U.S. Army Corps of Engineers
Omaha District

Technical Project Planning Meeting Package Kingsley Firing Range Annex
FUDS ID F10OR0569

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

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Technical Project Planning Memorandum

Site Inspection
Kingsley Firing Range Annex
Formerly Used Defense Site
FUDS ID F10OR0569

Military Munitions Response Program

Documentation for Technical Project Planning Meeting
Klamath Falls, Oregon
April 16, 2007

Hosted by U.S. Army Corps of Engineers

Prepared by Shaw Environmental, Inc.

April 5, 2007

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ABBREVIATIONS AND ACRONYMS

°F	degrees Fahrenheit
AOC	area of concern
ASR	Archives Search Report
bgs	below ground surface
CSM	Conceptual Site Model
DQO	Data Quality Objective
FS	Feasibility Study
FUDS	Formerly Used Defense Site
HRS	Hazard Ranking System
lb	pound
MC	munitions constituents
MEC	munitions and explosives of concern
MRSPP	Munitions Response Site Prioritization Protocol
NBEC	nitrogen-based explosive compound
NDAI	No Department of Defense Action Indicated
PA/SI	Preliminary Assessment/Site Inspection
PETN	pentaerythritol tetranitrate
Shaw	Shaw Environmental, Inc.
SHPO	State Historical Preservation Office
SI	Site Inspection
SSWP	Site-Specific Work Plan
T&E	threatened and endangered
TPP	Technical Project Planning
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
UXO	unexploded ordnance

Site: Kingsley Firing Range Annex

Location: Klamath Falls, Oregon

USACE District: Seattle

TPP #1 Meeting Location: Klamath Falls, Oregon

TPP #1 Meeting Date: April 16, 2007

AGENDA

Monday April 16, 2007

- **Convene**
    - **Introductions**
    - **Review Site Inspection Objectives**
        - **Goals, Objectives, and Roles & Responsibilities**
        - **Site Inspection Process**
        - **Technical Project Planning (TPP) Process**
        - **Review of Background Information**
- **Technical Project Planning Discussion**

- **Public Meeting**

Kingsley Firing Range Annex
Technical Project Planning Meeting
Klamath Falls, Oregon
April 16, 2007

Name	Organization	Phone (W)	Phone (C)	Email Address

1.0 Administrative Information

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

The TPP Meeting for the former Kingsley Firing Range Annex will be conducted on April 16, 2007 in Klamath Falls, Oregon. Representatives from the U.S. Army Corps of Engineers (USACE) – Omaha Design Center, the USACE - Seattle District, the Oregon Department of Environmental Quality (ODEQ), and Shaw Environmental, Inc. (Shaw) will be in attendance. A site tour will not be conducted as part of this meeting.

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

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

2.0 Site Inspection Objectives

2.1 Goal

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

2.2 Objectives

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

2.3 Roles & Responsibilities

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

2.4 Site Inspection Process

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

2.5 Technical Project Planning Process

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

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

3.0 Background Information

Historical information (including references to interviews and historical documents) contained in this package was obtained from the *Archives Search Report* (ASR) (USACE, 1995) and the *ASR Supplement* (USACE, 2004) for the former Kingsley Firing Range Annex.

3.1 Site Name and Location

The former Kingsley Firing Range Annex, FUDS identification number F10OR0569, is located approximately four miles north of Klamath Falls in Klamath County, Oregon (Figure 1, "Site Location").

3.2 Range Inventory

The Kingsley Firing Range Annex is included in the MMRP Inventory in the *Defense Environmental Programs Fiscal Year 2005 Annual Report to Congress* (DoD, 2005a) with range information as follows:

Range Name	Federal Facility Identification	Range Total Acres
Kingsley Firing Range Annex	F10OR0569	87

The ASR and ASR Supplement indicate that the total property acreage for the Kingsley Firing Range Annex consisted of 206.34 acres of land. That is only a portion of the original 734.26 acres known as the U.S. Marine Corps Recuperational Hospital (or the Marine Barracks). However, the ASR Supplement indicates that the range portion of the Kingsley Firing Range Annex, known as the Range Complex, consists of 87 acres.

The range area and coordinates are listed in the ASR Supplement (USACE, 2004) as follows:

Range Name	Range Identification	Approximate Area (acres)	UTM Coordinates (meters)
Range Complex	F10OR056901R01	87	X: 604412.00 Y: 4679217.00

Coordinates for the ranges are in Universal Transverse Mercator, Zone 10, NAD83.

Additionally there are three sub-ranges that are part of the Range Complex, as follows:

Sub-Range Name	Federal Facility Identification	Sub-Range Total Acres	UTM Coordinates (meters)
Rifle Range	F10OR0569-SR01	1259	X: 604306.00 Y: 4679492.00
Rocket Range	F10OR0569-SR02	410	X: 604442.00 Y: 4679191.00
Disposal Range	F10OR0569-SR03	13	X: 604412.00 Y: 4679097.00

The apparent large discrepancy in acreage between the Range Complex (87 acres) and the sub-ranges is due to the fact that the firing fan for the Rifle Range and Rocket Range are depicted and including in the sub-range acreage totals.

3.3 Property History

The information for the following sections is primarily obtained from the ASR (USACE, 1995) and the ASR Supplement (USACE, 2004).

3.3.1 Historical Military Use

- The former Kingsley Firing Range Annex was part of a larger 734 acre site known as the U.S. Marine Corps Barracks which was activated in 1944. The 734 acre site was built as a Marine Barracks and medical facility to be used for military personnel who had contracted tropical diseases.

- The Annex is comprised of 206.34 acres of land that was developed and used by the Air Force as a small arms firing range. The Range Complex consists of 87 acres.

- The U.S Marines and Oregon Army National Guard controlled the land prior to Air Force use. The land was under the DoD from 1944 to 1947.

- The treatment center was closed on October 28, 1947.

- The land was transferred in 1947 to the Oregon Technical Institute for use as a training facility for returning veterans, and then in turn it was transferred to the City of Klamath Falls for use as a park.

- The city could not maintain the area as a park; therefore, the land reverted back to the U.S. Government in 1964.

- With the exception of the rifle range, the General Services Administration put the property up for sale.

- The U.S. Air Force assumed control of a portion of the land (range complex) in February 1965 for the purpose of constructing a rifle range. The Air Force was in control of the Range Complex from 1965 to 1975.

  – The range complex was comprised of three separate sub-ranges (a rifle range with its firing fan, a 3.5 inch rocket range with its firing fan, and a small disposal range).

- The land was turned over to the Department of Interior who excessed the land and sold it to private individuals in 1976.

3.3.2 Munitions Information

- Due to several types of usage by the military, the Range Complex was subdivided into the following sub-ranges that all share common boundaries:

  – Rifle Range

    - Range was constructed by the Air Force in 1965
    - Historically used for small arms practice from 1965 to 1975
    - The rocket range firing fan overlaps this range
    - The firing line was approximately 60 yards wide with an impact berm 200 feet wide and 20 feet high
    - Range was approximately 500 yards in length, ending abruptly on a sheer mountain side immediately behind the berm
    - Firing positions were elevated and were at approximately 200 yards, 300 yards, and 500 yards.
    - The length of the range actually funneled into the mountain with each side of the range elevated. This dramatically decreased the rifle range acreage from that of a normal 500 yard range.
    - Portions of the rifle range firing fan fall within the rocket range firing fan.

  – Rocket Range

    - Used by the Army National Guard for 3.5-inch rocket practice.
    - In use from 1965 to 1975.
    - Historical records suggest only practice warheads were used during the training periods.

- A discovered rocket had an identifiable lot number and fuze nomenclature M-405, which is the practice version of the 3.5 inch rocket.
- Interview with a member of the Oregon Army National Guard indicated that the standard range firing fan in Army Regulation 385-63 was used, and only inert warhead type rockets were fired at an old vehicle.
- The exact firing point is unknown, but a most probable location was selected over which the standard range firing fan was overlaid and mapped.
- Historic records indicate that the rocket range is relatively clean; therefore, indicating very seldom use.
- The firing fan extends over the Disposal Range and Rifle Range.
- Approximately 6.45 acres on the extreme southwest edge of the firing fan area is located on non-FUDS property.

– Disposal Range

- It is assumed that this range was in use from 1965 through 1975.
- The range overlaps the southeastern portion of the Rocket Range
- The range has a radius of approximately 300 feet.
- The center of the range has a 3 to 4 foot high berm around it. This is an indication that the range could have been used for small quantities of explosives during Explosive Ordnance Disposal Team training with items such as shape charges.
- The berm could also indicate that the site was used for small burn/disposal operations (this was common practice during that time period).
- Range has two burn pits located approximately 200 feet apart. One of the pits is situated on flat ground with no pit or berm. The other are had a 6 foot high, horseshoe-shaped berm.
- Historical records indicate that several burned cartridges were found in the center of the berm. However, no ordnance was found outside the berm.

3.3.3 Ownership History

- Prior ownership

  – The land was under the DoD from 1944 until 1947.

  – The land was transferred in 1947 to the Oregon Technical Institute for use as a training facility for returning veterans, and then in turn it was transferred to the City of Klamath Falls for use as a park.

- The city could not maintain the area as a park; therefore, the land reverted back to the U.S. Government in 1964.

- The U.S. Marines and later the Oregon Army National Guard controlled the land prior to the Air Force taking control in 1965.

- The US Air Force assumed control of the land in February 1965 for the purpose of constructing a rifle range. The Air Force was in control of the range complex from 1965 to 1975.

- The land was turned over to the Department of Interior who excessed the land and sold it to private individuals in 1976.

Physical Setting

3.3.4 Topography and Vegetation

- The city of Klamath Falls is located at an elevation of 4,100 feet and is surrounded by the Coastal and Cascade mountain ranges.

- The Kingsley Firing Range Annex is located in the foothills of the Cascade mountain at an elevation of approximately 5,100 feet.

- Topography is relatively flat and has a rocky terrain with low ground cover and rock outcropping, including brush and native grasses.

3.3.5 Surface Water

- The county is located within the Lost River drainage area.

- Drainage from the site follows existing intermittent streams during periods of high precipitation.

- No ponds or surface water bodies are found in the immediate vicinity of the Range Complex. The nearest surface water is Swan Lake located approximately 2 miles east of the Range Complex.

3.3.6 Sensitive Environments

- The ASR states that no threatened or endangered are known to be found in the vicinity of the site. Therefore, Kingsley Firing Range Annex is not considered an Important Ecological Place (IEP).

- Table 1 presents the Army checklist for IEPs.

- The site is not managed for ecological purposes.

- According to the ASR, no historical or cultural resources were found to be present on the lands which contained the former Kingsley Firing Range Annex. This will be confirmed with the State Historical Preservation Office (SHPO).

