6_GWWells_TPP	M. Mireiter	5/31/07	CEN

XREF Files: IMAGE Files: airplane.jpg
File: N:\cad\DWG\116188-FUDS\116188SJ-a87.dwg Layout: Layout1 User: Karen.Black Jun 11, 2007 - 8:05am

OFFICE	DRAWN BY		DRAWING NUMBER	116188SJ-A87
SJ	K. Black	6-11-07		



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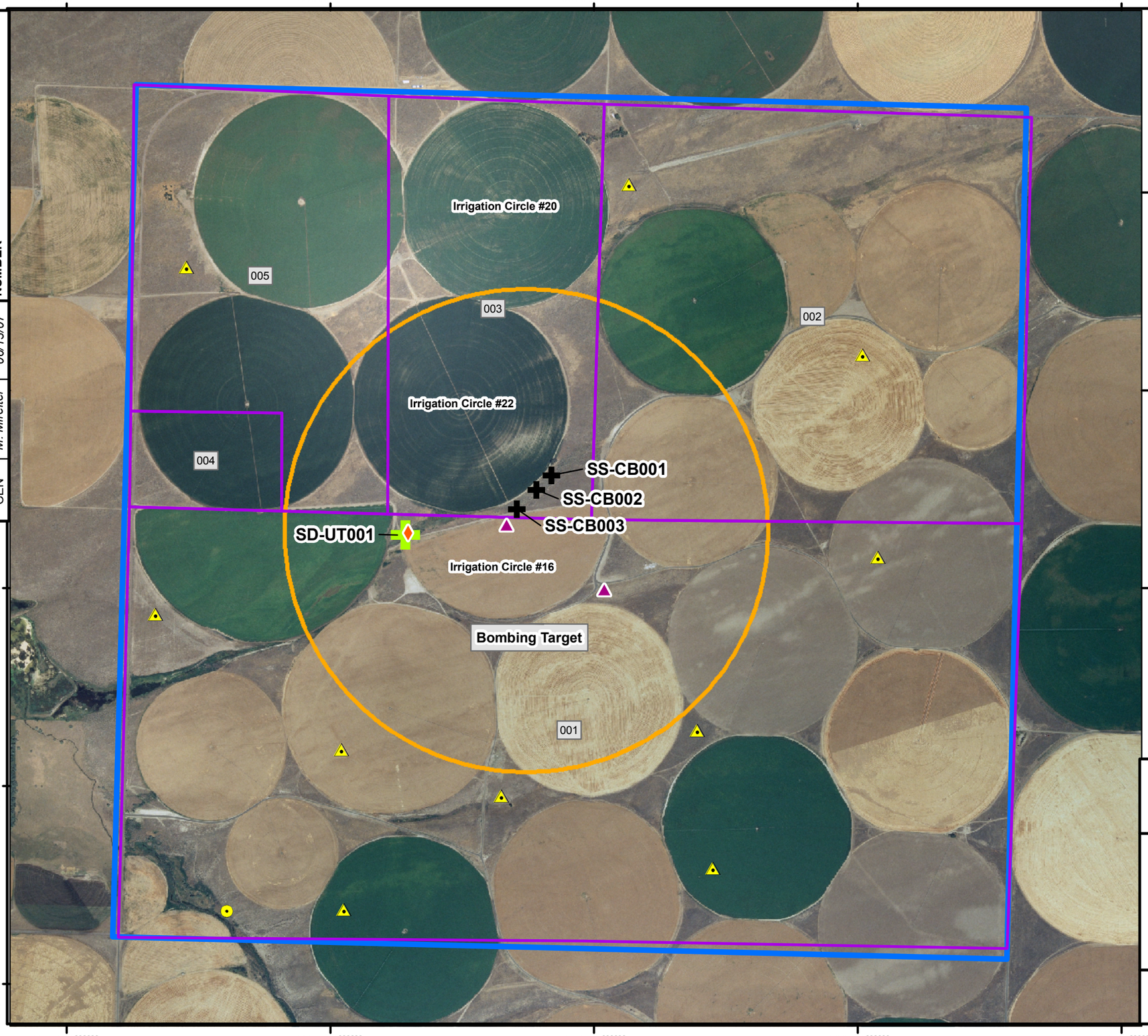
OMAHA DESIGN CENTER

FIGURE 7

CONCEPTUAL SITE MODEL
PRECISION BOMBING RANGE

COLD SPRINGS PRECISION BOMBING RANGE

Shaw® Shaw Environmental, Inc.

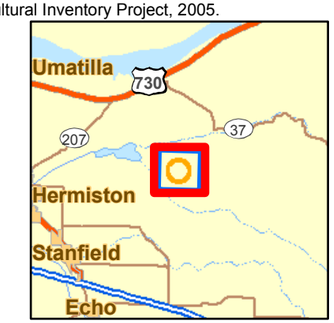


Legend

- Cold Springs Bombing Range FUDS Boundary
- Range Included in the MMRP Range Inventory
- Taxlot Parcel
- PA/SI Soil Sample Location
- PA/SI Sediment Sample Location
- Proposed Soil Sample
- proposed sediment sample
- Proposed Background Soil Sample
- Proposed Background Sediment Sample

NOTES:
1) FUDS and range boundaries were derived from the Cold Springs Bombing Range ASR Supplement.
2) USGS well information obtained from the US Geological Survey.
3) Non-USGS groundwater well information obtained from the State of Oregon, Water Resources Department. Wells are plotted in the center of either the Township/Range/Section, Townwnship/Range/Section/Quarter, or Township/Range/Section/Quarter/Quarter depending on available well data.
4) Aerial photo (Umatilla County) obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project, 2005.

N



0 625 1,250 2,500 Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 11N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

FIGURE 8

PROPOSED SAMPLING LOCATIONS

COLD SPRINGS PRECISION BOMBING RANGE

Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
CEN	M. Mireiter	06/13/07	Coldsprings_007_fig8_PropSampleLocs_TPP

Tables

Table 1
Army Checklist for Important Ecological Places [a]
Cold Springs Precision Bombing Range, Hermiston, Oregon

		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	☒ / ☐	Archives Search Report (ASR) states that one bird and two fish federal threatened and endangered (T&E) species may be in the vicinity of the Site.
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	☐ / ☒	

Table 1 (cont.)
Army Checklist for Important Ecological Places [a]
Cold Springs Precision Bombing Range, Hermiston, Oregon

		Yes / No	Comments
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	☒ / ☐	ASR states that one state T&E species may be in the vicinity of the Site.
24	Habitat known to be used by species under review as to its Federal endangered or threatened status	☒ / ☐	ASR states that seven candidate federal T&E species may be in the vicinity of the Site.
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
Potential MEC and MC
Cold Springs Precision Bombing Range

Range Areas	Munitions ID	Munitions	Associated MC	Comments
Bombing Range	Practice bomb, 100-pound	M38A2	Chromium, iron, copper, lead, manganese, and nickel	Made of light sheet metal
	Spotting Charge	M1A1	Black powder (potassium nitrate, sulfur, and charcoal)	
	Spotting Charge	M3	Black smoke mixture, black powder (potassium nitrate, sulfur, and charcoal)	
	Spotting Charge	M4	FS smoke	
	Practice Projectile	37-mm M55A1	Chromium, iron, copper, lead, manganese, and nickel	Made of steel
	Fuze	M56	Tetryl, lead, aluminum	

