

US Army Corps of Engineers ® Omaha District

# FINAL SITE INSPECTION REPORT Baxter Outlying Field Franklin County, Washington FUDS Property No. F10WA0616

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

Contract No. W912DY-04-D-0010 Delivery Order No. 003

September 2011

The views, opinions, and/or findings contained in this report are those of the author(s) and should not be construed as official Department of the Army position, policy, or decision, unless so designated by other documentation.



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#### **Baxter Outlying Field**

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Formerly Used Defense Sites Military Munitions Response Program

September 2011

Submitted to:

U.S. Department of the Army U.S. Army Corps of Engineers, Omaha District

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# List of Acronyms and Abbreviations

°F	degrees Fahrenheit
ASTM	ASTM International
bgs	below ground surface
CBGWMA	Columbia Basin Ground Water Management Area
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CSM	conceptual site model
DAHP	Department of Archaeology & Historic Preservation
DERP	Defense Environmental Restoration Program
DMM	discarded military munitions
DoD	Department of Defense
DOE	U.S. Department of Energy
DQO	data quality objective
EDR	Environmental Data Resources. Inc.
EOD	Explosive Ordnance Disposal
EPA	U.S. Environmental Protection Agency
ER	Engineer Regulation
FR	Federal Register
ft	foot or feet
FUDS	Formerly Used Defense Site(s)
GPS	Global Positioning System
HRS	Hazard Ranking System
HTRW	hazardous, toxic, or radioactive wastes
IATCB	Interdepartmental Air Traffic Control Board
IEP	Important Ecological Place
INPR	Inventory Project Report
MC	munitions constituents
MD	munitions debris
MEC	munitions and explosives of concern
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MMRP	Military Munitions Response Program
MRA	Munitions Response Area
MRS	Munitions Response Site
MRSPP	Munitions Response Site Prioritization Protocol
NAD	North American Datum
NAS	Naval Air Station
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NDAI	No Department of Defense Action Indicated
NWO	Northwestern Division Omaha District
OLF	Outlying Field
PA	Preliminary Assessment
QC	quality control

# List of Acronyms and Abbreviations (Cont.)\_\_\_\_\_

Risk Assessment Code
remedial investigation/feasibility study
right-of-entry
Superfund Amendments and Reauthorization Act
Shaw Environmental, Inc.
Site Inspection
Screening-Level Ecological Risk Assessment
Standard Operating Procedure
Site-Specific Work Plan
Technical Project Planning
U.S. Army Corps of Engineers
U.S. Bureau of Reclamation
United States Code
U.S. Fish and Wildlife Service
Universal Transverse Mercator
unexploded ordnance
Washington Department of Fish and Wildlife
Washington Department of Ecology
Washington National Heritage Program
Final Type I Work Plan, Site Inspections at Multiple Sites, NWO Region
World War II

# Glossary of Terms

Comprehensive Environmental Response, Compensation, and Liability Act of 1980

(CERCLA) – Also known as "Superfund," this congressionally enacted legislation provides the methodology for the removal of hazardous substances resultant from past / former operations. Response actions must be performed in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (USACE, 2003). CERCLA was codified as 42 USC 9601 et seq., on December 11, 1980, and amended by the Superfund Amendments and Reauthorization Act (SARA) on October 17, 1986.

**Defense Sites** – Locations that are or were owned by, leased to, or otherwise possessed or used by the Department of Defense (DoD). The term does not include any operational range, operating storage, or manufacturing facility, or facility that is used for or was permitted for the treatment or disposal of military munitions (10 USC 2710(e)(1)).

**Discarded Military Munitions (DMM)** – Military munitions that have been abandoned without proper disposal or removed from storage in a military magazine or other storage area for the purpose of disposal. The term does not include unexploded ordnance, military munitions that are being held for future use or planned disposal, or military munitions that have been properly disposed consistent with applicable environmental laws and regulations (10 USC 2710(e)(2)).

**Explosive Ordnance Disposal (EOD)** – The detection, identification, on-site evaluation, rendering safe, recovery, and final disposal of unexploded ordnance and of other munitions that have become an imposing danger, for example, by damage or deterioration (10 USC 2710(e)(2)).

**Formerly Used Defense Site (FUDS)** – Real property that was formerly owned by, leased by, possessed by, or otherwise under the jurisdiction of the Secretary of Defense or the components, including organizations that predate DoD. Some FUDS properties include areas formerly used as military ranges (10 USC 2710(e)(2)).

**Military Munitions** – Ammunition products and components produced for or used by the armed forces for national defense and security, including ammunition products or components under the control of the DoD, the U.S. Coast Guard, the U.S. Department of Energy, and the National Guard. The term includes confined gaseous, liquid, and solid propellants, explosives, pyrotechnics, chemical and riot control agents, smokes, and incendiaries, including bulk explosives, and chemical warfare agents, chemical munitions, rockets, guided and ballistic missiles, bombs, warheads, mortar rounds, artillery ammunitions, small arms ammunition, grenades, mines, torpedoes, depth charges, cluster munitions and dispensers, demolition charges, and devices and components of the above.

The term does not include wholly inert items, improvised explosive devices, and nuclear weapons, nuclear devices, and nuclear components, other than non-nuclear components of

nuclear devices that are managed under the nuclear weapons program of the Department of Energy after all required sanitization operations under the Atomic Energy Act of 1954 (42 USC 2011 et seq.) have been completed (10 USC 101(e)(4)(A) through (C)).

**Munitions Constituents (MC)** – Any materials originating from unexploded ordnance (UXO), discarded military munitions (DMM), or other military munitions, including explosive and non-explosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions (10 USC 2710(e)(3)).

**Munitions Debris (MD)** – Remnants of munitions (e.g., fragments, penetrators, projectiles, shell casings, links, fins) remaining after munitions use, demilitarization, or disposal (10 USC 2710(e)(2)).

**Munitions and Explosives of Concern (MEC)** – This term, which distinguishes specific categories of military munitions that may pose unique explosives safety risks means: (A) Unexploded ordnance (UXO), as defined in 10 USC 101(e)(5); (B) Discarded military munitions (DMM), as defined in 10 USC 2710(e)(2); or (C) Munitions constituents (e.g., TNT, RDX), as defined in 10 USC 2710(e)(3), present in high enough concentrations to pose an explosive hazard (10 USC 2710(e)(2)).

**Munitions Response Area (MRA)** – Any area on a defense site that is known or suspected to contain UXO, DMM, or MC. Examples are former ranges and munitions burial areas. An MRA comprises one or more munitions response sites (32 CFR§179.3).

**Munitions Response Site (MRS)** – A discrete location within an MRA that is known to require a munitions response (32 CFR§179.3).

**Munitions Response Site Prioritization Protocol (MRSPP)** – The MRSPP was published as a rule on October 5, 2005. This rule implements the requirement established in section 311(b) of the National Defense Authorization Act for Fiscal Year 2002 for the Department of Defense (DoD) to assign a relative priority for munitions responses to each location in the DoD's inventory of defense sites known or suspected of containing unexploded ordnance (UXO), discarded military munitions (DMM), or munitions constituents (MC). The DoD adopted the MRSPP under the authority of 10 USC 2710(b). Provisions of 10 USC 2710(b) require that the Department assign to each defense site in the inventory required by 10 USC 2710(a) a relative priority for response activities based on the overall conditions at each location and taking into consideration various factors related to safety and environmental hazards (70 FR 58016).

**Range** – A designated land or water area that is set aside, managed, and used for range activities of the Department of Defense. The term includes firing lines and positions, maneuver areas, firing lanes, test pads, detonation pads, impact areas, electronic scoring sites, buffer zones with restricted access, and exclusionary areas. The term also includes airspace areas designated for

military use in accordance with regulations and procedures prescribed by the Administrator of the Federal Aviation Administration (10 USC 101(e)(1)(A) and (B)).

**Range Activities** – Research, development, testing, and evaluation of military munitions, other ordnance, and weapons systems; and the training of members of the armed forces in the use and handling of military munitions, other ordnance, and weapons systems (10 USC 101(e)(2)(A) and (B)).

**Risk Assessment Code (RAC)** – An interim risk assessment procedure developed by the U.S. Army Engineering and Support Center, Huntsville (USAESCH), Ordnance and Explosives Directorate (CEHNC-OE) to address explosives safety hazards related to munitions. The RAC score was formerly used by the USACE to prioritize response actions at FUDS. The RAC procedure, which does not address environmental hazards associated with munitions constituents, has been superseded by the MRSPP.

**Unexploded Ordnance (UXO)** – Military munitions that (A) have been primed, fuzed, armed, or otherwise prepared for action; (B) have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material; and (C) remain unexploded either by malfunction, design, or any other cause (10 USC 101(e)(5)(A) through (C)).

# 1 Executive Summary

2 The Department of Defense (DoD) has established the Military Munitions Response Program

3 (MMRP) under the Defense Environmental Restoration Program to address DoD sites suspected

4 of containing munitions and explosives of concern (MEC) or munitions constituents (MC).

5 Under the MMRP, the U.S. Army Corps of Engineers (USACE) is conducting environmental

6 response activities at Formerly Used Defense Sites (FUDS) for the Army, DoD's Executive

7 Agent for the FUDS program. Shaw Environmental, Inc. (Shaw) is responsible for conducting

8 Site Inspections (SIs) at FUDS in the northwest region managed by the Omaha District Military

9 Munitions Design Center.

#### 10 SI Objectives and Scope

11 The primary objective of the MMRP SI is to determine whether a FUDS project warrants further

- 12 response action under the Comprehensive Environmental Response, Compensation, and Liability
- 13 Act (CERCLA). The SI collects the minimum amount of information necessary to make this
- 14 determination, as well as it (i) determines the potential need for a removal action; (ii) collects or
- 15 develops additional data, as appropriate, for Hazard Ranking System (HRS) scoring by the U.S.
- 16 Environmental Protection Agency (EPA); and (iii) collects data, as appropriate, to characterize
- 17 the release for effective and rapid initiation of the Remedial Investigation and Feasibility Study.
- 18 An additional objective of the MMRP SI is to collect the additional data necessary to complete
- 19 the Munitions Response Site Prioritization Protocol (MRSPP).
- 20 The scope of the SI reported herein is restricted to evaluation of the presence of MEC or MC
- 21 related to historical use of the FUDS prior to transfer. Potential releases of hazardous, toxic, or
- 22 radioactive wastes are not addressed within the current scope. The intent of the SI is to confirm
- 23 the presence or absence of MEC and/or associated MC.

#### 24 Baxter Outlying Field

- 25 This report presents the results of an SI conducted at Baxter Outlying Field (OLF), FUDS
- 26 Property Number F10WA0616, located in Franklin County, Washington, approximately 10 miles
- 27 north of Richland and 13 miles northwest of Pasco, Washington. The FUDS consists of
- 28 372.34 acres located in Township 11 North, Range 29 East, Section 30. The Baxter OLF was
- 29 used between 1943 and 1945.

#### 30 <u>Technical Project Planning</u>

- 31 The approach for the SI was developed by Shaw in consultation with site stakeholders. A
- 32 Technical Project Planning meeting conducted in April 2010 was attended by representatives
- 33 from the USACE Omaha Design Center, the USACE Seattle and Kansas City Districts, the
- 34 Washington Department of Ecology, U.S. Bureau of Reclamation, and Shaw. The stakeholders
- 35 agreed to the approach and identified one munitions response site (MRS), the Bombing Range.

#### 36 *SI Field Activities*

- 37 SI field activities, conducted in January 2011, included a site reconnaissance to look for evidence
- 38 of MEC and to avoid MEC during sampling. Samples were collected from surface soil.

#### 39 SI Recommendations

- 40 Based on historical and physical evidence, MEC is potentially present at the Bombing Range
- 41 MRS. Soil results from 2011 SI field activities indicate that lead and zinc are present at
- 42 concentrations exceeding background and are not attributable to natural processes. Physical
- 43 evidence from the Preliminary Assessment indicates that munitions used at the MRS are a
- 44 potential source of MC metals. The soil pathway is considered to be complete, although human
- 45 health screening levels were not exceeded, and an expanded Screening-Level Ecological Risk
- 46 Assessment concluded that adverse ecological impacts are not expected in soil. The surface
- 47 water/sediment pathway could not be directly evaluated during the SI and is considered to be
- 48 potentially complete based on elevated concentrations of metals in surface soil. In accordance
- 49 with the decision rules established for this SI and because the surface water/sediment pathway
- 50 could not be directly evaluated, a recommendation for additional investigation is made with
- 51 respect to MEC and MC for the Bombing Range MRS. Consideration of a removal action is not
- 52 warranted because an imminent threat to human health, safety, or the environment has not been
- 53 identified.
- 54 The location of the Bombing Range, as documented in the MRS Inventory (DoD, 2010), should
- be revised, so that the location of the center of the revised MRS location conforms with the
- 56 assumed target center at the center of the airfield.

## 57 1.0 Introduction

- 58 This Site Inspection (SI) Report presents the results of an SI conducted at the Baxter Outlying
- 59 Field (OLF) Formerly Used Defense Site (FUDS) located near Pasco, Washington. Shaw
- 60 Environmental, Inc. (Shaw) has prepared this report for the U.S. Army Corps of Engineers
- 61 (USACE) in accordance with Task Order 003, issued under USACE Contract
- 62 No. W912DY-04-D-0010. Shaw is responsible for conducting SIs at FUDS in the northwest
- 63 region managed by the USACE Northwestern Division Omaha District (NWO) Military
- 64 Munitions Design Center as directed by the Performance Work Statement (Appendix A).
- 65 The technical approach is based on the *Final Type I Work Plan, Site Inspections at Multiple*
- 66 Sites, NWO Region (Work Plan) (Shaw, 2006) and the Formerly Used Defense Sites, Military
- 67 Munitions Response Program, Site Inspections, Program Management Plan (USACE, 2005).

#### 68 1.1 Project Authorization

- 69 The Department of Defense (DoD) has established the Military Munitions Response Program
- 70 (MMRP) to address DoD sites suspected of containing munitions and explosives of concern
- 71 (MEC) or munitions constituents (MC). Under the MMRP, the USACE is conducting
- 72 environmental response activities at FUDS for the Army, DoD's Executive Agent for the FUDS
- 73 program.
- 74 Pursuant to USACE's Engineer Regulation (ER) 200-3-1 (USACE, 2004a) and the *Management*
- 75 *Guidance for the Defense Environmental Restoration Program* (DERP) (Office of the Deputy
- 76 Under Secretary of Defense [Installations and Environment], September 2001), USACE is
- conducting FUDS response activities in accordance with the DERP statute (10 USC 2701 et
- seq.), the Comprehensive Environmental Response, Compensation, and Liability Act of 1980
- 79 (CERCLA) (42 USC 9601), Executive Orders 12580 and 13016, and the National Oil and
- 80 Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR Part 300). As such, USACE
- 81 is conducting remedial SIs, as set forth in the NCP, to evaluate hazardous substance releases or
- 82 threatened releases from eligible FUDS.
- 83 While not all MEC/MC constitute CERCLA hazardous substances, pollutants, or contaminants,
- 84 the DERP statute provides DoD the authority to respond to releases of MEC/MC, and DoD
- 85 policy states that such responses shall be conducted in accordance with CERCLA and the NCP.