3.3.7 Climate

- Semi-arid region with warm summers and cool winters.
- The City of Klamath Falls is surrounded by the Cascade and Coastal mountain ranges which tend to collect the precipitation before it reaches the valley.
- The average annual maximum and minimum temperatures are 61.1 degrees Fahrenheit (ºF) and 35.4 ºF, respectively.
- The average total annual precipitation is 13.72 inches.
- The average total annual snowfall is 37.8 inches.

Geologic and Hydrogeologic Setting

3.3.8 Bedrock Geology

- The area is underlain by Pliocene volcanic rocks. Tuffaceous bedrock typically is present at depths of approximately 25 to 40 inches below ground surface (bgs).

3.3.9 Overburden Soils

- Area shows shallow to very deep, excessively drained and well drained soils in mountainous areas.
- The “Lorella” soils are shallow soils that formed in residual material originating from tuff and basalt.
- The “Rock Outcrop Nuss” consists of rock outcrops and shallow soils that are formed from tuff.
- The “Woodcock-Nuss-Royst” are shallow to deep soils formed from andesite, basalt, tuff, and ash.
- All three types of soils are prevalent on the site.

3.3.10 Hydrogeology

- Static water level in the area ranges from approximately 45 feet bgs to 400 feet bgs .

3.4 Population and Land Use

3.4.1 Nearby Population

- Klamath County has a diverse economy consisting of timber, cattle ranching, irrigation farming, and tourism.
- The Kingsley Firing Range Annex is located four miles north of Klamath Falls, Oregon

- Approximately 19,882 residents reside in Klamath Falls per the 2005 Bureau of Census population estimates (www.census.gov).

- The North Ridge Estates housing development was constructed adjacent to the Kingsley Firing Range Annex (across Old Fort Road).

3.4.2 Land Use

- Range itself has been used in the past for limited cattle grazing.

- Records indicate the following improvements to the site: a wood-frame administration building, two concrete ammunition buildings, a small wood-frame range building, a steel shipping container used for storage, several wooden polls, and a water system between the administration building and one firing range (Environmental Data Resources, Inc).

  – The administration building is sided with what appears to be cement/asbestos board

- Currently the land is not inhabited.

- Records indicated that the entire range was fenced and there were two locked gates on the access road to the range.

- The adjacent land (across Old Fort Road) was used for construction of the North Ridge Estates housing development.

  – In 2001, the Oregon Department of Environmental Quality (ODEQ) received a complaint of asbestos-containing material at the North Ridge Estates.

  – An inspection of the development revealed several violations of Oregon rules.

  – Subsequently some residents were relocated and the Environmental Protection Agency (EPA) has an ongoing cleanup of this area.

3.4.3 Area Water Supply

- Records indicate one groundwater well located near the North Ridge Estates, no wells are located on the Range Complex. The well was completed in 1963 for domestic use to a depth of 145 feet bgs.

- Figure 2, “Domestic Wells Within 4-Mile Radius” presents the location of the domestic wells.

3.5 Previous Investigations for MC and MEC

- Figure 3, “Site Layout” presents a layout of the Kingsley Firing Range Annex.

- A preliminary assessment of the former Kingsley Firing Range Annex was authorized in 1993

- The Findings and Determination of Eligibility dated October 23, 1995 concluded that the subject site was found to be used by the DOD

- The INPR recommended an OE investigation which is the subject of the ASR for the Former Kingsley Firing Range Annex (USACE, 1995).

- An ASR Supplement was issued 2004 and indicated one range, Range Complex, and three sub-ranges (Rifle Range, Rocket Range, and Disposal Range).

- The munitions used at the Kingsley Firing Range Annex and the associated MC are shown on Table 2.

3.6 Other Land Uses that May Have Contributed to Contamination

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

3.7 Summary of Previous Investigations

- According to an Environmental Data Resources, Inc. report, a PA/SI assessment and report was completed by the EPA in December 2004. A summary of the report will be added to the final TTP Memorandum once the document is received and reviewed.

- The Environmental Data Resources, Inc. report summarizes the following:

  – A combination of soil and creek sediment samples were collected, as well as a groundwater sample from an on-site well.

  – Samples were analyzed for metals and nitrate-based explosive compounds (NBECs). The groundwater sample was also analyzed for perchlorates.

  – Several soil samples contained elevated levels of lead and a few other metals such as arsenic and mercury.

  – No samples contained significant quantities of NBECs.

  – The groundwater sample had elevated vanadium levels.

4.0 Conceptual Site Model – Range Complex

4.1 Overview

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

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

The CSM is evaluated for completeness and further developed as needed through TPP meetings and additional investigation.

4.2 Background

The CSM is based on information presented in the ASR (USACE, 1995) and the ASR Supplement (USACE, 2004). The Kingsley Firing Range Annex is comprised of 206.34 acres of land that was developed and used by the Air Force as a small arms firing range from 1965 to 1975. The site was used by the U.S. Marine Corps, Oregon Army National Guard, and U.S. Air Force from 1942 until December 1975.

Due to several types of usage by the military, the Range Complex was divided into three sub-ranges that all share common boundaries: Rifle Range, Rocket Range, and Disposal Range. Figures 4 through 6 show greater detail of the sub-ranges.

4.2.1 History of use

- Rifle Range
  - The Rifle Range was constructed by the Air Force and was historically used for small arms practice from 1965 to 1975.

- Portions of the Rifle Range firing fan fall within the Rocket Range firing fan.
- The Rifle Range was approximately 500 yards in length, ending abruptly on a sheer mountain side located immediately behind the impact berm. Elevated firing positions were located at approximately 200 meters, 300 meters, and 500 meters.
- The firing line was approximately 60 yards wide, with an impact berm 200 feet wide and over 20 feet high.
- The length of the range actually funneled into the mountain with each side of the range elevated. This dramatically decreased the rifle range acreage from that of a normal 500 yard range.
- A 3.5 inch rocket was discovered on a fence post. The rocket had markings indicating it was an M-405 rocket, which is the practice version of the 3.5 inch rocket.
- There was no evidence of ordnance or explosive contamination at this site.

- Rocket Range
  - Used by the Army National Guard from 1965 to 1975 for 3.5-inch rocket practice.
  - Historical records suggest only practice warheads were used during the training periods. A warhead and rocket motor assembly were discovered on a fence post located on the Rifle Range. The lot and model number were readable, including the word “dummy” on the inert M-405 fuze.
  - The exact firing point is unknown, but a most probable location was selected over which the standard range firing fan was overlaid and mapped.
  - The Rocket Range firing fan extends over the Disposal Range and Rifle Range.
  - Approximately 6.45 acres of the Rocket Range firing fan area is located on non-FUDS property.
  - Scattered debris from 3.5 inch rockets started approximately 400 yards downrange of the firing point and well within the firing fan.

- Disposal Range
  - The exact dates of use are unknown. However, it is assumed to be comparable to the other ranges (1965 through 1975).

- The Disposal Range overlaps the southeastern portion of the Rocket Range
- The range extends out approximately 300 feet from the center.
- The center of the range has a 3 to 4 foot high berm enclosing the center. This is an indication that the range could have been used for small quantities of explosives during Explosive Ordnance Disposal Team training with items such as shape charges.
- The berm could also indicate that the site was used for small burn/disposal operations (this was common practice during that time period) for Cartridge Actuated Devices/Propellant Actuated Devices (CADD/PAD) devices and small arms burning.
- Two burn pits, approximately 200 feet apart were identified with ordnance related debris.
    - One of the pits was situated on flat ground with no pit or berm. It had ordnance residue in the form of small arms casings and ammunition clips. No live ordnance was found.
    - The second area had a 6 foot high berm. Within the berm was burned and melted ejection cartridges, small arms casings, and the empty base of an old style bomb. No live ordnance was found.

4.2.2 Munitions and Associated MC

Area of Concern	**Munitions**	**Munitions Constituents**
Range Complex	3.5-inch Rocket, Practice M29A2	Steel
	Fuze M-405 (dummy)	Plaster of paris, stearic acid
	M-2 (.30 caliber) M1911 (.45 caliber)	Lead, single-base (nitrocellulose) or double-base (nitrocellulose and nitroglycerin) powder
	500-lb Practice Bomb, Mk 65	Steel, black powder
	Ejection Cartridge, ARD 863-1	double-base (nitrocellulose and nitroglycerin) powder
	C4 Block explosive charge	RDX
	Detonating cord M60 Igniter	PETN

4.2.3 Previous MEC Finds

- During the ASR inspection, no evidence of ordnance or explosive contamination was found at the Rifle Range.
- During the ASR site inspection, scattered debris from practice 3.5 inch rockets was found at the Rocket Range.
- During the ASR site inspection, burned and melted ejection cartridges; small arms casings; ammunition clips; and the empty base of an old style bomb were found at the Disposal Range.
- No other MEC was reported or detected during the site inspection.

4.2.4 Previous MC Sample Results

- A PA/SI report was reportedly completed by the EPA in December 2004. A summary of the report will be added to the final TTP Memorandum once the document is received and reviewed.

4.2.5 Current and Future Land Use

- Land is privately owned. Fencing and signage on a portion of the Range Complex provides a level of access restrictions to the general public.
- Land is currently not inhabited. The property is infrequently used for hiking and horseback riding.
- Future land use is expected to remain the same as current land use.

4.2.6 Ecological Receptors

- This FUDS doe not qualify as an IEP because there are no threatened or endangered species located on or near the site, and the site is not managed for ecological purposes.

4.3 MEC Evaluation

- The Rifle Range was historically used for small arms practice from 1965 to 1975.
- The Rocket Range was used for training with practice 3.5-inch rockets.
- No live ordnance was found at the Disposal Range. A portion of the range was supposedly used by for Explosive Ordnance Disposal Team training with items such as shape charges.
- Historical evidence indicates that munitions and small arms debris are found at the site. No MEC has been found on any of the sub-ranges.
- The site is currently privately owned and is not inhabited.

- There is restricted access to portions of the site due to fencing and locked gates.
- A housing development, North Ridge Estates, is within 1 mile of the site.
- The nearest city is Klamath Falls, approximately 4 miles to the south.

4.3.1 MEC Evaluation/Investigation Needed

- A visual field reconnaissance survey of the Range Complex and sub-ranges will be conducted with the objective to visually locate MEC. The reconnaissance will be aided through the use of a handheld magnetometer for safety purposes.