Table 3
MEC and MC Exposure Pathway Analysis

Range Area & Type	MMRP Concern	Potential Contaminant of Concern	Affected Media (Potential Contaminant Sources) (Fate and Transport)	Exposure Routes and Potential Receptors			Data Gaps	Activities to Address Data Gaps (i.e., Sampling)
				Site Workers/ Contractor Personnel	Residents/ General Public	Ecological (Biota)		
Bombing Target	MEC	MEC in the form of *unexploded* practice bomb spotting charges may exist on the land surface. MEC in the form of *unexploded* projectile fuzes may exist on the land surface.	**Surface Soil** • MEC (unexploded practice bombs) are a hazard. • MEC (unexploded practice bombs) reported on surface.	• Potentially complete pathway. Exposure routes: • Vehicle and foot traffic • Agricultural tiling	• Incomplete pathway.	• Potentially complete pathway. Exposure routes: • Foot traffic	• 37-mm live projectile found in irrigation circle #20.	• Historical documents indicate that the bombing target was used for 100-pound practice bombs. Does not indicate target was used for live projectiles. • A visual field reconnaissance survey by a trained, unexploded ordnance (UXO) technician using a hand-held magnetometer will be performed of the Bombing Target, specifically in the areas surrounding irrigations circles #16, #20, and #22, and the gulch between circles #16 and #22 to assess the presence or absence of munitions and explosives of concern (MEC) and to document the current site conditions.
			Subsurface Soil • MEC (unexploded projectiles) are a hazard. • MEC (unexploded projectile) reported in subsurface.	• Potentially complete pathway. Exposure routes: • Intrusive activities • Agricultural tiling	• Incomplete pathway.	• Potentially complete pathway. Exposure routes: • Burrowing • Agricultural tilling	• 37-mm live projectile found in irrigation circle #20.	• Historical documents indicate that the bombing target was used for 100-pound practice bombs. Does not indicate target was used for live projectiles. • No subsurface investigations will be conducted.
	MC	Black powder, sheet metal (chromium, iron, copper, lead, manganese, and nickel), steel , lead, aluminum	**Soil** • Directly affected. • Potential metals contamination from munitions used. • Spotting charges do not contain hazardous components. • Fuze does not contain hazardous substances. • Fate & Transport: secondary source of potential sediment, surface water, and air contamination.	• Potentially complete pathway. Exposure routes: • Incidental ingestion • Dermal contact • Inhalation of soil particles	• Incomplete pathway.	• Potentially complete pathway. Exposure routes: • Ingestion • Direct Contact	• Limited soil data for metals and explosives exist from PA/SI investigation. • Additional metals and explosives data may be needed.	One surface soil sample will be collected at the location of MEC or munitions debris at irrigation circle #16 or #22. If no MEC or munitions debris is located, a soil sample will be collected near the reported bombing target at irrigation circle #16. The sample will be analyzed for select metals (aluminum, chromium, iron, copper, lead, manganese, and nickel). One surface soil sample will be collected in an area south of irrigation circle #16 in an area not impacted by irrigation and farming activities. The sample will be analyzed for select metals (aluminum, chromium, iron, copper, lead, manganese, and nickel).
			Sediment/Surface Water • Potentially affected media – Despain Gulch • Potential metals contamination • Spotting charges and fuze do not contain hazardous substances • Fate & Transport: via surface runoff from impacted soil	• Potentially complete pathway. Exposure routes: • Incidental ingestion • Dermal contact • Inhalation of surface water	• Incomplete pathway.	• Potentially complete pathway. Exposure routes: • Ingestion • Direct Contact	• Limited sediment and surface water data for metals and explosives exist from PA/SI investigation.	• No surface water samples will be collected • One sediment sample will be collected from a water collection area downgradient of the Bombing Target. The sample will be analyzed for select metals (aluminum, chromium, copper, iron, lead, manganese, and nickel)
			Groundwater • Not an affected media under current land use.	- Incomplete pathway.	• Incomplete pathway. .	• Incomplete pathway.	• Limited groundwater data for exists from PA/SI investigation.	• No groundwater samples will be collected
			Air • Potentially affected media due to blowing soil.	Potentially complete Pathway Exposure routes: Inhalation	Incomplete Pathway	Potentially complete Pathway Exposure routes: Inhalation	• Limited data for metals and explosives exist from PA/SI investigation.	Will use soil analytical data in risk screening

MMRP – Military Munitions Response Program
PA/SI - Preliminary Assessment/Site Inspection

Table 4
Proposed Sampling Approach
Cold Springs Precision Bombing Range

Area of Concern	Media	Samples	Munitions Constituents	
			Select Metals	TAL Metals
Bombing Target	Soil	2	2	0
	Sediment	1	1	0
	Surface Water	0	0	0
	Groundwater	0	0	0
Background	Soil	10	0	10
	Sediment	1	0	1
	Surface Water	0	0	0
	Groundwater	0	0	0
		Totals	3	11

QC Required Samples	Media	Samples	Select Metals	TAL Metals
Duplicate	Soil	1	1	1
	Sediment	1	1	1
	Surface Water	0	0	0
	Groundwater	0	0	0
		Totals	2	2
MS/MSD	Soil	1	1	1
	Sediment	0	0	0
	Surface Water	0	0	0
	Groundwater	0	0	0
		Totals	1	1

Abbreviations and Acronyms:

MS/MSD - matrix spike/matrix spike duplicate

QC - quality control

TAL - Target Analyte List

Notes:

1) In addition to the QC samples shown above, temperature blanks will be submitted with samples, one blank per cooler.

2) Metals by SW-846 EPA Method 6020A.

3) Select metals are aluminum, chromium, copper, iron, lead, manganese, and nickel.

4) TAL metals are aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, silver, vanadium, and zinc.

Table 5
Human Health Screening Criteria for Soil/Sediment at Oregon Sites[a]
Cold Springs Precision Bombing Range

Analyte	Abbreviation	CAS No.	Laboratory PQL (mg/kg)	Laboratory MDL (mg/kg)	EPA Region 6 Human Health MSSLs		
					Residential MSSL[a] (mg/kg)	Industrial MSSL[b] (mg/kg)	SSLs[c] DAF=1 (mg/kg)
Explosives							
2,4,6-Trinitrotoluene	2,4,6-TNT	118-96-7	0.040	0.012	1,800	21,000	
1,3,5-Trinitrobenzene	1,3,5-TNB	99-35-4	0.040	0.002	6.1	68	
1,3-Dinitrobenzene	1,3-DNB	99-65-0	0.040	0.008	16	64	
2,4-Dinitrotoluene[c]	2,4-DNT	121-14-2	0.040	0.014	0.72	2.8	0.00004
2,6-Dinitrotoluene[c]	2,6-DNT	606-20-2	0.040	0.007	0.72	2.8	0.00004
2-Amino-4,6-dinitrotoluene	2-Am-DNT	35572-78-2	0.040	0.010	No MSSL	No MSSL	
2-Nitrotoluene	2-NT	88-72-2	0.080	0.009	2.8	14	
3-Nitrotoluene	3-NT	99-08-1	0.080	0.022	1,600	23,000	
4-Amino-2,6-dinitrotoluene	4-Am-DNT	19406-51-0	0.040	0.006	No MSSL	No MSSL	
4-Nitrotoluene	4-NT	99-99-0	0.080	0.036	38	190	
Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	121-82-4	0.080	0.071	4.4	17	
Methyl-2,4,6-trinitrophenylnitramine	Tetryl	479-45-8	0.080	0.004	240	2,700	
Nitrobenzene	NB	98-05-3	0.040	0.006	20	110	0.007
Nitroglycerin	NG	55-63-0	4.0	0.040	No MSSL	No MSSL	
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	HMX	2691-41-0	0.080	0.012	3,100	34,000	
Pentaerythritol tetranitrate	PETN	78-11-5	0.20	0.042	No MSSL	No MSSL	
Metals/Inorganics							
Aluminum	Al	7429-90-5	100	2.7	76,000	100,000	
Antimony	Sb	7440-36-0	1.0	0.17	31	450	0.30
Arsenic	As	7440-38-2	5.0	0.61	0.39	1.8	1
Barium	Ba	7440-38-2	5.0	0.23	16,000	100,000	82
Beryllium	Be	7440-41-7	0.2	0.032	150	2,200	3
Cadmium	Cd	7440-43-9	0.5	0.14	39	560	0.4
Chromium[d]	Cr	7440-47-3	2.0	0.28	210	500	2
Cobalt	Co	7440-48-4	0.5	0.017	900	2,100	
Copper	Cu	7440-50-8	2.0	0.2	2,900	42,000	
Iron	Fe	7439-89-6	50	3.2	55,000	100,000	
Lead	Pb	7439-92-1	2.0	0.079	400	800	
Manganese	Mn	7439-96-5	2.0	0.057	3,200	35,000	
Mercury	Hg	7484-94-7	0.033	0.0097	23	340	
Nickel	Ni	7440-02-0	1.0	0.088	1,600	23,000	7
Silver	Ag	7440-22-4	0.3	0.019	390	5,700	2
Vanadium	V	7440-62-2	10	2.5	390	5,700	300
Zinc	Zn	7440-66-6	10	0.49	23,000	100,000	620
Perchlorate	ClO_4	14797-73-0	0.003	0.000584	55	790	

Abbreviations and Acronyms:
DAF = Dilution Attenuation Factor
EPA - Environmental Protection Agency
MDL - Method Detection Limit
mg/kg = milligrams per kilogram
MSSL = Medium-Specific Screening Levels
PQL - Practical Quantitation Limit
SSL = Soil Screening Level

Notes:
[a] MSSLs from Region 6 MSSL Table dated February 21, 2007 based on residential exposures to single chemical. The background information for these values is presented in *EPA Region 6 Human Health Medium-Specific Screening Levels* (2006).
[b] MSSLs from Region 6 MSSL Table dated February 21, 2007 based on industrial outdoor worker exposures to single chemical. The background information for these values is presented in *EPA Region 6 Human Health Medium-Specific Screening Levels* (2006).
[c] SSLs from Region 6 MSSL Table dated February 21, 2007. These values have not been generated from the soil-screening calculations. The values have been copied from the August 1998 Region 6 MSSL document and spot-checked using the latest EPA guidance (EPA, 2006).
[d] Total chromium values used.

