

**Final Proposed Plan
Operable Unit 3
Former Nebraska Ordnance Plant
Mead, Nebraska**

**U.S. Army Corps of Engineers
Kansas City District**

October 2012

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Operable Unit 3
Former Nebraska Ordnance Plant
Mead, Nebraska**

Date Issued – October 2012

U.S. Army Corps of Engineers – Kansas City District
635 Federal Building
601 E. 12th Street
Kansas City, Missouri 64106-2896

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Former Nebraska Ordnance Plant Operable Unit 3



*Mead
Saunders County, Nebraska
October 25, 2012*

*U.S. Army Corps of Engineers
Kansas City District (CENWK)*

1.0 PURPOSE OF THE PROPOSED PLAN

This Proposed Plan summarizes the basis for the U.S. Army Corps of Engineers (USACE)¹ recommendation of a response action at **Operable Unit² (OU)** 3 at the former Nebraska Ordnance Plant (NOP). USACE, as the lead agency, on behalf of the U.S. Department of Defense (DoD), developed this Proposed Plan with the support from the U.S. Environmental Protection Agency (EPA) and the Nebraska Department of Environmental Quality (NDEQ). USACE, in conjunction with EPA, is issuing this Proposed Plan to fulfill, in part, public participation responsibilities under Section 117(a) of the **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)** of 1980 as amended, and Section 300.430(f)(3)(i) of the **National Oil and Hazardous Substances Pollution Contingency Plan (NCP)**. The No Further Action (NFA) recommendation is based on the **Administrative Record**.

This Proposed Plan is for one of five OUs identified at the former NOP. OU3 includes a former on-site landfill and former unidentified waste disposal areas not previously identified. OU3 also includes **vapor intrusion** and surface water contamination. Contaminants evaluated include metals, explosives, **volatile organic compounds (VOCs)**, and **semi-volatile organic compounds (SVOCs)**.

Dates to Remember

Public Comment Period: October 25, 2012 through
November 24, 2012

Public Meeting: November 14, 2012

Yutan Veterans Country Club
1581 Yutan Road (South of Highway 92)
Yutan, Nebraska
7:00 p.m.

This Proposed Plan summarizes information detailed in the OU3 **Remedial Investigation (RI)** Reports, the **Baseline Risk Assessments (BLRAs)**, and other documents contained in the Administrative Record. USACE encourages the public to review these documents in the Administrative Record for this site. This Proposed Plan is intended to inform the public of USACE's and EPA's preliminary recommendation and to solicit public comments pertaining to the NFA recommendation.

2.0 COMMUNITY ROLE IN SELECTION PROCESS

Public participation is required to ensure the concern of the community is considered.

USACE will not make a final decision until comments received during the public comment period have been reviewed and considered. USACE is soliciting public comments on the NFA recommendation presented in this Proposed Plan. The public may submit comments on this Proposed Plan during the period beginning October 25, 2012, and concluding on November 24, 2012.

¹ A list of abbreviations can be found on Page 23.

² All of the terms appearing in bold print are defined in the Glossary on Pages 20 through 22.

All written comments should be sent during the public comment period to:

Ms. Kristine Stein
U.S. Army Corps of Engineers, Kansas City District
635 Federal Building (CENWK-PM-ED)
601 E. 12th Street
Kansas City, Missouri 64106-2896

A public meeting will be held during the public comment period at the Yutan Veterans Country Club in Yutan, Nebraska, on November 14, 2012 at 7:00 p.m. A one-hour public availability/poster session will precede the public meeting beginning at 6:00 p.m.

Comments received at the public meeting, as well as during the public comment period, will be summarized in the **Responsiveness Summary** of the **Record of Decision (ROD)**. The ROD will document the final decision for OU3. USACE will make the final decision after reviewing and after responding to all significant comments received during the public comment period.

3.0 SITE BACKGROUND

The former NOP occupies approximately 17,250 acres and is located approximately 0.5 miles south of the Village of Mead and 30 miles west of Omaha in Saunders County, Nebraska (Figure 1).

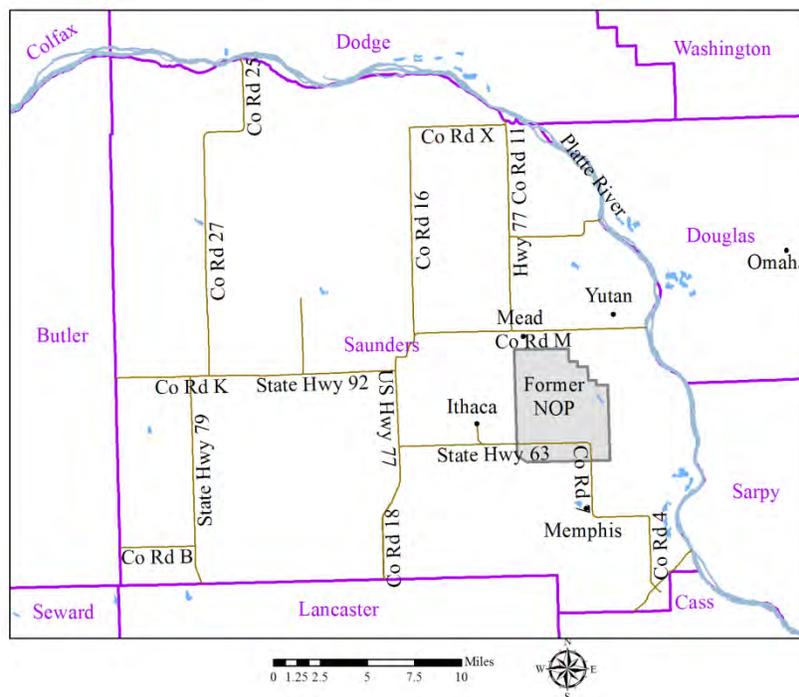


Figure 1. Location of Former NOP in Saunders County, Nebraska.

3.1 SITE HISTORY

During World War II, bombs, shells, and boosters were loaded, assembled, and packed at the NOP site. **Ordnance** production was temporarily terminated in 1945 and the facility was placed on standby; decontamination and shutdown procedures were initiated. Between 1945 and 1949, the buildings were decontaminated and used primarily for storage and disposal of bulk explosives and munitions.

In 1950, the plant was temporarily reactivated and produced an assortment of weapons for use in the Korean Conflict. The plant was again placed on standby status in 1956. In 1959, the NOP site was transferred to the General Services Administration for disposition. Approximately 1,000 acres were retained by the Army for National Guard and Army Reserve training, 12 acres were retained by the Army for use as a Nike Missile Maintenance Area, 2,000 acres were transferred to the U.S. Air Force to build the Offutt Air Force Base Atlas Missile Area, and 40 acres were transferred to the Department of Commerce.

From 1959 to 1960, the Offutt Air Force Base Atlas Missile Area S-1 launch area was built north of Load Line (LL) 4 (Investigation Areas 18 and 19 on Figure 2). The Air Force also occupied 34 acres of the northern portion of LL 1 (Investigation Areas 12 and 13 on Figure 2) for use as the Air Force Ballistic Missile Division Technical Area. The missile facilities were deactivated in 1964 and the Atlas Missile Area and the Nike Missile Maintenance Area were transferred to the Nebraska National Guard.

In 1962, approximately 9,600 acres of the former NOP were purchased by the University of Nebraska – Lincoln (UNL) for use as an agricultural research farm. An additional 600 acres were obtained by UNL in 1964. Private individuals and corporations purchased 5,250 acres. Currently, most of the site is owned by UNL for the operation of the Agricultural Research and Development Center (ARDC). The remaining area is owned by the Nebraska National Guard and Army Reserves. Private ownership accounts for the remaining portions of the site. Adjacent land use is primarily agricultural, except for the Village of Mead, which is located north of the site.