4.4 MC Pathway Evaluation

4.4.1 Overview of Site Characteristics

- Munitions debris from 3.5-inch practice rockets consist primarily of light steel, chromium, copper, iron, lead, manganese, and nickel.
- Munitions debris from practice bombs consist primarily of steel/sheet metal, chromium, copper, iron, lead, manganese, and nickel.
- Small arms casings and filler consist of lead, single-base (nitrocellulose) or double-base (nitrocellulose and nitroglycerin) powder.
- Demolition charges C-4 and detonation cord contain explosives RDX and pentaerythritol tetranitrate (PETN).
- Debris from ejection cartridges contains single-base (nitrocellulose) or double-base (nitrocellulose and nitroglycerin) powder.
- The site is currently privately owned and is uninhabited.
- There is restricted access to portions of the site due to fencing and locked gates.
- A housing development, North Ridge Estates, is within 1 mile of the site.
- Figure 2 presents the groundwater wells within a 4-mile radius. Figures 7 and 8 present the sensitive receptors within a 2-mile radius and the surface water drainage within a 15-mile radius, respectively.

4.4.2 Overview of Pathways

Affected media and potential pathways for MC include:

- Soil: Soil is the primary medium of concern due to the presence of small arms and munitions debris (i.e., practice rockets, practice bombs, small arms remnants, explosive remnants) and possibly MC in the soil. The soil also serves as a secondary source of air contamination.

- Surface Water: The nearest surface water is Swan Lake located approximately 2 miles east of the Range Complex. Because of the distance, there is no complete surface water pathway.

- Sediment: Because of the distance to the nearest surface water, there is no complete pathway for sediment.

- Groundwater: Groundwater is a potentially affected media since the migration of MC directly to the groundwater from the soil is considered to be possible. However, the static water level ranges from approximately 45 feet bgs to 400 feet bgs in this area.

- Air: Air is a possible completed pathway through inhalation of contaminated soil particles. The prevailing wind direction is from the southeast. Blowing dust from the sub-ranges could mobilize soil particles. The pathway is considered to be complete.

Exposure media at the Kingsley Firing Range Annex include soil, groundwater, and air. An analysis of exposure pathways and receptors for each media is provided in Table 3.

Figures 9 through 11 illustrate the conceptual site model for the Rifle Range, Rocket Range, and Disposal Range and the potential pathways of MC contamination.

4.4.3 Soil Exposure Pathway

4.4.3.1 Migration Pathway

- The potential routes of human exposure to MC include incidental ingestion of and dermal contact with contaminated soil, as well as inhalation of soil particles during intrusive work.

- The potential routes of wildlife exposure to contaminated soils include incidental ingestion of and dermal contact with contaminated media. Plants may uptake MC and then subsequently be eaten by wildlife. Burrowing animals may ingest MC contaminated soil and subsequently be eaten by predators.

4.4.3.2 Human Receptors

- The most likely current and future human receptors are the landowners

4.4.3.3 Ecological Assessment

- This site has been determined not to be an IEP since the ASR states that no threatened or endangered species are known to be found in the vicinity of the site and the site is not being managed for ecological purposes.

4.4.4 Groundwater Pathway

4.4.4.1 Migration Pathway

- The potential routes for human exposure to contaminated groundwater include ingestion, dermal contact, and inhalation where groundwater is used as a water supply.

- The potential route of wildlife to direct exposure is not a concern.

4.4.4.2 Human Receptors

- The most likely current and future human receptors are the landowners.

4.4.4.3 Ecological Assessment

- This site has been determined not to be an IEP since the ASR states that no threatened or endangered species are known to be found in the vicinity of the site and the site is not managed for ecological purposes.

4.4.5 Groundwater Pathway

4.4.5.1 Migration Pathway

- The potential route for human exposure to contaminated air includes inhalation during times of blowing dust.

- The potential route of wildlife exposure to contaminated air includes inhalation during times of blowing dust.

4.4.5.2 Human Receptors

- The most likely current and future human receptors are the landowners.

4.4.5.3 Ecological Assessment

- Wildlife.

4.4.6 MC Soil, Air, and Groundwater Evaluation/Investigation Needed

- Three soil samples are planned for the Kingsley Firing Range Annex.
  - One soil sample will be collected at from the front of the impact berm at the Rifle Range. The sample will be analyzed for select metals (chromium, copper, iron, lead, manganese, and nickel) and explosives (including nitroglycerin and PETN).

  - One soil sample will be collected from the Rocket Range in an area with a high concentration of practice rocket fragments. The sample will be analyzed for select metals (chromium, copper, iron, lead, manganese, and nickel) and explosives (including nitroglycerin and PETN).

  - One soil sample will be collected at one of the Disposal Range burn pits. The sample will be analyzed for select metals (chromium, copper, iron, lead, manganese, and nickel) and explosives (including nitroglycerin and PETN).

- One groundwater sample will be collected from a well near the Range Complex. The sample will be analyzed for select metals (chromium, copper, iron, lead, manganese, and nickel) and explosives (including nitroglycerin and PETN).

- Ten background soil samples will be collected from non-impacted areas of the range. Samples will be analyzed for select metals (chromium, copper, iron, lead, manganese, and nickel).

- No air sample will be collected. The results of the soil samples will be used in the evaluation of the air pathway. The air pathway is included in the development of the EPA Region 9 preliminary remediation goals.

4.5 CSM Summary/Data Gaps

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

Pathway	**Presence of MEC**	**Presence of MC**	**Proposed Inspection Activities**
Soil	Unknown	Scattered debris from practice 3.5 inch rockets was found at the Rocket Range. Burned and melted ejection cartridges; small arms casings; ammunition clips; and the empty base of an old style bomb were found at the Disposal Range.	Visual field reconnaissance and soil sampling.
Sediment	Unknown	Unknown	Incomplete Pathway
Surface Water	Unknown	Unknown	Incomplete Pathway
Groundwater	Unknown	Unknown	Groundwater sample
Air	None	None	Included in evaluation of soil pathway.

Kingsley Firing Range Annex HRS Data Gaps

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

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

5.0 References

Interstate Technical and Regulatory Council, 2003, *Characterization and Remediation of Soils at Closed Small Arms Firing Ranges*

Shaw Environmental, Inc. (Shaw), 2006, *Type I Work Plan, Site Inspections of Multiple Sites*.

U.S. Army Corps of Engineers (USACE), 1995, *Archives Search Report (ASR) Finding for the Former Kingsley Firing Range Annex, Klamath Falls, Oregon*, Project No. F10OR056901, September.

U.S. Army Corps of Engineers (USACE), 2004, *ASR Supplement, Kingsley Firing Range*, November.

U.S. Census Bureau, Population Estimates, www.census.gov.

U.S. Department of Defense (DoD), 2005, *Defense Environmental Programs Fiscal Year 2005 Annual Report to Congress*.

Proposed Sampling Scheme

Proposed Field Investigation

The proposed field investigation and sampling to be conducted at the former Kingsley Firing Range Annex is detailed below and summarized in Table 4. The investigation approach will be defined in more detail in a Site-Specific Work Plan (SSWP) that will be submitted to Oregon Department of Environmental Quality and other stakeholders for review. The SSWP will reference technical details including sampling and analytical methods that are described in the *Type I Work Plan, Site Inspections at Multiple Sites* prepared by Shaw and submitted to U.S. Army Corps of Engineers (USACE) as final in February 2006.

Reconnaissance

A visual field reconnaissance survey by a trained, unexploded ordnance (UXO) technician using a hand-held magnetometer will be performed in the three sub-ranges (Rifle Range, Rocket Range, and Disposal Range) to assess the presence or absence of munitions and explosives of concern (MEC) and to document the current site conditions. Several transects will be walked during which visual observations and magnetic anomalies will be noted. Transects will be recorded using a global positioning system, and appropriate features influencing the survey will be noted, such as vegetation density and type, topography, etc. If MEC is found, the qualified UXO technician will attempt to make a determination of the hazard, and appropriate notifications will be made as detailed in the *Type I Work Plan, Site Inspections at Multiple Sites* and SSWP. Digital photographs will be taken to document significant features.

Visual reconnaissance surveys will also be performed at all sampling locations to aid in sample location selection and to allow the sampler to work safely.

Soils

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

One soil sample will be collected from the front of the impact berm at the Rifle Range. One soil sample will be collected from the Rocket Range in an area with a high concentration of practice rocket fragments. One soil sample will be collected at one of the Disposal Range burn pits. If no MEC or munitions debris is located at these ranges, a soil sample will be collected at a representative location identified in the field.

Groundwater

One groundwater sample will be collected from an accessible well located near the Range Complex.

Groundwater, Sediment, and Surface Water

No sediment or surface water sampling is planned.

Analyses

All soil samples will be analyzed for select metals (aluminum, chromium, copper, iron, lead, manganese, and nickel) by USEPA SW-846 Method 6020A. Soil samples will be passed through an ASTM International No. 10 (2-millimeter [mm]) wire mesh sieve at the laboratory prior to analysis for metals in order to remove coarser particles and foreign objects, including large metallic fragments from the practice rockets or practice bombs, which have a low degree of bioavailability (Interstate Technical and Regulatory Council, 2003, *Characterization and Remediation of Soils at Closed Small Arms Firing Ranges*).

Soil samples will also be analyzed for explosives by USEPA SW-846 Method 8330A and for nitroglycerine and pentaerythritol tetranitrate (PETN) by Method 8330A (Modified).

Background Sampling

Site-specific or regional data regarding background concentrations of metals in soil are not known to be available. Therefore, ten background soil samples will be collected. The composite soil sample locations will be determined in the field in areas that do not appear to have been impacted by past site operations. The background samples will be analyzed for Target Analyte List metals, plus molybdenum only. The soil background samples will be used to develop an upper tolerance limit for comparison of metals soil concentrations at the target areas.

TPP Meeting Notes and Data Quality Objectives

Site Inspection ***Technical Project Planning Meeting***
Kingsley Firing Range Annex ***April 16, 2007***

Technical Project Planning and Development of Data Quality Objectives

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

TPP Phases

Phase I: Identify the Current Project

1. Team members identified to date include: USACE – representatives from the Omaha Design Center and the Seattle District, Shaw Environmental, Inc. (Shaw) as a USACE contractor, Oregon Department of Environmental Quality, and the leaseholders.

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

2. The areas of concern (AOCs) identified are:

   - Range Complex and three sub-ranges (Rifle Range, Rocket Range, and Disposal Range).

   Question: Are there any other AOCs to be identified?

3. Based on information available about the site and shared through discussions with the USACE, are there concerns about this area that have been expressed by the Oregon Department of Environmental Quality or USEPA, as well as by landowners.

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

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

Phase II: Determine Data Needs

4. Existing site information includes an Archives Search Report (ASR) and ASR Supplement both prepared by the USACE in 1995 and 2004, respectively. A PA/SI was reportedly prepared for the USEPA in 2004. The USACE is currently reviewing their archives to locate a copy of the report. Pertinent information will be added to the final TTP Memorandum and may be used for field decisions.

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

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

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

Based on site use, soil is the primary affected medium at the Kingsley Firing Range Annex. Sediment/surface water is not a potential pathway of munitions constituents (MC) because the closest surface water is approximately two miles from the site. Groundwater is a potential pathway since MC could be introduced to the groundwater through the soils. Air is also a potential pathway if soil particles become airborne. Considering current and future land use, primary receptors of any contaminants that may be present would most likely be landowners and animals using the area.