Table 6
Selection of Soil Screening Toxicity Values for Constituents of Potential Ecological Concern (Oregon Sites)
Cold Springs Precision Bombing Range

Parameter	ODEQ Level II Screening Level [a] Lowest Value for Plants/Inverts./ Birds/Mammals (mg/kg)	Proposed Benchmarks										Potential Biocumulative Constituent? [h]	Final Ecological Screening Value Soil [i] (mg/kg)	Laboratory PQL (mg/kg)
		EPA Region 5 ESLs (2003) [b] (mg/kg)	EPA Region 7 [c] (mg/kg)		EPA Region 8 [d] (mg/kg)		EPA Region 10 [e] (mg/kg)		Other Values: Talmage et al.(1999) [f] or LANL (2005) [g] (mg/kg)					
Metals/Inorganics														
Aluminum	50	NVA	50	EPA-R4	NVA		50	EPA-R4	5.5	LANL			50	100
Arsenic	10	5.7	18	SSL	18	SSL	18	SSL	6.8	LANL	Yes		10	5
Barium	85	1.04	330	SSL	330	SSL	330	SSL	110	LANL			85	5
Cadmium	4	0.00222	0.36	SSL	0.36	SSL	0.36	SSL	0.27	LANL	Yes		4	0.5
Chromium (total)	0.4	0.4	26	SSL	26	SSL	26	SSL	2.3	LANL	Yes		0.4	2
Cobalt	20	0.14	13	SSL	13	SSL	13	SSL	13	LANL			20	1
Copper	50	5.4	60	ORNL	28	SSL	60	ORNL	10	LANL	Yes		50	2
Iron	10	NVA	200	EPA-R4	NVA		200	EPA-R4	NVA				10	50
Lead	16	0.0537	11	SSL	11	SSL	11	SSL	14	LANL	Yes		16	2
Manganese	100	NVA	100	EPA-R4	220	SSL	100	EPA-R4	50	LANL			100	2
Mercury	0.1	0.1	0.00051	ORNL	0.00051	ORNL	0.00051	ORNL	0.013	LANL	Yes		0.1	0.033
Nickel	30	13.6	30	ORNL	38	SSL	30	ORNL	20	LANL	Yes		30	1
Silver	2	4.04	2	ORNL	4.2	SSL	2	ORNL	0.05	LANL	Yes		2	0.3
Vanadium	2	1.59	7.8	SSL	7.8	SSL	7.8	SSL	0.025	LANL			2	10
Zinc	50	6.62	8.5	ORNL	8.5	ORNL	8.5	ORNL	10	LANL	Yes		50	10

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

Parameter	ODEQ Level II Screening Level [a] Lowest Value for Plants/Inverts./ Birds/Mammals (mg/kg)	Proposed Benchmarks									Potential Biocumulative Constituent? [h]	Final Ecological Screening Value Soil [i] (mg/kg)	Laboratory PQL (mg/kg)
		EPA Region 5 ESLs (2003) [b] (mg/kg)	EPA Region 7 [c] (mg/kg)		EPA Region 8 [d] (mg/kg)		EPA Region 10 [e] (mg/kg)		Other Values: Talmage et al.(1999) [f] or LANL (2005) [g] (mg/kg)				
Explosives													
2,4-Dinitrotoluene	NVA	1.28	1.28	EPA-R4	NVA		1.28	EPA-R4	0.52	LANL		1.28	0.04
2,6-Dinitrotoluene	NVA	0.0328	0.0328	EPA-R4	NVA		0.0328	EPA-R4	0.37	LANL		0.0328	0.04
2-Amino-4,6-Dinitrotoluene	NVA	NVA	NVA		NVA		NVA		2.1	LANL		2.1	0.04
4-Amino-2,6-Dinitrotoluene	NVA	NVA	NVA		NVA		NVA		0.73	LANL		0.73	0.04
1,3-Dinitrobenzene	NVA	0.655	0.655	EPA-R4	NVA		0.655	EPA-R4	0.073	LANL		0.655	0.02
HMX	NVA	NVA	NVA		NVA		NVA		27	LANL		27	0.05
Nitrobenzene	8	1.31	1.31	EPA-R4	NVA		1.31	EPA-R4	2.2	LANL		8	0.02
RDX	NVA	NVA	NVA		NVA		NVA		7.5	LANL		7.5	0.075
1,3,5-Trinitrobenzene	NVA	0.376	0.376	EPA-R4	NVA		0.376	EPA-R4	6.6	LANL		0.376	0.02
2,4,6-Trinitrotoluene	NVA	NVA	NVA		NVA		NVA		6.4	LANL		6.4	0.04
2-Nitrotoluene	NVA	NVA	NVA		NVA		NVA		2	LANL		2	0.075
3-Nitrotoluene	NVA	NVA	NVA		NVA		NVA		2.4	LANL		2.4	0.05
4-Nitrotoluene	NVA	NVA	NVA		NVA		NVA		4.4	LANL		4.4	0.04
Tetryl	NVA	NVA	NVA		NVA		NVA		0.99	LANL		0.99	0.065

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

Abbreviations and Acronyms:
Dutch – Dutch Intervention Values
EPA – Environmental Protection Agency
EPA-R4 – EPA Region 4
LANL – Los Alamos National Laboratory
mg/kg – milligrams per kilogram
NVA: No value available
ODEQ – Oregon Department of Environmental Quality
ORNL – Oak Ridge National Laboratory Ecological PRGs (Efroymson et al)
PQL – Practical Quantitation Limit
SSL – EPA Eco Soil Screening Levels

Notes:
[a]Oregon Department of Environmental Quality Screening Level Values (December 2001).
[b]Ecological Screening Levels (ESLs), U.S. Environmental Protection Agency (EPA) Region 5, August 2003.
[c]EPA Region 7: Catherine Wooster-Brown (Eco Risk Assessor) recommends the following hierarchy: EPA EcoSSLs; ORNL Efroymson values; EPA Region 4 values; other published values.
[d]EPA Region 8: Dale Hoff (Eco Risk Assessor) recommends the following hierarchy: EPA SSLs; Dutch Intervention Values or ORNL Efroymson values.
[e]EPA Region 10: Joseph Goulet (Eco Risk Assessor) says Region 10 has no recommended hierarchy; therefore, values from the EPA 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, 1999, Nitroaromatic Munitions Compounds: Environmental Effects and Screening Values, '**Revisions Environmental Contaminant Toxicology.'**
[g]Los Alamos National Laboratory (LANL), Eco Risk Database, Release 2.2, September 2005.
[h]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 (EPA, 2000) and ODEQ EQSLVs (ODEQ, 2001).
[i]Final Screening Value selected using the following hierarchy:
1. State Value (Oregon)
2. EPA Region State Located In (EPA Region 10)
3. Lower of Talmage et al. (1999) or LANL (2005) values.