The former NOP site was placed on the EPA **National Priorities List (NPL)** of **Superfund** sites under Section 105 of CERCLA, in August 1990 after several environmental investigations. In September of 1991, USACE, EPA, and NDEQ entered into an **Interagency Agreement (IAG)** under Section 120 of CERCLA to investigate environmental contamination at the former NOP. USACE has conducted these activities under the **Defense Environmental Restoration Program (DERP)**.

3.2 OPERABLE UNITS

Due to the size and complexity of the former NOP site, as with many Superfund sites, the site was organized into OUs. The focus of this Proposed Plan is OU3 which, as noted previously, includes a former on-site landfill and former waste disposal areas.

OU1 addressed the risk due to exposure to explosives-contaminated soil (top four feet of soil). A ROD for OU1 was issued in November 1995 and is available in the Information Repository located in the Mead Public Library. The remedy was completed in 1997.

OU2 addressed the remediation of contaminated **groundwater**, soil contaminated with volatile organic and explosive compounds (exclusive of those addressed in OU1) which may continue to be a source of groundwater contamination. The ROD for OU2 was issued in October 1996. The final decision selected in the ROD was containment and focused extraction of groundwater and soil removal. The groundwater extraction system is currently operating on-site.

OU3 includes a former on-site landfill and former waste disposal areas. OU3 includes soil in several investigation areas, as well as surface water (Figure 2), and areas of potential vapor intrusion located above the OU2 groundwater plumes. Five areas investigated during the RI included underground storage tanks (USTs)/above ground storage tanks (ASTs). These were addressed under the USACE Containerized Hazardous, Toxic, and Radioactive Waste (CON/HTRW) program.

OU5 addresses the areas of the former NOP site where UNL disposed of wastes, including a permitted landfill. The lead agency for OU5 is EPA. UNL continues to implement response actions at the site.

Removal activities took place in 2007 and 2008 and a RI/Feasibility Study (FS) was completed. A Proposed Plan was announced and comments were received from July 1, 2011, through August 1, 2011. A ROD will be issued by EPA.

Environmental investigations and **remedial** actions to address explosive hazards and chemical warfare material are being conducted under the Military Munitions Response Program (MMRP). A Military Munitions Site Inspection is also being conducted on-site. This Site Inspection is part of the MMRP being conducted by USACE, but is considered separate from the OUs. There are three sites being investigated one near the former Detonation Craters, one near the former NOP **Landfill** Area, and one near the Potential Landfill Area.

Several OUs physically overlap with OU3. OU1 contained the top four feet of explosives-contaminated soil; a few areas that were remediated in OU1 are included in OU3 for other compounds in soil. OU5 contains sites used by UNL which overlap with several areas included in OU3. OU5 was characterized during an RI and some response actions have been completed during a Non-Time Critical Removal Action. Additional response actions will be implemented after the ROD is issued. MMRP areas of concern also overlap some OU3 investigation areas.

3.3 PUBLIC PARTICIPATION ACTIVITIES

USACE has conducted public meetings since 1990 and quarterly Open House presentations since 2008. The purpose of the Open House presentations are to keep the public informed of ongoing investigations and foster communication between USACE, EPA, NDEQ, and the local community.

4.0 SITE CHARACTERISTICS

4.1 AREA DEMOGRAPHICS

Saunders County had a population of 20,780 according to the 2010 U.S. Census. The nearest towns and populations in 2010 are listed below (US Census Bureau 2011).

- Ithaca - 148
- Mead - 569
- Memphis - 114
- Yutan – 1,174

4.2 SITE LAND USE

The majority of the former NOP site is currently owned by UNL-ARDC (approximately 9,536 acres). Approximately 2,176 acres are owned by the U.S. government and used by the Nebraska National Guard, the U.S. Air Force, and the Army Reserves. Privately-owned crop and pasture land makes up the majority of the rest of the area with the Mead Cattle Company occupying approximately 2,240 acres. Most of the adjacent land is used for agriculture, with the exception of the town of Mead.

The former North Burning Grounds is currently used by UNL as a wildlife plantings area for tall grasses and weeds. A Permanent Deed Notation established by UNL exists for the North Burning Ground (Figure 2) and Potential Landfill Area that prohibits any land use other than a wildlife habitat (US 2005b). Another Permanent Deed Notation exists for a former UNL solid waste disposal area (US 2005c) located near the former NOP Landfill Area (Figure 2) states “any future use of the site must not disturb the integrity of the containment or monitoring system unless approved by NDEQ” (US 2005c).

4.3 TOPOGRAPHY, HYDROGEOLOGY, AND CLIMATE

Elevations at the former NOP site range from 1,210 feet above mean sea level (amsl) in the northeastern portion of the site to 1,105 feet amsl in the southwestern corner near Silver Creek (USGS 1981).

Three major aquifers are present at and in the vicinity the former NOP site: the Todd Valley aquifer, the Platte River alluvial aquifer, and the Omadi Sandstone aquifer (ECC 2009). Within the northwestern portion of the former NOP site, the Omadi Shale acts as an aquitard between the Todd Valley aquifer and the Omadi Sandstone aquifer (URS 2008). Where the Omadi Shale is absent (i.e., in the southeastern portion of the former NOP site), the Todd Valley aquifer and the Platte River alluvial aquifer are hydraulically connected with the Omadi Sandstone (ECC 2009).

Saunders County, Nebraska is subjected to cold northerly winds in the winters and hot southerly winds in the summer. April and September are the wettest months, with annual precipitation averaging 28 inches per year. An average snowfall of 31 inches occurs annually, with January exhibiting the coldest temperatures [average low temperature of 13° Fahrenheit (F)]. An average high temperature of 88°F occurs in July (Woodward-Clyde 1997).