#### 86 1.2 Site Name and Location

- 87 The Baxter OLF, FUDS Property Number F10WA0616, is located in Franklin County,
- 88 Washington, approximately 10 miles north of Richland and 13 miles northwest of Pasco,
- 89 Washington (Figure 1-1). The FUDS consists of 372.34 acres located in Township 11 North,
- 90 Range 29 East, Section 30.

- 91 Baxter OLF is included in the MRS Inventory in the *Defense Environmental Programs Annual*
- 92 Report to Congress Fiscal Year 2010 (DoD, 2010) under Federal Facility Identification Number
- 93 WA09799FA22900, with the following information:

Site ID	MRSPP Score	Nearest City	Ownership Interest	Range Total Area (acres)	Land Use Restrictions	Land Use Access Controls
01OEW	Evaluation Pending	Pasco	No Data Available	649	Unrestricted public access	No Controls

94 Range areas and coordinates are listed in the *ASR Supplement* (USACE, 2008) as follows:

Range Name	Range Identification	Approximate Area (acres)	UTM Coordinates (meters)*
Bombing Range	F10WA061601R01	649	N 5146653.7 E 789576.4

95 \* Coordinates for the ranges are in Universal Transverse Mercator (UTM) Zone 10N, North American

97 For purposes of the SI, the Bombing Range MRS is identified, consistent with the physical

98 location, acreage, and latitude and longitude of the Bombing Range as indicated in the MRS

99 Inventory and ASR Supplement. The UTM coordinates listed in the ASR Supplement (USACE,

100 2008) as shown above, indicate that the Baxter OLF lies within UTM Zone 10N, which is not

101 correct. UTM Zone 10N lies between longitude 120 degrees west and 126 degrees west. The

102 longitude for Baxter OLF is 119 degrees west, which is within UTM Zone 11N. Therefore,

103 using UTM Zone 11N, the UTM coordinates have been recalculated as being North 5142183

104 meters and East 328540 meters.

# 105 *1.3 Purpose, Scope, and Objectives of the Site Inspection*

106 The primary objective of the MMRP SI is to determine whether a FUDS project warrants further 107 response action under CERCLA or not. The SI collects the minimum amount of information

108 necessary to make this determination, as well as it (i) determines the potential need for a removal

109 action; (ii) collects or develops additional data, as appropriate, for Hazard Ranking System

110 (HRS) scoring by the U.S. Environmental Protection Agency (EPA); and (iii) collects data, as

appropriate, to characterize the release for effective and rapid initiation of the Remedial

112 Investigation and Feasibility Study (RI/FS). An additional objective of the MMRP SI is to

113 collect the additional data necessary to complete the Munitions Response Site Prioritization

- 114 Protocol (MRSPP).
- 115 The scope of the SI reported herein is restricted to evaluation of the presence of MEC or MC
- related to historical use of the FUDS prior to transfer. Potential releases of hazardous, toxic, or
- 117 radioactive wastes (HTRW) are not addressed within the current scope. The intent of the SI is to
- 118 confirm the presence or absence of contamination from MEC and/or MC. The general approach

<sup>96</sup> Datum (NAD) 83.

119 for each SI is to conduct records review and site reconnaissance to evaluate the presence or 120 absence of MEC, and to collect samples at locations where MC might be expected based on the 121 conceptual site model (CSM). The following decision rules are used to evaluate the results of 122 the SI: 123 Is No DoD Action Indicated (NDAI)? An NDAI recommendation may be made if: 124 There is no indication of MEC; and 125 • MC contamination does not exceed screening levels determined from Technical 126 Project Planning (TPP). 127 Is an RI/FS warranted? An RI/FS may be recommended if: 128 There is evidence of MEC hazard. MEC hazard may be indicated by direct • 129 observation of MEC during the SI, by indirect evidence (e.g., a crater potentially 130 caused by impact of unexploded ordnance [UXO]), or by a report of MEC being found in the past without record that the area was subsequently cleared; or 131 132 MC contamination exceeds screening levels determined from TPP. • 133 Is a removal action warranted? A removal action may be needed if: 134 High MEC hazard is identified. Shaw will immediately report any MEC findings • 135 so that USACE can determine the hazard in accordance with the MRSPP. An example of a high hazard would be finding sensitive MEC at the surface in a 136 137 populated area with no barriers to restrict access; or 138 • Elevated MC risk is identified. Identification of an imminent threat to human 139 health, safety, or the environment (e.g., confirming MC concentrations above 140 health-based risk standards in a well used as a source of drinking water) would 141 trigger notification of affected stakeholders. Data would be presented at a second TPP meeting regarding the possible need for a removal action. 142 143 For purposes of applying these decision rules, USACE has provided guidance that evidence of 144 MEC will generally be a basis of recommending RI/FS. Evidence of MEC may include 145 confirmed presence of MEC from historical sources or SI field work, or presence of munitions debris (MD). 146 147 1.4 *Munitions Response Site Prioritization Protocol* The MRSPP was published as a rule on October 5, 2005 (70 FR 58028). This rule implements 148

the requirement established in section 311(b) of the National Defense Authorization Act for

150 Fiscal Year 2002 for the DoD to assign a relative priority for munitions responses to each

151 location in the DoD's inventory of defense sites known or suspected of containing UXO,

152 discarded military munitions, or MC (70 FR 58016).

153 This report includes draft MRSPP scoring sheets for the munitions response sites identified in

154 this SI Report (Appendix K). The MRSPP scoring will remain draft after this SI Report is

- 155 finalized, pending Army MRSPP Quality Assurance Panel review. The scoring will be reviewed
- 156 on an annual basis and reapplied as necessary to incorporate new information.

# 157 2.0 Property Description and History

- 158 Unless otherwise referenced, the following historical and physical setting information in
- 159 Sections 2.1 and 2.2 is taken from the *Inventory Project Report* (INPR) (USACE, 2004b), the
- 160 Preliminary Assessment (PA) Report (USACE, 2006a), and the ASR Supplement (USACE,
- 161 2008).

#### 162 2.1 Historical Military Use

- 163 The following provides a property description and discusses the history of Baxter OLF.
- 164 Figures 1-2 and 2-1 show Baxter OLF on historical (1948) and recent (2006) aerial photographs.

165 The 1948 aerial photograph shows the landing strip configuration. The 2006 aerial photograph

- 166 shows no indication of the former landing strips or military usage. The area is used for
- 167 agricultural production and residences.
- 168 Baxter OLF, also known as Baxter Auxiliary Field and Outlying Field 7, was one of
- 169 22 properties in the Tri-Cities (Richland, Kennewick, and Pasco), Washington area that were
- 170 leased or otherwise acquired for Navy use during World War II (WWII) as outlying fields for
- 171 pilot training associated with Naval Reserve Air Base Pasco. Naval Reserve Air Base Pasco was
- 172 originally commissioned on July 31, 1942, as an initial flight training school for Navy cadets.
- 173 The Naval Reserve Air Base Pasco had 304 planes used for primary training, including
- 174 243 Kaydets, 10 N3N Yellow Perils, 10 N2T Timms, 3 SOC Seagulls, 7 NSJ Texans,
- 175 1 J2F-3 Duck, and 30 other unidentified planes. Cadets arrived in groups of 25 to 200 per
- 176 month, and the base graduated between 19 and 269 students each month. Primary training
- 177 consisted of 84 hours of training, and a pilot had to fly solo within 12 hours or be dropped from
- training. During its use as a flight training school, 1,878 pilots successfully completed their
- training at Naval Reserve Air Base Pasco and were then stationed at Corpus Christi, Texas, for
- 180 intermediate training (Oberst, no date; Colletta, 1985; and Naval Air Station [NAS], Pasco,
- 181 1945a).
- 182 Because of the buildup from the war, the Navy expanded operations at Naval Reserve Air Base
- 183 Pasco and established the NAS Pasco on January 1, 1943, which later became an operations base
- 184 for fleet aircraft and personnel on December 11, 1943. The NAS Pasco also housed an aircraft
- 185 overhaul and repair department. Following the designation as an operations base, some of the
- 186 outlying fields, including Baxter OLF, were converted to bombing ranges. As a base for fleet
- 187 squadrons, NAS Pasco staged advanced training in dive bombing, aerial gunnery, rocket firing,
- 188 and tactical operations, with as many as 269 aircraft stationed at the field (USACE, 2006a).
- 189 The Interdepartmental Air Traffic Control Board (IATCB) approved the landing field for Baxter
- 190 OLF in August 1943, located at 46 degrees 25 minutes 00 seconds north and 119 degrees
- 191 14 minutes 00 seconds west (Figure 1-2) (IATCB, 1943). The landing field consisted of four

- 192 landing strips set in the form of an asterisk. An undated data sheet detailing the characteristics of
- 193 the NAS Pasco OLFs indicates that the surface improvements at Baxter OLF consisted of a
- 194 "1500' circle with four 500' extensions," that was graded and surfaced with soil oil (NAS Pasco,
- 195 undated-a). Analysis of aerial photographs of the Baxter OLF provided in the PA Report
- 196 (USACE, 2006a) dated 1943 and 1948 indicated that each of the landing strips was
- 197 approximately 1,500 feet (ft) long. The 1943 aerial photograph showed a small circle
- approximately 150 ft in diameter on each leg of the landing strips. The photographic
- 199 interpretation of the circles was that they were "possibly aiming targets for bombing activities."
- 200 In May 1944, the IATCB changed the designation of the Baxter OLF to a "caution area" for a
- 201 Dive and Low-level bombing target (IATCB, 1944). The "caution area" consisted of a 3-mile
- circle centered at 46 degrees 25 minutes 05 seconds north and 119 degrees 14 minutes
- 203 10 seconds west (Figure 1-2). The completion date of the target is not known, but NAS Pasco
- 204 reported that three bomb targets at other outlying fields were completed in March 1944 (NAS
- 205 Pasco, 1944). Also, an undated activity list for NAS Pasco OLFs indicates that Baxter OLF was
- 206 used for the purpose of "Glide & Dive Bombing" (NAS Pasco, undated-b).
- 207 In May 1945, NAS Pasco issued a warning to military personnel and civilians living in the area
- to avoid the former auxiliary fields as the fields were being used as bombing ranges. The
- 209 presence of unexploded practice bombs presented a hazard if disturbed (*The Sky Writer*, 1945).
- 210 Baxter OLF was the scene of a fatal accident in July 1945. A FM-2 bomber lost a wing and
- 211 crashed during a glide bombing run (NAS Pasco, 1945b).
- After the war, the Navy evaluated the effects of military operations on the outlying fields. The
- results of the evaluation indicated that the 17 outlying fields contained "numerous tins from duds
- and shell cases" (Headquarters, Thirteenth Naval District, 1946).
- Following the end of WWII, activities at NAS Pasco ended. On June 1, 1946, NAS Pasco was placed in "caretaker" status and "inactive" status one month later (USACE, 2006a).

#### 217 2.2 Munitions Information

- 218 Potential munitions used at the range include miniature practice bombs AN-Mk 5 Mod 1,
- AN-Mk 23, AN-Mk 43, and Mk 19 Mod 1 (Table 2-1). The AN-Mk 5 Mod 1 weighed 2 pounds
- 11 ounces and was made of a zinc alloy. The AN-Mk 23 weighed 3 pounds and was made of
- cast iron. The AN-Mk 43 weighed 4 pounds 7 ounces and was made from a lead-antimony
- alloy. These three miniature practice bombs were 8.25 inches long and 2.18 inches in diameter.
- The Mk 19 Mod 1 weighed 13.2 pounds, was 13 inches long, and was made from lead-antimony
- alloy with steel fins.
- 225 These munitions were of solid construction with an axial cavity extending the length of the bomb
- to house a signal cartridge. Typically these miniature practice bombs used the Mk 4 series of

- signal cartridges. See Table 2-1 for munitions information. The signal contained a black powder
- 228 or smokeless powder expelling charge and a red phosphorous pyrotechnic mixture.
- 229 Miniature practice bombs have been reported by property owners, and MD from a miniature
- 230 practice bomb Mk 19 Mod 1 was observed by the PA field team (Figure 2-1).
- 231 There is no evidence that chemical warfare materiel has been used at this FUDS.

#### 232 2.3 Ownership History

- 233 Prior to acquisition by the Navy, the land at the Baxter OLF was used for dry land wheat farming
- 234 or was undeveloped. Based on historical aerial photographs (circa 1941) evaluated in the PA
- Report, use prior to 1942 was described as "open pasture" (USACE, 2006a). Originally, the
- 236 Navy acquired Baxter OLF by lease (124.03 acres) and by a five-year condemnation
- 237 (248.31 acres) in August and November 1942, respectively, for use as a landing field for cadet
- flight training. In June 1, 1943, the lease for the 124 acre parcel expired. The INPR stated "...it
- is unknown whether the lease was renewed. The condemnation expired on November 7, 1947"
- 240 (USACE, 2004b).
- Following use by the Navy, the land returned to agricultural use. Currently the FUDS and MRS
- are primarily used for irrigated agricultural uses and for a few residences. Property is owned byprivate citizens. Parcel ownership is shown on Figure 2-2.

# 244 2.4 Physical Setting

# 245 2.4.1 Topography and Vegetation

Baxter OLF lies approximately 1 mile east of the Columbia River. The topography of the Baxter OLF is generally flat (Figure 2-3). The maximum site elevation is approximately 880 ft above mean sea level and slopes generally to the west. Rankin Canyon lies directly west of the FUDS and extends down to the Columbia River approximately 1 mile to the west. There is also a small topographic low on the eastern boundary of the FUDS and MRS. The surrounding topography is

- 251 generally gently rolling hills.
- 252 During SI visual reconnaissance, native vegetation was observed to include sagebrush, rabbit
- brush, and dryland grasses. Much of the area is irrigated farmland growing alfalfa, asparagus,
- and potatoes, as well as hard and soft fruit orchards.

# 255 2.4.2 Land Use

- 256 The current land use is for agricultural and residential purposes. There is a currently closed
- 257 private residential school (which operated as Cyprus Gardens Academy and later as Country
- Haven Academy) located within and near the MRS (Figure 2-4). Portions of the former school
- 259 facility, including several dormitories, are located within the MRS. A public elementary school
- 260 (Edwin Markham) is located approximately 2 miles from the FUDS. Land use is not expected to
- change. However, the private residential school may reopen in the future.

- 262 Aerial photograph interpretation presented in the PA Report (USACE, 2006a) indicates that the
- area of the FUDS has been used for agricultural purposes since at least 1948. There is no
- 264 indication of irrigation canals on the 1948 aerial photograph (Figure 1-2). Irrigation canals are
- 265 first observed on a 1958 aerial photograph (Appendix L). Review of a 1941 photograph in the
- 266 PA Report indicated that the "future airfield is open pasture at this time" (USACE, 2006a).
- 267 Since WWII, the area has been extensively developed for farming, with the addition of irrigation
- canals.
- 269 Based on the 2011 SI visual reconnaissance and review of recent aerial photography
- 270 (Figure 2-1), the land use within and near the FUDS is primarily agricultural with a few
- 271 residences. Elevated irrigation canals transect the MRS. Common crops include alfalfa,
- asparagus, potatoes, and hard and soft fruit.