Other References:
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 August, 2007: http://www.epa.gov/ecotox/ecossl.
U.S. Environmental Protection Agency, 2001, Supplemental Guidance to RAGS: Region 4 Bulletins, Ecological Risk Assessment. Originally published November 1995.
Website version last updated November 30, 2001: http://www.epa.gov/region4/waste/ots/ecolbul.htm.
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. Risk-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

Table 7
Selection of Ecological Sediment Screening Toxicity Values for Constituents of Potential Ecological Concern (Oregon Sites)
Cold Springs Precision Bombing Range

Parameter	ODEQ Screening Level Values [a] (mg/kg) Freshwater	EPA Region 5 ESLs[b] (mg/kg)	EPA Region 7 [c] (mg/kg)		EPA Region 8 [d] (mg/kg)		EPA Region 10 [e] (mg/kg)		Other Values: Talmage et al. (1999) [f] or LANL (2005) [g] (mg/kg)		Potential Bioaccumulative Constituent? [g]	Final Ecological Screening Value Sediment [h] (mg/kg)	Laboratory PQL (mg/kg)
Metals/Inorganics													
Aluminum	NVA	NVA	NVA		NVA		NVA		2.80E+02	LANL		2.80E+02	20.0
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	1.0
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	1.0
Iron	NVA	NVA	NVA		NVA		NVA		2.00E+01	LANL		2.00E+01	15.0
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	1.0
Manganese	1.10E+03	NVA	NVA		NVA		NVA		7.20E+02	LANL		1.10E+03	0.5
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	1.0
Explosives													
RDX	NVA	NVA	NVA		NVA		NVA		1.30E-01	TAL		1.30E-01	0.075
HMX	NVA	NVA	NVA		NVA		NVA		4.70E-02	TAL		4.70E-02	0.050
1,3,5-Trinitrobenzene	NVA	NVA	NVA		NVA		NVA		2.40E-02	TAL		2.40E-02	0.020
1,3-Dinitrobenzene	NVA	8.61E-03	NVA		NVA		NVA		6.70E-02	TAL		6.70E-02	0.020
2,4-Dinitrotoluene	NVA	1.44E-03	NVA		NVA		NVA		2.90E-01	LANL		2.90E-01	0.040
2,6-Dinitrotoluene	NVA	3.98E-03	NVA		NVA		NVA		1.90E+00	LANL		1.90E+00	0.040
2,4,6-TNT	NVA	NVA	NVA		NVA		NVA		9.20E-01	TAL		9.20E-01	0.040
2-Amino-4,6,-Dintrotoluene	NVA	NVA	NVA		NVA		NVA		7.00E+00	LANL		7.00E+00	0.040
4-Amino-2,6,-Dintrotoluene	NVA	NVA	NVA		NVA		NVA		1.90E+00	LANL		1.90E+00	0.040
2-Nitrotoluene	NVA	NVA	NVA		NVA		NVA		5.60E+00	LANL		5.60E+00	0.075
3-Nitrotoluene	NVA	NVA	NVA		NVA		NVA		4.90E+00	LANL		4.90E+00	0.050
4-Nitrotoluene	NVA	NVA	NVA		NVA		NVA		1.00E+01	LANL		1.00E+01	0.040
Nitrobenzene	NVA	1.45E-01	NVA		NVA		NVA		3.20E+01	LANL		3.20E+01	0.020
Tetryl	NVA	NVA	NVA		NVA		NVA		1.00E+02	LANL		1.00E+02	0.065
Nitroglycerin	NVA	NVA	NVA		NVA		NVA		1.70E+03	LANL		1.70E+03	10
PETN	NVA	NVA	NVA		NVA		NVA		1.20E+05	LANL		1.20E+05	0.50

Table 7 (Cont.)
Selection of Ecological Sediment Screening Toxicity Values for Constituents of Potential Ecological Concern (Oregon Sites)
Cold Springs Precision Bombing Range

Abbreviations and Acronyms:
EPA – Environmental Protection Agency
EPRGs – Oak Ridge National Laboratory Ecological PRGs
ISQGs – Canadian Interim Sediment Quality Guidelines
LANL – Los Alamos National Laboratory
MAC – MacDonald Consensus Values
mg/kg – milligrams per kilogram
NVA – No Value Available
TAL – Talmage et al (1999)
PQL – Practical Quantitation Limit

[a]Oregon Department of Environmental Quality Screening Level Values (December 2001).
[b]Ecological Screening Levels (ESLs), USEPA Region 5, August 2003.
[c]EPA Region 7: Catherine Wooster-Brown (Eco Risk Assessor) recommends the following hierarchy: MacDonald Consensus Values (MacDonald, 2000); ORNL Efroymson values (ORNL, 1977).
[d]EPA Region 8: Dale Hoff (Eco Risk Assessor) recommends the following hierarchy: MacDonald Consensus Values (MacDonald, 2000); Canadian ISQG values (CCME, 2003) or ORNL Efroymson values (ORNL, 1977).
[e]EPA Region 10: Joseph Goulet (Eco Risk Assessor) says Region 10 has no recommended hierarchy; therefore, values from the EPA 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 Munitions Compounds: Environmental Effects and Screening Values, Revisions Environmental Contaminant Toxicology.'
[g]Los Alamos National Laboratory (LANL), Eco Risk Database, Release 2.2, September 2005.
[h]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 (EPA, 2000) and ODEQ EQSLVs (ODEQ, 2001).
[i]Final Screening Value selected using the following hierarchy:

1. State Value (Oregon)
2. EPA Region State Located In (EPA 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.

Other References:
Efroymson, R.A., et al., 1997, Preliminary 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.

Draft Worksheets

Site Information Worksheet

Site: Cold Springs Precision Bombing Range
Project: Cold Springs Precision Bombing Range

	Site Information Needed	Suggested Means to Obtain Site Information	Potential Source(s) of Site Information	Responsible for Obtaining	Deadline for Obtaining Site Information
1	Schedule for Sampling	Consultation	ODEQ and landowners	Shaw	Prior to field work
2	Point of Contact for Community	Not Applicable	USACE	USACE	Prior to field work
3	Access Agreements	Correspondence, call, or visit stakeholders	Letters/conversations with stakeholders	USACE	Prior to field work
4	Areas of Cultural Significance within AOC	SHPO	Phone SHPO	Shaw	For inclusion in final TPP Memo

Munitions Response Site Prioritization Protocol (MRSPP) Data Gaps
32 CRF Part 179

Installation: **Cold Springs Precision Bombing Range**
AOC: **Bombing Target**
RMIS Range ID: **F10OR0172**

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	M38A2 100-lb practice bombs with black powder, black smoke, or FS smoke spotting charges
	2	Source of Hazard			x	Former practice bombing target
	3	Location of Munitions			x	Historical evidence indicates munition debris litters the site. Confirmed presence of MEC; 37-mm live artillery round found in 1975
	4	Ease of Access			x	No barrier
	5	Status of Property			x	Non-DoD control
	6	Population Density			x	< 100 persons per square mile
	7	Population Near Hazard			x	0 inhabited structures w/in 2 miles
	8	Activities/Structures			x	Agricultural - irrigated crops and occasional livestock grazing
	9	Ecological and/or Cultural Resources			x	Ecological resources present
	10	**EHE Module Score**				
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	No barrier
	15	Status of Property			x	Non-DoD control
	16	Population Density			x	< 100 persons per square mile
	17	Population Near Hazard			x	0 inhabited structures w/in 2 miles
	18	Activities/Structures			x	Agricultural - livestock grazing
	19	Ecological and/or Cultural Resources			x	Ecological resources present
	20	**CHE Module Score**				
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.

Cold Springs Precision Bombing Range HRS Data Gaps

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

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	1.8	Source scale (i.e., 1:24,000, etc.)
3	1.12	Site Permits
4	2.3	Confirm no tribal lands within 4 miles or surface water within 15 miles
5	2.4	Confirm if there are other NPL sites within 1 mile of the site
6	2.5	Confirm property owners
7	5.3	Population within 1 mile, within 4 miles
8	6	Water use (GW within 4 miles, SW within 15 miles)
9	6.1	Total drinking water population served
10	6.2	Type of drinking water supply system (GW or SW?)
11	6.3	Other water uses of GW within 4 miles
12	6.4	Depth to aquifer within 4 miles
13	7.1	Confirm existence of sensitive or potentially vulnerable environment

Attachment A
PA/SI Summary

Table 6-1—Potential Sources: Bombing Range Analytical Results
Cold Springs PBR FUDS PA/SI
Umatilla County, Oregon