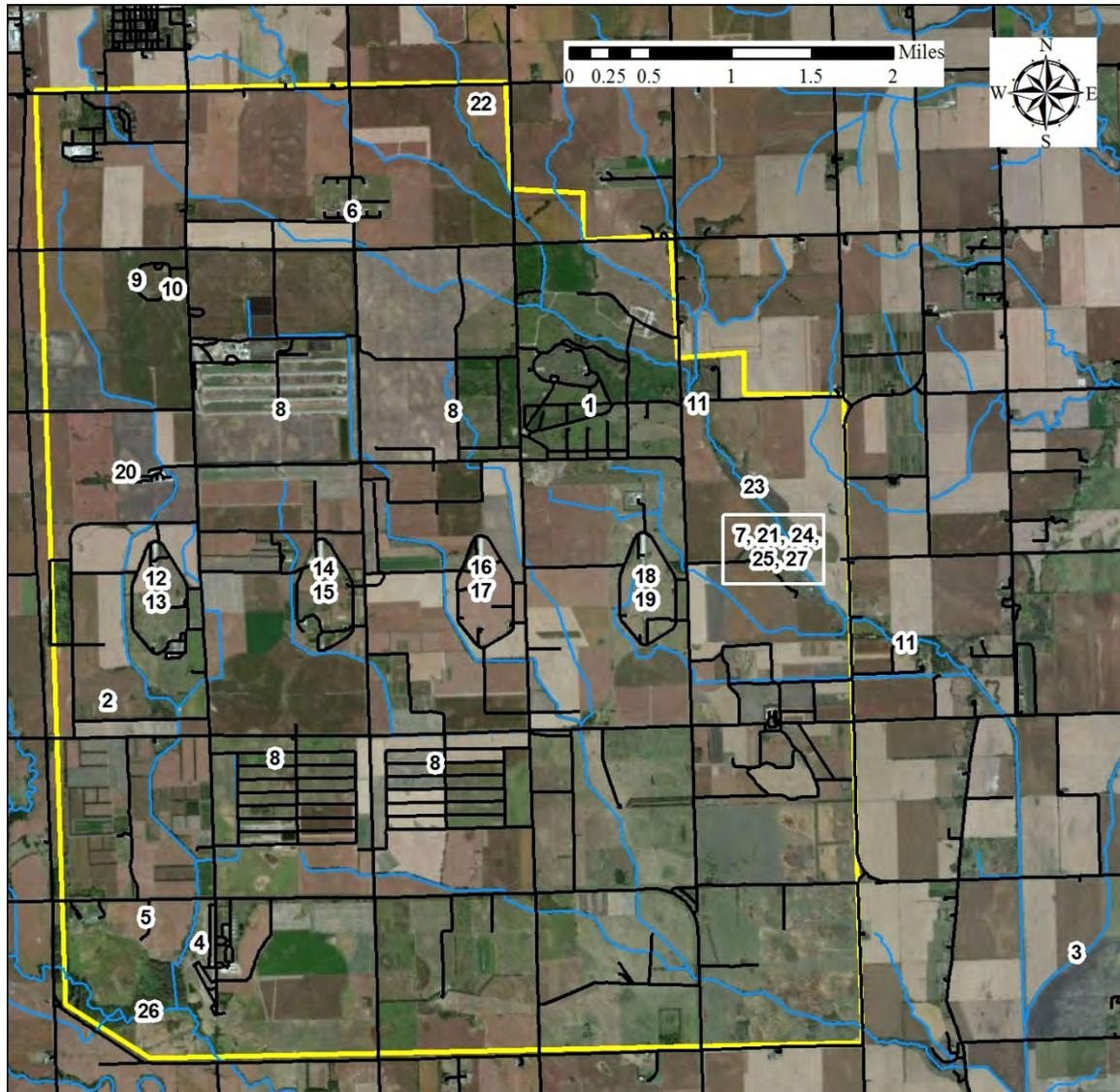
4.4 SURFACE WATER

A number of streams are located within, and near, the former NOP site. The three largest streams are Johnson, Clear, and Silver Creeks. Johnson Creek merges with Clear Creek southeast of the site and continues downstream as Clear Creek.

Silver Creek is located on the southwest corner of the site and drains into Wahoo Creek (Figure 2) south of the former NOP and north of the city of Ashland. A diversion channel was built to redirect the upper portion of Silver Creek such that it flows into Wahoo Creek. Wahoo Creek flows into Salt Creek, which discharges into the Platte River near the southeastern corner of Saunders County.

The majority of surface runoff from the former NOP flows into Johnson Creek. Surface runoff from the western portion of the former NOP site drains southward and eventually enters Silver Creek. The surface drainage area for Silver Creek includes LL1, the former Administration Area, and the Bomb Booster Assembly Area.

The Todd Valley aquifer discharges to Johnson Creek and Clear Creek southeast of the site, and to Silver and Wahoo Creeks south of the site.



- Investigation Area:
- 1 Former Atlas Missile Area Potential Waste Area
 - 2 Bermed Area
 - 3 Clear Creek
 - 4 Former Demolition Ground
 - 5 Former Detonation Craters
 - 6 Former Ammonium Nitrate Plant Potential Waste Area
 - 7 Former NOP Landfill Area
 - 8 Former Raw Product Igloo Storage Areas
 - 9 Former Teteryl Pelleting
 - 10 Former Potential Waste Area
 - 11 Johnson Creek
 - 12 Former LL1 Bomb Production Building
 - 13 Former LL1 Paint Operations Area
 - 14 Former LL2 Bomb Production Building
 - 15 Former LL2 Paint Operations Area
 - 16 Former LL3 Bomb Production Building
 - 17 Former LL3 Paint Operations Area
 - 18 Former LL4 Bomb Production Building
 - 19 Former LL4 Paint Operations Area
 - 20 Potential Waste Disposal Area
 - 21 Former North Burning Ground
 - 22 Northeast Boundary Area
 - 23 Natural Resources District Reservoir
 - 24 Potential Landfill Area
 - 25 Former Proving Grounds
 - 26 Silver Creek
 - 27 Former South Burning Ground

Figure 2. Locations of OU3 Investigation Areas.
 (Note: Locations are approximate)

5.0 OU3 AREAS OF INVESTIGATION

5.1 INTRODUCTION

There have been multiple environmental investigations at OU3 which have been documented in the following reports:

- Preliminary Assessment (PA) of Ordnance Contamination, 1991 (TCT 1991)
- RI Report, 1997 (Woodward-Clyde 1997)
- RI Report Addendum, 2000 (URS 2000a)
- Revised BLRA, 2000 (URS 2000b)
- FS, 2000 (URS 2000c)
- **Engineering Evaluation and Cost Analysis (EE/CA)** Addendum to the FS, 2007 (URS 2007)
- Non-Time Critical Removal Action, 2008 (Kingston 2008)
- Supplemental RI Report and Supplemental BLRA, 2012 (GEO 2012)

This proposed plan sets forth the recommended NFA for the 27 areas included in OU3. The majority of these sites have been evaluated in either the risk screening process of the RI, the 2000 Baseline Risk Assessment, or the 2012 Supplemental Baseline Risk Assessment. Several UST sites were originally evaluated or addressed in conjunction with earlier OU3 efforts, however, as USTs are not included under CERCLA, these are not considered in the recommended remedy. In addition, some sites contained explosives contaminated soils which were addressed in either OU1 or OU2 but may remain in OU3 due to continued evaluations of other compounds. Table 1 provides an explanation of where each site was investigated, evaluated, or in some cases, re-evaluated, and the basis for the risk determination at the site. It also indicates if these sites were addressed in OU1 or OU2 for explosives contamination.

5.2 INVESTIGATION AREAS

The following is a summary of the investigation areas shown on Figure 2.

5.2.1 Former Atlas Missile Area Potential Waste Area (Investigation Area 1)

Soil samples were collected from 0 to 20 feet below ground surface (bgs) and compared with screening levels for **metals**, explosives, VOCs, and SVOCs. Manganese exceeded the background screening level in one sample. This value was only 6% over the screening limit and was considered an isolated occurrence. This area was identified as requiring NFA (Woodward-Clyde 1997).

5.2.2 Bermed Area (Investigation Area 2)

Soil samples were collected from 0 to 3 feet bgs in this area. The results from the samples did not exceed the screening levels for VOCs, SVOCs, explosives, or metals and the area was identified as NFA required (Woodward-Clyde 1997).

5.2.3 Clear Creek (Investigation Area 3)

See discussion in Section 5.2.28: Surface Water.

5.2.4 Former Demolition Ground (Investigation Area 4)

The area known as the 'Culvert Area' was investigated during the PA of Ordnance Contamination; the 'Culvert Area' became the former Demolition Ground investigation area. PA activities included a visual survey, a geophysical survey, and soil samples.

A geophysical survey of the area was conducted to identify possible or suspected waste disposal activities. Soil samples were collected from 0 to 20 feet bgs in this area. The results from the samples did not exceed the screening levels for VOCs, SVOCs, explosives, or metals and this area was identified as NFA required (Woodward-Clyde 1997).

5.2.5 Former Detonation Craters (Investigation Area 5)

The area known as the ‘Turnout Area’ was investigated during the PA of Ordnance Contamination; the ‘Turnout Area’ became the former Detonation Craters investigation area. PA activities included a visual survey, a geophysical survey, and soil samples from excavation pits.

Soil samples were collected from 0 to 3 feet bgs in the area and compared with screening levels for metals, explosives, VOCs, and SVOCs. Manganese exceeded the background screening level in one sample at less than 1.5 times the screening level. It was considered an isolated occurrence and this area was identified as NFA required (Woodward-Clyde 1997).

5.2.6 Former Ammonium Nitrate Plant Potential Waste Area (Investigation Area 6)

A geophysical survey of the area was conducted to identify possible or suspected waste disposal activities. Soil samples were collected from 0 to 20 feet bgs in the area. The results from the samples did not exceed the screening levels of VOCs, SVOCs, explosives, or metals and the area was identified as NFA required (Woodward-Clyde 1997).