#### 273 2.4.3 Nearby Population

- 274 The Baxter OLF lies approximately 10 miles north of the city of Richland and 13 miles
- 275 northwest of the city of Pasco, Washington (Figure 1-1). The populations in 2009 for Richland,
- 276 Washington, and Pasco, Washington, were estimated at 47,527 and 57,647, respectively (U.S.
- 277 Census, 2010). The population in 2000 within a 4-mile radius of the Baxter OLF is
- 278 1,148 persons, with 390 housing units and 337 households (Figure 2-5). There are several
- 279 residences on the FUDS. The population density for the census block that the MRS is in is
- 280 30.4 persons per square mile. The population within a 2-mile radius of the Bombing Range
- 281 MRS is 613 persons, with 195 housing units and 168 households.

#### 282 **2.4.4 Climate**

- 283 The U.S. Department of Energy (DOE) Hanford Site, located across the Columbia River from
- the Baxter OLF, has the closest meteorological station and network, which is operated by the
- 285 Pacific Northwest National Laboratory. The following climatic data were obtained from
- 286 Hanford Site Climatological Summary 2004 with Historical Data (Hoitink et al., 2005). The
- 287 Baxter OLF lies within the semiarid shrub-steppe Pasco Basin of the Columbia Plateau in
- southeastern Washington. The regional temperatures, precipitation, and winds are affected by
- the presence of mountain barriers. The Cascade Range to the west influences the region by its
- rain shadow effect. The Rocky Mountains and ranges of the southern British Columbia protect
- the region from severe cold polar air masses that move across southern Canada and from winter
- storms associated with them (Hoitink et al., 2005).
- 293 The normal minimum and maximum monthly temperatures are 31.8 degrees Fahrenheit (°F) in
- January and 76.3°F in July (Hoitink et al., 2005). The normal number of days in a year with
- 295 daily temperature below 32°F is 23. The normal number of days in a year with daily
- 296 temperatures above 100°F is 12. The normal annual precipitation is 6.98 inches. The wettest
- 297 month of the year is December with a normal precipitation amount of 1.11 inches. The driest
- 298 months of the year are July and August with a normal precipitation of 0.27 inches. The normal

- annual snowfall is 15.4 inches. The prevailing wind direction is from the northwest with an
- 300 average wind speed of 7.6 miles per hour. Peak gusts wind directions are from south-southwest,
- 301 southwest, or west-southwest.

#### 302 2.4.5 Area Water Supply

- 303 Drinking water in the vicinity of the Baxter OLF is obtained from groundwater wells. Drinking
- 304 water production is typically from groundwater occurring within the Ringold and Hanford
- 305 Formations (greater than 140 ft below ground surface [bgs]). Groundwater wells located within
- a 4-mile radius of the Baxter OLF are shown on Figure 2-6. A search of the EPA's Safe
- 307 Drinking Water Information System database indicated that there are 24 community,
- 308 7 non-transient non-community, and 16 transient non-community water systems in Franklin
- 309 County. Within Township 11 north, Range 29 east, the vicinity of Baxter OLF, there are
- 310 5 community and 3 transient non-community water systems. The water source is groundwater
- 311 for all systems listed on the EPA website, with the exception of the Pasco Water Department
- 312 which obtains its water from the Columbia River (EPA, 2011; Washington State Department of
- 313 Health, 2010).
- 314 Domestic water is supplied to residents in the Baxter OLF vicinity by the White Bluff Water
- 315 Association. Wells for this system are located northeast of the FUDS in Township 11 North,
- 316 Range 29 East, Section 20. Water is obtained from wells located upgradient of the FUDS and
- 317 completed at depths of 51 ft bgs and 612 ft bgs (Washington State Department of Health, 2010
- and WDOE, 2010). One groundwater supply well within the FUDS and MRS is shown on
- 319 Figure 2-6. This well is a water supply well for the closed Country Haven Academy private
- 320 school. The well obtains water from 153 ft bgs.
- 321 Some groundwater located east and upgradient of the FUDS has nitrate concentrations that are
- 322 greater than the EPA Maximum Contaminant Level of 10 milligrams per liter (mg/L). The
- 323 elevated nitrate is the result of agricultural activities. Based on spring 2007 data, the FUDS
- 324 vicinity is outside areas of high nitrate concentrations (Columbia Basin Ground Water
- 325 Management Area [CBGWMA], 2010).
- 326 Irrigation water delivery canals provide most irrigation water to farmlands in the vicinity of the
  327 FUDS. The irrigation water is obtained from an extensive irrigation water distribution system
  328 originating at Grand Coulee, Washington (approximately 100 miles north of the FUDS) and is
  320 III the US Description of the FUDS of the function of the FUDS of the function of the function
- 329 managed by the U.S. Bureau of Reclamation (USBR).

#### 330 2.4.6 Surface Water

- 331 The nearest permanent body of water is the Columbia River, approximately 1 mile west of the
- 332 FUDS. Rankin Canyon extends from the western border of the FUDS and drains into the
- 333 Columbia River. Rankin Canyon has an unnamed intermittent stream within it. Figure 2-7
- 334 shows the regional surface water drainage within a 15-mile radius of the Baxter OLF.

#### 335 2.4.7 Geologic and Hydrogeologic Setting

- Baxter OLF is located within the Pasco Basin of the Walla Walla Plateau section of the
- 337 Columbia Plateau province. The Pasco Basin is a down-warped area within the central portion
- 338 of the Columbia River Basalt plateau. The Pasco Basin is bordered on the west and north by a
- 339 series of northwestern trending asymmetric, faulted anticlinal ridges and to east by the Palouse
- Hills. The Columbia River transects the Pasco Basin (DOE, 1988).

#### 341 2.4.7.1 Bedrock Geology

- 342 The Pasco Basin is underlain by greater than 10,000 ft of basalt belonging to the Columbia River
- 343 Basalt Group. The Columbia River Basalt Group includes flood-type basalts that erupted
- between 16.5 and 6 million years ago from vents located in southeastern Washington and
- 345 adjacent Idaho and Oregon. The upper basalt flows are interbedded with lacustrine sedimentary
- units (DOE, 1988). Depth to bedrock in the vicinity ranges from 370 to 450 ft bgs.

#### 347 2.4.7.2 Overburden Soils

- 348 Overlying the Columbia River Basalt Group is the Ringold Formation. The Ringold Formation
- 349 is comprised of consolidated gravels, sands, silts, and clays up to several hundred feet thick in
- the Pasco Basin. These deposits are attributed to the ancestral Columbia River (DOE, 1988).
- 351 Within the Pasco Basin, the Columbia River Basalt and Ringold Formation have been scoured
- and flooded by cataclysmic floods during the Pleistocene glaciations, resulting in deposits of the
- 353 Hanford Formation. The Hanford Formation includes two main facies, the coarse-grained Pasco
- 354 Gravels and the fine-grained Touchet Beds (DOE, 1988). Overlying the Hanford Formation are
- 355 lacustrine, alluvial, colluvial, eolian, and landslide deposits. The Baxter OLF ground surface is
- 356 comprised primarily of eolian deposits.
- Soils at the FUDS consist primarily of very fine sandy silt loams and silt loams (U.S. Departmentof Agriculture, 2010).
- 359 2.4.7.3 Hydrogeology
- 360 Groundwater within the Pasco Basin occurs within the interflow zones of the Columbia River
- 361 Basalt Group and within sandy and gravelly units of the Ringold and Hanford Formations.
- 362 Near-surface groundwater also occurs as a result of leakage from the extensive network of
- 363 irrigation canals and agricultural irrigation. Groundwater production for domestic water systems
- and irrigation wells is from aquifers present in the gravelly portions of the Hanford and Ringold
- 365 Formations (greater than 140 ft below ground surface [bgs]) and interflow zones within the
- 366 Columbia River Basalt Group. Groundwater flow is west towards the center of the Pasco Basin
- and the Columbia River (CBGWMA, 2007; DOE, 1988).

#### 368 2.4.8 Sensitive Environments

- 369 The information relative to sensitive environments provided for this site was compiled from the
- USFWS (2010), Washington Department of Fish and Wildlife (WDFW, 2008) and Washington

- 371 Natural Heritage Program (WNHP, 2010). A database search by the WDFW did not identify any
- federal or state endangered, threatened, or federal candidate species as occurring within the
- boundary of the FUDS or MRS (WDFW, 2010). WDFW identified one priority habitat, "rural
- antural open space," located within Rankin Canyon in the western portion of the FUDS and MRS
- 375 (Figure 2-4). The FUDS and MRS are primarily agricultural fields. There are no records that
- indicate the presence of rare plants or high-quality native ecosystems within the FUDS (WNHP,
- 377 2010).
- 378 There are wetlands identified within the FUDS (Figure 2-4) based on information contained in
- the National Wetlands Inventory (USFWS, 2010). Wetlands appear to be the result of
- 380 subsurface seepage from irrigation canals and irrigation of fields. The eastern wetland is nearly
- 381 surrounded by an irrigation canal, with no apparent surface drainage outlet.
- 382 The FUDS and MRS are considered to contain Important Ecological Places (IEPs) as defined by
- the USACE (2006b) or EPA (1997) because of the presence of wetlands (Table 2-2). The Baxter
- 384 OLF FUDS and Bombing Range MRS contain no known habitat for threatened, endangered or
- candidate species (WDFW, 2010). A portion of the FUDS and MRS that overlaps Rankin
- 386 Canyon is located within an area that the state has identified as priority habitat "shrub-steppe"
- and is considered to be managed for ecological purposes (Figure 2-4) (WDFW, 2010).
- 388 2.5 Previous Investigations for MC and MEC
- 389 2.5.1 Inventory Project Report
- An INPR (USACE, 2004b) was approved in February 2004. The INPR identified the remnants 390 391 of the former airfield and reported that the property owners have discovered practice bombs on 392 the Baxter OLF. The INPR identified the bombs as likely being AN-Mk 23 miniature practice 393 bombs and indicated that they would likely have been deployed with a Mk 4 signal, which is 394 similar to a blank 10-gauge shotgun shell. The shell contained a commercial primer, a black 395 powder or smokeless powder expelling charge, and a pyrotechnic or inert marker load. A map 396 provided in the INPR indicated where a landowner reported that the miniature practice bombs 397 were found. The location is shown on Figures 1-2 and 2-1. A report prepared for the USACE by 398 Herrera Environmental Consultants (2002) provided the field documentation for the INPR. The 399 INPR determined that the site was eligible under the DERP-FUDS program.

#### 400 2.5.2 Preliminary Assessment Report

- 401 The PA Report (USACE, 2006a) was prepared to collect information regarding the Baxter OLF
- 402 by compiling information obtained through historical records searches, interviews with
- 403 individuals associated with the FUDS, and a visit to the site. The investigation focused on
- 404 whether the potential exists that hazards remain on the Baxter OLF as a result of WWII-era
- 405 training activities. The PA reviewed historical aerial photographs and found no indication of
- 406 cratering as would be expected if high explosive bombs were used at the FUDS. Property

- 407 owners were interviewed, and one reported having found small bombs while performing ground408 tilling and harvesting activities.
- 409 The PA Report noted that the former airfield at Baxter OLF was covered with "soil oil" when
- 410 first built. In 1952, the owner of the property sued the U.S. Government for damages to the
- 411 property from the airstrip surface and was awarded \$2,175 in damages.
- 412 The PA field team found evidence of the use of AN-Mk 5 Mod 1, AN-Mk 23, AN-Mk 43, and
- 413 Mk 19 Mod 1 miniature practice bombs. The PA field team found MD from a Mk 19 Mod 1
- 414 miniature practice bomb (Figure 2-1). All of these miniature practice bombs used the
- 415 Mk 4 signals. The PA Report identified one munitions response area, the Bombing Target,
- 416 associated with the FUDS property, consisting of 649 acres.
- 417 The PA Report concluded that "MEC may exist at Baxter Outlying Field that are no longer intact
- 418 or did not completely function," specifically identifying "the potential for additional practice
- 419 bombs to be present on the property." The PA Report also concluded, based on "observed
- 420 physical presence of munitions debris on the ground surface," that there was "potential for latent
- 421 MC contamination on site."
- 422 Based on findings of the PA Report, USACE ranked the site according to the Remedial
- 423 Assessment Code (RAC) procedure to address explosives safety hazards. Possible scores range
- 424 from 5 (lowest risk category, generally for sites slated for project closeout as NDAI) to 1 (for
- 425 sites with the highest level of assessed risk). Baxter OLF was assigned a RAC score of 3.

# 426 2.5.3 ASR Supplement

- 427 No Archives Search Report was prepared for this site. The *ASR Supplement* was issued on
- 428 September 12, 2008, and summarized the results of the PA Report (USACE, 2006a). The ASR
- 429 Supplement identified one range (Bombing Range), Range Number F10WA061601R01. The
- 430 ASR Supplement indicated a RAC score of 3. The ASR Supplement reported MRS coordinates
- 431 incorrectly referenced to UTM Zone 10. As discussed in Section 1.2, Baxter OLF is located
- 432 within UTM Zone 11. The MRS UTM coordinates have been recalculated for Zone 11.

# 433 2.6 Other Land Uses that May Have Contributed to Contamination

- "Soil oil," a petroleum product, was applied to the airstrip to stabilize soils when constructed in
  1942, and although the material has since been removed from agricultural fields (date unknown)
  there is the potential for contamination from petroleum hydrocarbons and possibly metals
  contained in the "soil oil." During field reconnaissance, remnants of the former landing strip
  material were observed in a debris pile at the edge of a field. The landing strip material appeared
  to be native soil (sandy silt) that was indurated by the "soil oil." The material was approximately
  3 inches thick. Photographs of the landing strip material are provided in Appendix E
- 441 (Photographs 1240034 and 1240035).

- 442 Baxter OLF is currently being used for agricultural purposes, and fertilizers, herbicides, and
- 443 pesticides may have been legally applied to the soil. Therefore, there is the potential for these
- 444 types of compounds to be present within the soil.
- The FUDS lies within the CBGWMA, which is a broad area within the Columbia Plateau that
- 446 has high concentrations (greater than the Maximum Contaminant Level of 10 mg/L) of nitrate.
- 447 The high levels are considered the result of past and current agricultural practices of applying
- 448 nitrogen-rich fertilizers to agricultural fields (CBGWMA, 2001).

# 449 2.7 Past Regulatory Activities

450 There have been no regulatory actions, with respect to MEC or MC, reported for the site.

## 451 2.8 Previous MEC Finds

- 452 No MEC has been confirmed based on past reports of miniature practice bombs being found at
- 453 the Baxter OLF. The INPR (USACE, 2004b) and the PA Report (USACE, 2006a) reported that
- 454 landowners indicated miniature practice bombs had been found in agricultural fields in the past.
- 455 It is unknown whether found items contained unexploded signal charges. The INPR included a
- 456 map showing the area as reported by the owner of the land where the miniature practice bombs
- 457 had been found. This area is shown on Figures 1-2 and 2-1. The PA field team reported finding
- 458 MD from a Mk 19 Mod 1 bomb.