Description	Background	Potential Source							
Field Number	SS-BK001	SS-CB001	SB-CB001	SS-CB002	SB-CB002	SS-CB003	SB-CB003	SS-CS001	SS-BS001
EPA Number	04494268	04494250	04494251	04494253	04494254	04494255	04494256	04494257	04494252
CLP Number	MJ4A70	MJ4A53	MJ4A54	MJ4A56	MJ4A57	MJ4A58	MJ4A59	NA	MJ4A55
Location	Background Soil	Surface Soil at Bombing Range	Subsurface Soil at Bombing Range	Surface Soil at Bombing Range	Subsurface Soil at Bombing Range	Surface Soil at Bombing Range	Subsurface Soil at Bombing Range	Caliche Soil	Soil From within Practice Bomb Casing
Inorganics (mg/kg)									
Aluminum	6610	6320	7660	7370	8580	6010	5560	—	4860
Antimony	0.53 U	0.53 U	0.53 U	0.48 U	0.72 U	0.50 U	0.41 U	—	0.48 U
Arsenic	**3.5**	**2.7**	**4.4**	**6.3**	**6.0**	**1.9**	**1.8**	—	**2.6**
Barium	**104**	**101**	**113**	**99.4**	**123**	**84.7**	**81.9**	—	**81.4**
Beryllium	0.05 U	0.02 U	0.11 BJK	0.15 BJK	0.16 BJK	0.61 U	0.51 U	—	0.52 U
Cadmium	0.53 U	0.54 U	0.53 U	0.55 U	0.53 U	0.61 U	0.51 U	—	0.52 U
Calcium	**16800 JK**	**6440 JK**	**21200 JK**	**12900 JK**	**10600 JK**	**3200 JK**	**2970 JK**	—	**9770 JK**
Chromium	**9.0**	**7.9**	**10.4**	**11.1**	**13.6**	**7.4**	**6.5**	—	**5.4**
Cobalt	**6.8**	**6.9**	**7.1**	**7.3**	**8.1**	**6.4**	**6.0**	—	**7.5**
Copper	**11.9 JK**	**11.9 JK**	**14.3 JK**	**17.4 JK**	**17.0 JK**	**11.6 JK**	**9.2 JK**	—	**13.4 JK**
Iron	**16300**	**16200**	**16500**	**16000**	**17800**	**16400**	**15800**	—	**20700**
Lead	**5.9**	**4.7**	**5.9**	**8.3**	**7.6**	**5.2**	**3.9**	—	**3.6**
Magnesium	**5480 JK**	**3780 JK**	**5650 JK**	**5920 JK**	**6380 JK**	**3310 JK**	**3040 JK**	—	**3800 JK**
Manganese	**303 JK**	**328 JK**	**328 JK**	**346 JK**	**378 JK**	**312 JK**	**296 JK**	—	**330 JK**
Mercury	0.11 U	0.11 U	0.02 BJK	0.11 U	0.11 U	0.12 U	0.10 U	—	0.10 U
Nickel	**10.1**	**9.5**	**11.4**	**12.4**	**14.4**	**8.3**	**7.8**	—	**7.5**
Potassium	**1500**	**1590**	**1760**	**1740**	**2000**	**1700**	**1460**	—	**815**
Selenium	3.7 UJK	3.8 UJK	3.7 UJK	3.8 UJK	3.7 UJK	4.2 UJK	3.6 UJK	—	3.6 UJK
Silver	**1.1**	**1.2**	1.0 BJK	**1.1**	**1.2**	**1.2 JK**	**1.2**	—	**1.4**
Sodium	159 BJK	142 BJK	142 BJK	133 BJK	176 BJK	133 BJK	116 U	—	229 BJK
Thallium	1.8 U	2.2 BJK	2.2 BJK	2.1 BJK	2.1 BJK	2.1 BJK	2.0 BJK	—	2.5 BJK
Vanadium	**33.5**	**34.6**	**34.6**	**29.8**	**33.3**	**36.8**	**36.8**	—	**42.3**
Zinc	**38.2 JK**	**33.7 JK**	**40.2 JK**	**41.1 JK**	**44.6 JK**	**39.6 JK**	**31.3 JK**	—	**34.5 JK**
Perchlorate Method 314.0 (mg/kg)									
Perchlorate	0.020 U	**0.83**	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Nitrate Base Explosive Compounds (mg/kg)									
1,3,5-Trinitrobenzene	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	—	0.20 U
1,3-Dinitrobenzene	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	—	0.20 U
2,4,6-Trinitrotoluene	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	—	0.20 U
2,4-Dinitrotoluene	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	—	0.20 U
2,6-Dinitrotoluene	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	—	0.20 U
2-Amino-4,6-Dinitrotoluene	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	—	0.20 U
2-Nitrotoluene	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	—	0.20 U
3-Nitrotoluene	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	—	0.20 U
4-Amino-2,6-Dinitrotoluene	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	—	0.20 U
4-Nitrotoluene	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	—	0.20 U
HMX	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	—	0.20 U
Nitrobenzene	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	—	0.20 U
RDX	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	—	0.20 U
Tetryl	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	—	0.20 U

Notes:
Bold type indicates the sample concantration above the Sample Quantitation Limit (SQL).
Bold Underline type indicates a sample concentration that is significant as defined in Section 5
mg/kg: milligram per kilogram

Data Qualifiers:
BJK: Analyte positively detected. Reported result lies between the MDL and SQL and reported as an estimated quantity. Unknown bias.
JK: The analyte was positively identified. The associated numerical value is an unknown low-bias estimate
JL: The analyte was positively identified. The associated numerical value is a low-bias estimate
U: The analyte was analyzed for but not detected. The associated numerical value is the sample quantitation limit.
UJK: The analyte was analyzed for but not detected. The associated numerical value is an unknown bias estimate.

Table 7-2—Groundwater Domestic Wells Analytical Results
Cold Springs PBR FUDS PA/SI
Umatilla County, Oregon

Description	Target				
Field Number	GW-DW001	GW-DW002	GW-DW003	GW-DW004	GW-DW005
EPA Number	04494264	04494265	04494269	04494270	04494275
CLP Number	MJ4A66	MJ4A67	MJ4A71	MJ4A72	MJ4A77
Location	Ramirez Well	Messenger Well	Stahl Hutterian Well	Hat Rock State Park	Schmittle Well
Inorganics (µg/L)					
Aluminum	200 U	200 U	200 U	200 U	200 U
Antimony	60.0 U	60.0 U	60.0 U	60.0 U	60.0 U
Arsenic	5.0 U	5.2 U	5.4 U	10.7 U	12.9 U
Barium	80.9 BJK	56.0 BJK	25.8 BJK	66.0 BJK	72.0 BJK
Beryllium	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Cadmium	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Calcium	**86200**	**38200**	**9360**	**77100**	**59600**
Chromium	10.0 U	10.0 U	10.0 U	0.99 BJK	10.0 U
Cobalt	50.0 U	50.0 U	50.0 U	50.0 U	50.0 U
Copper	25.0 U	4.4 BJK	25.0 U	9.1 BJK	7.3 BJK
Iron	**226**	100 U	100 U	**114**	100 U
Lead	10.0 U	10.0 U	10.0 U	3.3 U	10.0 U
Magnesium	**31300**	**13500**	3330 BJK	**23500**	**32300**
Manganese	**262**	0.31 U	**25.8**	0.23 U	**194**
Mercury	0.03 U	0.03 U	0.03 U	0.04 U	0.04 U
Nickel	40.0 U	40.0 U	40.0 U	40.0 U	1.8 U
Potassium	**14300**	**7060**	**16600**	**8260**	**5620**
Selenium	35.0 U	35.0 U	35.0 U	35.0 U	35.0 U
Silver	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Sodium	**42100**	**54300**	**79700**	**36500**	**33700**
Thallium	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U
Vanadium	50.0 U	41.5 BJK	39.4 BJK	21.1 BJK	34.6 BJK
Zinc	32.0 BJK	17.0 BJK	34.6 BJK	**541**	**101**
Perchlorate Method 314.0 (µg/L)					
Perchlorate	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perchlorate Method 8321A-mod (µg/L)					
Perchlorate	1.0 U	**0.25**	**0.30**	**1.2**	0.20 U
Nitrate Base Explosive Compounds (µg/L)					
1,3,5-Trinitrobenzene	0.48 U	0.48 U	0.48 U	0.48 U	0.52 U
1,3-Dinitrobenzene	0.48 U	0.48 U	0.48 U	0.48 U	0.52 U
2,4,6-Trinitrotoluene	0.48 U	0.48 U	0.48 U	0.48 U	0.52 U
2,4-Dinitrotoluene	0.48 U	0.48 U	0.48 U	0.48 U	0.52 U
2,6-Dinitrotoluene	0.48 U	0.48 U	0.48 U	0.48 U	0.52 U
2-Amino-4,6-Dinitrotoluene	0.48 U	0.48 U	0.48 U	0.48 U	0.52 U
2-Nitrotoluene	0.48 U	0.48 U	0.48 U	0.48 U	0.52 U
3-Nitrotoluene	0.48 U	0.48 U	0.48 U	0.48 U	0.52 U
4-Amino-2,6-Dinitrotoluene	0.48 U	0.48 U	0.48 U	0.48 U	0.52 U
4-Nitrotoluene	0.48 U	0.48 U	0.48 U	0.48 U	0.52 U
HMX	0.48 U	0.48 U	0.48 U	0.48 U	0.52 U
Nitrobenzene	0.48 U	0.48 U	0.48 U	0.48 U	0.52 U
RDX	0.48 U	0.48 U	0.48 U	0.48 U	0.52 U
Tetryl	0.48 U	0.48 U	0.48 U	0.48 U	0.52 U

Notes:
Bold type indicates the sample concentration above the Sample Quantitation Limit (SQL).
µg/L: micrograms per liter.