5.2.7 Former NOP Landfill Area (Investigation Area 7)

The former NOP Landfill Area was investigated during the 1991 PA of Ordnance Contamination; any explosives contamination found was addressed as a part of OU1.

The former NOP Landfill Area was not sampled as a part of OU3. The site-wide Environmental Evaluation and Cost Analysis for Ordnance and Explosives removal recommended against intrusive activities at the former NOP Landfill for safety reasons. The Phase I RI objective was to evaluate whether groundwater was being affected by thiodiglycol (chemical warfare agent degradation byproduct), and if concentrations were sufficient to pose a risk to human health or the environment. Thiodiglycol was not detected in 10 groundwater sampling events that took place from September 1994 to December 2000 (ECC 2010). NFA is recommended for this investigation area.

5.2.8 Former Raw Product Igloo Storage Areas (Investigation Area 8)

Soil samples were collected from 0 to 1 feet bgs in this area and compared with screening levels for metals, explosives, and high explosives. No explosives were found above screening criteria and no metals exceeded risk-based criteria. The area was identified as requiring NFA (Woodward-Clyde 1997).

5.2.9 Former Tetryl Pelleting Area (Investigation Area 9)

Soil samples were collected from 0 to 2 feet bgs in this area and compared with screening levels for metals and explosives. No explosives were found above screening criteria. Values above screening levels for barium (1 sample), copper (1 sample), and zinc (2 samples) were less than 1.5 times the screening level and were considered isolated occurrences. The area was identified as requiring NFA (Woodward-Clyde 1997).

5.2.10 Former Potential Waste Area (Investigation Area 10)

A geophysical survey of the area was conducted to identify possible or suspected waste disposal activities. Soil samples were collected from 0 to 20 feet bgs in this area. Sample results did not exceed the screening levels for VOCs, SVOCs, explosives, or metals and the area was identified as NFA required (Woodward-Clyde 1997).

5.2.11 Johnson Creek (Investigation Area 11)

See discussion in Section 5.2.28: Surface Water.

5.2.12 Former LL1 Bomb Production Building (Investigation Area 12)

The LLs were investigated during the 1991 PA of Ordnance Contamination; any explosives contamination found was addressed as a part of OU1 and OU2 remedial actions. During the RIs, soil samples were collected from 0 to 2 feet bgs in this area and compared with screening levels for metals and explosives. Both metals and explosives exceeded screening levels. This area was carried forward into the 2000 BLRA and a Hazard Index (HI) value below 1 was identified (URS 2000b). NFA is recommended for this investigation area.

5.2.13 Former LL1 Paint Operations Area (Investigation Area 13)

The LLs were investigated during the 1991 PA of Ordnance Contamination; any explosives contamination found was addressed as a part of OU1 and OU2 remedial actions. During the RIs, soil samples were collected from 0 to 2 feet bgs in this area and compared with screening levels for metals. Sample results exceeded screening levels. This area was carried forward into the 2000 BLRA and an HI value below 1 was identified (URS 2000b). NFA is recommended for this investigation area.

5.2.14 Former LL2 Bomb Production Building (Investigation Area 14)

The LLs were investigated during the 1991 PA of Ordnance Contamination; any explosives contamination found was addressed as a part of OU1 and OU2 remedial actions. During the RIs, soil samples were collected from 0 to 2 feet bgs in this area and compared with screening levels for metals and explosives. Both metals and explosives exceeded screening levels. This area was carried forward into the 2000 BLRA and an HI value below 1 was identified (URS 2000b). NFA is recommended for this investigation area.

5.2.15 Former LL2 Paint Operations Area (Investigation Area 15)

The LLs were investigated during the 1991 PA of Ordnance Contamination; any explosives contamination found was addressed as a part of OU1 and OU2 remedial actions. During the RIs, soil samples were collected from 0 to 2 feet bgs in this area and compared with screening levels for metals. Sample results exceeded screening levels and this area was carried forward into the 2000 BLRA (URS 2000b) where an HI value over 1 was identified. Soil with antimony concentrations greater than 31 milligrams per kilogram (mg/kg) was excavated in a 2008 removal action (Section 5.3). NFA is recommended for this investigation area.

5.2.16 Former LL3 Bomb Production Building (Investigation Area 16)

The LLs were investigated during the 1991 PA of Ordnance Contamination; any explosives contamination found was addressed as a part of OU1 and OU2 remedial actions. During the RIs, soil samples were collected from 0 to 2 feet bgs in this area and compared with screening levels for metals

and explosives. Both metals and explosives exceeded screening levels. This area was carried forward into the 2000 BLRA and an HI value below 1 was identified (URS 2000b). NFA is recommended for this investigation area.

5.2.17 Former LL3 Paint Operations Area (Investigation Area 17)

The LLs were investigated during the 1991 PA of Ordnance Contamination; any explosives contamination found was addressed as a part of OU1 and OU2 remedial actions. During the RIs, soil samples were collected from 0 to 2 feet bgs in this area and compared with screening levels for metals. Sample results exceeded screening levels. This area was carried forward into the 2000 BLRA and an HI value below 1 was identified (URS 2000b). NFA is recommended for this investigation area.

5.2.18 Former LL4 Bomb Production Building (Investigation Area 18)

The LLs were investigated during the 1991 PA of Ordnance Contamination; any explosives contamination found was addressed as a part of OU1 and OU2 remedial actions. During the RIs, soil samples were collected from 0 to 2 feet bgs in this area and compared with screening levels for metals and explosives. Both metals and explosives exceeded screening levels. This area was carried forward into the 2000 BLRA and an HI value below 1 was identified (URS 2000b). NFA is recommended for this investigation area.

5.2.19 Former LL4 Paint Operations Area (Investigation Area 19)

The LLs were investigated during the 1991 PA of Ordnance Contamination; any explosives contamination found was addressed as a part of OU1 and OU2 remedial actions. During the RIs, soil samples were collected from 0 to 2 feet bgs in this area and compared with screening levels for metals. Sample results exceeded screening levels. This area was carried forward into the 2000 BLRA where an HI value over 1 was identified (URS 2000b). Soil with antimony concentrations in excess of 31 mg/kg was excavated in a 2008 removal action (Section 5.3). NFA is recommended for this investigation area.

5.2.20 Potential Waste Disposal Area (Investigation Area 20)

A geophysical survey of this area was conducted to identify possible or suspected waste disposal activities. Soil samples were collected from 0 to 2 feet bgs in the area. Sample results did not exceed the screening levels for VOCs, SVOCs, explosives, or metals and the area was identified as NFA required (Woodward-Clyde 1997).

5.2.21 Former North Burning Ground (Investigation Area 21)

The former North Burning Ground was investigated during the 1991 PA of Ordnance Contamination; any explosives contamination found was addressed as a part of OU1. PA activities included a visual survey, a geophysical survey, and a soil sample.

Samples were collected from 0 to 10 feet bgs. These samples were analyzed for metals, VOCs, and SVOCs. This area was addressed for explosives in soil as a part of the OU1 remedial action. In Phase III of the RI, soil samples exceeded screening levels for metals in isolated locations (URS 2000a). This area was carried forward into the 2000 BLRA where an HI value below 1 was identified (URS 2000b). During an unrelated UNL removal action, a burn layer was identified. This burn layer was investigated further in the Supplemental RI (GEO 2012) where the former North Burning Ground and Potential Landfill Area were treated as a combined investigation area.

The former North Burning Grounds was reinvestigated during the Supplemental RI, based on observations made during the UNL removal action. A burn layer was encountered during UNL removal actions at the North Burning Ground that were conducted in 2008. A sample of the burn layer contained antimony and lead concentrations exceeding human health screening levels. As a result, additional sampling was completed to characterize the extent of the burn layer identified. This area was carried forward into the 2012 BLRA (GEO 2012) where an HI value below 1 was identified. NFA is recommended for this investigation area.