# 459 3.0 Site Inspection Tasks

460 SI tasks conducted for this FUDS property involved compiling and reviewing historical reports 461 and information, using this information in the subsequent TPP and overall SI process. Following 462 the TPP meeting, the *Site-Specific Work Plan* (SSWP) (Shaw, 2010b) was prepared to define the 463 SI field activities necessary to collect the information needed to address the data gaps and data 464 quality objectives (DQOs). Field work was conducted at the site on January 24, 2011.

#### 465 3.1 Technical Project Planning

466 TPP involved compiling and reviewing historical reports and information to identify data gaps
467 and develop a path forward. A TPP meeting with key stakeholders of the property, the USACE
468 from the Kansas City and Seattle Districts and Omaha Design Center, Washington Department
469 of Ecology (WDOE), USBR, and Shaw was held April 8, 2010, at the Best Western Pasco Inn
470 and Suites in Pasco, Washington.

- 471 The major decisions and agreements made at the TPP meeting included:
- The MRS agreed to be addressed in this SI is the Bombing Range (Figure 2-1).
- 473 Discussions were held concerning the MRS radius to be used. The radius used in the PA • Report (USACE, 2006a) and the ASR Supplement (USACE, 2008) was 3,000 ft and based 474 475 on a standard Bombing Target, Practice (also known as Precision Bombing Range, Precision Bombing Target, Bombing Range). The bombing range is identified in 476 477 historical documentation (Herrera Environmental Consultants, Inc., 2002; USACE, 478 2004b and 2006a), as a Glide and Dive Bombing range, which has different attributes than the standard bombing target. The primary difference is that in a Glide and Dive 479 Bombing range, bombs are dropped from an altitude of 2,500 ft, while bomb release 480 481 altitude for a standard Bombing Target is 25,000 ft. In addition, the safety radius for the 482 Dive and Glide Bombing range is 1,500 ft. The TPP team agreed that for field 483 reconnaissance and sampling activities, an MRS radius of 3,000 ft will be used. It was 484 agreed that discussions would be included in the SI Report concerning the appropriate MRS radius to be used for the MRS Inventory. 485
- The stakeholders reviewed the CSM, and all agreed that soil is the only medium of
   interest. Surface water and sediment were also considered but would be included only if
   the presence of a wetland was confirmed via a windshield tour. No evidence of wetlands
   was identified during a windshield tour.
- The stakeholders reviewed the human health and ecological screening levels and were in agreement with the levels.
- All stakeholders agreed that the potential MC consists of metals (antimony, lead, and zinc) and that sampling efforts would be focused on the area indicated by property owners as having a high density of miniature practice bomb finds shown on a map included in the INPR (USACE, 2004b).
- All stakeholders agreed on the plan to collect four background samples from the Baxter
   OLF area (outside the MRS boundary) combined with four samples from each of the

- 498 other three nearby OLFs (Coyote, Humorist, and Wheatland) to create a background data 499 set of 16 samples. The USACE Seattle District representative requested that the 500 proposed background sampling approach be reviewed by the Shaw geochemist to assure 501 the team that the approach meets background sampling objectives. The Shaw geochemist 502 (Dr. Jonathan Myers) was contacted concerning the appropriateness of the background 503 sampling approach. His conclusion was that "if geochemical evaluation methods are 504 used along with statistical methods to compare site samples to background samples, then 505 any contamination should be easily detectable, even with only four background samples 506 per site."
- 507 TPP meeting results were documented in the *TPP Memorandum* (Shaw, 2010a), which was
- 508 issued final on July 9, 2010, after incorporating comments from the stakeholders. The proposed
- technical approach was defined in the SSWP (Shaw, 2010b), which was issued final on
- 510 November 8, 2010, after incorporating comments from the stakeholders.
- 511 A more complete discussion of the TPP meeting is contained in Appendix B. As discussed
- 512 during the TPP meeting and documented in the *TPP Memorandum* (Shaw, 2010a), the following
- 513 project objectives and DQOs were developed.

# 514 Objective 1: Determine if the site requires additional investigation or can be recommended 515 for NDAI based on the presence or absence of MEC.

- 516 DQO No. 1 The MRS will be recommended for further investigation because MEC and MD
- 517 have been previously reported and confirmed in the PA Report.
- 518 DQO No. 2 If there is indication of an imminent MEC hazard, the site may be recommended 519 for a removal action.

#### 520 **Objective 2: Determine if the site requires additional investigation or can be recommended** 521 **for NDAI based on the presence or absence of MC above screening levels.**

- 522 DQO No. 3 Soil samples will be collected and analyzed as proposed in Section 4.3.1 of the
- 523 TPP Memorandum (Shaw, 2010a). Analytical results will be compared to screening levels for
- 524 human health risk and ecological assessment and to background levels for naturally occurring
- 525 substances. 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 exceed background but are less than human health screening levels, the
   site will be recommended for NDAI relative to MC.
- If sample results exceed both human health screening levels and background levels, the
   site will be recommended for additional investigation.
- If sample results do not exceed human health screening levels but do exceed both
   ecological screening levels and background levels, a screening-level ecological risk
   assessment will be completed in accordance with the *Screening-Level Ecological Risk Assessments for FUDS MMRP Site Inspections* (USACE, 2006b). Based on the results of

- 536the screening-level risk assessment, additional evaluation of the data will be conducted in537conjunction with the stakeholders to determine if additional investigation is warranted.
- 538 SI sampling activities were conducted at the MRS to address these DQOs. The media sampled at 539 the Bombing Range included only surface soil.

## 540 3.2 Additional Records Research

#### 541 3.2.1 Coordination with State Historic Preservation Office

- Shaw contacted the Washington Department of Archaeology & Historic Preservation (DAHP),
  and no indication of the presence or absence of archaeological or cultural resources was provided
  (DAHP, 2010a) (Appendix C). A Shaw archaeologist/cultural resources specialist reviewed the
  Washington DAHP *Washington Information System for Architectural and Archaeological Records Data* database (DAHP, 2010b) and found no known cultural resources identified within
  the EUDS houndaries
- 547 the FUDS boundaries.

#### 548 3.2.2 Coordination with Natural Resources Offices

549 Shaw has coordinated with the USFWS and Washington State wildlife and natural resources 550 agencies concerning the potential presence of threatened or endangered species at the FUDS and 551 MRS. Searches of federal and Washington State databases indicates that there are no known 552 federal or state threatened or endangered species (USFWS, 2010; WDFW, 2008 and 2010) or 553 rare species or high-quality native ecosystems (WNHP, 2010) in the vicinity of the FUDS or 554 MRS (Appendix C).

#### 555 3.2.3 Historical Aerial Photographs

556 A review of current (2006) and historical (1943, 1948, 1958, 1964, 1973, 1982, 1991, and 1996) 557 aerial photographs of the FUDS has been completed as part of preparation of this SI. The 1943 558 and 1948 aerial photographs (Figure 1-2 and Appendix L) show the landing strips and the 559 surrounding land of the FUDS and MRS. There are four landing strips intersecting at the center 560 to form an asterisk; each landing strip is approximately 1,700 ft in length. There are no 561 indications of bomb craters or targets on the 1948 aerial photograph. The area surrounding the 562 FUDS and MRS is plowed agricultural fields. By 1958, approximately 50 percent of the former 563 landing strips has been changed over to agricultural fields, and by 1964, this area has increased 564 to approximately 75 percent. Irrigation canals are first observed on the 1958 aerial photograph. 565 By 1973, the former landing strips are completely incorporated into agricultural production, and 566 no vestiges of the former landing strips are visible. Between the 1964 and the 1973 aerial 567 photographs, a water body developed in the area where the wetland discussed in Section 2.4.8 568 was identified. By 1991, this water body is no longer discernable on aerial photography. Little 569 change is observable between the 1991 and the 2006 aerial photographs. The 2006 aerial 570 photograph shows no indication of the former landing strips or military usage. The area 571 currently is used for agricultural production and residences. The residences are located within

and just outside the northern, eastern, and southeastern MRS boundary. The 1958 through 1991

- aerial photographs were obtained from "The EDR Aerial Photo Decade Package"
- 574 (Environmental Data Resources, Inc. [EDR], 2010a) and are included in Appendix L.
- 575 The PA Report (USACE, 2006a) reported that on a 1943 aerial photograph "Each runway is
- 576 inscribed with a 150'-diameter circle comprised of light-toned material near each end. The
- 577 circles are possibly aiming targets for bombing activities." Measurements taken, as part of the
- 578 2011 SI activities, from the 1943 aerial photograph indicate that the circles are approximately
- 579 225 ft in diameter. A portion of the 1943 aerial photograph is included as an inset on Figure 1-2.
- A copy of the full 1943 aerial photograph (from Plate 3 of the PA Report [USACE, 2006a]) is
- 581 provided in Appendix L.

## 582 *3.2.4 Environmental Database Search*

- 583 Environmental database search reports have been reviewed. No mapped environmental sites
- 584 were found in the database search (EDR, 2010b). The government records search met the
- 585 requirements of ASTM International (ASTM) Standard Practice for Environmental Site
- 586 Assessments: Phase I Environmental Site Assessment Process (ASTM, 2007). The database
- 587 search included "available ("reasonably ascertainable") government records on the target
- property or within the search radius around the target project" (EDR, 2010b).

# 589 3.2.5 Rights-of-Entry

- 590 Prior to mobilizing to the site, the Project Manager for the USACE Seattle District obtained
- 591 right-of-entry (ROE) for each property where SI activities were conducted. ROEs for some
- 592 parcels identified in the SSWP within the MRS were not obtained (see Section 3.7).

# 593 3.3 Field Work

594 SI field activities, conducted on January 24, 2011, included site reconnaissance and collection of 595 surface soil samples within the Bombing Range MRS. Background samples were also collected 596 from locations outside the MRS. The following conditions were recorded in the field log book 597 (Appendix D) and/or by digital photographs (Appendix E):

- Presence or absence of evidence of MEC;
- Changes, if any, in sample location because of field constraints;
- 600 General site conditions; and
- Vegetative cover.

# 602 *3.4 Sampling and Analysis*

- 603 Sampling included collection of five surface soil samples including one field duplicate within the
- Bombing Range MRS and four background soil samples from outside the MRS (Table 3-1).
- 605 Samples were collected and analyzed in accordance with the SSWP (Shaw, 2010b) and work
- variance VAR-171-01 using the standard operating procedures (SOPs) from the Work Plan
- 607 (Shaw, 2006). The samples were analyzed for MC of potential concern (antimony, lead, and

- 608 zinc). Analysis for aluminum, calcium, iron, magnesium, and manganese was also completed for
- 609 possible geochemical evaluation purposes, if needed. Background samples were analyzed for
- 610 chromium and nickel in addition to the above analytes to establish a larger background dataset
- 611 for use at other nearby OLFs, as discussed in Section 3.6.1 below. Laboratory analysis was
- 612 performed by Test America Laboratories of Denver, Colorado, using the following analytical
- 613 methods:
- Antimony, chromium, lead, manganese, nickel, and zinc by EPA SW-846
   Method 6020 (chromium and nickel analyzed for background samples only); and
- Aluminum, calcium, iron, and magnesium by EPA SW-846 Method 6010B.
- 617 Analytical results are provided in Appendix F.

#### 618 *3.5 Laboratory Analysis and Data Quality Review*

619 One hundred percent of the analytical data have been reviewed and validation qualifiers assigned

- 620 based on EPA CLP National Functional Guidelines for Inorganic Data Review, October 2004.
- 621 ADR software (version 8.3) was used to assist in the data validation process for all areas with the
- 622 exception of initial calibration, initial and continuing calibration verification, initial and
- 623 continuing calibration blanks, interference check standards, and serial dilutions. The overall data
- 624 quality of the data collected for the Baxter OLF SI has been discussed in the Analytical Data
- 625 Quality Assurance/Quality Control Report (Appendix G).
- Results of the analyses, as discussed in the evaluation, suggest that the results are indicative of the media analyzed, with the exception of the quality control (QC) exceedances listed below:
- Antimony results for regular field sample NWO-171-0001 and its corresponding field duplicate sample NWO-171-0005 were qualified "J" due to their calculated relative percent difference exceeding QC criteria (relative percent difference greater than 50 percent).
- Antimony and zinc results reported for sample NWO-171-5001 were qualified "J" due to matrix spike/matrix spike duplicate spike recoveries reported outside QC criteria. Results may be biased low.
- Aluminum, calcium, iron, and magnesium results for soil sample NWO-171-5001 were
   qualified "J" due to serial dilution test percent difference exceeding QC criteria (percent
   difference less than 10 percent).
- No data were qualified "R" as unusable. Overall, the data are fully usable for their intendedpurpose.
- 640 3.6 Screening Levels
- 641 The following subsections describe the development of screening levels for this SI.

#### 642 *3.6.1 Background Data*

- As agreed upon at the TPP meeting, four background soil samples were collected from the
- 644 Baxter OLF area. The Baxter OLF is one of four closely associated and nearby OLF FUDS.
- 645 Coyote, Humorist, and Wheatland OLFs are the others. The four background soil samples were
- 646 combined with four background samples from each of the other three OLFs to form a single soil
- 647 background data set that was used for background comparisons for all four FUDS. A total of
- 648 16 background soil samples were collected from the vicinity of the four FUDS, with 4 samples
- 649 collected at each FUDS. All four OLF FUDS have a very similar soil type (loamy sand to very
- 650 find sand), deposited by eolian processes, and have a similar source from west of the Columbia
- River. This approach reduced the background sampling requirements for individual FUDS,
- while increasing the background data set sample numbers and accounting for greater natural
- variability. This approach also allowed for local FUDS-specific evaluation of natural variation.
- Figure 3-1 shows the background sample locations for all four OLFs.
- The SSWP identified the four background sample locations from the Baxter OLF vicinity to be

656 from agricultural fields similar to those within the MRS. However, ROEs could not be obtained

- 657 for the sampling location property parcels. A work variance was obtained to move the
- background samples to locations where ROEs were obtained, but the locations were outside the
- 659 MRS boundary. Sampling locations within property with ROEs and similar agricultural fields
- 660 were not available. The locations selected were within the upper slopes of Rankin Canyon in
- undisturbed native soil (Figure 3-1). The upper slopes of Rankin Canyon are exposed to similar
- 662 eolian depositional processes as that of the MRS fields. A copy of the work variance is provided
- 663 in Appendix D.
- The background surface soil sample analytical results were used to calculate background
- screening levels for metals using published EPA guidance (EPA, 1989, 1992, 1994, 1995, and
- 666 2006a). A summary of the surface soil background screening level calculations is presented in
- 667 Appendix L. The surface soil background screening levels are either a 95<sup>th</sup> upper tolerance limit
- 668 for normal and lognormal distributed analytes or the 95<sup>th</sup> percentile for nonparametric distributed
- analytes. Table 3-2 presents the calculated background screening levels used for this SI.
- 670 The background data set for lead was determined to have a normal distribution and zinc to have a
- 671 lognormal distribution. Parametric 95<sup>th</sup> upper tolerance limits were calculated as background
- 672 screening levels for these elements. Antimony was determined to have a nonparametric
- 673 distribution, and 95<sup>th</sup> percentiles were calculated for the background screening levels.
- 674 Evaluation of the background data from Baxter OLF indicated that antimony, lead and zinc
- 675 concentrations were statistically consistent with those from other OLFs. However, the chromium
- and nickel concentrations from the Baxter OLF background samples were elevated with respect
- 677 to the chromium and nickel concentrations of the other three OLF data sets (Appendix L).
- 678 Including the Baxter OLF chromium and nickel background data would impart a high bias to the

- 679 resulting background summary statistics and background screening values. Excluding these
- 680 elevated concentrations provided more representative background summary statistics and
- background screening levels for the Coyote, Humorist, and Wheatland OLFs.
- An additional soil sample (NWO-171-5005) was collected from soil adjacent to the remnants of
- 683 the former landing strip at Baxter OLF. A "soil oil" was applied to the landing strip surface to
- stabilize the soil, much like asphalt oil is applied today to roads. The sample from Baxter OLF is
- used for informational purposes only to identify if the non-munitions related "soil oil" contained
- any metals that are also MC and may have migrated to soil. A discussion of the analytical results
- 687 is provided in Section 4.4.2.4.