Data Qualifiers:
BJK: Analyte positively detected. Reported result lies between the MDL and SQL and reported as an estimated quantity. Unknown bias.
U: The analyte was analyzed for but not detected. The associated numerical value is the sample quantitation limit.

Table 7-3—Target Sediment Samples Analytical Results
Cold Springs PBR FUDS PA/SI
Umatilla County, Oregon

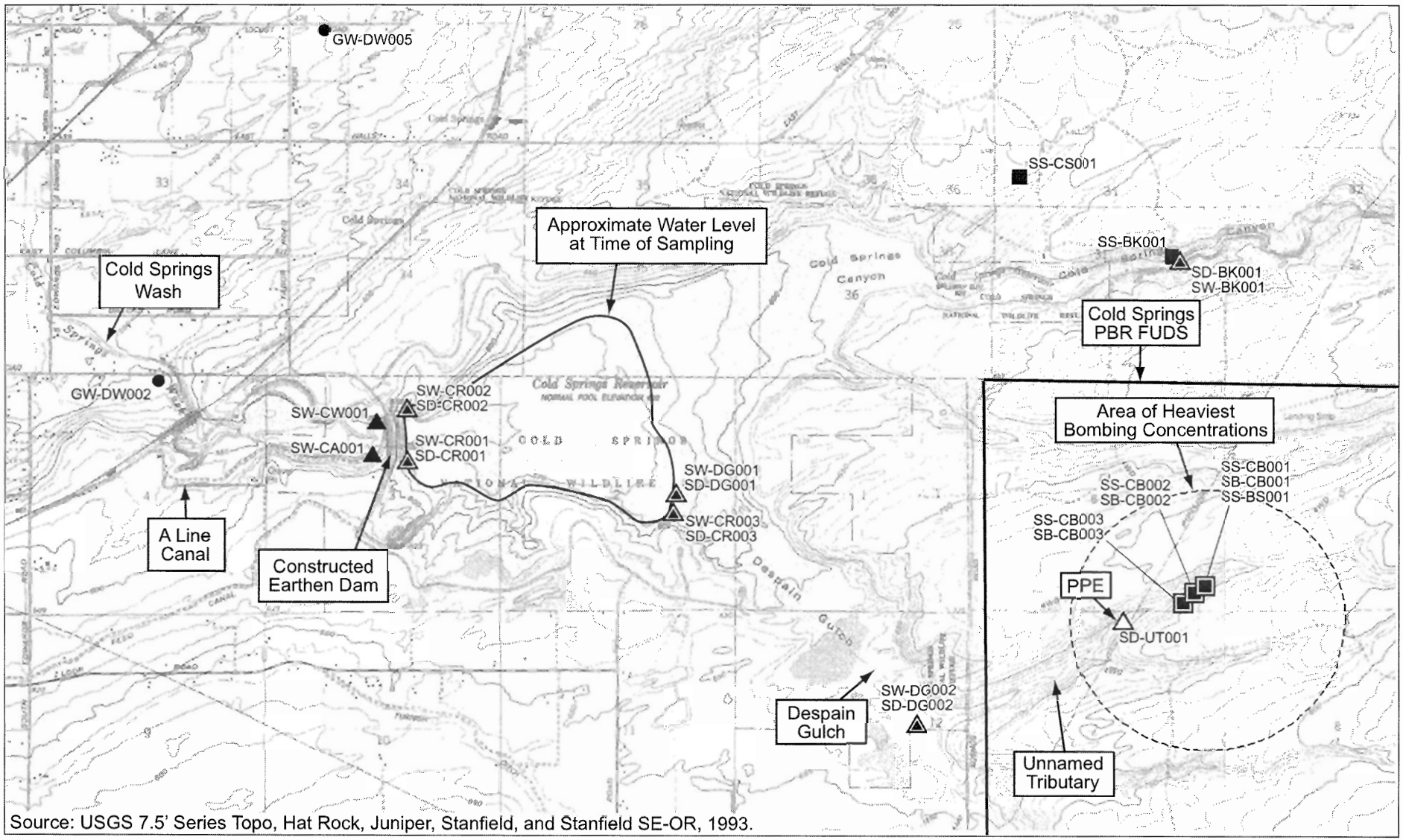
Description	Background	Targets					
Field Number	SD-BK001	SD-CR001	SD-CR002	SD-DG001	SD-CR003	SD-UT001	SD-DG002
EPA Number	04494267	04494261	04494263	04494272	04494274	04494276	04494278
CLP Number	M/J24A69	M/J24A63	M/J24A65	MJ24A74	MJ24A76	MJ24A78	MJ24A80
Location	Background Sediment	Southwest Corner of Cold Springs Reservoir	Northwest Corner of Cold Springs Reservoir	Sediment Sample at Despain Gulch and Cold Springs Reservoir Confluence	Cold Spring Reservoir South of the Confluence with Despain Gulch	Sediment Sample at the PPE in Unnamed Tributary	Despain Gulch Upstream of Confluence with Cold Springs Reservoir
Inorganics (mg/kg)							
Aluminum	**4030**	**8790**	**8530**	**4180**	**6450**	**8410**	**11400**
Antimony	0.65 U	0.71 U	0.61 U	0.62 U	0.73 U	0.86 U	0.68 U
Arsenic	**2.4**	**3.9**	**3.6**	**2.0**	**3.0**	**3.5**	**4.4**
Barium	**60.9**	**128**	**113**	**58.9**	**82.9**	**127**	**160**
Beryllium	0.72 U	0.11 BJK	0.07 U	0.67 U	0.75 U	0.07 U	0.20 BJK
Cadmium	0.72 U	0.72 U	0.67 U	0.67 U	0.75 U	0.70 U	0.79 U
Calcium	**5710 JL**	**3760 JL**	**3920 JL**	**3250 JL**	**4260 JL**	**12000 JL**	**5850 JL**
Chromium	**5.5**	**9.1**	**9.8**	**4.8**	**8.2**	**9.8**	**12.7**
Cobalt	6.1 BJK	**10.8**	**8.6**	4.9 BJK	**7.1 JK**	**8.3**	**8.8**
Copper	**7.1 JL**	**12.3 JL**	**14.0 JL**	**6.8 JL**	**9.0 JL**	**16.1 JL**	**20.5 JL**
Iron	**12900**	**21500**	**21100**	**14000**	**17300**	**20000**	**19800**
Lead	**2.8**	**7.2**	**6.5**	**2.9**	**4.1**	**6.7**	**7.6**
Magnesium	**2640 JL**	**3500 JL**	**4410 JL**	**2500 JL**	**4010 JL**	**5320 JL**	**4690 JL**
Manganese	**191 JL**	**674 JL**	**491 JL**	**216 JL**	**396 JL**	**316 JL**	**491 JL**
Mercury	0.14 U	0.02 BJK	0.02 BJK	0.13 U	0.15 U	0.14 U	0.02 BJK
Nickel	**5.6 JK**	**8.9**	**10.4**	**5.8**	**8.5**	**11.1**	**12.1**
Potassium	**994**	**1800**	**1800**	**944**	**1610**	**2470**	**3000**
Selenium	5.0 UJK	5.0 UJK	4.7 UJK	4.7 UJK	5.3 UJK	4.9 UJK	5.6 UJK
Silver	1.2 BJK	**1.6**	**1.7**	0.96 BJK	**1.3 JK**	**1.4**	**1.5 JK**
Sodium	310 BJK	200 BJK	216 BJK	246 BJK	237 BJK	**2010**	**620 JK**
Thallium	1.3 U	3.1 BJK	**2.7 JK**	1.7 U	2.1 BJK	2.3 BJK	2.5 BJK
Vanadium	**38.2**	**46.7**	**46.1**	**37.7**	**38.7**	**41.8**	**43.6**
Zinc	**28.9 JL**	**42.4 JL**	**43.8 JL**	**28.2 JL**	**35.9 JL**	**53.1 JL**	**46.9 JL**
Perchlorate Method 314.0 (mg/kg)							
Perchlorate	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Nitrate Base Explosive Compounds (mg/kg)							
1,3,5-Trinitrobenzene	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	—
1,3-Dinitrobenzene	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	—
2,4,6-Trinitrotoluene	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	—
2,4-Dinitrotoluene	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	—
2,6-Dinitrotoluene	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	—
2-Amino-4,6-Dinitrotoluene	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	—
2-Nitrotoluene	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	—
3-Nitrotoluene	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	—
4-Amino-2,6-Dinitrotoluene	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	—
4-Nitrotoluene	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	—
HMX	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	—
Nitrobenzene	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	—
RDX	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	—
Tetryl	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	—