Question: Do team members concur with the Conceptual Site Model (CSM)?

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

   Questions:

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

Phase III: Develop Data Collection Options

7. Proposed approach:

    1. Conduct surface reconnaissance with magnetometer at the three sub-ranges.

    2. Find suitable soil background sample locations (ten locations total) and sample.

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

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

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

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

Phase IV: Finalize Data Collection Program

8. **Background data**.
    Site sampling results will be compared to background concentrations. Site will be considered NDAI for MC if site results do not exceed background.

    Question: What background data will be used for evaluation?

    Are background data sets available from previous site studies?

    Are background data sets available from statewide studies?

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

9. **Human health screening level risk assessment**.
    Sample results that exceed background will be compared to screening values. Site will be considered NDAI for MC if site results do not exceed screening values (depending also on ecological evaluation). What concentrations of potential contaminants of concern (metals and explosives) lead to decision end-points for human health?

    Note: Oregon State standards are provided in Tables 5 and 6.

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

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

    Does the site qualify as an IEP?

    Is the site managed for ecological purposes?

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

    Note: Oregon State standards are provided in Table 7.

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

11. **Other sampling issues.**

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

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

Data Quality Objectives

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

- Below risk-based screening levels = NDAI;
- Above risk-based screening levels and background = Remedial Investigation/Feasibility Study (FS).

The following expanded project objectives have been developed.

Objective 1: Determine if the site requires additional investigation or can be recommended for NDAI based on the presence or absence of munitions and explosives of concern (MEC).

DQO #1 – Utilizing trained UXO personnel and handheld magnetometers, a visual search will be conducted searching for physical evidence to indicate the presence of MEC (e.g., MEC on the surface, munitions debris, craters, and soil discoloration indicative of explosives. The visual search will consist of areas within the three sub-ranges. The following decision rules will apply:

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

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

DQO #2 – Soil samples will be collected and analytical results will be compared to background. Results from previous investigations will also be included in the evaluation provided the analytical data meet data quality requirements developed for the SI. The following decision rules will apply:

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

Objective 3: Obtain data required for Hazard Ranking System (HRS) scoring.

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

Objective 4: Obtain data required for MRSPP ranking.

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

Next Steps

- USACE will obtain necessary rights-of-entry
- Shaw will prepare the final TPP Memorandum and distribute for concurrence.
- Shaw will prepare the SSWP for review and comment.
- Shaw will conduct field work.
- Shaw will prepare the SI Report and submit for stakeholder review.
- USACE/Shaw will schedule a second TPP Meeting to review comments on the draft report.

Figures

DRAWING NUMBER: Kingsley_001_fig1_SiteLocaton_TPP

DRAWN BY: J. Lillis 3/21/07

OFFICE: CEN

576000.000000 588000.000000 600000.000000 612000.000000 624000.000000 636000.000000

4708000.000000 4696000.000000 4684000.000000 4672000.000000 4660000.000000

Agency Lake
Williamson River
Pelican Bay
Upper Klamath Lake
Ball Bay
Shoalwater Bay
Howard Bay
Aspen Lake
Caledonia Canal
Whiteline Reservoir
Swan Lake
Ritter Reservoir
Johnny Lake
Meadow Lake
Short Lake
Wild Billy Lake
Sprague River
Smokey Lake
Muckney Lake
Whiskey Creek
Klamath Falls
Link River
Lake Ewauna
Altamont
Round Lake
Alkali Lake
Bonanza
Oatman Lake
Largent Pond
Ness Lake
Lost River
Wright Creek
Low Line Ditch
John Boyle Reservoir
Klamath River
Harpold Reservoir
Spring Lake
Long Lake
Fivemile Reservoir
Merrill
Malin
Mud Lake
Indian Tom Lake
Lake Miller
Sheepy Lake
Lower Klamath Lake
White Lake
97
140
39
66

Legend

Kingsley Firing Range Annex FUDS Boundary

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

N

0 2 4 8 Miles

REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

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OMAHA DESIGN CENTER

FIGURE 1

SITE LOCATION

KINGSLEY FIRING RANGE ANNEX

Shaw® Shaw Environmental, Inc.

598200 000000 602400 000000 606600 000000 610800 000000

4684000 000000

4680000 000000

4676000 000000

4672000 000000

DRAWING NUMBER *Kingsley_002_fig02_GWWells_TPP*

DRAWN BY *J. Lillis* *04/05/07*

OFFICE CEN

Legend

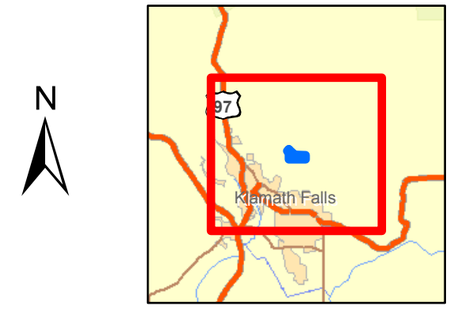
- Kingsley Firing Range Annex FUDS Boundary
- 4-Mile Radius From Kingsley Firing Range Annex FUDS Boundary

Groundwater Well Type

- Community
- Domestic
- Industrial
- Livestock
- USGS Monitoring Well

NOTES:

1) FUDS boundary and range boundaries were derived from the Kingsley Firing Range Annex ASR Supplement.
2) Groundwater well information obtained from the US Geological Survey.
3) Non-USGS groundwater well information obtained from the State of Oregon, Water Resources Department. Wells are plotted in the center of either the Township/Range/Section, Township/Range/Section/Quarter, or Township/Range/Section/Quarter/Quarter depending on available well data.
3) Aerial photograph (Klamath County) obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-APFO National Agricultural Inventory Project (NAIP), 2006.



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

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FIGURE 2
GROUNDWATER WELLS WITHIN 4-MILE RADIUS

KINGSLEY FIRING RANGE ANNEX

Shaw® Shaw Environmental, Inc.

602400.000000 603600.000000 604800.000000 606000.000000 607200.000000

4680700.000000
4679600.000000
4678500.000000
4677400.000000
4676300.000000

Rifle Range & Safety Fan

Rocket Range & Safety Fan

Disposal Range

Range Complex No. 1

Legend

Kingsley Firing Range Annex FUDS Boundary

Ranges Included in the MMRP Range Inventory

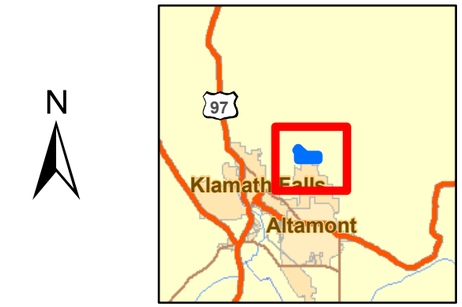
- Range Complex No. 1
- Disposal Range
- Rifle Range
- Rocket Range

Groundwater Well Type

- Community
- Domestic
- Industrial
- Livestock

NOTES:

1) FUDS boundary and range boundaries were derived from the Kingsley Firing Range Annex ASR Supplement.
2) Groundwater well information obtained from the State of Oregon, Water Resources Department. Wells are plotted in the center of either the Township/Range/Section, Township/Range/Section/Quarter, or Township/Range/Section/Quarter/Quarter depending on available well data.
3) Aerial photograph (Klamath County) obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-APFO National Agricultural Inventory Project (NAIP), 2006.



N

0 875 1,750 3,500
Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

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FIGURE 3

SITE LAYOUT

KINGSLEY FIRING RANGE ANNEX

Shaw® Shaw Environmental, Inc.

DRAWING NUMBER	Kingsley_003_fig03_SiteLocaton_TPP
DRAWN BY	J. Lillis
	04/05/07
OFFICE	CEN

603650 000000 604500 000000 605350 000000 606200 000000 607050 000000

4679500 000000

4678750 000000

4678000 000000

4677250 000000

4676500 000000

004 018 005 003 006 008 001 007 002 009 010 011 017 012 013 019 016 015 014

Rifle Range

DRAWING NUMBER *Kingsley_004_fig04_AOC_RifleRng_TPP*

DRAWN BY *J. Lillis* *04/05/07*

OFFICE CEN

Legend

- Kingsley Firing Range Annex FUDS Boundary
- Taxlot Parcel

Ranges Included in the MMRP Range Inventory

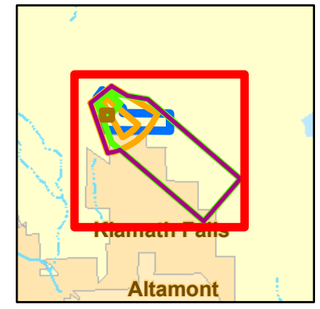
- Rifle Range

Ground Water Wells

- Community
- Domestic
- LiveStock
- Thermal

NOTES:

1) FUDS boundary and range boundaries were derived from the Kingsley Firing Range Annex ASR Supplement.
2) Groundwater well information obtained from the State of Oregon, Water Resources Department. Wells are plotted in the center of either the Township/Range/Section, Township/Range/Section/Quarter, or Township/Range/Section/Quarter/Quarter depending on available well data.
3) Aerial photograph (Klamath County) obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-APFO National Agricultural Inventory Project (NAIP), 2006.



N

0 625 1,250 2,500 Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

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FIGURE 4

RIFLE RANGE

KINGSLEY FIRING RANGE ANNEX

Shaw® Shaw Environmental, Inc.

DRAWING NUMBER: Kingsley_005_fig05_AOC_RocketRng_TPP

DRAWN BY: J. Lillis 04/05/07

OFFICE: CEN

603750.000000 604200.000000 604650.000000 605100.000000 605550.000000

4679590.000000

4679200.000000

4678810.000000

4678420.000000

4678030.000000

018 005 003 006 008 001 007 009 002 010 Rocket Range 011 013 017 012

Legend

- Kingsley Firing Range Annex FUDS Boundary
- Taxlot Parcel

Ranges Included in the MMRP Range Inventory

- Rocket Range

Groundwater Well Type

- Domestic

NOTES:

1) FUDS boundary and range boundaries were derived from the Kingsley Firing Range Annex ASR Supplement.
2) Groundwater well information obtained from the State of Oregon, Water Resources Department. Wells are plotted in the center of either the Township/Range/Section, Township/Range/Section/Quarter, or Township/Range/Section/Quarter/Quarter depending on available well data.
3) Aerial photograph (Klamath County) obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-APFO National Agricultural Inventory Project (NAIP), 2006.

N

Klamath Falls

0 300 600 1,200 Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

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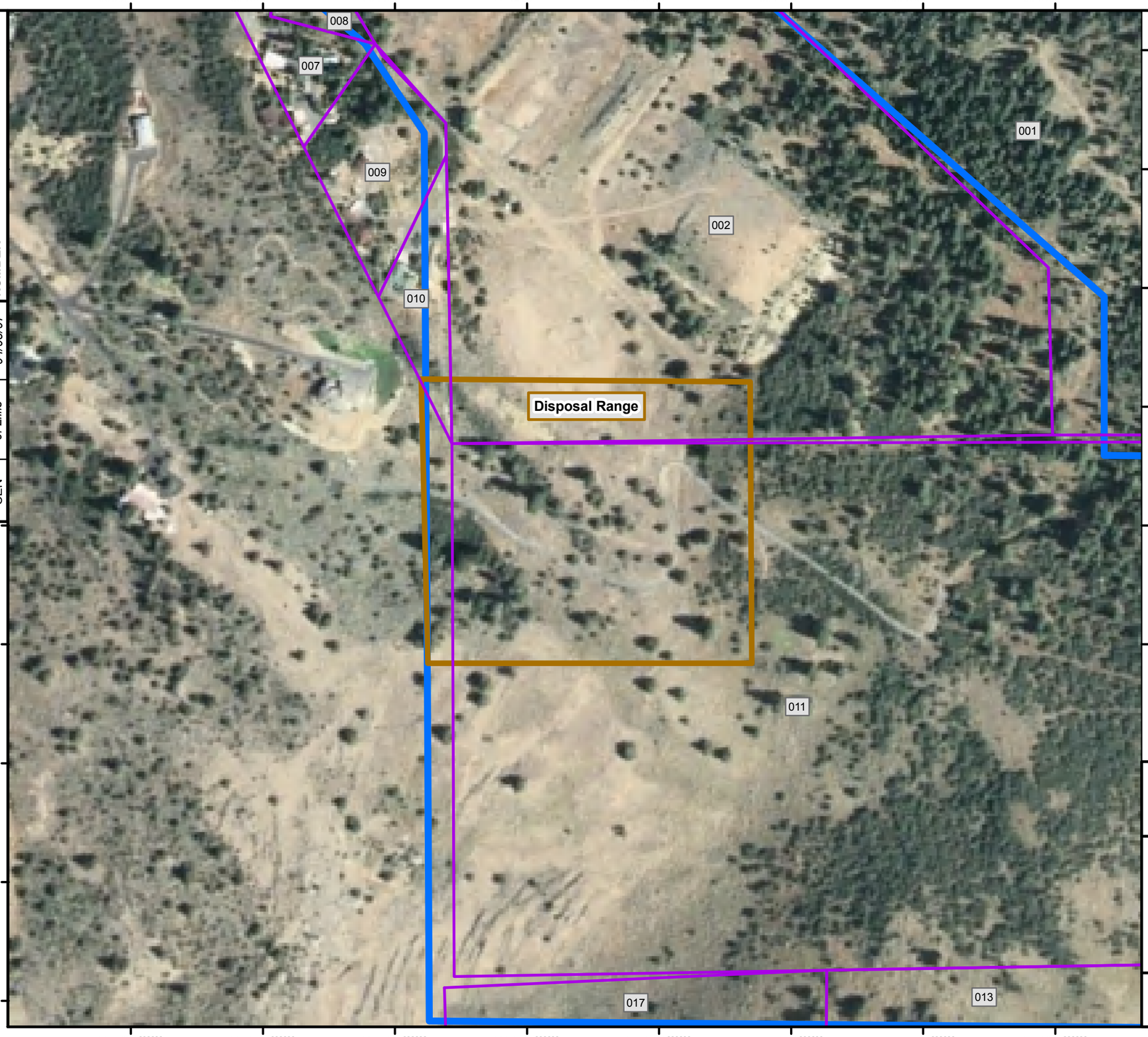
FIGURE 5

ROCKET RANGE

KINGSLEY FIRING RANGE ANNEX

Shaw Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
CEN	J. Lillis	04/05/07	Kingsley_006_fig06_AOC_DisposalRng_TPP



603900 604000 604100 604200 604300 604400 604500 604600

4679440 4679350 4679260 4679170 4679080 4678990 4678900 4678810 4678720

Legend

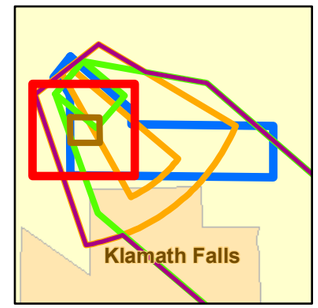
Kingsley Firing Range Annex FUDS Boundary

Taxlot Parcel

Ranges Included in the MMRP Range Inventory

Disposal Range

NOTES:
1) FUDS boundary and range boundaries were derived from the Kingsley Firing Range Annex ASR Supplement.
2) Aerial photograph (Klamath County) obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-APFO National Agricultural Inventory Project (NAIP), 2006.



0 125 250 500 Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

FIGURE 6

DISPOSAL RANGE

KINGSLEY FIRING RANGE ANNEX

Shaw Shaw Environmental, Inc.

OFFICE CEN | DRAWN BY J. Lillis 04/05/07 | DRAWING NUMBER Kingsley_007_fig07_SensRec_TPP

600000 000000 602500 000000 605000 000000 607500 000000 610000 000000

4681800 000000 4679600 000000 4677400 000000 4675200 000000 4673000 000000

Rifle Range

Rocket Range

Disposal Range

Range Complex No. 1

King Cobra Canyon

Canyon

KLAMATH FALLS

ALTAMONT

Lost River

A Canal

Klamath Falls Canyon Canal

97

39

Legend

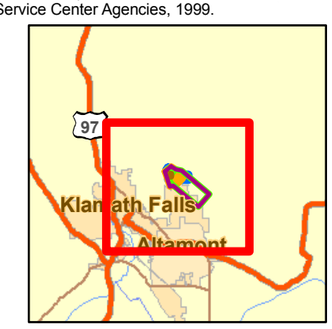
- Kingsley Firing Range Annex FUDS Boundary
- 2-Mile Radius From Kingsley Firing Range Annex FUDS Boundary
- 2-Mile Radius From Ranges Included in the MMRP Range Inventory

Ranges Included in the MMRP Range Inventory

- Range Complex No. 1
- Disposal Range
- Rifle Range
- Rocket Range
- Wetland Area
- Klamath Falls County Fairgrounds
- Hospital
- School

NOTES:

1) FUDS boundary and range boundaries were derived from the Kingsley Firing Range Annex ASR Supplement.
2) Wetlands data obtained from the U.S. Fish and Wildlife Service, 200605, NWIDBA.CONUS_wet_poly: Classification of Wetlands and Deepwater Habitats of the United States. U.S. Department of the Interior, Fish and Wildlife Service, Washington, DC. FWS/OBS-79/31., U.S. Fish and Wildlife Service, Branch of Habitat Assessment, Washington, D.C.
3) Topo map (Klamath County) obtained from the U.S. Department of Agriculture, Service Center Agencies, 1999.



N

0 1,750 3,500 7,000 Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

FIGURE 7

SENSITIVE RECEPTOR LOCATIONS

KINGSLEY FIRING RANGE ANNEX

Shaw® Shaw Environmental, Inc.

DRAWING NUMBER: Kingsley_008_fig8_SurfaceWater_TPP

DRAWN BY: J. Lillis 3/27/07

OFFICE: CEN

578000.000000 589500.000000 601000.000000 612500.000000 624000.000000

4700000.000000 4690000.000000 4680000.000000 4670000.000000 4660000.000000

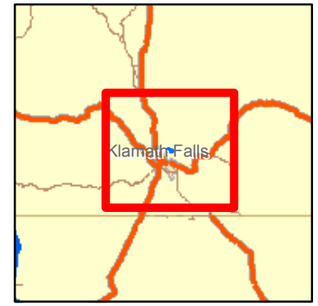
Williamson River
Agency Lake
Pelican Bay
Ball Bay
Shoalwater Bay
Upper Klamath Lake
Moss Creek
Denny Creek
Howard Bay
Aspen Lake
Caledonia Canal
Anderson Creek
South Fork Trout Creek
Sprague River
Cherry Creek
Muckney Lake
Buck Creek
Rock Creek
Whiteline Reservoir
Cabin Creek
Swan Lake
Rattlesnake Creek
Wildhorse Creek
Fisher Creek
Johnny Lake
Short Lake
Meadow Lake
A Canal
Link River
Lake Ewauna
Round Lake
Alkali Lake
Buck Creek
Lost River
Spencer Creek
Oatman Lake
Largent Pond
Lost River Diversion Channel
Ness Lake
Lost River
Wright Creek
John Boyle Reservoir
Klamath River
Spring Lake
Lost River

Legend

Kingsley Firing Range Annex FUDS Boundary

15-Mile Radius From Kingsley Firing Range Annex FUDS Boundary

NOTES:
1) FUDS boundary was derived from the Kingsley Firing Range Annex ASR Supplement.
2) Topo map (Klamath County) obtained from the U.S. Department of Agriculture, Service Center Agencies, 1999.



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

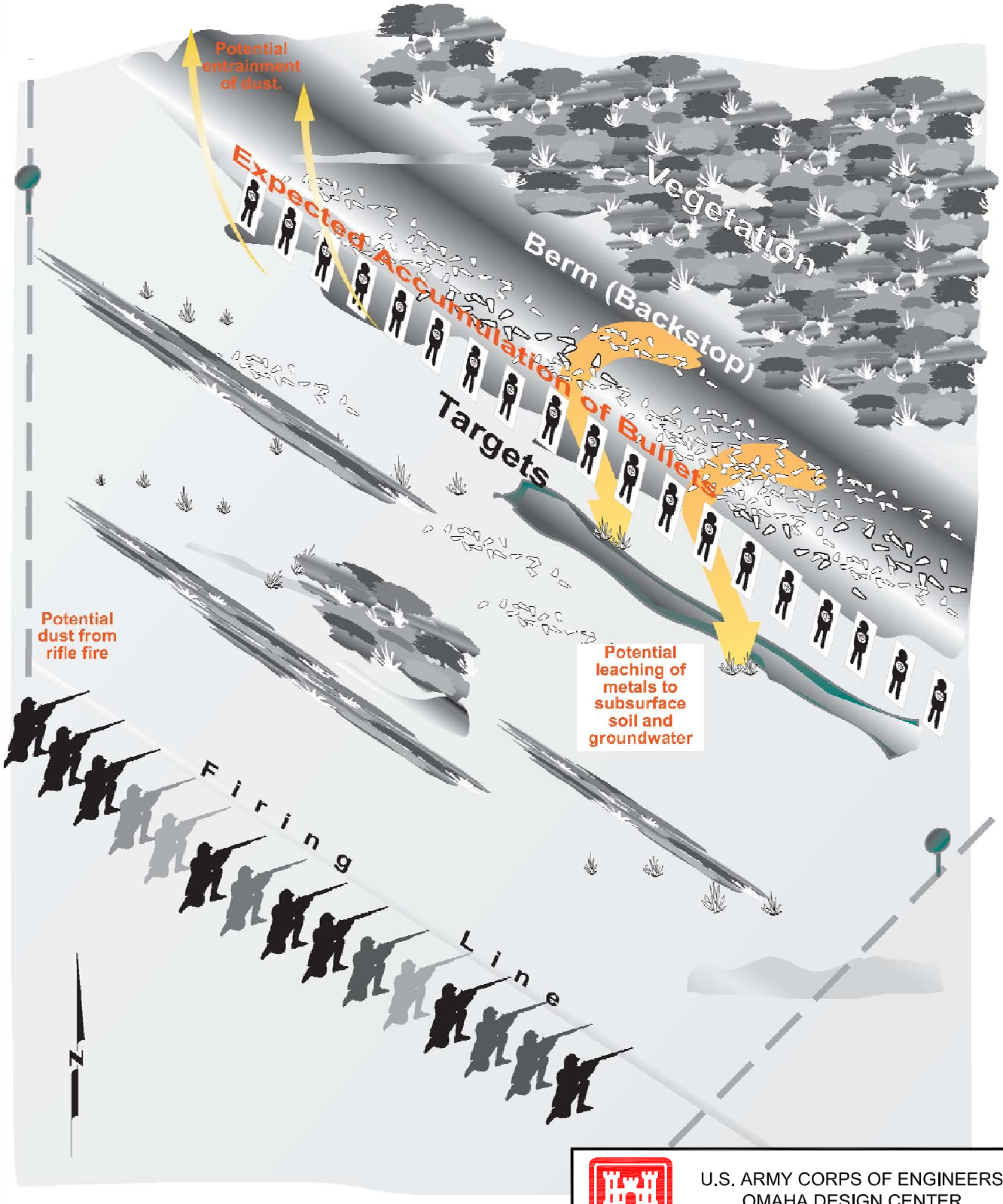
FIGURE 8

SURFACE WATER DRAINAGE

KINGSLEY FIRING RANGE ANNEX

Shaw® Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
SJ	K. Black	4-5-07	116188SJ-A78



U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

FIGURE _

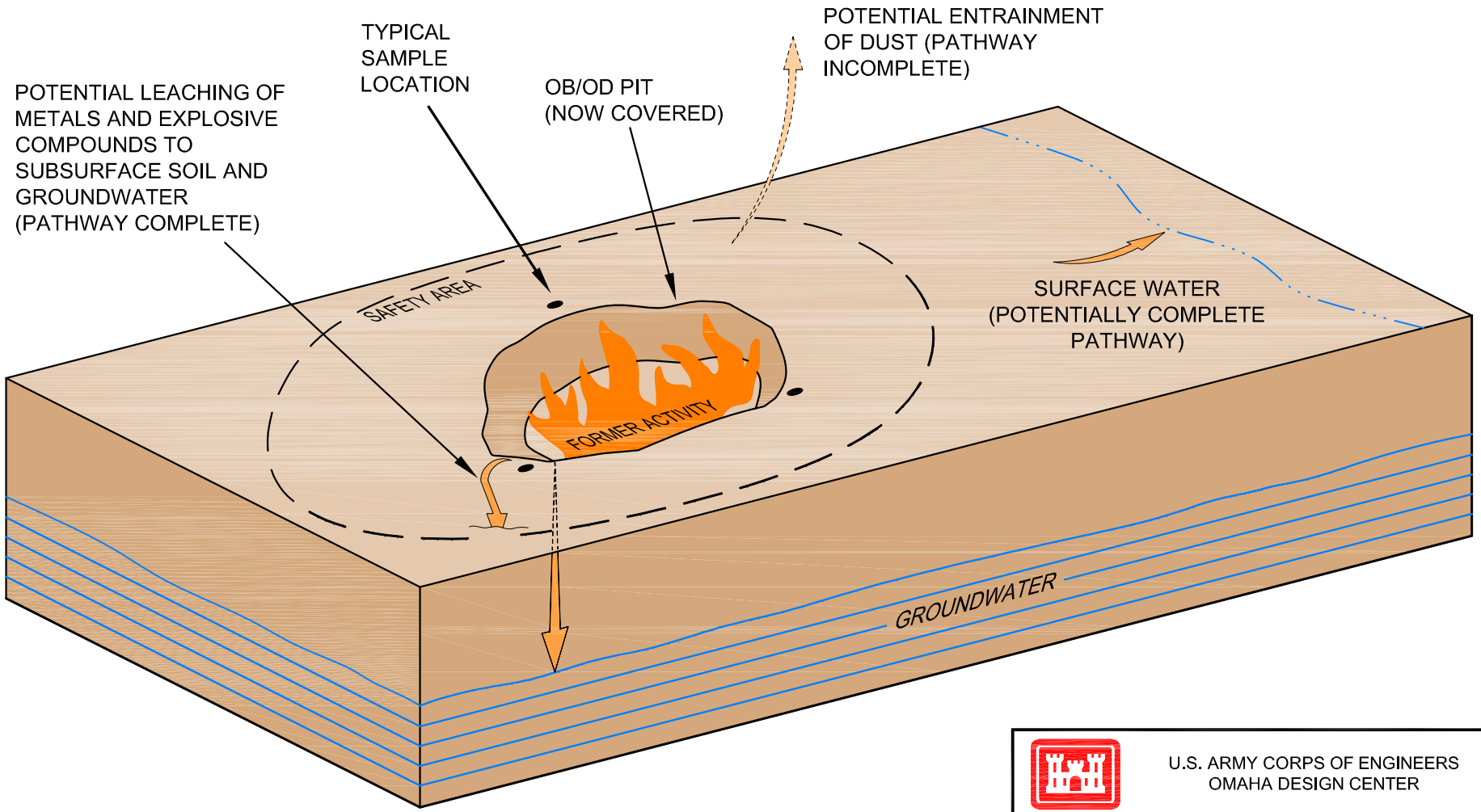
CONCEPTUAL SITE MODEL
RIFLE RANGE

KINGSLEY FIRING RANGE ANNEX

Shaw® Shaw Environmental, Inc.

XREF Files: IMAGE Files:
File: N:\cad\DWG\116188-FUDS\116188SJ-a76.dwg Layout: Layout User: Karen.Black Apr 05, 2007 - 9:41am

OFFICE	DRAWN BY		DRAWING NUMBER	116188SJ-A76
SJ	K. Black	4-5-06		



RECEPTORS:

- Site Users/Workers/Farmers
- Recreational Site Users (Hunters)
- Biota (deer, turkey)

U.S. ARMY CORPS OF ENGINEERS
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FIGURE _

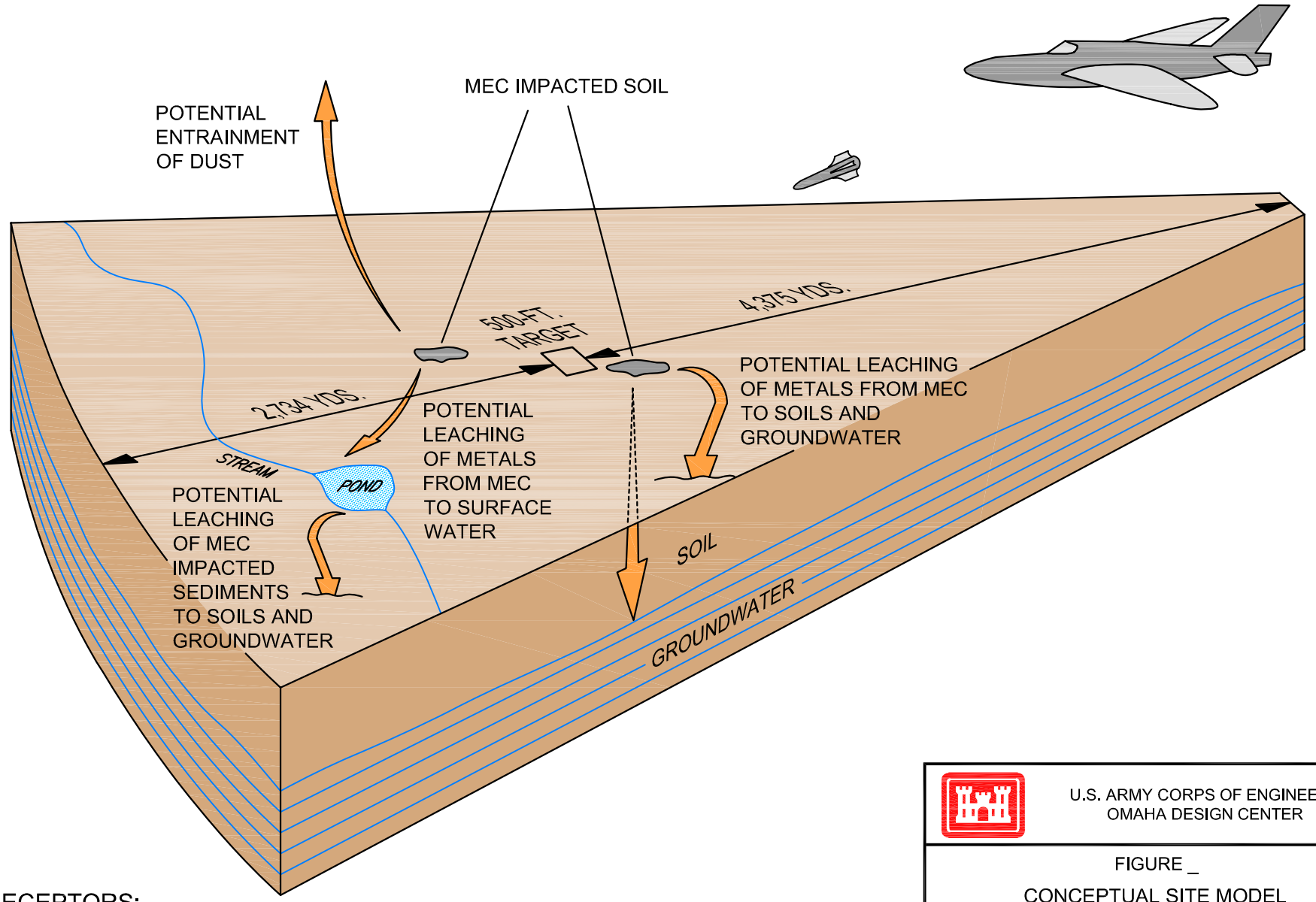
CONCEPTUAL SITE MODEL
OPEN BURNING/OPEN DETONATION PIT

KINGSLEY FIRING RANGE ANNEX

Shaw® Shaw Environmental, Inc.

XREF Files: IMAGE Files:
File: N:\cad\DWG\116188-FUDS\116188SJ-a77.dwg Layout: Layout1 User: Karen.Black Apr 05, 2007 - 9:54am

OFFICE	DRAWN BY		DRAWING NUMBER	116188SJ-A77
SJ	K. Black	4-5-07		



RECEPTORS:

- BLM Workers/State of WY Workers/Ranch Workers
- Land Owners/Local Residents/Recreational Users
- Biota (Wildlife/Livestock)

U.S. ARMY CORPS OF ENGINEERS
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FIGURE _

CONCEPTUAL SITE MODEL
ROCKET, AIR TO GROUND

KINGSLEY FIRING RANGE ANNEX

Shaw® Shaw Environmental, Inc.

Tables

Table 1. Army Checklist for Important Ecological Places [a]
Kingsley Firing Range Annex, Klamath Falls, Oregon

		Yes / No	Comments
1	Locally important ecological place identified by the Integrated Natural Resource Management Plan, BRAC Cleanup Plan or Redevelopment Plan, or other official land management plans	☐ / ☒	
2	Critical habitat for Federal designated endangered or threatened species	☐ / ☒	
3	Marine Sanctuary	☐ / ☒	
4	National Park	☐ / ☒	
5	Designated Federal Wilderness Area	☐ / ☒	
6	Areas identified under the Coastal Zone Management Act	☐ / ☒	
7	Sensitive Areas identified under the National Estuary Program or Near Coastal Waters Program	☐ / ☒	
8	Critical areas identified under the Clean Lakes Program	☐ / ☒	
9	National Monument	☐ / ☒	
10	National Seashore Recreational Area	☐ / ☒	
11	National Lakeshore Recreational Area	☐ / ☒	
12	Habitat known to be used by Federal designated or proposed endangered or threatened species	☐ / ☒	ASR states that no T&E species known in the vicinity of the Site.
13	National preserve	☐ / ☒	
14	National or State Wildlife Refuge	☐ / ☒	
15	Unit of Coastal Barrier Resources System	☐ / ☒	
16	Coastal Barrier (undeveloped)	☐ / ☒	
17	Federal land designated for protection of natural ecosystems	☐ / ☒	
18	Administratively Proposed Federal Wilderness Area	☐ / ☒	
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. Potential MEC and MC at Kingsley Firing Range Annex
Klamath Falls, Oregon

Range Areas	Munitions ID	Munitions	Associated MC	Comments
	3.5 inch Rocket	Practice M29A2	Steel	
	Fuze	M-405 (dummy)	Plaster of paris, stearic acid	
	Small Arms	M-2 (.30 caliber) M1911 (.45 caliber)	Lead, single-base (nitrocellulose) or double-base (nitrocellulose and nitroglycerin) powder	
	500 lb-Practice Bomb	Mk 65	Steel, black powder	
	Ejection Cartridge	ARD 863-1	double-base (nitrocellulose and nitroglycerin) powder	
	Block Charges, C4	M112 and M5AI	RDX	
	Detonating cord, Igniter	M60 Igniter	PETN	

Table 3. MEC and MC Exposure Pathway Analysis
Kingsley Firing Range Annex, Klamath Falls, Oregon

Range Area & Type	MMRP Concern	Potential Contaminant of Concern (PCOCs)	Affected Media (Potential Contaminant Sources) (Fate and Transport)	Exposure Routes and Potential Receptors			Data Gaps	Activities to Address Data Gaps (i.e., Sampling)
				Site Workers/ Contractor Personnel	Residents/ General Public	Ecological (Biota)		
Range Complex	MEC	MEC in the form of *unexploded* practice rockets may exist on the land surface. MEC in the form of *unexploded* practice bombs may exist on the land surface.	**Surface Soil** • MEC (unexploded practice rockets and bombs) are a hazard. • MEC (practice rocket and bomb debris) reported on surface.	• Potentially complete pathway. Exposure routes: • Vehicle and foot traffic	• Incomplete pathway.	• Potentially complete pathway. Exposure routes: • Foot traffic	• No live projectiles found.	• Historical documents indicate that the Rifle Range was used for firing of small arms; the Rocket Range was used for firing of practice 3.5 rockets; and the Disposal Range had two burn pits and was possibly used for explosives detonation. History does not indicate ranges were used for live projectiles. • A field reconnaissance survey by a trained unexploded ordnance (UXO) technician using a hand-held magnetometer will be performed at the sub-ranges assess the presence or absence of munitions and explosives of concern (MEC) and to document the current site conditions.
			Subsurface Soil • MEC (unexploded projectiles) are a hazard. • MEC (unexploded projectile) reported in subsurface.	• Potentially complete pathway. Exposure routes: • Intrusive activities	• Incomplete pathway.	• Potentially complete pathway. Exposure routes: • Burrowing	• No live projectiles found.	• Historical documents indicate that the bombing target was used for 100-pound practice bombs. Does not indicate target was used for live projectiles. • A field reconnaissance survey by a trained unexploded ordnance (UXO) technician using a hand-held magnetometer will be performed at the sub-ranges assess the presence or absence of munitions and explosives of concern (MEC) and to document the current site conditions.
	MC	Black powder, sheet metal (chromium, iron, copper, lead, manganese, and nickel), steel , lead, explosives, RDX, PETN	**Soil** • Directly affected. • Potential metals contamination from munitions used. • Spotting charges do not contain hazardous components. • Fuze does not contain hazardous substances. • Fate & Transport: secondary source of potential sediment, surface water, and air contamination.	• Potentially complete pathway. Exposure routes: • Incidental ingestion • Dermal contact • Inhalation of soil particles	• Incomplete pathway.	• Potentially complete pathway. Exposure routes: • Ingestion • Direct Contact	• Additional metals and explosives data may be needed.	Three soil sample will be collected, one at each sub-range. If no MEC or munitions debris is located, a soil sample will be collected at a location determined in the field. The samples will be analyzed for explosives (including nitroglycerin and pentaerythritol tetranitrate [PETN]) and select metals (chromium, iron, copper, lead, manganese, and nickel). Additonally, ten background soil samples will be collected and analyzed for select metals.
			Sediment/Surface Water • Not affected media	• Incomplete pathway.	• Incomplete pathway.	• Incomplete pathway.	Not applicable	• No surface water samples or sediment will be collected
			Groundwater • Not an affected media under current land use.	Potentially complete pathway Exposure routes: • Incidental ingestion • Dermal contact • Inhalation of water	• Incomplete pathway. .	• Potentially complete pathway. Exposure routes: • Ingestion • Direct Contact	• Additional metals and explosives data may be needed.	• One groundwater sample will be collected • The sample will be analyzed for select metals (chromium, copper, iron, lead, manganese, molybdenum, and nickel) and explosives, (including nitroglycerin and PETN)
			Air • Potentially affected media due to blowing soil.	Potentially complete Pathway Exposure routes: Inhalation	Incomplete Pathway	Potentially complete Pathway Exposure routes: Inhalation	• Additional metals and explosives data may be needed.	Will use soil analytical data in risk screening

Table 4. Proposed Sampling Approach
Kingsley Firing Range Annex

Area of Concern	Media	Samples	Select Metals	TAL Metals and molybdenum	Explosives	PETN	Nitroglycerin
Rifle Range	Soil	1	1	0	1	1	1
	Sediment	0	0	0	0	0	0
	Surface Water	0	0	0	0	0	0
	Groundwater	0	0	0	0	0	0
Rocket Range	Soil	1	1	0	1	1	1
	Sediment	0	0	0	0	0	0
	Surface Water	0	0	0	0	0	0
	Groundwater	0	0	0	0	0	0
Disposal Range	Soil	2	2	0	2	2	2
	Sediment	0	0	0	0	0	0
	Surface Water	0	0	0	0	0	0
	Groundwater	0	0	0	0	0	0
Background	Soil	10	0	10	0	0	0
	Sediment	0	0	0	0	0	0
	Surface Water	0	0	0	0	0	0
	Groundwater	0	0	0	0	0	0
		Totals	4	10	4	4	4

QC Required Samples	Media	Samples	Select Metals	TAL Metals and molybdenum	Explosives	PETN	Nitroglycerin
Duplicate	Soil	1	1	1	1	1	1
	Sediment	0	0	0	0	0	0
	Surface Water	0	0	0	0	0	0
	Groundwater	0	0	0	0	0	0
		Totals	1	1	1	1	1
MS/MSD	Soil	1	1	1	1	1	1
	Sediment	0	0	0	0	0	0
	Surface Water	0	0	0	0	0	0
	Groundwater	0	0	0	0	0	0
		Totals	1	1	1	1	1

Notes:

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

2) Metals by SW-846 6020A. Explosives by SW-846 8330A. PETN and Nitroglycerin by SW-845 8330A (Modified).

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

MS/MSD - matrix spike/matrix spike duplicate

PETN - pentaerythritol tetranitrate

QC - quality control

TAL - Target Analyte List

Table 5. Human Health Screening Criteria for Soil
Kingsley Firing Range Annex, Klamath Falls, Oregon

Analyte	Abbreviation	CAS No.	Region 9 Human Health Screening Values [a]			Laboratory Method Detection Limit (mg/kg)
			Residential PRG[b] (mg/kg)[b]	SSLs[c] DAF=1 (mg/kg)	SSLs[c] DAF=20 (mg/kg)	
Chromium[e]	Cr	7440-47-3	210	2	38	1.0
Copper	Cu	7440-50-8	3,100			1.0
Iron	Fe	7439-89-6	23,000			15.0
Lead	Pb	7439-92-1	400[f]			1.0
Manganese	Mn	7439-96-5	1,800			25.0
Molybdenum	Mo	7439-98-7	390			0.06
Nickel	Ni	7440-02-0	1,600	7	130	1.0
Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	121-82-4	4.4			0.075
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	HMX	2691-41-0	3,100			0.050
2,4,6-Trinitrotoluene	2,4,6-TNT	118-96-7	16			0.040
1,3,5-Trinitrobenzene	1,3,5-TNB	99-35-4	1,800			0.020
1,3-Dinitrobenzene	1,3-DNB	99-65-0	6.1			0.020
2,4-Dinitrotoluene[d]	2,4-DNT	121-14-2	0.72	0.00004	0.0008	0.040
2,6-Dinitrotoluene[d]	2,6-DNT	606-20-2	0.72	0.00004	0.0008	0.040
2-Amino-4,6-dinitrotoluene	2-Am-DNT	35572-78-2	12			0.040
2-Nitrotoluene	2-NT	88-72-2	0.88			0.075
3-Nitrotoluene	3-NT	99-08-1	730			0.050
4-Amino-2,6-dinitrotoluene	4-Am-DNT	19406-51-0	12			0.040
4-Nitrotoluene	4-NT	99-99-0	12			0.040
Nitrobenzene	NB	98-05-3	20	0.007	0.1	0.020
Nitroglycerin	NG	55-63-0	35			
PETN	PETN	78-11-5	0.50	NVA	NVA	

DAF = Dilution Attenuation Factor. mg/kg = milligrams per kilogram.
PRG = Preliminary Remediation Goal. mg/L = milligrams per iter.
SSL = Soil Screening Level.

a If laboratory cannot meet any of the preferred QLs with routine SW 846 methodology (as supported by MDLs that are no greater than 1/3 QL), laboratory's QL must be identified in laboratory submittal as failing to meet the QL. Some screening values cannot be obtained with routine methodology to the QL. In those cases, the QL achievable with a routine SW 846 methodology would be accepted.
b PRGs from Region 9 PRG Table dated October 2004 and addendum dated 28 December 2004, based on single chemical.
c SSLs from Region 9 PRG Table dated October 2004 and revision note dated 28 December 2004.
d Carcinogenic DNT mixture values used if more conservative than noncarcinogenic isomer-specific values.
e Total chromium values used.
f Values listed from Oregon risk-based concentrations: 400 mg/kg (residential)

Table 6
Human Health Screening Criteria for Groundwater
Kingsley Firing Range Annex, Klamath Falls, Oregon Sites [a]

Analyte	Abbreviation	CAS No.	Laboratory Method Detection Limit (µg/L)	Region 9 Tap Water PRG[b] (µg/L)	Federal Drinking Water Criteria MCLs[c] (µg/L)
Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	121-82-4	0.8	0.61	
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	HMX	2691-41-0	0.4	1,800	
2,4,6-Trinitrotoluene	2,4,6-TNT	118-96-7	0.3	2.2	
1,3,5-Trinitrobenzene	1,3,5-TNB	99-35-4	0.2	1,100	
1,3-Dinitrobenzene	1,3-DNB	99-65-0	0.2	3.6	
2,4-Dinitrotoluene[d]	2,4-DNT	121-14-2	0.3	0.099	
2,6-Dinitrotoluene[d]	2,6-DNT	606-20-2	0.3	0.099	
2-Amino-4,6-dinitrotoluene	2-Am-DNT	35572-78-2	0.2	7.3	
2-Nitrotoluene	2-NT	88-72-2	0.4	0.049	
3-Nitrotoluene	3-NT	99-08-1	0.8	120	
4-Amino-2,6-dinitrotoluene	4-Am-DNT	19406-51-0	0.2	7.3	
4-Nitrotoluene	4-NT	99-99-0	0.4	0.66	
Nitrobenzene	NB	98-05-3	0.2	3.4	
Nitroglycerin	NG	55-63-0	0.5		
PETN	PETN	78-11-5	1.3		
Chromium[f]	Cr	7440-47-3	2.0	110	100
Copper	Cu	7440-50-8	3.0	1,500	1,000[e] 1,300[g]
Iron	Fe	7439-89-6	5.0	11,000	300[e]
Lead	Pb	7439-92-1	1.0		15[g]
Manganese	Mn	7439-96-5	2.0	880	50[e]
Molybdenum	Mo	7439-98-7	5.0	180	
Nickel	Ni	7440-02-0	1.0	730	

Table 6 (Cont.)
Human Health Screening Criteria for Groundwater at Oregon Sites

MCL = Maximum Contaminant Level
PRG = Preliminary Remediation Goal
µg/L = micrograms per liter

a If laboratory cannot meet these QLs with routine SW 846 methodology (as supported by MDLs that are no greater than 1/3 QL), laboratory's QL must be identified in laboratory submittal as failing to meet the QL. Some screening values cannot be obtained with routine methodology to the QL.
Note that no surface water samples are planned at this time. If surface water is collected, additional human health screening criteria will be compiled.
b Region 9 PRG Table dated October 2004 and revision note dated 28 December 2004, based on single chemical.
c Primary MCL from the 2004 Edition of the Drinking Water Standards and Health Advisories, dated Winter 2004, is listed unless otherwise indicated.
d Carcinogenic DNT mixture values used if more conservative than noncarcinogenic isomer-specific values.
e Secondary MCL from the 2004 Edition of the Drinking Water Standards and Health Advisories, dated Winter 2004.
f Total chromium values used if available.
g Action level from the 2004 Edition of the Drinking Water Standards and Health Advisories, dated Winter 2004.

Table 7
Selection of Ecological Soil Screening Toxicity Values for Constituents of Potential Ecological Concern
Kingsley Firing Range Annex, Klamath Falls, Oregon

Parameter	ODEQ Level II Screening Level [a]	Proposed Benchmarks									Potential Bio accumulative Constituent? [h]	Final Ecological Screening Value Soil [i]	Practical Quantitation Limit
	Lowest Value for Plants/Inverts./ Birds/Mammals (mg/kg)	Region 5 ESLs [b] (2003) (mg/kg)	Region 7 [c] (mg/kg)		Region 8 [d] (mg/kg)		Region 10 [e] (mg/kg)		Other Values: Talmage et al. (1999) [f] or LANL (2005) [g] (mg/kg)			(mg/kg)	(mg/kg)
Metals/Inorganics													
Chromium (total)	0.4	0.4	26	SSL	26	SSL	26	SSL	2.3	LANL	Yes	0.4	1.0
Copper	50	5.4	60	ORNL	190	Dutch	60	ORNL	10	LANL	Yes	50	1.0
Iron	10	NVA	200	EPA-R4	NVA		200	EPA-R4	NVA			10	15.0
Lead	16	0.0537	11	SSL	11	SSL	11	SSL	14	LANL	Yes	16	1.0
Manganese	100	NVA	100	EPA-R4	NVA		100	EPA-R4	50	LANL		100	0.5
Molybdenum	2	NVA	2	ORNL	2	ORNL	2	ORNL	NVA			2	0.5
Nickel	30	13.6	30	ORNL	30	ORNL	30	ORNL	20	LANL	Yes	30	1.0

Draft Worksheets

Site Information Worksheet

Site: **4 MRAs/MRSs**

Project: **Boardman Air Force Range**

	Site Information Needed[a]	Suggested Means to Obtain Site Information	Potential Source(s) of Site Information	Responsible for Obtaining	Deadline for Obtaining Site Information
1	Appropreate analytical parameters and methods	TPP stakeholder concurrence		Stakeholders	For inclusion in TPP Memo
2	Human health and ecological screening values	TPP stakeholder concurrence		Stakeholders	For inclusion in TPP Memo
3	SI approach for sampling for metals	TPP stakeholder concurrence		Stakeholders	For inclusion in TPP Memo
4	MRA/MRS locations and boundaries	Review of aerial photographs	Aerial photographs (1940's - 1960s)	Shaw	For inclusion in Site Specific Work Plan
5	Ambient (background) metals	Review and/or sample	Published literature	Shaw	For inclusion in Site Specific Work Plan
6	ODEQ human health and ecological screening levels	TPP stakeholder concurrence	ODEQ	ODEQ	For inclusion in TPP Memo
10	Lat/Long and x,y on all maps	GIS	Add to maps	Shaw	For inclusion in TPP Memo
11	Point of contact for community	Not applicable			Before start of field work
12	Access agreements	Letters, call, or visit stakeholders	Letters/conversations with stakeholders	USACE	Before start of field work
13	Conceptual site model	Report review	Report prepared for machine gun range near Casper Airport	WDEQ (G. Breed)	For inclusion in TPP Memo
14	Threatened or endangered species within MRAs/MRSs	Phone	Oregon Game and Fish, U.S. Fish and Wildlife	Shaw	For inclusion in TPP Memo
15	Areas of cultural significance within MRAs/MRSs	SHPO	Phone SHPO	Shaw	For inclusion in TPP Memo

[a] Refer to EM 200-1-2, Paragraphs 1.1.3 and 2.2.

Site Information Worksheet

Site: Kingsley Firing Range Annex

Project: Kingsley Firing Range Annex

	Site Information Needed[a]	Suggested Means to Obtain Site Information	Potential Source(s) of Site Information	Responsible for Obtaining	Deadline for Obtaining Site Information
1	Schedule for Sampling	Consultation	ODEQ and landowners	Shaw	Prior to field work
2	Access Agreements	Rights of Entry requests	Landowners	USACE	Prior to field work
3	Areas of Cultural Significance within AOC	SHPO	Phone SHPO	Shaw	For inclusion in final TPP Memo

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

Installation: Kingsley Firing Range Annex
AOC: Range Complex (Rifle Range, Bombing Range, Disposal Range)
RMIS Range ID: F10OR0569

Module	Table No.	Table Description	Data Gap	Potential Source of Information to Fill Data Gap	No Data Gap	Description of Known Data
Explosive Hazard Evaluation (EHE)	1	Munitions Type			x	M29A2 3.5 inch practice rockets, Mk 65 500-lb practice bombs with black powder, C4 explosives (RDX, PETN), small arms (.30 caliber and .45 caliber)
	2	Source of Hazard			x	Former small arms range, practice rocket range, and OB/OD area
	3	Location of Munitions	x			Historical evidence indicates munition debris litters the Rocket Range. Amunitions debis found at OB/OD area. No munitions found at Rifle Range.
	4	Ease of Access	x			Partial barrier
	5	Status of Property			x	Non-DoD control
	6	Population Density			x	< 100 persons per square mile
	7	Population Near Hazard			x	0 inhabited structures w/in 2 miles
	8	Activities/Structures			x	Agricultural - irrigated crops and livestock grazing
	9	Ecological and/or Cultural Resources		confirm State Historical Preservation Office	x	Ecological resources present
	10	**EHE Module Score**				
Chemical Warfare Materiel (CWM) Hazard Evaluation (CHE)	11	CWM Configuration			x	Historical evidence indicates that CWM are not present
	12	Sources of CWM			x	Historical evidence indicates that CWM are not present
	13	Location of CWM			x	Historical evidence indicates that CWM are not present
	14	Ease of Access			x	No barrier
	15	Status of Property			x	Non-DoD control
	16	Population Density			x	< 100 persons per square mile
	17	Population Near Hazard			x	0 inhabited structures w/in 2 miles
	18	Activities/Structures			x	Agricultural - livestock grazing
	19	Ecological and/or Cultural Resources			x	Ecological resources present
	20	**CHE Module Score**				
Health Hazard Evaluation (HHE)	21	HHE Factor Levels	x	Contaminant hazard evaluation pending analytical results		
	22	HHE Three-Letter Combination Levels	x	Contaminant hazard evaluation pending analytical results		
	23	HHE Module Ratings	x	Contaminant hazard evaluation pending analytical results		
	24	HHE Module Rating	x	Contaminant hazard evaluation pending analytical results		
MRS Priority	**25**	**MRS Priority (Based on Highest Hazard Evaluation Module Rating)**	**x**	**Evaluation pending filling of data gaps**		

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