#### 688 3.6.2 Human Health Screening

- 689 Human health screening levels for soil are based on the WDOE Soil Cleanup Levels
- 690 (Washington Administrative Code 173-340, 2007) and EPA Regional Screening Levels (EPA,
- 691 2010). The final screening level was based on the lowest value (Table 3-3). Potential human
- 692 receptors include agricultural workers, residents, students, and trespassers.

#### 693 3.6.3 Ecological Screening

- As discussed in Section 2.4.8, the MRS contains IEPs (wetlands) and an area managed for
   ecological purposes, and comparison of MRS analytical results to ecological screening levels is
   appropriate.
- 697 The final ecological screening levels selected are based on the hierarchy of:
- 698 1. Washington State value,
- 699 2. EPA Region Washington State is located in, and
- 7003. Los Alamos National Laboratory value.
- Table 3-4 lists the ecological screening levels.

#### 702 3.7 Variances from the SSWP

703 One work variance was issued to the SSWP (Shaw, 2010b). The Final SSWP (Shaw, 2010b)

704 identified properties for which field activities were planned during the SI. ROEs for only three

- parcels were obtained by the USACE Seattle District. ROEs were obtained for map parcel
- numbers 1, 15, and 16 by the USACE Seattle District; ROEs for other parcels where field
- activities were initially planned were not obtained (Figure 2-2). A work variance was prepared
- 708 limiting field activities to parcels where ROE was granted. These parcels represent the central
- portion of the reported bombing target area and where the landowner has reported MD. The
- revised work effort did not compromise the achievement of DQOs other than determining
- 711 whether a wetland area has been impacted by MC. A copy of the work variance is provided in
- 712 Appendix D.

#### 713 3.8 Second TPP Meeting

- A second TPP meeting was held on September 22, 2011, via telephone conference call, and
- 715 included representatives of USACE Omaha Design Center, USACE Seattle District, USACE
- 716 Kansas City District, WDOE, USBR, and Shaw. The primary purpose of the meeting was to
- review and discuss the SI results and recommendations, including the MRSPP scores, before
- 718 issuing the Final SI Report. The TPP team agreed with the conclusions and recommendations
- summarized in the Draft Final SI Report issued in August 2011. A summary of the second TPP
- 720 meeting is included in Appendix B.

## 721 3.9 Public Notice

- 722 Prior to issuing the *Draft TPP Memorandum*, Shaw posted a public notice in the *Tri-City Herald*
- 723 with a request for additional historical information about the FUDS. The public notice was
- published on April 18 and April 21, 2010, with a request for responses to be directed to the
- 725 USACE Seattle District and Omaha District. A copy of the public notice is provided in
- 726 Appendix C. No responses were received to the public notice.

# 727 4.0 Bombing Range MRS

#### 728 4.1 History and Land Use

729 Baxter OLF, also known as Baxter Auxiliary Field and Outlying Field 7, was one of

730 22 properties in the Tri-Cities (Richland, Kennewick, and Pasco), Washington area that were

731leased or otherwise acquired for Navy use during WWII as outlying fields for pilot training

associated with Naval Reserve Air Base Pasco. Naval Reserve Air Base Pasco was originally

commissioned on July 31, 1942, as an initial flight training school for Navy cadets.

The IATCB approved the landing field for Baxter OLF in August 1943, located at 46 degrees

735 25 minutes 00 seconds north and 119 degrees 14 minutes 00 degrees west (IATCB, 1943). The

136 landing field consisted of four landing strips set in the form of an asterisk. An undated data sheet

737 detailing the characteristics of the NAS Pasco OLFs indicates that the surface improvements at

- 738 Baxter OLF consisted of a "1500' circle with four 500' extensions," that was graded and
- surfaced with soil oil (NAS Pasco, undated-a). Analysis of aerial photographs of the Baxter OLF
- provided in the PA Report (USACE, 2006a) dated 1943 and 1948 indicated that each of the
- 141 landing strips was approximately 1,500 ft long. The 1943 aerial photograph showed a small
- 742 circle approximately 150 ft in diameter on each leg of the landing strips. Measurements taken

from 1943 and 1948 aerial photographs as part of this SI show that the landing strip lengths are

approximately 1,700 ft in length and the small circles on each leg of the landing strips are 225 ft

- in diameter. The PA Report indicated that the circles are possibly aiming targets for bombing
- 746 activities.

747 In May 1944, the IATCB changed the designation of the Baxter OLF to a "caution area" for a

748 Dive and Low-level bombing target (IATCB, 1944). The "caution area" consisted of a 3-mile

circle centered at 46 degrees 25 minutes 05 Seconds north and 119 degrees 14 minutes

- 750 10 seconds west. The completion date of the target is not known, but NAS Pasco reported that
- three bomb targets at other outlying fields were completed in March 1944 (NAS Pasco, 1944).
- The bombing range was identified as a Glide and Dive Bombing Range (IATCB, 1944). Also,

an undated activity list for NAS Pasco OLFs indicates that Baxter OLF was used for the purpose

- 754 of "Glide & Dive Bombing" (NAS Pasco, undated-b).
- 755 The differences between the landing field location identified in 1943 (IATCB, 1943) with that
- 756 indicated for the caution area for a Dive and Low-level bombing target (IATCB, 1944) are small
- 757 (approximately 850 ft). These two locations are shown on Figure 1-2. These locations are also
- offset from the center of the landing strips shown on the 1948 aerial photograph.
- 759 The Dive and Glide Bombing Range was used for advanced pilot training. During dive
- bombing, the aircraft descends toward the target at an angle of 60 degrees or more (U.S. Naval
- Academy, 1958). This increased the speed of the aircraft to speeds greater than that achievable

- 762 during horizontal flight giving greater speed to the bomb. The bomb is released at between
- 763 2,000 and 6,000 ft altitude. The low release altitude results in a short flight time and air
- resistance; wind and target motion are minimized. In glide bombing, the attack angle is less than
- 765 60 degrees. The glide technique is better suited for fighter aircraft which have problems dealing
- with the higher speeds in deep dives. In glide bombing, the bombs are released at an altitude of
- 767 between 2,000 and 3,000 ft.
- 768 In May 1945, NAS Pasco issued a warning to military personnel and civilians living in the area
- to avoid the former auxiliary fields as the fields were being used as bombing ranges. The
- presence of unexploded practice bombs presented a hazard if disturbed (*The Sky Writer*, 1945).
- 771 Baxter OLF was the scene of a fatal accident in July 1945. A FM-2 bomber lost a wing and
- crashed during a glide bombing run (NAS Pasco, 1945b).
- After the war, the Navy evaluated the effects of military operations on the outlying fields. The
- results of the evaluation indicated that the 17 outlying fields contained "numerous tins from duds
- and shell cases" (Headquarters, Thirteenth Naval District, 1946).
- Following the end of WWII, activities at NAS Pasco ended. On June 1, 1946, NAS Pasco was
- placed in "caretaker" status and "inactive" status one month later (USACE, 2006a).
- The PA Report and *ASR Supplement* center the Bombing Range MRS over the FUDS and extend
- it beyond the FUDS boundaries. The radius of the MRS is 3,000 ft with an area of 649 acres.
- 780 The size of the radius is consistent with the radius used for a Bombing Target, Practice (also
- 781 known as Precision Bombing Range, Precision Bombing Target, Bombing Range) (USACE,
- 782 2008).
- 783 The FUDS is currently used for agricultural purposes and a few residences. There is a currently
- closed private residential school (which operated as Cyprus Gardens Academy and later as
- 785 Country Haven Academy) located within and near the MRS (Figure 2-4). Portions of the former
- school facility, including several dormitories, are located within the MRS. A public elementary
- school (Edwin Markham) is located approximately 2 miles from the FUDS. It is not known if
- the private residential school will reopen in the future.
- 789 Typical crops grown in the vicinity include alfalfa hay, asparagus, grass, potatoes, and soft and
- hard fruit. There are no barriers to access. Fields are irrigated using either center pivot or wheel
- 791 lines. Orchards are irrigated using buried lines with sprinkler heads. An irrigation canal
- traverses the center of the FUDS (Figure 2-7) and is filled with water from March through
- 793 October. Access to the FUDS is by paved county road.

#### 794 4.2 Previous Investigations

- Both the INPR (USACE, 2004b) and the PA Report (USACE, 2006a) indicated that miniature
- practice bombs had been found within the MRS by landowners. The INPR provided a map
- showing the area where a landowner reported miniature practice bomb finds (Figure 2-1). The
- PA field team found evidence of the use of AN-Mk 5 Mod 1, AN-Mk 23, AN-Mk 43, and Mk 19
- Mod 1 miniature practice bombs. All of these miniature practice bombs used the Mk 4 signals.
- 800 The PA Report also indicated that MD from a Mk 19 Mod 1 bomb was found during the PA field
- 801 visit (Figure 2-1). A RAC of 3 was assigned for MEC risk. The ASR Supplement (USACE,
- 802 2008) was completed in 2008 and summarized the results of the PA Report.

# 803 4.3 MEC Evaluation

# 804 4.3.1 Preliminary Conceptual Site Model Summary for MEC

805 The Dive and Glide Bombing Range was used for advanced pilot training. During dive 806 bombing, the aircraft descends toward the target at an angle of 60 degrees or more (U.S. Naval 807 Academy, 1958). This increased the speed of the aircraft to speeds greater than those achievable 808 during horizontal flight, giving greater speed to the bomb. The bomb is released at between 809 2,000 and 6,000 ft altitude. The low release altitude results in a short flight time and air 810 resistance; wind and target motion are minimized. In glide bombing, the attack angle is less than 811 60 degrees. The glide technique is better suited for fighter aircraft which have problems dealing 812 with the higher speeds in deep dives. In glide bombing, the bombs are released at an altitude of 813 between 2,000 and 3,000 ft. The preliminary CSM developed for the MRS identified miniature 814 practice bombs AN-Mk 5 Mod 1, AN-Mk 23, AN-Mk 43, and Mk 19 Mod 1 (Table 2-1) as 815 potential MEC. These miniature practice bombs used the Signal, Practice Bomb, Mk 4 for 816 signaling impact. Surface soil and subsurface soil were identified as potential pathways of 817 human exposure to MEC. Agricultural workers, residents, students, and trespassers were

- 818 identified as potential human receptors, with the potential route of human exposure identified as
- 819 direct contact. A revised CSM based on the SI findings at the MRS is presented in Appendix J.

# 820 4.3.2 Field Observations and Historical Evidence of MEC

- 821 A visual reconnaissance of the Bombing Range MRS at Baxter OLF was conducted on
- January 24, 2011, to identify evidence of former range activities (e.g., surface debris, stressed
- 823 vegetation). A two-person team including a qualified UXO technician conducted the visual
- 824 inspection. The visual reconnaissance was supplemented with a hand-held frequency domain
- 825 electromagnetic instrument (all-metals detector) to avoid potential MEC that may be buried and
- not visible and to identify any metallic items that may be present. Reconnaissance goals
- 827 included gathering information about site access, general site conditions, and evidence of former
- 828 range activities (e.g., surface debris and presence of remnant landing strip material).
- 829 Reconnaissance was generally conducted along a meandering path within the Bombing Range
- 830 MRS. The path walked during the visual reconnaissance was recorded using a hand-held Global
- 831 Positioning System (GPS) unit. In total, approximately 35,500 ft of reconnaissance was
- conducted on foot and approximately 5,800 ft were driven within the MRS. Figure 4-1 shows
- the GPS paths and waypoint and photograph locations for the SI. Field notes are provided in
- 834 Appendix D, and photographs are included as Appendix E.

No MEC was encountered during the reconnaissance. During the reconnaissance, the field team

- did not observe any MD. No indications of bombing activities such as impact craters were
- 837 observed during SI reconnaissance activities, although none would be expected from an area that
- has been repeatedly tilled.

839 During field reconnaissance, remnants of the former landing strip cover material were observed 840 at waypoints 72 and 73 (Figure 4-1). The landing strip material appeared to have been 841 stockpiled at the edge of the field as evidenced by mounds of the material. The landing strip 842 material appeared to consist of native soils (sandy silt) that have had "soil oil" distributed atop it. 843 The material was moderately inducated by the oil. The layer of inducated soil was approximately 844 3-inches thick (Appendix E, Photographs 1240034 and 1240035). The location of the stockpiled 845 landing strip material is near the projected position of the eastern end of the east-to-west trending 846 landing strip. No evidence of the runway material within current agricultural fields was noted. 847 The 1943 aerial photograph (Figure 1-2 and Appendix L) shows the runways with small circles 848 near the end of each landing strip. The PA Report indicated that these small circles may have 849 been bombing targets. (USACE, 2006a) The circular features are not visible on the 1948 aerial 850 photograph (Figure 1-2).

- 851 The all-metals detector indicated the presence of subsurface anomalies. Many of the subsurface 852 anomalies were located in the area where a landowner had reported in the INPR that miniature
- 852 anomalies were located in the area where a landowner had reported in the hyper that miniature 853 practice bombs had been found during ground tilling operations (Figure 4-1) and where the
- practice bombs had been found during ground tilling operations (Figure 4-1) and where the
  former landing strips (and apparent bombing targets) had been constructed (Figure 1-2). The
- 855 proximity of the subsurface anomalies to the location of landowner reports of miniature practice
- borb finds and the location of the former landing strips suggests that some anomalies may be
- associated with metallic components of miniature practice bombs. The all-metals detector is
- 858 designed to detect the electromagnetic field of metallic objects. Subsurface investigation was not
- 859 conducted, and the sources of the anomalies are unknown.
- 860 The terrain is generally flat in the central portion of the MRS but slopes down into Rankin
- 861 Canyon in the western portion of the MRS. To the east, the terrain slopes down to a topographic
- 862 low. The land is currently cultivated and is used for growing alfalfa hay (Appendix E,
- 863 Photograph 1240009). Past uses for the land have been reported to be for growing potatoes
- 864 (USACE, 2006b). Other crops that are frequently grown in the vicinity include asparagus, corn,
- grass, and soft and hard fruits. Three semi-circular irrigation pivot lines were observed within
- the area where reconnaissance was completed. Parcels where ROEs were not obtained were
- 867 observed from the public road, and land conditions appeared similar to those of the land walked.
- 868 Several residences were observed to be within and near the MRS.
- 869 The area of the reported wetland in the eastern portion of the MRS was viewed from the road on
- 870 January 24, 2011, during field reconnaissance activities. No ROE was obtained to walk the area.
- 871 No evidence of the wetland was observed, and the area was in similar condition as when it was

- viewed in April 2010 (Appendix E, Photographs 4200001 through 4200006). The western
- 873 wetland area was walked during the 2011 SI field activities, and no evidence of the wetland area
- 874 was observed (Appendix E, Photographs 1240019 through 1240022). The area was cultivated
- and used for growing alfalfa hay.
- No wildlife, other than small birds, was observed during the reconnaissance. The field team didnot observe any evidence of environmental stress to vegetation or wildlife.
- 878 MD from miniature practice bombs had been reported by landowners and reported in the INPR
- 879 (USACE, 2004b) and the PA Report (USCAE, 2006a). No MEC or MD was identified during
- 880 field reconnaissance activities. Correspondence between the Commandant, Thirteenth Naval
- 881 District and the Commanding Officer, Naval Ammunition Depot, Puget Sound, authorized to
- issue and ship AN-Mk 19 and AN-Mk 23 miniature practice bombs to NAS Pasco
- 883 (Commandant, Thirteenth Naval District, 1943).