Notes:
Bold type indicates the sample concentration above the detection limit
Bold underline type indicates a sample concentration that is significant as defined in Section 5
mg/kg: milligram per kilogram
— Constituent not analyzed

Data Qualifiers:
BJK: Analyte positively detected. Reported result lies between the MDL and SQL and reported as an estimated quantity. Unknown bias
JK: The analyte was positively identified. The associated numerical value is an unknown bias estimate
JL: The analyte was positively identified. The associated numerical value is a low-bias estimate
U: The analyte was analyzed for but not detected. The associated numerical value is the sample quantitation limi
UJK: The analyte was analyzed for but not detected. The associated numerical value is an unknown bias estimate

Table 7-4—Surface Water Sample Analytical Results
Cold Springs PBR FUDS PA/SI
Umatilla County, Oregon

Description	Background	Target						
Field Number	SW-BK001	SW-CA001	SW-CW001	SW-CR001	SW-CR002	SW-DG001	SW-CR003	SW-DG002
EPA Number	04494266	04494258	04494259	04494260	04494262	04494271	04494273	04494277
CLP Number	MJ4A68	MJ4A60	MJ4A61	MJ4A62	MJ4A64	MJ4A73	MJ4A75	MJ4A79
Location	Background Surface Water	Surface Water Sample at Line A Canal	Surface Water Sample at Line A Canal	Surface Water Sample at Cold Springs Reservoir on the Southwest Corner	Surface Water Sample at Cold Springs Reservoir on the Northwest Corner	Surface Water Sample at Despain Gulch and Cold Springs Reservoir Confluence	Surface Water Sample at Cold Spring Reservoir South of the Confluence with Despain Gulch	Surface Water Sample in Despain Gulch Upstream of Confluence with Cold Springs Reservoir
Inorganics (µg/L)								
Aluminum	200 U	278	200 U	865	872	2030	921	446
Antimony	60.0 U	60.0 U	60.0 U	60.0 U	60.0 U	60.0 U	60.0 U	60.0 U
Arsenic	14.5 U	14.0 U	**32.9**	10.0 U	10.0 U	10.4 U	4.2 U	6.8 U
Barium	200 BJK	44.0 BJK	53.1 BJK	75.6 BJK	78.8 BJK	181 BJK	86.7 BJK	114 BJK
Beryllium	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Cadmium	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Calcium	**89200**	**34700**	**50100**	**28500**	**28600**	**97900**	**37600**	**97900**
Chromium	10 BJK	10.0 U	10.0 U	10.0 U	0.55 BJK	1.1 BJK	10.0 U	10.0 U
Cobalt	50.0 U	50.0 U	50.0 U	50.0 U	50.0 U	1.4 U	50.0 U	50.0 U
Copper	25.0 U	2.0 BJK	25.0 U	1.6 BJK	1.6 BJK	4.4 BJK	1.5 BJK	1.5 BJK
Iron	100 U	**438**	**416**	**1240**	**1400**	**2830**	**1330**	**505**
Lead	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Magnesium	**56000**	**15600**	**20500**	**11700**	**11800**	**43800**	**17600**	**54800**
Manganese	4.5 U	**105**	**572**	**210**	**225**	**207**	**332**	**143**
Mercury	0.20 U	0.20 U	0.20 U	0.03 U	0.20 U	0.20 U	0.03 U	0.03 U
Nickel	40.0 U	40.0 U	40.0 U	1.4 U	40.0 U	2.3 U	40.0 U	40.0 U
Potassium	**13500**	4030 BJK	**7390**	3980 BJK	3980 BJK	**11200**	4730 BJK	**15400**
Selenium	35 BJK	35.0 U	35.0 U	35.0 U	35.0 U	35.0 U	35.0 U	4.6 BJK
Silver	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Sodium	**194000**	**40800**	**50800**	**32000**	**32000**	**213000**	**39500**	**225000**
Thallium	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U
Vanadium	**57.6**	39.2 BJK	35.6 BJK	4.1 BJK	4.8 BJK	39.8 BJK	5.1 BJK	31.9 BJK
Zinc	60 BJK	14.3 BJK	14.7 BJK	10.9 BJK	11.5 BJK	34.1 BJK	14.8 BJK	35.4 BJK
Perchlorate Method 314.0 (µg/L)								
Perchlorate	**7.68**	2.0 U	2.0 U	2.0 U	8 U	**12.0**	2.0 U	**3.63 J**
Perchlorate Method 8321A-mod (ug/L)								
Perchlorate	**7.6**	**0.39**	0.17 QJK	0.058 QJK	0.049 QJK	**1.1**	0.035 QJK	**3.7**
Nitrate Base Explosive Compounds (mg/L)								
1,3,5-Trinitrobenzene	0.51 U	0.62 U	0.49 U	0.52 U	0.54 U	0.64 U	0.49 U	0.49 U
1,3-Dinitrobenzene	0.51 U	0.62 U	0.49 U	0.52 U	0.54 U	0.64 U	0.49 U	0.49 U
2,4,6-Trinitrotoluene	0.51 U	0.62 U	0.49 U	0.52 U	0.54 U	0.64 U	0.49 U	0.49 U
2,4-Dinitrotoluene	0.51 U	0.62 U	0.49 U	0.52 U	0.54 U	0.64 U	0.49 U	0.49 U
2,6-Dinitrotoluene	0.51 U	0.62 U	0.49 U	0.52 U	0.54 U	0.64 U	0.49 U	0.49 U
2-Amino-4,6-Dinitrotoluene	0.51 U	0.62 U	0.49 U	0.52 U	0.54 U	0.64 U	0.49 U	0.49 U
2-Nitrotoluene	0.51 U	0.62 U	0.49 U	0.52 U	0.54 U	0.64 U	0.49 U	0.49 U
3-Nitrotoluene	0.51 U	0.62 U	0.49 U	0.52 U	0.54 U	0.64 U	0.49 U	0.49 U
4-Amino-2,6-Dinitrotoluene	0.51 U	0.62 U	0.49 U	0.52 U	0.54 U	0.64 U	0.49 U	0.49 U
4-Nitrotoluene	0.51 U	0.62 U	0.49 U	0.52 U	0.54 U	0.64 U	0.49 U	0.49 U
HMX	0.51 U	0.62 U	0.49 U	0.52 U	0.54 U	0.64 U	0.49 U	0.49 U
Nitrobenzene	0.51 U	0.62 U	0.49 U	0.52 U	0.54 U	0.64 U	0.49 U	0.49 U
RDX	0.51 U	0.62 U	0.49 U	0.52 U	0.54 U	0.64 U	0.49 U	0.49 U
Tetryl	0.51 U	0.62 U	0.49 U	0.52 U	0.54 U	0.64 U	0.49 U	0.49 U



Source: USGS 7.5' Series Topo, Hat Rock, Juniper, Stanfield, and Stanfield SE-OR, 1993.