5.2.22 Northeast Boundary Area (Investigation Area 22)

This investigation area was added after Phase II of the RI. Three test pits (4 feet deep) were excavated in this area during the Phase III RI. Metals in soil exceeded screening levels. This area was carried forward into the 2000 BLRA where an HI value below 1 was identified (URS 2000b). NFA is recommended for this investigation area.

5.2.23 Natural Resources District Reservoir (Investigation Area 23)

See discussion in Section 5.2.28: Surface Water.

5.2.24 Potential Landfill Area (Investigation Area 24)

A geophysical survey of the area was conducted to identify possible or suspected waste disposal activities. Soil samples were collected from 0 to 21 feet bgs in this area. This area was investigated further in Phase III of the RI (URS 2000a). Test pits were excavated following the identification of geophysical anomalies; soil sample results exceeded screening levels for metals and explosives. This area was carried forward into the 2000 BLRA (URS 2000a) and an HI value over 1 was identified to be associated with antimony-contaminated soils. The antimony-contaminated soil (remedial goal of 31 mg/kg) was addressed during a subsequent removal action in 2008 (Section 5.3). A burn layer observed in the test pits was investigated further in the Supplemental RI (GEO 2012), where the former North Burning Ground and Potential Landfill Areas were treated as a combined investigation area.

The Potential Landfill Area was reinvestigated during the Supplemental RI, based on observations made during the UNL removal action. A burn layer was encountered during UNL removal actions conducted in 2008. A sample of the burn layer contained antimony and lead concentrations exceeding human health screening levels. During the UNL removal action ash was observed. As a result, additional sampling was completed to characterize the extent of the burn layer identified. These areas were carried forward into the 2012 BLRA (GEO 2012) where an HI value below 1 was identified. NFA is recommended for this investigation area.

5.2.25 Former Proving Grounds (Investigation Area 25)

The former Proving Grounds was investigated during the 1991 PA of Ordnance Contamination; any explosives contamination found was addressed as a part of OU1. PA activities included a visual survey, a geophysical survey, and a soil sample.

This area was addressed for explosives in soil as a part of OU1. Soil exceeding risk-based remediation goals in the top 4 feet was addressed in the OU1 remedial action.

Following the OU1 remedial action, this area was investigated under OU3. During Phase I and II of the RI, soil samples were collected from 0 to 10 feet bgs in this area and compared with screening levels. Concentrations of metals in the soil samples exceeded screening levels. During Phase III of the RI, a geophysical survey of the area was conducted to identify possible or suspected waste disposal activities,

and test pits were excavated (3 to 10 feet deep) to investigate an anomaly identified during the survey. Samples exceeded screening levels for metals and explosives. The single explosive compound detected above screening levels was located at 9 feet bgs, deeper than the remedial action in OU1. This area was carried forward into the 2000 BLRA (URS 2000b) where an HI value below 1 was identified. NFA is recommended for this investigation area.

5.2.26 Silver Creek (Investigation Area 26)

See discussion in Section 5.2.28: Surface Water.

5.2.27 Former South Burning Ground (Investigation Area 27)

The former South Burning Grounds was investigated during the 1991 PA of Ordnance Contamination; any explosives contamination found was addressed as a part of OU1. PA activities included shallow soil samples.

Soil samples were collected from 0 to 3 feet bgs in the area and compared with screening levels. SVOCs and two explosive compounds exceeded screening criteria. The impacted soils were remediated as a part of the OU1 remedial action (OHM 1998). The area was identified as NFA required (Woodward-Clyde 1997).

5.2.28 Surface Water (Investigation Areas 3, 11, 23, and 26)

Johnson, Clear, and Silver Creeks surface water and sediment samples were taken from 1995 to 1996. Samples were analyzed for metals, explosives, VOCs, and SVOCs. Metals in surface water samples from Investigation Areas 3, 11, and 26 exceeded screening levels. These creeks were analyzed further in Phase III of the RI (URS 2000a) along with the Natural Resources District (NRD) Reservoir. Surface water samples and sediment samples from the creeks and the NRD Reservoir (including fish tissue sampling) were analyzed for metals and explosives. Metals in surface water samples from Investigation Areas 3, 11, 23, and 26 exceeded screening levels. The 2000 BLRA identified hazards in excess of an HI of 1 for the adult and child recreational fisherman in Johnson and Clear Creek.

The 2000 BLRA result for the NRD Reservoir indicated hazards in excess of an HI of 1 for the child recreational fisherman receptor (HI of 1.2). This HI was due primarily to ingestion of fish (HI of 0.36) and the majority of the ingestion risk was due to selenium (HI of 0.2). This HI value reported was the sum of the HIs for all chemicals without regard for the target organs. When the chemicals of concern were re-evaluated by target organ, the recalculated HIs are all below 1 for each target organ. NFA is recommended for the NRD Reservoir (URS 2000b).

Surface water samples from Johnson, Clear, and Silver Creeks (Figure 2) have been collected since 2004 as part of the OU2 quarterly groundwater sampling. These samples had been analyzed for VOCs and explosives and the results incorporated into the 2012 BLRA (GEO 2012). This area was carried forward into the 2012 BLRA and HI values below 1 were identified (GEO 2012). NFA is recommended for these investigation areas.

5.2.29 Vapor Intrusion

The 1997-2000 OU3 RI did not include assessments of vapor intrusion. A vapor intrusion assessment was conducted for EPA in 12 buildings overlying the **trichloroethene (TCE)** groundwater plumes in 2007. The results of the EPA study indicated that vapor intrusion was not a concern for eight of the 12 buildings. Indoor air and sub-slab **soil gas** sampling was conducted as part of the Supplemental RI (GEO 2012) at the four remaining buildings: Unit 006 (UNL Storage Building), Unit 001 (Residence), Unit 003

(Feed Mill), and Unit 011 (Feed Mill Office). NFA is recommended for this investigation area based on the results of the 2012 BLRA (Section 6.1.3) (GEO 2012).

5.3 OU3 REMOVAL ACTIONS

The antimony contaminated soils identified in the 2000 BLRA were excavated in 2008. These soils had concentrations over the risk-based remediation goal of 31 mg/kg. Approximately 575, 310, and 175 cubic yards were removed from the Potential Landfill Area (Investigation Area 24 in Figure 2), LL2 Paint Operations Area (Investigation Area 15 on Figure 2), and LL4 Paint Operations Area (Investigation Area 19 on Figure 2), respectively, and backfilled with clean soil. The excavated soil from all three areas was disposed of in the Butler County Landfill. During excavation in the Potential Landfill Area, a pocket of approximately 3 cubic yards of transite tiles (asbestos-containing material) was found, the tiles were set aside in a separate area and removed from the site under the supervision of a Nebraska certified Asbestos Supervisor and disposed of in the Butler County Landfill.

6.0 SUMMARY OF OU3 RISK

Both cancer and non-cancer risks were calculated in the human health risk assessment portion of the 2000 BLRA. An **ecological risk assessment** was also completed in the 2000 BLRA.

6.1 HUMAN HEALTH RISK ASSESSMENT

A risk assessment calculates a baseline risk which is an estimate of the likelihood of health problems occurring without cleanup. Information on the concentration of compounds found at the site is combined with ways that people might be exposed to the compounds and used to determine cancer or non-cancer risks. Incremental Lifetime Cancer Risks (ILCRs) represent the additional probability that a person may develop cancer as a result of exposure to chemicals at the site. These risks are reported as numerical probabilities (e.g., a 2×10^{-4} for a 2 in 10,000 increase in the chance of a person getting cancer as a result of chemical exposure). Non-cancer risks have been addressed by calculating an HI. An HI of 1 or less indicates that adverse non-cancer health effects are considered extremely unlikely while an HI greater than 1 indicates that adverse health effects may occur. Two BLRAs were conducted for OU3 – a Revised BLRA in 2000 and a Supplemental BLRA in 2012.