## 884 4.3.3 MEC Risk Assessment

- 885 The following section presents a qualitative assessment of the risk associated with potential
- 886 MEC at the Bombing Range MRS. This assessment is based on historical documentation, prior
- investigation, and visual inspection conducted during this SI. A MEC assessment is provided to
- 888 convey relative risk on a scale from low to high and is not intended to be a thorough risk
- assessment as would be conducted for an RI/FS.
- 890 Although neither MEC nor MD was observed during the SI visual reconnaissance, historical and
- 891 physical evidence indicates that landing strips were constructed for the U.S. Navy at the
- 892 Bombing Range MRS, and this area later served as a bombing range, where practice munitions
- 893 were used. MEC are potentially present in the form of miniature practice bombs containing
- unexploded signals.
- The AN-Mk 5 Mod 1 weighed 2 pounds 11 ounces and was made of a zinc alloy. The
- AN-Mk 23 weighed 3 pounds and was made of cast iron. The AN-Mk 43 weighed 4 pounds
- 897 7 ounces and was made from a lead-antimony alloy. These three miniature practice bombs were
- 898 8.25 inches long and 2.18 inches in diameter and were designed for low-altitude horizontal or
- 899 dive-bombing practice.
- 900 The Mk 19 Mod 1 was larger and heavier than the other models and was designed for high-
- altitude horizontal bombing practice. MD from the MK 19 Mod 1 was found by the PA field
- 902 team (USACE, 2006a). The Mk 19 Mod 1 weighed 13.2 pounds, was 13 inches long, and was
- 903 made from lead-antimony alloy with steel fins.
- 904 These munitions were of solid construction with an axial cavity extending the length of the bomb
- to house a signal cartridge. Typically these miniature practice bombs used the Mk 4 series of
- 906 signal cartridges. The signal contained a black powder or smokeless powder expelling charge
- 907 and a marker load of red phosphorous pyrotechnic mixture. Upon impact, the soil or water was

- 908 pushed into the nose of the bomb, forcing the firing pin into the shotgun shell primer. The
- 909 expelling charge would function, expelling and igniting the red phosphorous, thus producing a
- 910 flash and smoke.
- 911 There is a reasonable probability that intact miniature practice bombs with unfired signals may 912 be present in the subsurface. This is suggested by the detection of subsurface anomalies using an 913 all-metals detector during the SI field reconnaissance. Although the source of the subsurface 914 anomalies was not determined, there is a reasonable possibility that they are munitions-related. 915 The higher count of subsurface anomalies in the vicinity of the former landing strip, suspected 916 targets locations, and where landowners indicated that miniature practice bombs had been found 917 suggest that the anomalies may be munitions-related (Figure 4-1). Ground tilling associated with 918 agricultural activities could bring munitions-related items to the surface and present a potential 919 exposure to workers, residents, students, and trespassers. The placement of the signal inside the 920 bomb cavity creates a potential for a concentrated blast effect if ignited. If a bomb were struck 921 by a vehicle or farm machinery, a signal may ignite but would unlikely seriously injure the 922 operator. However, a person who came into direct contact with a bomb could cause the signal to
- 923 ignite by jarring, dropping, or tampering with the device, possibly resulting in burns, blinding,
- other injury, or death.
- The MRS is primarily located in open fields used for agricultural purposes, is not fenced, and has
  no access restrictions (Figure 2-1). It is owned by private landowners. Human receptors may
- 927 include agricultural workers, residents, students, and trespassers. Agricultural workers may be
   928 exposed to MEC during the tilling process for crops. Residents, students, and trespassers may be
- 929 exposed to surface MEC via direct contact.
- Based on historical and physical evidence, the overall risk from potential MEC at the MRS isconsidered to be low based on the following:
- Insensitive practice munitions were formerly used for training purposes.
- No MEC or MD was observed during SI visual reconnaissance, although landowners have reported finds in the past resulting from intrusive activity (tilling).
- 935
   Under current and anticipated future land use, there is limited potential for exposure of receptors by direct contact with MEC.
- 937 4.4 Munitions Constituents Evaluation
- 938 4.4.1 Preliminary Conceptual Site Model Summary for Munitions Constituents
- 939 The preliminary CSM developed for the MRS indicates that miniature practice bombs were
- 940 formerly used, potentially including the AN-Mk 5 Mod 1, made of zinc alloy, AN-Mk 23, made
- of cast iron, the AN-Mk 43, made of lead-antimony alloy, and Mk 19 Mod 1, made of
- 942 lead-antimony alloy with steel fins (Table 2-1). Physical evidence of the use of the
- 943 Mk 19 Mod 1 miniature practice bomb was reported in the PA Report (USACE, 2006a).

- 944 The metals antimony, lead, and zinc are the MC of potential concern. Black powder and red
- 945 phosphorus are not considered MC of potential concern as they are not hazardous substances.
- 946 Smokeless powder, consisting primarily of nitrocellulose and dinitrotoluene, would only be
- 947 present if the signal failed to detonate and only then in small quantities. The constituents of
- smokeless powder are not considered MC of potential concern.

949 Surface soil and sediment were identified as potential pathways for human and ecological 950 exposure to MC. Groundwater is considered an incomplete pathway because the depth of 951 sustainable groundwater resources is greater than 140 ft bgs and the MC metals have low 952 solubility and leaching rate. Agricultural workers, residents, students, and trespassers were 953 identified as potential human receptors, with the potential route of human exposure identified as 954 ingestion and direct contact. A revised CSM based on the SI findings at the MRS is presented in 955 Appendix J. The MRS is considered to contain IEPs due to the presence of wetlands and an area 956 considered to be managed for ecological purposes (Table 2-2).

# 957 4.4.2 Soil Exposure Pathway

- 958 Four surface soil samples were proposed and collected within the MRS and analyzed for metals.
- Sample locations are shown in Figure 4-2. An additional soil sample (NWO-171-5005) was
- 960 collected from soil directly adjacent to remnants of the former landing strip material for
- 961 informational purposes to determine whether the "soil oil" used to construct landing strips is a
- potential source of metals being evaluated as MC of potential concern. A discussion of the
- results from this sample is presented in Section 4.4.2.4. GPS data for the sample locations are
- 964 provided in Appendix H.
- 965 The MRS and background surface soil samples were collected from a depth of 0 to 6 inches as
- 966 composite samples using the 7-point wheel method, as described in the Work Plan (Shaw, 2006).
- Each soil sample was sieved by the laboratory with a No. 10 sieve prior to analysis. Samples
- 968 were collected at the approximate locations planned in the SSWP (Shaw, 2010b), because no
- 969 surface features indicative of MEC or MD were observed, nor were there any indications of
- 970 stressed vegetation or barren areas indicative of contaminants being present. Soils types from
- 971 both MRS and background samples were similar fine-grained soils consisting of sandy silts to
- 972 sandy silty loams.
- 973 The samples were analyzed for MC of potential concern (antimony, lead, and zinc). Analysis for
- aluminum, calcium, iron, magnesium, and manganese was also completed for possible
- 975 geochemical evaluation purposes, if needed.
- 976 Table 4-1 shows analytical results of soil samples compared to background, human health, and
- 977 ecological screening levels.

### 978 4.4.2.1 Comparison to Background Data

- 979 The analytical results were compared to the background screening levels established for this SI
- 980 (Section 3.6.1). Antimony in sample NWO-171-0001 and lead and zinc in sample
- 981 NWO-171-0003 exceed the soil background screening levels (Table 4-1).
- 982 A geochemical evaluation was performed, in accordance with the work plan, to determine if the
- 983 concentrations in surface soils are caused by natural processes or are potentially attributable to
- 984 MC (Appendix L). Geochemical evaluation indicates that all detected concentrations of
- antimony in the Baxter OLF MRS surface soil samples are most likely natural. The lead and
- 286 zinc concentrations of sample NWO-171-0003 (65.0 mg/kg and 210 mg/kg, respectively) are
- anomalously high relative to indicator elements associated with soil-forming minerals, and,
- given the available data, cannot be explained as the result of natural processes. Based on the
- geochemical evaluation, all antimony concentrations are considered to be naturally occurring and
- 990 will not be carried forward for comparison to human health or ecological screening levels. Lead
- and zinc concentrations in sample NWO-171-0003 may be related to former military munitions
- activities and are carried forward for comparison to human health and ecological screening
- 993 levels.
- 994 *4.4.2.2 Comparison to Human Health Screening Levels*
- 995 The analytical results that exceeded background surface soil screening levels and were
- determined to be not the result of natural processes (lead and zinc) do not exceed the humanhealth screening levels (Table 4-1).
- 998 4.4.2.3 Comparison to Ecological Screening Levels
- 999 The analytical results that exceeded background surface soil screening levels and were
- 1000 determined to be not the result of natural processes (lead and zinc) were compared with
- 1001 ecological screening levels (Table 4-1). These lead and zinc analytical results exceeded the
- 1002 ecological screening levels.
- 1003 An expanded SLERA was performed to evaluate the potential ecological risks from elevated lead
- 1004 and zinc concentrations in accordance with SLERA guidance (USACE, 2006b). A summary of
- 1005 the expanded SLERA is presented in Appendix L. An exposure point concentration was
- 1006 calculated for lead and zinc and compared to ecological screening levels. The estimated lead
- 1007 exposure point concentration does not exceed the ecological screening level. The estimated zinc
- 1008 exposure point concentration does exceed the ecological screening level. An evaluation of the
- 1009 ecological screening level was completed, and it was found that more rigorous plant effects
- 1010 evaluation has been completed since the original study. Based on the more recent plant effects
- 1011 studies, a revised ecological screening level was used in the expanded SLERA. The results of
- 1012 the comparison indicate that the estimated zinc exposure point concentration does not exceed the

revised ecological screening level. The expanded SLERA concluded that adverse impacts fromsoil on avian and mammalian wildlife are not expected.

### 1015 4.4.2.4 Landing Strip "Soil Oil" Soil Sample

1016 An additional soil sample (NWO-171-5005) was collected from soil adjacent to the remnants of 1017 the former landing strip at Baxter OLF. A "soil oil" was applied to the landing strip surface to 1018 stabilize the soil, much like asphalt oil is applied today to roads. The sample was collected to 1019 determine if the non-munitions related "soil oil" may be a source of metals that are being 1020 evaluated in this SI. The sample analytical results are compared to background, human health, 1021 and ecological screening levels, just as MRS-specific soil sample results are on Table 4-1. The 1022 sample shows an elevated zinc concentration (221 mg/kg) relative to background (98.1 mg/kg). 1023 Antimony and lead are below background screening levels. The elevated zinc concentration 1024 suggests that the soil oil may be a potential source of zinc in soil separate from the miniature 1025 practice bombs. However, the "soil oil" soil sample does not have an elevated lead 1026 concentration and is likely not the source of lead in the MRS-specific sample. A geochemical 1027 evaluation was completed to determine if the zinc concentration in the sample is caused by 1028 natural processes or is potentially attributable to the "soil oil" (Appendix L). Geochemical 1029 evaluation indicates that the detected zinc concentration in sample NWO-171-5005 is most likely 1030 natural. A similar sample was also collected from soil adjacent to landing strip material at the

- 1031 Wheatland OLF, and no elevated MC-related analytes were detected (Shaw, 2011 [in
- 1032 preparation]).

## 1033 4.4.3 Surface Water/Sediment Pathway

Two wetland areas were identified within the MRS (Figure 2-4). The wetland area located in the western portion of the MRS was observed during field activities, and no evidence of the wetland was found. The area was under cultivation for alfalfa hay when observed in January 2011. The USBR reported that subsurface drains had been installed in the area of the western wetland to remove accumulated water (USBR, 2010; Appendix C).

- 1039 The SSWP (Shaw, 2010b) had identified a data objective to visit the eastern wetland area and
- 1040 collect a soil sample from the area. However, because a ROE could not be obtained for the
- 1041 property, the eastern wetland area could not be visited and the sample was not collected, in
- 1042 accordance with a work variance (Section 3.7).
- 1043 An evaluation of the surface water/sediment pathway could not be completed because no sample
- 1044 could be collected from the wetland area.

### 1045 4.4.4 Groundwater Pathway

- 1046 Groundwater is considered an incomplete pathway because the depth of sustainable groundwater
- 1047 resources is greater than 140 ft bgs, and the metals MC have a low solubility and leaching rate.
- 1048 No groundwater samples were collected.

### 1049 *4.4.5 Air Pathway*

- 1050 Air is not considered to be a significant pathway because inhalation of non-volatile MC in vapor
- 1051 form will not occur under normal environmental conditions. The potential inhalation of soil
- 1052 particles is considered as part of the soil pathway and is included in the development of health-
- 1053 based screening levels for soil.

# 1054 5.0 Summary and Conclusions

1055 The summary and conclusions of the SI are presented in this section. Recommendations for 1056 further action are presented in Section 6.0. An updated CSM is presented in Appendix J.

1057 The Baxter OLF FUDS consists of one MRS identified as the Bombing Range. The glide and

1058 dive bombing range was used by crews of the U.S. Navy from NAS Pasco between 1943 and

1059 1945. Based on historical information, the FUDS was initially an outlying landing field used for

1060 pilot training associated with Naval Reserve Air Base Pasco. Aerial photographs from 1943 and

1061 1948 confirm the presence of landing strips at the FUDS (Figure 1-2).

1062 Following the designation as an operations base, some of the outlying fields, including Baxter

1063 OLF, were converted to bombing ranges. In May 1944, the designation of the Baxter OLF was

1064 changed to a "caution area" for a Dive and Low-level bombing target (IATCB, 1944). Small

1065 circular features identified on the 1943 aerial photograph may have been bombing targets.

1066 Miniature practice bombs were the only munitions reported as being used at the bombing range.

Landowners have reported finding miniature practice bombs following agricultural ground tilling
operations (USACE, 2004b and 2006a). The PA field team observed MD from a Mk 19 Mod 1
miniature practice bomb (USACE, 2006a). No MEC or MD was observed during the 2011 SI
field activities.