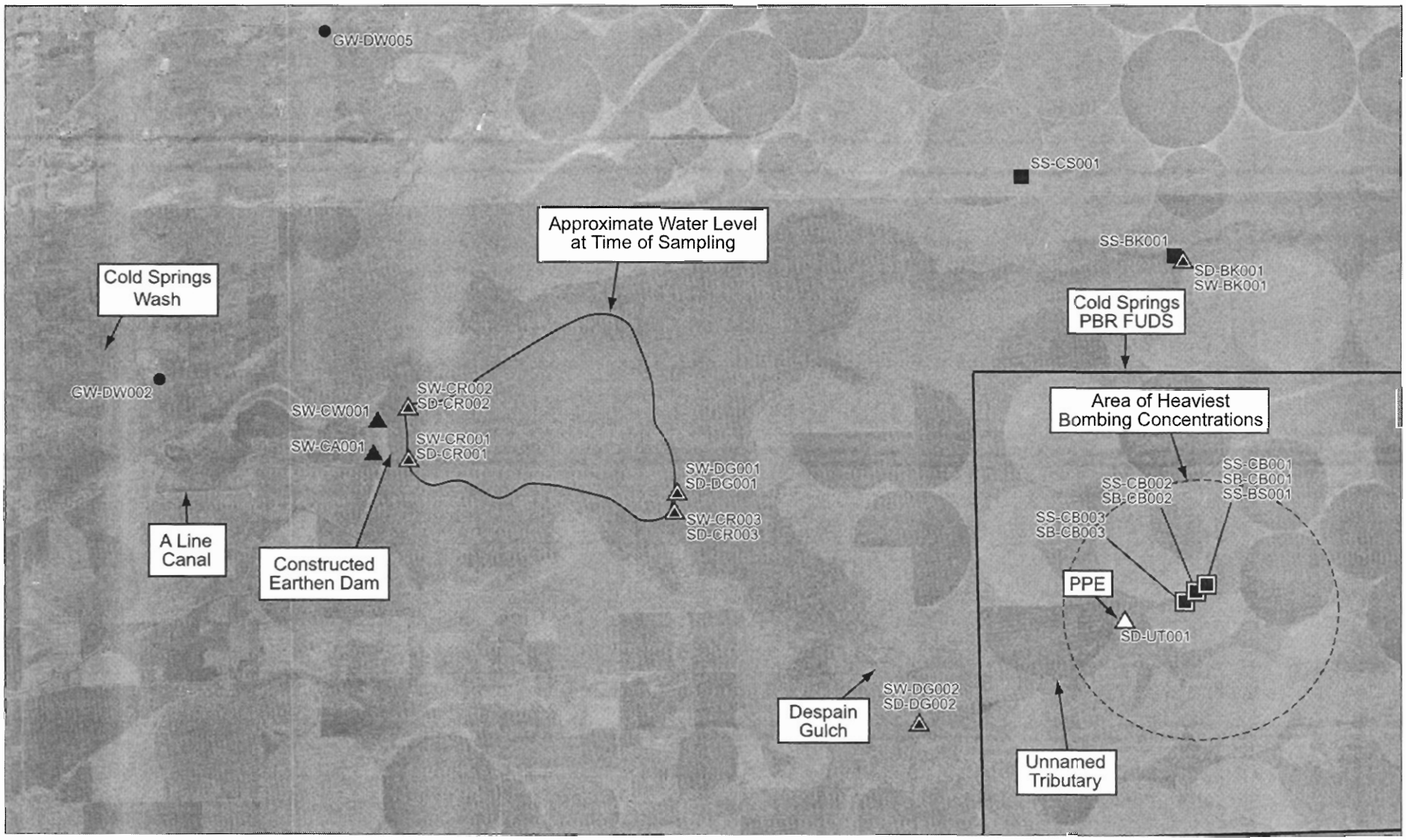
0 1500 3000
Scale in Feet

GW-DW005 ● Groundwater Sample Location
SD-CR001 △ Sediment Sample Location
SW-CA001 ▲ Surface Water Sample Location
SS-CB003 ■ Soil Sample Location
SB-CB003 □ Subsurface Soil Sample Location

Sample Location Map Detail
Cold Springs Precision Bombing Range FUDS PA/SI
Umatilla County, OR

Figure
3-2

05-0068 Fig3-2.ai



0 1500 3000

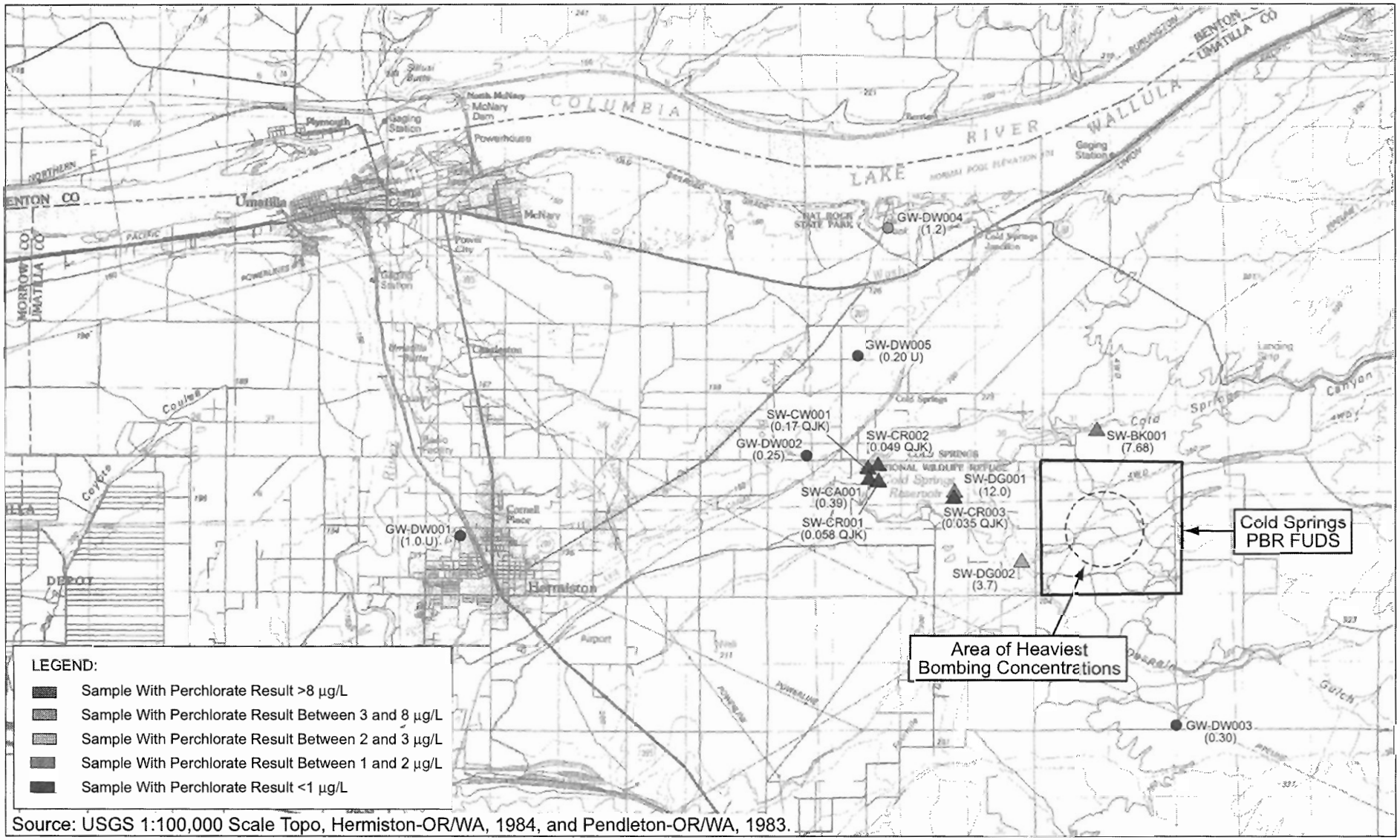
Scale in Feet

GW-DW005 ● Groundwater Sample Location
SD-CR001 △ Sediment Sample Location
SW-CA001 ▲ Surface Water Sample Location
SS-CB003 ■ Soil Sample Location
SB-CB003 □ Subsurface Soil Sample Location

Sample Location Map Detail with Aerial Photo
Cold Springs Precision Bombing Range FUDS PA/SI
Umatilla County, OR

Figure
3-3

05-0068 Fig3-3.ai



Source: USGS 1:100,000 Scale Topo, Hermiston-OR/WA, 1984, and Pendleton-OR/WA, 1983.

Cold Spring PBR FUDS PA/SI Perchlorate Results—December 2004

Cold Springs Precision Bombing Range FUDS PA/SI

Umatilla County, OR

N

0 1 2

Scale in Miles

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GW-DW001	Station ID
(1.5)	Perchlorate Concentration (µg/L)
○	Groundwater Sample Location
△	Surface Water Sample Location

Figure

7-1

05-0068 Fig7-1.ai