6.1.1 Soils BLRA Results

Both BLRAs evaluated six receptors potentially exposed to soils in the investigation areas:

- Resident Farmer Adult
- Resident Farmer Child
- Trespasser Adult
- Trespasser Juvenile
- On-Site Worker
- Construction Worker

All receptors were evaluated for intake of chemicals via soil **ingestion**, **dermal contact**, and inhalation of fugitive dusts and vapors from surface soil. The construction worker was also evaluated for exposure to deeper soils associated with excavation. Cancer risks for all receptors in all areas fell within or below the acceptable risk range of 10^{-6} to 10^{-4} . In all investigation areas, HIs were less than 1, except in the LL2 and LL4 Paint Operations Area (Investigation Areas 15 and 19) and the Potential Landfill Area (Investigation Area 24). HI values less than 1 indicate that adverse non-cancer health effects are extremely unlikely to occur as a result of soil exposure. In Investigation Areas 15, 19, and 24, antimony-contaminated soil produced HI values greater than 1. Removal of antimony-contaminated soil above the cleanup goal of 31

mg/kg from all three areas in 2008 (Section 5.3) has, however, eliminated the potential for adverse health effects.

The 2012 BLRA estimated risks for non-residential receptors in two areas, the Potential Landfill Area and the former North Burning Ground, and found cancer risks well within or below the acceptable risk range of 10^{-6} to 10^{-4} . Adverse non-cancer health effects were also found to be extremely unlikely, where all the HIs were much less than 1.

All soil exposures evaluated in the 2000 and 2012 BLRAs indicated that cancer risks from exposures to soil well within or below the acceptable risk range of 10^{-6} to 10^{-4} and that adverse non-cancer health effects are not expected to occur under current usage scenarios.

6.1.2 Surface Water BLRA Results

The 2012 BLRA evaluated risks for recreational fishermen (adult and child) exposed to surface water and eating fish from Johnson, Clear, and Silver Creeks. These risks were assessed in the Phase III RI in 2000 with cancer risks to an adult recreational fisherman being estimated at 7.0×10^{-5} in Johnson and Clear Creeks and 1.8×10^{-5} in Silver Creek. In addition, there were HI values of 2 and 4 for adult and child recreational fishermen in Johnson and Clear Creeks and 1.2 for the child recreational fisherman in the NRD Reservoir indicating possible adverse non-cancer health effects. The HI value for the NRD Reservoir was re-evaluated (Section 5.2.28) and the resulting HI value was below 1.

Cancer risks for Johnson, Clear, and Silver Creeks in the 2012 BLRA included surface water data taken from 2004 to 2010 and were within or below the acceptable risk range of 10^{-6} to 10^{-4} . HIs in the 2012 BLRA were well below 1.

The 2012 BLRA, which is based on data from December 2007 through May 2010, shows that cancer risk was within or below the acceptable risk range of 10^{-6} to 10^{-4} and HI values were below 1 for human health exposure to Johnson, Clear, and Silver Creeks, and the NRD Reservoir.

6.1.3 Vapor Intrusion BLRA Results

A vapor intrusion study in 2007 analyzed indoor air and sub-slab soil gas from 12 buildings. The indoor air samples were taken on the first floor and in the basement where people might breathe the air.

Sub-slab soil gas samples were also taken to assess the possible buildup of vapors under the buildings, which would indicate the potential for vapor intrusion. These results show values of TCE above screening levels in Unit 001 (Residence) and elevated sub-slab soil gases suggesting that vapors are accumulating under Units 006 (UNL Storage Building) and 011 (Feed Mill Office). These buildings, as well as Unit 003 (Feed Mill), were resampled as part of the Supplemental RI field work and reinvestigated in the 2012 BLRA.

Cancer risks for residents at Unit 001 were estimated to fall well within or below the acceptable risk range of 10^{-6} to 10^{-4} . The HI values for adult and child residents (0.3) were both below 1.

Unit 006 is a storage building which is infrequently entered. The cancer risk of 4×10^{-7} fell within or below the acceptable risk range of 10^{-6} to 10^{-4} . The HI for the worker (0.1) does not exceed 1.

Cancer risks from the buildings studied for vapor intrusion were within or below the acceptable risk range of 10^{-6} to 10^{-4} and HI values were below 1 in indoor air, based on current usage scenarios and do not show significant accumulations of sub-surface soil gas.

6.2 ECOLOGICAL RISK ASSESSMENT

An ecological risk assessment was performed as part of the 2000 BLRA. A qualitative assessment was conducted for three reaches of Johnson Creek (including the NRD Reservoir), one reach of Clear Creek, and two reaches of Silver Creek for suitability as a habitat for the plains minnow (a species of concern). The habitat assessment determined that habitat conditions did not favor the plains top minnow.

Five receptors were selected for the ecological risk assessment:

- Benthic macroinvertebrate communities
- Benthivorous Fish (bullhead and common carp) (fish)
- Mallard duck (waterfowl)
- Great Blue Heron (wading birds)
- Raccoon (omnivorous mammal)

Surface water, sediment, and fish tissue were collected and analyzed. The chemicals considered were explosives, VOCs, SVOCs, and metals. Data were screened against appropriate screening levels to determine **contaminants of potential ecological concern (COPECs)**.

No surface water chemicals were retained as COPECs. No COPECs were retained for the NRD Reservoir. Silver was retained as a COPEC for sediment in Johnson Creek. Silver, selenium, and p-Cresol were retained for sediment in Silver Creek. The ecological assessment used both the qualitative weight-of-evidence approach and the semi-quantitative ecotoxicity quotient approach found that the COPECs presented negligible risk to aquatic and terrestrial receptors on-site.

6.3 SUMMARY OF RISK ASSESSMENT

Risk assessment results indicate that all risks and hazards, with regard to human health or the environment, are within or below acceptable values and NFA is recommended for all of the OU3 investigation areas and for vapor intrusion.

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Table 1. Summary of OU3 Investigation Areas

Investigation Area	Description	PA of Ordnance Contamination# (TCT 1991)	Result of RI Phase I and II (Woodward-Clyde 1997)	Result of RI Phase III (URS 2000a)	Result of Revised BLRA (URS 2000b)	Result of Supplemental RI (GEO 2012)	Result of Supplemental BLRA (GEO 2012)	Remedial Actions/ Removal Actions#
1	Former Atlas Missile Area – Potential Waste Area	--	One isolated detection above SLs, NFA	--	--	--	--	--
2	Bermed Area SW of LL1	--	No compound detected above SLs, NFA	--	--	--	--	--
3	Clear Creek	--	Metals detected above SLs	Metals detected above SLs	HI hazard to Adult and Child Recreational Fisherman	VOCs detected above SLs	Hazard/Risk below an HI of 1 and within 10 ⁻⁶ to 10 ⁻⁴ , NFA	--
4	Former Demolition Ground	No UXO or ordnance debris	No compound detected above SLs, NFA	--	--	--	--	--
5	Former Detonation Craters	No UXO or ordnance debris	One isolated detection above SLs, NFA	--	--	--	--	--
6	Former Ammonium Nitrate Plant – Potential Waste Area	--	No compound detected above SLs, NFA	--	--	--	--	--
7	Former NOP Landfill Area	--	No compound detected above SLs, NFA	--	--	--	--	--
8	Former Raw Products Igloo Storage Areas	--	No compound detected above SLs, NFA	--	--	--	--	--
9	Former Teteryl Pelleting Area	--	Four isolated detections above SLs, NFA	--	--	--	--	--
10	Former Potential Waste Area SE of Bomb Booster Area	--	No compound detected above SLs, NFA	--	--	--	--	--
11	Johnson Creek	--	Metals detected above SLs	Metals detected above SLs	HI hazard to Adult and Child Recreational Fisherman	VOCs detected above SLs	Hazard/Risk below an HI of 1 and within 10 ⁻⁶ to 10 ⁻⁴ , NFA	--
12	Former LL1 Bomb Production Building	Explosives found in surface drainage areas, no UXO located	Metals and explosives detected above SLs	Not sampled	Hazard/Risk below an HI of 1 and within or below 10 ⁻⁶ to 10 ⁻⁴ , NFA	--	--	LL1 explosives contamination addressed in OU1 and OU2 remedial actions
13	Former LL1 Paint Operations Areas		Metals detected above SLs	Not sampled	Hazard below an HI of 1, NFA*	--	--	
14	Former LL2 Bomb Production Building	Explosives found in surface drainage areas, no UXO located	Metals and explosives detected above SLs	Not sampled	Hazard/Risk below an HI of 1 and within or below 10 ⁻⁶ to 10 ⁻⁴ , NFA	--	--	LL2 explosives contamination addressed in OU1 and OU2 remedial actions; OU3 removal action completed for antimony-contaminated soils, NFA
15	Former LL2 Paint Operations Areas		Metals detected above SLs	Not sampled	HI hazard to a resident child	--	--	
16	Former LL3 Bomb Production Building,	Explosives found in surface drainage areas, no UXO located	Metals and explosives detected above SLs	Not sampled	Hazard/Risk below an HI of 1 and within or below 10 ⁻⁶ to 10 ⁻⁴ , NFA	--	--	LL3 explosives contamination addressed in OU1 and OU2 remedial actions
17	Former LL3 Paint Operations Areas		Metals detected above SLs	Not sampled	Hazard below an HI of 1, NFA*	--	--	
18	Former LL4 Bomb Production Building,	No UXO located.	Metals and explosives detected above SLs	Not sampled	Hazard/Risk below an HI of 1 and within or below 10 ⁻⁶ to 10 ⁻⁴ , NFA	--	--	LL4 explosives contamination addressed in OU1 and OU2 remedial actions; OU3 removal action completed for antimony-contaminated soils in Paint Operations Area , NFA
19	Former LL4 Paint Operations Areas		Metals detected above SLs	Not sampled	HI hazard to a resident child*	--	--	
20	Former Potential Waste Disposal Area	--	No compound detected above SLs, NFA	Not sampled	--	--	--	--
21	Former North Burning Ground	Ordnance debris. No explosive components.	Metals detected above SLs	Metals detected above SLs	Hazard/Risk below an HI of 1 and below 10 ⁻⁶ to 10 ⁻⁴ , NFA	Metals detected above SLs	Hazard/Risk below an HI of 1 and within or below 10 ⁻⁶ to 10 ⁻⁴ , NFA	Burn Layer identified in UNL Removal Action, NFA
22	Northeast Boundary Area	--	Not sampled	Metals detected above SLs	Hazard below an HI of 1, NFA*	--	--	--
23	Natural Resources District Reservoir	--	Not sampled	Metals detected above SLs	Hazard/Risk below an HI of 1 and below 10 ⁻⁶ to 10 ⁻⁴ , NFA	--	--	--
24	Potential Landfill Area	--	Anomalies detected	Metals and explosives detected above SLs	HI hazard to a resident child Risk within or below 10 ⁻⁶ to 10 ⁻⁴ .	Metals detected above SLs	Hazard/Risk below an HI of 1 and within or below 10 ⁻⁶ to 10 ⁻⁴ , NFA	Removal action completed for antimony-contaminated soils, NFA
25	Former Proving Grounds	High explosives on surface, no UXO located	Anomalies identified	Metals and explosives detected above SLs	Hazard/Risk below an HI of 1 and below 10 ⁻⁶ to 10 ⁻⁴ , NFA	--	--	Explosives contamination addressed in OU1 remedial action
26	Silver Creek	--	Metals detected above SLs	Metals detected above SLs	Hazard/Risk below an HI of 1 and below 10 ⁻⁶ to 10 ⁻⁴ , NFA	VOCs detected above SLs	Hazard/Risk below an HI of 1 and within or below 10 ⁻⁶ to 10 ⁻⁴ , NFA	--
27	Former South Burning Grounds	Propellant on surface, no UXO located	SVOCs detected above SLs	Not sampled	--	--	--	SVOC detected above SLs removed in OU1 remedial action, NFA.
--	Vapor Intrusion	--	Not sampled	Not sampled	Not sampled	VOCs detected above SLs	Hazard/Risk below an HI of 1 and within 10 ⁻⁶ to 10 ⁻⁴ , NFA	--

*no carcinogens carried forward into risk assessment

#Unless otherwise noted, the entire Load Line was treated as one investigation area during the PA and any Remedial or Removal Actions.

LL: Load Line; NFA: No Further Action; OU: Operable Unit; RI: Remedial Investigation; SLs: Screening Levels; SVOC: semi-volatile organic compound; VOC: volatile organic compound

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7.0 COMMUNITY PARTICIPATION

7.1 PUBLIC COMMENT PERIOD

A public comment period, which extends from October 25, 2012 through November 24, 2012, has been established. The purpose of this comment period is to offer the public and other stakeholders the opportunity to review and comment on the Proposed Plan. A final decision will not be made until comments received during the public comment period have been evaluated. Comments received will be included in the Administrative Record and summarized in the Responsiveness Summary section of the ROD, the document which formalizes the selection of the final decision. Comments must be postmarked no later than November 24, 2012.

All written comments should be sent to Ms. Kristine Stein, USACE's Project Manager, at the following address:

Ms. Kristine Stein
U.S. Army Corps of Engineers, Kansas City District
635 Federal Building (CENWK-PM-ED)
601 E. 12th Street
Kansas City, Missouri 64106-2896

Based on public comments or new information, USACE and EPA may decide to modify the NFA recommendation or select another remedial action. Therefore, it is important to comment on the Proposed Plan. USACE will respond to comments received in the Responsiveness Summary section of the ROD, which will be placed in the Administrative Record at the Mead Public Library.

7.2 PUBLIC MEETING

CERCLA requires that USACE and EPA consider the views and comments of the public before making a decision on the remedial actions. Public comments may cause a modification to the Proposed Plan.

Holding a public meeting is one way for interested parties to share their views and comments about the Proposed Plan. All interested individuals are encouraged to attend a public meeting scheduled at the Yutan Veterans Country Club. USACE, EPA, and NDEQ representatives will be present. A court reporter will be present to record the meeting. The meeting will be held on November 14, 2012 starting at 7:00 p.m. A one-hour public availability/poster session will precede the public meeting beginning at 6:00 p.m. At the meeting the public will be allowed to present spoken and written comments on the Proposed Plan.

An interested party may also submit comments in writing. Written comments should be addressed to Ms. Kristine Stein at the address listed above.

If you have any questions about USACE's Proposed Plan or the public comment period, please contact the following USACE, EPA, or NDEQ personnel:

Ms. Kristine Stein
U.S. Army Corps of Engineers, Kansas City District
635 Federal Building (CENWK-PM-ED)
601 E. 12th Street
Kansas City, Missouri 64106-2896

Mr. Ken Rapplean
Environmental Protection Agency, Region VII
11201 Renner Boulevard
Lenexa, Kansas 66219

Ms. Stacey Stricker
Nebraska Department of Environmental Quality
Suite 400, The Atrium
1200 N Street
PO Box 98922
Lincoln, Nebraska 68509

The OU3 Administrative Record has been established at the following location:

Mead Public Library
316 South Vine Street
Mead, Nebraska 68041
(402) 624-6605

The Administrative Record contains the OU3 Reports, and other material used in preparation of this Proposed Plan. The Mead Public Library is open as shown, and is subject to change. Hours available online at: <http://www.meadnebraska.net/library>:

Tuesdays and Thursdays
9:00 am to 11:00 am
2:00 pm to 7:00 pm
Wednesdays
3:00 pm to 5:00 pm
Saturdays
9:00 am to 12:00 pm

8.0 GLOSSARY OF TERMS

This glossary defines the technical terms used in this Proposed Plan. These terms and abbreviations contained in this glossary are often defined in the context of hazardous waste management, and apply specifically to work performed under the Superfund program. Therefore, these terms may have other meanings when used in a different context.

Administrative Record: The body of documents that forms the basis for selection of a particular response at a site.

Baseline Risk Assessment (BLRA): A study of the actual or potential danger to human health or the environment from hazardous substances at a specific site. The study includes a human health and an ecological risk component. The BLRA estimates risks at the site as it currently exists, with no remedial action taken.

Contaminants of Concern (COCs): A subset of all the chemicals detected at the site that represent those contaminants posing the greatest potential human health risks at the site due to their inherent toxicity or prevalence at the site.

Contaminants of Potential Ecological Concern (COPECs): A subset of all the chemicals detected at the site that represent those contaminants posing the greatest potential risk to the environment at the site due to their inherent toxicity or prevalence at the site.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): CERCLA is also referred to as “Superfund.” A federal law that addresses the discharge and remediation of hazardous substances, pollutants, and contaminants into the environment. It provides for a structured remedial system, makes any entity that had a role in the contamination liable for the cleanup, arranges for the funding of abandoned sites, and authorizes the National Contingency Plan (NCP).

Defense Environmental Restoration Program (DERP): A program established to design and implement cleanups at sites historically used by the United States government for military activities.

Dermal Contact: An exposure route by which a receptor (e.g., human or target organism) comes into contact with a contaminant through direct skin contact with contaminated soils or groundwater.

Ecological Risk Assessment: The portion of a BLRA that addresses risks to ecological receptors.

Engineering Evaluation/Cost Analysis (EE/CA): A document used to identify the objectives of the removal action and analyze the effectiveness, implementability, and cost of various alternatives, it also documents the recommended action and describe reasons for the recommendation. The NCP requires an EE/CA for all non-time critical removal actions.

Feasibility Study (FS): A comprehensive evaluation of potential alternatives for remediating contamination. The FS identifies general response actions, screens potentially applicable technologies and process options, assembles alternatives, and evaluates detailed alternatives.

Groundwater: Water found beneath the ground surface that fills pores between materials such as sand, silt, gravel, or rock which is often used as a source of drinking water via municipal or domestic wells.

Hazard Index (HI): A numerical representation of the health hazard, unrelated to cancer, posed by contaminants through one or more exposure pathways. An HI value of 1 is similar in concept to a

“threshold value” for non-cancer toxicity. An HI value less than one indicates the lack of any non-cancer hazard, while a value greater than 1 indicates a potential health concern.

Ingestion: To come into contact with a contaminant by means of eating or drinking contaminated soils or water.

Inhalation: To come into contact with a contaminant by means of breathing in contaminated air or vapor.

Incremental Lifetime Cancer Risk (ILCR): Incremental probability of an individual developing cancer as a result of potential carcinogen exposure averaged over a lifetime.

Interagency Agreement (IAG): A written agreement between EPA and another federal agency carrying out site cleanup activities (e.g., the Department of Defense), that sets forth the roles and responsibilities of the agencies for performing and overseeing the activities. States are often parties to IAGs.

Landfill: A disposal facility where waste is placed in or on land.

Metals: Chemical elements such as iron and aluminum generally characterized by ductility, malleability, luster, and conductivity of heat and electricity. Metals naturally exist in soils.

National Oil and Hazardous Substance Pollution Contingency Plan (NCP): The federal regulations specifying the methods and criteria for cleaning up Superfund sites.

National Priorities List (NPL): EPA’s list of national priorities among the known releases or threatened releases of hazardous substances, pollutants, or contaminants throughout the United States and its territories. The NPL is intended primarily to guide EPA in determining which sites warrant further investigation.

Operable Unit (OU): A term which refers to a portion of a Superfund site where action is undertaken in incremental steps to remedy risks to human health or the environment.

Ordnance: Military supplies, including weapons, ammunition, combat vehicles, maintenance tools, and equipment. The ordnance assembled at the site were explosive devices such as bombs.

Polycyclic Aromatic Hydrocarbons (PAHs): An organic compound that occurs in oil, coal, and tar deposits and is produced as byproducts of burning fuel.

Record of Decision (ROD): The decision document in which USACE or EPA selects a remedy for a Superfund site.

Remedial: An adjective describing the course of study combined with actions to correct site contamination problems through identifying the nature and extent of cleanup strategies under the Superfund program.

Remedial Investigation (RI): The first part of a two-part study which determines how much and what kind of contamination exists at a site. A RI generally involves collecting and analyzing samples of groundwater, surface water, soil, sediment, and air. The second part of the study is a FS (see above).

Responsiveness Summary: A portion of the ROD in which public comments are summarized and responses to comments are made. The responsiveness summary addresses public comments on the Proposed Plan and other documents.

Semi-volatile Organic Compounds: A group of organic compounds that have a tendency to change from liquids to gases at relatively low temperatures, higher than ambient temperatures.

Soil Gas: Gas occurring in the unsaturated soil pore spaces.

Superfund: The common name given to CERCLA (see above).

Surface Soil: Soil samples taken from the top 0.5 feet of soil from the ground surface.

Total Recoverable Petroleum Hydrocarbons (TRPH): A group of organic compounds that includes mineral oil, hydrocarbon oil, extractable hydrocarbons, and oil and grease.

Trichloroethene (TCE): A stable, colorless liquid with a low boiling point. TCE has many industrial applications, including use as a solvent and as a metal degreasing agent. TCE may be toxic to humans when inhaled, ingested or through skin contact and can damage vital organs, especially the liver [see also Volatile Organic Compounds].

Vapor Intrusion: The migration of volatile chemicals from contaminated groundwater or soil into an overlying building.

Volatile Organic Compounds (VOCs): A group of organic compounds that have a tendency to change from liquids to gases at ambient temperatures and pressures.

9.0 LIST OF ACRONYMS AND ABBREVIATIONS

amsl	above mean sea level
ARDC	Agricultural Research and Development Center
AST	above ground storage tank
bgs	below ground surface
BLRA	Baseline Risk Assessment
BTEX	benzene, toluene, ethylbenzene, and xylene
CENWK	U. S. Army Corps of Engineers, Kansas City District
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	contaminant of concern
CON/HTRW	Containerized Hazardous, Toxic, and Radioactive Waste
COPEC	contaminant of potential ecological concern
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
ECC	Environmental Chemical Corporation
EE/CA	Engineering Evaluation/Cost Analysis
EPA	U.S. Environmental Protection Agency
°F	degrees Fahrenheit
FS	Feasibility Study
GEO	GEO Consultants, LLC
HI	hazard index
IAG	Interagency Agreement
ILCR	Incremental Lifetime Cancer Risk
LL	Load Line
mg/kg	milligrams per kilogram
MMRP	Military Munitions Response Program
NCP	National Contingency Plan
NDEQ	Nebraska Department of Environmental Quality
NFA	No Further Action
NPL	National Priorities List
NRD	Natural Resources District
NOP	Nebraska Ordnance Plant
OU	Operable Unit
PA	Preliminary Assessment
PAH	polycyclic aromatic hydrocarbon
RI	Remedial Investigation
ROD	Record of Decision
SVOC	semi-volatile organic compound
TCE	trichloroethene
TRPH	total recoverable petroleum hydrocarbon
UNL	University of Nebraska – Lincoln
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
UST	underground storage tank
VOC	volatile organic compound

10.0 REFERENCES AND KEY DOCUMENTS

- ECC (Environmental Chemical Corporation) 2009. Draft *Final. Site-Wide Work Plan. Support Services*. Former Nebraska Ordnance Plant, Mead, Nebraska.
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