1071 The radius and area of the Bombing Range MRS is based on a Bombing Target, Practice (also

1072 known as: Precision Bombing Range, Precision Bombing Target, Bombing Range) (USACE,

1073 2008). The Bombing Target, Practice was designed for high altitude use (below 25,000 ft) and

- 1074 accommodated miniature practice bombs and 100- and 500-lb practice bombs. The original
- 1075 designation of the bombing target in 1944 by the IATCB was as a Glide and Dive Bombing
- 1076 Range (IATCB, 1944). A standard Dive and Glide Bombing Target, Practice is listed as having
- 1077 a radius of 1,500 feet and an area of 162 acres. The recommended release altitude is 2,500 ft and
- 1078 probable munitions would be miniature practice bombs and Mk 15 series 100-lb practice bombs.
- 1079 The list of miniature practice bombs, however, did not include the Mk 19 Mod 1, which is
- 1080 heavier and larger than the AN-Mk 5, An-Mk 23 and AN-Mk 43 miniature practice bombs, and
- 1081 is designed for high altitude use. Use of the Mk 19 Mod 1 miniature practice bomb is confirmed
- 1082 by the observation of MD by the PA field team. Therefore, based on the documented use of
- 1083 Mk 19 Mod 1 miniature practice bomb at the MRS, a 3,000-ft radius and a 649-acre area for a
- 1084 high altitude bombing target is appropriate for the Bombing Range MRS.

1085 Remnants of the former landing strip material were identified at the edge of a field during the

1086 2011 SI field activities. An area of subsurface metallic anomalies was found near the area

1087 identified by landowners, in the INPR, where miniature practice bombs were found during

1088 ground tilling operations (USACE, 2004b). This area is also coincident with the location of the

- former landing strips. If the subsurface anomalies are munitions related, there is a reasonable
  probability that intact miniature practice bombs with unfired signals may be present. Continued
  farm activities could bring the items to the surface resulting in an exposure risk. The overall risk
- 1092 from potential MEC at the MRS is considered to be low based on the following:
- Insensitive practice munitions were formerly used for training purposes.
- MD was identified during the PA site visit in 2005 (USACE, 2006a), and landowners have reported finding MD in the past following intrusive activity (tilling).
- No MEC or MD was observed during SI visual reconnaissance.
- Under current and anticipated future land use, there is limited potential for exposure of receptors by direct contact with MEC.
- 1099 Five soil samples, including one field duplicate, were collected from the MRS. Sample locations
- 1100 were within or near the area identified in the INPR by landowners as where miniature practice
- 1101 bombs were found during farming ground tilling operations (USACE, 2004b). Soil samples
- 1102 were analyzed for MC associated with miniature practice bombs (antimony, lead, and zinc) as
- 1103 well as select metals for potential geochemical evaluation (aluminum, calcium, iron, magnesium,
- and manganese).
- 1105 An additional soil sample was collected at a location adjacent to a stockpile "soil oil" material
- 1106 (former landing strip cover material) to evaluate if the application of non-munitions related "soil
- 1107 oil" to the landing strips may have contributed to elevated MC metals. The results of the
- 1108 evaluation indicate that the detected metals concentrations were either below background
- 1109 screening levels or determined to be at natural concentrations. A similar sample was also
- 1110 collected from soil adjacent to landing strip material at the Wheatland OLF, and no elevated
- 1111 MC-related analytes were detected (Shaw, 2011). Based on these analyses, the non-munitions
- related "soil oil" did not adversely impact MC metals concentrations in soil.
- 1113 Antimony in one sample and lead and zinc in a second sample were detected at concentrations
- 1114 that exceeded the soil background screening levels. A geochemical evaluation indicated that all
- 1115 detected concentrations of antimony are most likely natural. The lead and zinc concentrations
- 1116 exceeding background screening levels are anomalously high and, given the available data,
- 1117 cannot be explained as the result of natural processes. Physical evidence, consisting of
- 1118 observations by USACE during the PA field activities, of MD from Mk 19 Mod 1 miniature
- 1119 practice bombs confirms the past use of the MRS for bombing activities and as a potential source
- 1120 for elevated lead concentrations in soil.
- 1121 Lead and zinc concentrations that exceeded background screening levels were compared to
- 1122 human health screening levels for soil. No exceedances of human health screening levels were
- 1123 observed.

- 1124 Because the MRS contains an IEP, the elevated lead and zinc concentrations were compared to
- 1125 ecological screening levels. The concentrations exceeded the screening levels, and an expanded
- 1126 SLERA was completed. The results of the expanded SLERA concluded that the estimated lead
- 1127 exposure point concentration does not exceed ecological screening levels, and the estimated zinc
- 1128 exposure point concentration does not exceed the revised ecological screening level. The
- 1129 expanded SLERA concluded that adverse ecological impacts are not expected from soil.
- 1130 The soil pathway is considered to be complete because maximum concentrations of lead and zinc
- 1131 exceeded background screening levels and there is a documented MC source for lead
- 1132 (Mk 19 Mod 1 miniature practice bomb) at the MRS. However, because the maximum detected
- 1133 concentrations do not exceed human health and revised ecological screening levels, potentially
- 1134 significant exposure of human and ecological receptors to MC in surface soil is not anticipated.
- 1135 The SSWP identified the surface water/sediment pathway was potentially complete; however,
- additional data were needed to fully evaluate the pathway (Shaw, 2010b). The additional data
- needed included field reconnaissance at the two wetland areas and collection of a soil sample
- 1138 from the eastern wetland. Field reconnaissance of the western wetland was completed, and no
- 1139 evidence of a wetland area was observed. For the eastern wetland, field reconnaissance and
- sample collection could not be completed because an ROE for the property could not be
- 1141 obtained. Because elevated MC metals in soil were detected above background screening levels
- and determined to be not from natural processes and a munitions source has been documented,
- 1143 there is a potential for transport of impacted soils to the wetland area. An elevated irrigation
- 1144 canal installed prior to 1958 currently prevents the transport of impacted soils from the target
- area to the wetland. It is not known if transport occurred prior to installation of the irrigation
- 1146 canal. Based on the presence of metals in soil at concentrations that exceed background
- screening levels that may be attributable to an MC source, the surface water/sediment pathway is
- 1148 considered to be potentially complete.
- 1149 The groundwater pathway is considered incomplete due to depth to sustainable groundwater 1150 resources and low solubility and leaching rate of MC.
- 1151 Air is not considered to be a significant pathway because inhalation of non-volatile MC in vapor
- 1152 form will not occur under normal environmental conditions. The potential inhalation of soil
- 1153 particles is considered as part of the soil pathway and is included in the development of health-
- 1154 based screening levels for soil.

# 1155 6.0 Recommendations

1156 Results of the SI provide the basis for conclusions and/or recommendations for further actions at1157 each of the MRSs.

### 1158 6.1 Bombing Range MRS

1159 Based on historical and physical evidence, MEC is potentially present at the Bombing Range 1160 MRS. Soil results from 2011 SI field activities indicate that lead and zinc are present at 1161 concentrations exceeding background and are not attributable to natural processes. Physical 1162 evidence from the PA indicates that munitions used at the MRS are a potential source of MC 1163 metals. The soil pathway is considered to be complete, although human health screening levels 1164 were not exceeded and an expanded SLERA concluded that adverse ecological impacts are not 1165 expected from soil. The surface water/sediment pathway could not be directly evaluated during the SI and is considered to be potentially complete based on elevated concentrations of metals in 1166 1167 surface soil. In accordance with the decision rules established for this SI and because the surface water/sediment pathway could not be directly evaluated, a recommendation for additional 1168 1169 investigation is made with respect to MEC and MC for the Bombing Range MRS. Consideration 1170 of a removal action is not warranted because an imminent threat to human health, safety, or the 1171 environment has not been identified.

## 1172 6.2 Munitions Response Site

1173 Results of the SI field activities provide the basis for identifying MRSs and for scoring an MRS1174 using MRSPP (Appendix K).

- Based on the use and physical distribution of the bombing range at Baxter OLF, one MRS isidentified:
- Bombing Range.
- 1178 The MRS has an area of approximately 649 acres, consistent with the area of the range identified
- 1179 in the ASR Supplement. Based on the discussion presented in Section 5.0 the MRS is
- appropriately sized to accommodate high altitude bombing using the Mk 19 Mod 1 miniature
- 1181 practice bomb and no adjustment to the area of the MRS is recommended. The location of the
- 1182 Bombing Range, as documented in the MRS Inventory (DoD, 2010), should be revised, so that
- 1183 the location of the center of the revised MRS location conforms with the assumed target center at
- the center of the airfield (Figure 6-1). The revised UTM coordinates are Zone 11 N, NAD 83, in
- 1185 meters of X=328351 (East), Y =5142365 (North). Figure 6-2 shows the revised location of the
- 1186 MRS on the 2006 aerial photograph. The revised location does not change the risk exposure
- 1187 discussed in earlier sections of this SI.

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Figures



# **Legend** Baxter Outlying Field FUDS Boundary U.S. Department of Energy Handford Site NOTES: FUDS property boundary was derived from the Baxter Outlying Field ASR Supplement (USACE, 2008).

Topographic maps (Franklin and Benton Counties) were obtained from the U.S. Department of Agriculture, Service Center Agencies, 1999.



REFERENCE/PROJECTION: NAD 83 UTM Zone 11N

# **FIGURE 1-1**

# SITE LOCATION













Shav

Omaha District













- FUDS property boundary was derived from the Baxter Outlying Field ASR Supplement (USACE, 2008).
- 2) Census data were obtained from StreetMap (ESRI, 2006).
- The 2005 population of Franklin County was 47.6 people per square mile.
   The Census Block Centroid Units represent centroids of the smallest entities for which the Census Bureau tabulates census information, bounded on all sides by visible features such as streets, streams, and railroad tracks, and/or invisible boundaries such as city, town, and county limits. The population assigned to a centroid unit may be a positive integer or zero. The centroid populations were summed within defined distances from the FUDS boundary to generate population totals presented on the inset table.
   Aerial photograph (Franklin County) was obtained from the U.S. Department
- Aerial photograph (Franklin County) was obtained from the U.S. Department of Agriculture, Service Center Agencies: photograph is from the USDA-APFO National Agriculture Imagery Program (NAIP), 2006.



**FIGURE 2-5** 

## **CENSUS DATA WITHIN A 4-MILE RADIUS**

















NOTES:

- 1) FUDS property and range boundaries were derived from the Baxter Outlying Field ASR Supplement (USACE, 2008).
- 2) General area of reported practice bomb finds was derived from Figure 2 of the INPR (USACE, 2004).
- INPR (USACE, 2004).
  Parcel data was obtained from the Franklin County Assessor MapSifter Website: http://franklinwa.mapsifter.com/mapsifter/disclaimer.aspx
  Aerial photograph (Franklin County) was obtained from the U.S. Department of Agriculture, Service Center Agencies: photograph is from the USDA-APFO National Agriculture Imagery Program (NAIP), 2006.
  The 3,000-ft safety zone is depicted by the orange boundary line of the range.



## **FIGURE 4-1**

# SITE INSPECTION RECONNAISSANCE



















# **Tables**
### Table 2-1Munitions InformationBaxter Outlying Field

Location	Munitions	Component	Munitions Constituents	Munitions Constituents of Potential Concern
Bombing Range MRS	Miniature Practice Bombs: AN-Mk 5 Mod 1, AN-Mk 23, AN-Mk 43, Mk 19 Mod 1	Bomb Body	AN-Mk 5: 2 pounds 11 ounces made of zinc alloy; AN-Mk 23: 3 pounds made of cast iron; AN-Mk 43: 4 pounds 7 ounces made of lead-antimony alloy; and Mk 19 Mod 1: 13.2 pounds made of lead-antimony alloy.	Antimony, lead, and zinc
	Signal, Practice Bomb:	Filler: black powder, red phosphorus	Black powder (potassium nitrate, sulfur, charcoal) and red phosphorus.	none
	Mk 4 Mods 3 and 4	Filler: smokeless powder, red phosphorus	Smokeless powder nitrocellulose, dinitrotoluene, diphenylamine, potassium sulfate, graphite.	none

#### Notes:

Practice bombs do not contain high explosives.

Iron is not a hazardous material and therefore not a munitions constituent of concern.

The components of black power are not hazardous materials and therefore not a munitions constituent of concern.

Red phosphorus is not a hazardous material and therefore not a munitions constituent of concern.

The components of smokeless powder would be consumed on detonation and if detonation failed would be present only in small quantities.

# Table 2-2Army Checklist for Important Ecological Places aBaxter Outlying Field

		Yes / No	Comments
1	Locally important ecological place identified by the Integrated		
	Natural Resource Management Plan, BRAC Cleanup Plan or		
	Redevelopment Plan, or other official land management plans		
2	Critical habitat for Federal designated endangered or threatened		
	species		
3	Marine Sanctuary		
4	National Park		
5	Designated Federal Wilderness Area		
6	Areas identified under the Coastal Zone Management Act		
7	Sensitive Areas identified under the National Estuary Program or		
	Near Coastal Waters Program		
8	Critical areas identified under the Clean Lakes Program		
9	National Monument		
10	National Seashore Recreational Area		
11	National Lakeshore Recreational Area		
12	Habitat known to be used by Federal designated or proposed		
	endangered or threatened species		
13	National preserve		
14	National or State Wildlife Refuge		
15	Unit of Coastal Barrier Resources System		
16	Coastal Barrier (undeveloped)		
17	Federal land designated for protection of natural ecosystems		
18	Administratively Proposed Federal Wilderness Area		
19	Spawning areas critical for the maintenance of fish/shellfish species		
	within river, lake, or coastal tidal waters		
20	Migratory pathways and feeding areas critical for maintenance of		
	anadromous fish species within river reaches or areas in lakes or		
	coastal tidal waters in which fish spend extended periods of time		
21	Terrestrial areas utilized for breeding by large or dense aggregations		
	of animals		
22	National river reach designated as Recreational		

## Table 2-2 (Cont.)Army Checklist for Important Ecological Places <sup>a</sup>Baxter Outlying Field

		Yes / No	Comments
23	Habitat known to be used by state designated endangered or		
	threatened species		
24	Habitat known to be used by species under review as to its Federal		
	endangered or threatened status		
25	Coastal Barrier (partially developed)		
26	Federally designated Scenic or Wild River		
27	State land designated for wildlife or game management	$\boxtimes$ / $\Box$	Priority habitat within Rankin Canyon used for wildlife
			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	$\boxtimes$ / $\Box$	Small wetland areas located in western and eastern
			portions of MRS (see Figure 2-4).
33	Fragile landscapes, land sensitive to degradation if vegetative habitat		
	or cover diminishes		

<sup>a</sup> 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 3-1Summary of Samples Collected and Sample Tracking Information<br/>Baxter Outlying Field

Location ID	Sample Number	Sample Purpose	Sample Type	Sample Date	Start Depth (ft)	End Depth (ft)	Laboratory Sample ID	Aluminum, calcium, iron, and magnesium by SW-846 6010B	Antimony, Chromium, lead, manganese, nickel, and zinc by SW-846 6020	Antimony, lead, manganese, and zinc by SW-846 6020					
					Baxter	Outlying	Field Bombing Ra	nge MRS							
171A001	NWO-171-0001	REG	SS	24-Jan-11	0	0.5	280-12059-1	X		X					
	NWO-171-0005	FD	SS	24-Jan-11	0	0.5	280-12059-5	X		X					
171A002	NWO-171-0002	REG	SS	24-Jan-11	0	0.5	280-12059-2	X		X					
171A003	NWO-171-0003	REG	SS	24-Jan-11	0	0.5	280-12059-3	X		X					
171A004	NWO-171-0004	REG	SS	24-Jan-11	0	0.5	280-12059-4	X		X					
Background Samples Collected at Baxter Outlying Field															
171A005 NWO-171-5001 REG SS 24-Jan-11 0 0.5 280-12059-6 X X															
	NWO-171-5001-MS	MS	SS	24-Jan-11	0	0.5	280-12059-6MS	X	X						
	NWO-171-5001-MSD	MSD	SS	24-Jan-11	0	0.5	280-12059-6MSD	Х	Х						
171A006	NWO-171-5002	REG	SS	24-Jan-11	0	0.5	280-12059-7	Х	Х						
171A007	NWO-171-5003	REG	SS	24-Jan-11	0	0.5	280-12059-8	Х	Х						
171A008	NWO-171-5004	REG	SS	24-Jan-11	0	0.5	280-12059-9	Х	Х						
	Baxter Outlying Field Landing Strip Material Sample														
171A009	NWO-171-5005	REG	SS	24-Jan-11	0	0.5	280-12059-10	X	X						
				Backg	round Sa	mples Co	ollected at Wheatlar	nd Outlying Field							
172A005	NWO-172-5001	REG	SS	25-Jan-11	0	0.5	280-12060-6	X	X						
172A006	NWO-172-5002	REG	SS	25-Jan-11	0	0.5	280-12060-7	X	X						
	NWO-172-5002-MS	MS	SS	25-Jan-11	0	0.5	280-12060-7MS	X	X						
	NWO-172-5002-MSD	MSD	SS	25-Jan-11	0	0.5	280-12060-7MSD	X	X						
172A007	NWO-172-5003	REG	SS	25-Jan-11	0	0.5	280-12060-8	X	X						
172A008	NWO-172-5004	REG	SS	25-Jan-11	0	0.5	280-12060-9	X	X						
				Whea	atland Ou	utlying Fi	ield Landing Strip N	Aaterial Sample		-					
172A009	NWO-172-5005	REG	SS	25-Jan-11	0	0.5	280-12060-10	X	Х						
				Backg	ground S	amples C	Collected at Humoris	t Outlying Field		-					
173A007	NWO-173-5001	REG	SS	28-Jan-11	0	0.5	280-12236-8	X	X						
	NWO-173-5001-MS	MS	SS	28-Jan-11	0	0.5	280-12236-8MS	X	X						
	NWO-173-5001-MSD	MSD	SS	28-Jan-11	0	0.5	280-12236-8MSD	X	X						
173A008	NWO-173-5002	REG	SS	2-Feb-11	0	0.5	280-12236-9	X	X						
173A009	NWO-173-5003	REG	SS	2-Feb-11	0	0.5	280-12236-10	X	X						
173A010	NWO-173-5004	REG	SS	2-Feb-11	0	0.5	280-12236-11	X	X						
	NWO-173-5006	FD	SS	2-Feb-11	0	0.5	280-12236-12	X	X						

### Table 3-1 (Cont.) Summary of Samples Collected and Sample Tracking Information Baxter Outlying Field

Location ID	Sample Number	Sample Purpose	Sample Type	Sample Date	Start Depth (ft)	End Depth (ft)	Laboratory Sample ID	Aluminum, calcium, iron, and magnesium by SW-846 6010B	Antimony, Chromium, lead, manganese, nickel, and zinc by SW-846 6020	Antimony, lead, manganese, and zinc by SW-846 6020
				Bacl	kground	Samples	<b>Collected at Coyote</b>	Outlying Field		
174A005	NWO-174-5001	REG	SS	26-Jan-11	0	0.5	280-12061-6	X	X	
	NWO-174-5001-MS	MS	SS	26-Jan-11	0	0.5	280-12061-6MS	X	X	
	NWO-174-5001-MSD	MSD	SS	26-Jan-11	0	0.5	280-12061-6MSD	X	X	
174A006	NWO-174-5002	REG	SS	26-Jan-11	0	0.5	280-12061-7	X	X	
174A007	NWO-174-5003	REG	SS	27-Jan-11	0	0.5	280-12061-8	X	X	
174A008	NWO-174-5004	REG	SS	27-Jan-11	0	0.5	280-12061-9	X	X	

Notes:

FD = field duplicate sample

ft = feet

ID = identification

MRS = munitions response site

MS = matrix spike

MSD = matrix spike duplicate

REG = regular field sample

SS = surface soil (0 - 0.5ft below ground surface)

X = Indicates a sample was collected and analyzed for the given parameter

### Table 3-2Background Soil Screening LevelsBaxter Outlying Field

Element	Statistic Type	Background Screening Level (mg/kg)
Antimony	95 <sup>th</sup> Percentile	0.0430
Lead	95 <sup>th</sup> UTL	14.3
Zinc	95 <sup>th</sup> UTL	98.1

Notes:

FUDS = Formerly Used Defense Site mg/kg = milligrams per kilogram UTL = upper tolerance limit

Background screening levels are based on statistical calculations from 16 soil samples collected from the vicinity of the four nearby FUDS Outlying Fields (Baxter, Coyote, Humorist, and Wheatland) with 4 soil samples collected at each FUDS. See Section 3.6.1 and Appendix L for discussion of calculations.

### Table 3-3Human Health Screening Levels for SoilBaxter Outlying Field

			EPA Regiona Levels (1	al Screening RSLs) <sup>a</sup>	Washington D				
Analyte	Abbreviation	CAS No.	Residential RSLs (mg/kg)	Industrial RSLs (mg/kg)	Method B Level - Unrestricted <sup>c</sup> (mg/kg)	Leaching - Phase 3 Model - Unrestricted <sup>d</sup> (mg/kg)	Method B Level - Industrial <sup>e</sup> (mg/kg)	Leaching - Phase 3 Model - Industrial <sup>f</sup> (mg/kg)	Final Screening Level <sup>g</sup> (mg/kg)
			1	Metals					
Antimony	Sb	7440-36-0	31	410	NVA	NVA	NVA	NVA	31
Lead	Pb	7439-92-1	400	800	NVA	3,000	NVA	3,000	400
Zinc	Zn	7440-66-6	23,000	310,000	NVA	NVA	NVA	NVA	23,000

#### Acronyms and Abbreviations:

CLARC = Cleanup Level and Risk Calculation EPA = U.S. Environmental Protection Agency mg/kg = milligrams per kilogram NVA = no value available RSL = Regional Screening Level WAC = Washington Administrative Code

#### Notes:

<sup>a</sup> EPA Regional Screening Levels for Chemical Contaminants at Superfund Sites. Table dated November 2010.

<sup>b</sup> Cleanup levels are established under the Model Toxics Control Act Cleanup Regulation. Chapter 173-340 WAC.

<sup>c</sup> Values from Notes on Method A Cleanup Levels WAC 173-340-720, 740, and 745. Table 740-1, Table 5: Method B Calculations for Carcinogens for Soil Ingestion Plus Dermal Contact and Table 6: Method B Calculation for Soil Ingestion Plus Dermal Contact. Based on unrestricted land use. From CLARC Notes updated on November 23, 2004.

<sup>d</sup> Values from Notes on Method A Cleanup Levels WAC 173-340-720, 740, and 745, Table 740-1, Table 7: 3-Phase Model Assumptions and Results. Based on protection of groundwater. From CLARC Notes updated on November 23, 2004.

<sup>e</sup> Values from Notes on Method A Cleanup Levels WAC 173-340-720, 740, and 745, Table 745-1, Table 5: Method C Industrial Calculations for Carcinogens for Soil Ingestion Plus Dermal Contact and Table 6: Method C Industrial Calculations for Carcinogens for Soil Ingestion Plus Dermal Contact. Based on industrial land use. From CLARC Notes updated on November 23, 2004.

<sup>f</sup> Values from Notes on Method A Cleanup Levels WAC 173-340-720, 740, and 745, Table 745-1, Table 7: 3-Phase Model Assumptions and Results. Based on protection of groundwater. From CLARC Notes updated on November 23, 2004.

<sup>g</sup> Final Screening Level selected based on the lowest value listed for chemical between RSL and Washington Department of Ecology – Soil Cleanup Levels. The proposed analytical method reporting limits are capable of reporting concentrations below the screening level.

#### Table 3-4 **Ecological Screening Levels for Soil Baxter Outlying Field**

Analyte	Washington Department of Ecology Lowest Value for Plants/ Soil Biota/Wildlife <sup>a</sup> (mg/kg)	EPA Region 5 ESLs <sup>b</sup> (2003) (mg/kg)	EPA Re (mg	EPA Region 7 <sup>c</sup> (mg/kg)		EPA Region 8 <sup>d</sup> (mg/kg)		EPA Region 10 <sup>e</sup> (mg/kg)		7alues: 2009) <sup>f</sup> kg)	Potential Bioaccumulative Constituent? <sup>g</sup>	Final Proposed Ecological Screening Level Soil <sup>h</sup> (mg/kg)
Metals	etals											
Antimony	5	0.142	0.27	SSL	0.27	SSL	0.27	SSL	0.05	LANL		5
Lead	50 0.0537 11 SSL		11	SSL	11	SSL	14	LANL	Yes	50		
Zinc	86	6.62	46	SSL	46	SSL	46	SSL	48	LANL	Yes	86

#### Acronyms and Abbreviations:

EcoSSLs = Ecological Soil Screening Levels EPA = U. S. Environmental Protection Agency ESLs = Ecological Screening Levels LANL = Los Alamos National Laboratory

PRGs = Preliminary Remediation Goals SSLs = EPA Ecological Soil Screening Levels

ORNL = Oak Ridge National Laboratory Ecological PRGs (Efroymson et al.)

mg/kg = milligrams per kilogram

WAC = Washington Administrative Code

#### Notes:

<sup>a</sup> Washington Department of Ecology, Toxics Cleanup Program, Table 749-3, Ecological Indicator Soil Concentrations for Protection of Terrestrial Plants and Animals. Developed under WAC 173-340-7493 (2)(a)(i). <sup>b</sup> Ecological Screening Levels (ESLs), EPA Region 5, August 2003.

<sup>c</sup> 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.

<sup>d</sup> EPA Region 8: Dale Hoff (Eco Risk Assessor) recommends the following hierarchy: EPA SSLs; Dutch Intervention Values or ORNL Efroymson values.

<sup>e</sup> 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.

<sup>f</sup>Los Alamos National Laboratory (LANL), Eco Risk Database, Release 2.4, December 2009.

<sup>g</sup> Potential bioaccumulative constituents will be evaluated in more detail, as some screening values do not take into account bioaccumulation.

Potential bioaccumulative potential from: Bioaccumulation Testing and Interpretation for the Purposes of Sediment Quality Assessment: Status and Needs (EPA, 2000) and ODEQ Environmental Quality

Screening Level Values (ODEQ, 2001).

<sup>h</sup> Final Screening Level selected using the following hierarchy:

1. State Value (Washington)

2. EPA Region State Located In (EPA Region 10)

3. LANL (2009) value

The proposed analytical method reporting limits are capable of reporting concentrations below the screening level.

#### **Other References:**

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### Table 4-1 Comparison of Soil Results to Background, Human Health, and Ecological Screening Levels Baxter Outlying Field

Location	Location							4001			171	4001		171A002			
Sample Number							NWO-171-0001				NWO-1	71-0005		NWO-171-0002			
Sample Date							24-Jan-11				24-Jan-11				24-Jan-11		
Sample Depth (ft bgs)							0 to	0.5			0 to	0.5			0 to	0.5	
Sample Purp	Sample Purpose						R	EG		FD				REG			
Fraction	Parameter	Units	Site Inspection Background 95th UTL / 95th Percentile	Site Inspection Ecological Screening Level	Site Inspection Human Health Screening Level	Result	PQL	MDL	VQ	Result	PQL	MDL	VQ	Result	PQL	MDL	VQ
Metals	Antimony	mg/kg	0.0430	5	31	0.0561	0.354	0.0124	J	0.0258	0.345	0.0121	J	0.0245	0.377	0.0132	J
Metals	Lead	mg/kg	14.3	50	400	11.8	0.708	0.0161		9.87	0.69	0.0157		9.69	0.755	0.0172	
Metals	Zinc	mg/kg	98.1	86	23000	79	4.42	0.28		65.9	4.31	0.272		75.4	4.72	0.298	

#### Notes:

[Bold Face] = Result exceeds Site Inspection Background 95th UTL / 95th Percentile.

[*Italicized*] = Result exceeds Site Inspection Ecological Screening Level.

[<u>Underlined</u>] = Result exceeds Site Inspection Human Health Screening Level.

bgs = below ground surface

FD = field duplicate sample

ft=feet

MDL = method detection limit

mg/kg = milligrams per kilogram

PQL = practical quantitation limit

REG = regular field sample

UTL = upper tolerance limit

VQ = validation qualifier

#### Validation Qualifier Definition:

J = The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed.

### Table 4-1 (Cont.) Comparison of Soil Results to Background, Human Health, and Ecological Screening Levels Baxter Outlying Field

Location	Location						171A003				1714	<b>A004</b>			171/	<b>\009</b>	
Sample Number						NWO-171-0003			NWO-171-0004				NWO-171-5005				
Sample Date						24-Jan-11				24-Ja	an-11		24-Jan-11				
Sample Depth (ft bgs)							0 to	0.5			0 to	0.5			0 to	0.5	
Sample Purp	ose						R	EG		REG				Landing Strip Soil			
Fraction	Parameter	Units	Site Inspection Background 95th UTL / 95th Percentile	Site Inspection Ecological Screening Level	Site Inspection Human Health Screening Level	Result	PQL	MDL	VQ	Result	PQL	MDL	VQ	Result	PQL	MDL	VQ
Metals	Antimony	mg/kg	0.0430	5	31	0.0294	0.396	0.0139	J	0.0262	0.333	0.0117	J	0.0165	0.396	0.0139	J
Metals	Lead	mg/kg	14.3	50	400	65	0.792	0.018		9.66	0.667	0.0152		12.7	0.792	0.018	
Metals	Zinc	mg/kg	98.1	86	23000	210	4.95	0.313		64.5	4.17	0.263		221	4.95	0.313	

#### Notes:

[Bold Face] = Result exceeds Site Inspection Background 95th UTL / 95th Percentile.

[*Italicized*] = Result exceeds Site Inspection Ecological Screening Level.

[<u>Underlined</u>] = Result exceeds Site Inspection Human Health Screening Level.

bgs = below ground surface

FD = field duplicate sample

 $\mathbf{ft} = \mathbf{feet}$ 

MDL = method detection limit

mg/kg = milligrams per kilogram

PQL = practical quantitation limit

 $REG = regular \ field \ sample$ 

UTL = upper tolerance limit

VQ = validation qualifier

#### Validation Qualifier Definition:

J = The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed.