PROPOSED PLAN
For
SELECTED AREAS OF CONCERN AND AREAS OF INTEREST

FUDS PROJECT NO. B07MO017302

Former Tyson Valley Powder Farm
Eureka, Missouri, St. Louis County

U.S. Army Corps of Engineers
Kansas City District
Kansas City, Missouri
May 2014
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1.0 INTRODUCTION

This Proposed Plan presents the Department of Defense (DoD) plan addressing 23 Areas of Concern (AOCs) and 4 Areas of Interest (AOIs) at the former Tyson Valley Powder Farm (TVPF) property in Eureka, Missouri. A list of these AOCs and AOIs is presented in Table 1. The remaining AOCs and AOIs at the TVPF are subject to ongoing investigation and evaluation and are not addressed in this Proposed Plan.

The United States Army (Army), as the lead agency under the Formerly Used Defense Sites (FUDS) program, on behalf of the DoD, is issuing this Proposed Plan to solicit public participation as required under Section 117a of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Section 300.430(f)(2) of the National Contingency Plan (NCP). The public participation process, as required by CERCLA and the NCP, offers the public a reasonable opportunity for submittal of written or oral comments and to participate in a public meeting during the public comment period.

This Proposed Plan was prepared by the United States Army Corps of Engineers (USACE). Pursuant to the Defense Environmental Restoration Program (DERP), the USACE has conducted environmental activities on behalf of the Army and coordinated with the Missouri Department of Natural Resources (MDNR) and the United States Environmental Protection Agency (EPA) Region 7 throughout the CERCLA process.

Investigations and evaluation support a determination of No Remedial Action by the DoD is necessary to ensure protection of human health and the environment for AOCs and AOIs presented in Table 1.

Copies of the investigation reports are maintained in the Administrative Record at the St. Louis County Eureka Hills Public Library. Primary documents used in the development of the Proposed Plan are listed in the reference section near the back of this document. The Army encourages the public to review these and additional documents to gain a comprehensive understanding of the activities conducted at the TVPF Site.

The USACE Site Investigation (SI) reports, Environmental Consolidation Report (ECR), Lone Elk Park Sediment and Surface Water Report, Remedial Investigation (RI) reports,

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and other technical reports did not identify environmental contaminants in the soils, sediments, surface water, or groundwater at the selected AOCs/AOIs at levels requiring further DoD action.

As presented in the Phase IV RI Report Appendix A20, the 23 AOCs and 4 AOIs that are the subject of this Proposed Plan were determined to:

- Have not had DoD activity which released contamination; or
- Do not contain contamination above background levels or risk screening levels; or
- Do not contain contamination that exceeds the accepted risk management range for cancer as discussed in the NCP; and
- Present no ecological risk or adverse impact to ecological communities.

### 2.0 COMMUNITY ROLE IN SELECTION PROCESS

The public participation process, as required by CERCLA under Section 117a and the National Contingency Plan, offers the public a reasonable opportunity for submittal of written or oral comments and to participate in a public meeting during the public comment period. USACE relies on public participation to ensure that the concerns of the community are considered in selecting an effective remedy for the Site. Further details of the public meeting, comment period, and submittal of comments are provided in the box on this page and in Section 8 of this Proposed Plan.

Although this Proposed Plan recommends No Remedial Action by the DoD for the 23 AOCs and 4 AOIs, a final determination will not be made until the public comment period ends and all comments received during the public comment period are considered. This Proposed Plan is available for a public comment period beginning May 7, 2014 and concluding on June 5, 2014.

Written and oral comments will be accepted at the Public Meeting. Written comments not provided at the Public Meeting should be sent during the public comment period to:

**United States Army Corps of Engineers**  
ATTN: Edwin Louis  
CENWK-PM-E  
601 East 12th Street  
Kansas City, MO 64106-2896  
edwin.g.louis@usace.army.mil

### 3.0 SITE BACKGROUND

#### 3.1 Site Location

The Site is located in St. Louis County, approximately four miles east of Eureka, Missouri, north of I-44.

#### 3.2 Site History

The former TVPF was originally developed by the Ordnance Department through the purchase of 2,622 acres of land in June 1941 to provide storage of powder, priming,
pyrotechnics, incendiary chemicals, and small arms ammunition produced at the St. Louis Army Ammunition Plant. Prior to acquisition by the DoD in 1941 the site was uninhabited except for the mining towns of Mincke, Tyson, and Morschels.

The former TVPF was also used for testing and disposal of small arms ammunition. The facility was composed of the following:

- 52 partially buried munitions storage bunkers (igloos),
- 10 pentaerythritol tetranitrate (PETN) vaults,
- 5 trinitrotoluene (TNT) magazines,
- 4 firing ranges (350, 1800, 2250, and 4800 feet),
- 3 brick chemical warehouses,
- 2 burning pans,
- 2 warehouses, and a
- Popping Kettle Building.

Ancillary buildings part of the former TVPF include, but are not limited to:

- canning house building,
- paint storage shed,
- solvent storage building,
- electric shop,
- 3 oil storage sheds,
- 1 mercury bin/truck inspection station,
- heavy duty garage,
- plumbing shop,
- guard house, and
- fire station.

The former TVPF was declared surplus in 1945 and reported to the War Assets Administration. The area was then donated to St. Louis County in 1950 for park and recreation purposes. In 1951, the Department of the Army reoccupied 2,371 acres of the original 2,622 acres for use during the Korean War. The remainder stayed under the jurisdiction of St. Louis County. In 1961, the property was once again declared surplus and transferred to the General Services Administration which in turn transferred the property to the Department of Health, Education, and Welfare. The Department of Health, Education, and Welfare conveyed 1,966 acres to Washington University in 1963 and the remaining 405 acres to St. Louis County in 1964 for park and recreation purposes.

Investigations and studies at the former TVPF have resulted in the identification of 36 AOCs and 8 AOIs. Of these 44 sites, 23 AOCs and 4 AOIs are being proposed for No Remedial Action by the DoD (see Table 1). The locations of the 23 AOCs are shown on Figure 1 and the 4 AOIs are shown on Figure 2. The remaining AOCs and AOIs are the subject of separate ongoing investigations and evaluation and are not covered by this Proposed Plan.

3.2.1 Current/Future Land Use

The former TVPF is currently divided into three major portions: Washington University’s Tyson Research Center (TRC), St. Louis County’s Lone Elk County Park (LECP), and West Tyson County Park (southern portion only). The sources for environmental concerns related to past DoD operations are only located in TRC and LECP. The southern portion of West Tyson County Park was located outside the security fence line of the historical main operating area; no storage or handling activities took place in this area.

The TRC is currently used throughout the year for biological and ecological research studies conducted by Washington University and a Field Science Program during summer for school students from the St. Louis area. A portion of the TRC property is home to
Figure 1.
FORMER TYSON VALLEY POWDER FARM
PROPOSED PLAN
MAY 2014

AREAS OF CONCERN

1. Igloo #12 Area (specific to Igloo #12)
2. Firing Range/Quarry
3. PETN Vaults
4. Residences Along West Tyson Parcel
5. Pevely Farms Golf Course
6. Easternmost Intermittent Stream in W. Tyson Parcel
7. Westernmost Intermittent Stream in W. Tyson Parcel
8. Bluegrass Spring
9. Roadside Northwest of the Popping Kettle Area
10. Railroad Spur Path Throughout Tyson Valley Parcel
11. Railroad Gate Entrance
12. Meramec River
13. Amistre Creek
14. Wildlife Pond at Lone Elk Parcel
15. Tyson Hollow
16. Probable Point of Entry for Intermittent Stream
17. Lake at Lone Elk Parcel
18. Spring Pond at Lone Elk Parcel
19. Administrative Building
20. Additional Igloos
21. Amistre Creek Spring Park
22. South Railroad Ditches
the Endangered Wolf Center which conducts research and studies for the preservation of wolves.

Most of the remaining former DoD igloos and vaults are used by Washington University for storage, libraries, and laboratories. The three former DoD chemical warehouses have been extensively used as art studios and for other similar activities.

The recently constructed TRC Living Learning Center is a laboratory, classroom, and showcase for green architecture and other sustainable technologies. Washington University may construct temporary housing facilities at the TRC for use by students and research faculty in the future.

3.2.2 Nearby Land Use

The former TVPF is located along the I-44 corridor between the Missouri towns of Eureka and Valley Park. It is located in an area that remains primarily undeveloped. The area comprising the former TVPF is located within St. Louis County and is unincorporated thus subject to county rather than municipal zoning restrictions.

Land uses at TRC and LECP are not expected to change significantly in the foreseeable future. TRC and LECP are part of a greenway known as the Henry Shaw Ozark Corridor, an area southwest of the city of St. Louis deemed valuable for its aesthetic and natural assets. West Tyson County Park, TRC, LECP, Castlewood State Park, Antire Valley County Park, Route 66 State Park, and the Forest 44 Conservation Area are considered the hub of the Henry Shaw Ozark Corridor.

3.3 Environmental History

Environmental investigations and related studies at the former TVPF are extensive.

For more detailed information on the investigations and studies please refer to the Administrative Record at the Eureka Hills Public Library (See Box on Page 3).

The earliest study to include environmental sampling was conducted in 1981 by the EPA when soil samples were collected at the Popping Kettle Area (AOC 3) and analyzed for metals. This initial field investigation was followed by several separate investigations, records searches, studies, and reports. A phased investigation was performed by USACE with initial results reported in the 2005 Phase I-III RI Report and Baseline Risk Assessment (BLRA). The progression in evaluation focused on areas that required additional investigation and analysis.

A comprehensive list of all investigations and studies, as well as discussions related to these activities and sampling results, is presented in the Phase IV RI Report (USACE, 2012). Upon completion of the Phase IV RI Report and an addendum to update the human health and ecological risk screening and BLRA (USACE, 2014), USACE determined it appropriate to pursue a remedy decision on 23 AOCs and 4 AOIs with a plan for No Remedial Action by the DoD.

Environmental investigations and studies for the remaining AOCs and AOIs at the TVPF are ongoing and are not addressed in this Proposed Plan.

4.0 AREA CHARACTERISTICS

4.1 Regional Setting

The former TVPF is located within the Ozark Plateau physiographic province of the Interior Highlands division. The Ozark Plateau is further subdivided into the Springfield Plateau, the Salem Plateau, and
the St. Francois Mountains. The former TVPF is located near the northeastern boundary of the Salem Plateau and north of the St. Francois Mountains where bedrock gently dips to the northeast.

The Salem Plateau includes areas of karst topography where dissolution of carbonate rocks along bedding planes, fractures, and faults has resulted in the formation of caves, tunnels, springs, sinkholes, and disappearing streams. Weathering processes also include the development of the epikarst or upper weathered bedrock zone.

4.2 Local Characteristics

The area surrounding the former TVPF is characterized as having relatively rugged, heavily-wooded hillsides and ravines that are a result of down cutting by the intermittent streams that form the drainage basin of the Meramec River.

The area of the former TVPF is comprised of unconsolidated materials, such as residual cherty soils and alluvial deposits of the Quaternary Period, which mantle bedrock. Bedrock in the area of TVPF consists of shales, limestone, dolomite, and sandstone units. More detailed information on the site-specific geology is provided in the Administrative Record.

Drainage on the former TVPF property consists of numerous ditches, ravines, and intermittent streams that convey rainfall and runoff from snowmelt. Primary drainage on the property is controlled by three intermittent streams located within Mincke, Tyson, and Elk Hollows. The intermittent streams, which receive the majority of the surface water runoff, flow northward onto the floodplain of the Meramec River where they discharge to the Meramec River.

In general, groundwater flow in the Meramec River floodplain deposits and shallow bedrock is towards the north-northeast. Regional groundwater flow is towards the northeast and east based on flow in the deeper bedrock units. This flow direction follows the regional dip of bedrock and is towards the junction of the Missouri and Mississippi rivers. In the area surrounding the TRC some groundwater flows towards seeps and springs.

The majority of the land surface at the former TVPF is composed of open fields or wooded areas along gradual to steep sloping hillsides. The main asphalt access roads, as well as the majority of the buildings and structures of the former TVPF, are located within Tyson Hollow. These structures are serviced by gravel or worn asphalt roads.

4.3 Nature and Extent of Contamination

For the AOCs and AOIs that are the subject of this Proposed Plan, potential environmental contaminants of soils and/or groundwater for which analysis was conducted include the following chemical groups: metals; volatile organic compounds (VOCs); semi-volatile organic compounds (SVOCs), which includes polycyclic aromatic hydrocarbons (PAHs); polychlorinated biphenyls (PCBs); explosives; perchlorate; pesticides; and dioxins and furans. These potential contaminants were either not detected, detected at levels below or similar to natural background levels, detected at levels that are below health based risk screening levels, or at levels that are within the accepted cancer risk management range. For more detailed information on individual sample results please see Appendix C of the Phase IV RI Addendum. The Phase IV RI Addendum is provided as Appendix A20 of the Phase IV
RI Report. This document is provided as part of the Administrative Record.

5.0 SUMMARY OF SITE RISKS

Human health risk screening and ecological risk evaluations were performed to form the basis for No Remedial Action required at the selected AOCs/AOIs. This process included evaluation of the analytical results for samples collected during several site investigations and previous human health and ecological risk screening evaluations performed on these results. These investigations and risk screenings are documented in the following:

- USACE SI Report (1989),
- EPA Expanded Site Inspection Report (2002),
- USACE Lone Elk Park Sediment and Surface Water Report (2004),
- USACE Environmental Consolidation Report (2005),
- USACE Phases I-IV RI Reports (2005 and 2012),
- USACE Phase IV RI Addendum (Appendix A20 to the Phase IV RI Report) 2014.

Numerous other technical reports and memoranda based on focused studies of the various AOCs were also used for reference (see Appendix A, Phase IV RI Report).

Initial human health risk and ecological screening assessments had been performed for most of the AOCs as part of the Phase I-III RI efforts. The results were reported in the BLRA. Human health risk screening was also performed as part of the ECR effort, where results were screened using EPA’s 2005 Preliminary Remediation Goal (PRG) screening levels. Another round of human health and ecological screening and risk assessment was performed during the Phase IV RI effort for those AOCs/AOIs that were covered during that phase of investigation. Results are documented in the Phase IV RI Report BLRA.

5.1 Human Health Screening

Since some of the human health screening levels previously used for the AOCs/AOIs have changed over the years, USACE rescreened the data available for the AOCs and AOIs against the most current established screening levels.

This rescreening effort compared concentrations of detected chemical constituents in soil, sediment and groundwater at the AOCs/AOIs to EPA’s April 2012 residential soil and tapwater Regional Screening Levels (RSL) for Chemical Contaminants at Superfund Sites, and against background levels. For groundwater, the April 2012 tap water RSLs and EPA maximum contaminant levels (MCLs) for public water supplies were used. The results of this rescreening effort are provided in the 2014 Phase IV RI Addendum, Appendix A20 of the Phase IV RI Report. For completeness, reported levels of radiation were compared to EPA’s PRGs for Radionuclides in soil and drinking water in addition to MCLs for groundwater and surface water.

There are a number of polychlorinated dibenzodioxin (PCDD) and dibenzofuran (PCDF) compounds which are generally reported when an environmental sample is analyzed for dioxins. Not all of the PCDDs and PCDFs have as high a cancer risk as 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD). The Toxicity Equivalent (TEQ) process accounts for the relative cancer potencies of the other PCDD and PCDF compounds and then is used to adjust their concentrations to equivalent concentrations of 2,3,7,8-TCDD that would pose the same...
risk. When all compound concentrations have been adjusted to their 2,3,7,8-TCDD equivalent concentrations, these TEQ concentrations are added together into a single TEQ concentration, which can then be compared to the dioxin RSL (or any other screening level or cleanup standard) and used to determine the total cancer risks and likelihood of non-cancer related health effects.

In some instances concentrations of chemical constituents exceeded the screening levels. In these cases, further evaluation of the data and calculation of the estimated risk were performed. Results indicated that although the detected concentrations exceeded the screening levels, they were within the NCP’s acceptable concentration levels representing an excess lifetime cancer risk ranging from $1 \times 10^{-4}$ to $1 \times 10^{-6}$ (E-04 to E-06), meaning a 1 in 10,000 to 1 in 1,000,000 incremental probability of an individual developing cancer over a lifetime as a result of site-related exposure to potential carcinogens. In this Proposed Plan, this range is referred to as the accepted cancer risk management range. Risk-based remedial actions on CERCLA properties are considered protective when the cancer risk for all contaminants does not exceed E-04, or a final Hazard Index (HI) of 1 (please see the Glossary in Section 10 of the Proposed Plan).

In addition to the screening against human health levels, sample results were also compared to background, naturally occurring levels. These levels are only defined for metals and PAHs in soils and sediments. Background levels were established by the collection and testing of soil samples from areas and properties not associated with DoD activities at the former TVPF.

Soils are derived from the decay and erosion of bedrock material. Background or naturally occurring levels of metals in soils are highly dependent on the type of bedrock in the area since some bedrock material can contain higher levels of some metals than other bedrock materials. For example, as evidenced by the lead mining in the state of Missouri, lead is often associated with limestone. Arsenic and iron are often associated with shales.

PAH compounds are considered to be ubiquitous in the environment. As the Agency for Toxic Substances and Disease Registry (ATSDR) noted in section 1.3 in their 1995 Toxicological Profile for PAHs:

“PAHs have many sources unrelated to this or any hazardous waste site, including cigarette smoke, vehicle exhaust, asphalt roads, coal tar, wildfires, agricultural burning, residential wood burning, waste incineration, and cooking meat and other foods at high temperatures.”

PAH compounds are also associated with areas near railroad train tracks and infrastructure.

5.2 Ecological Screening

In addition to the human health rescreening effort, the ecological risk screening that was initially performed in the Phase I-IV RI and Environmental Consolidation Report was reviewed. Qualitative ecological risk evaluations were performed and, if needed, a quantitative risk evaluation was conducted. Quantitative risk evaluations included comparing the detected chemicals in soils, sediments, and surface water to ecological screening levels for different types of receptors such as plants, mammals, birds, and soil invertebrates. Results indicated there are no significant ecological risks or adverse impacts to the ecology at these 23...
AOCs and 4 AOIs. Please see the 2014 Phase IV RI Addendum, Appendix A20, for more detail and discussions on the ecological risk screening process and results.

6.0 SUMMARIES OF THE AOCs AND AOIs

A short summary for each of the AOCs and AOIs is provided below and includes a description of each area, the investigation history, and conclusion which discusses the human health risk and environmental risk. Some AOCs were addressed without analytical data if it was determined the area had not been used by DoD and samples had not been collected.

6.1 AOC 1: Igloo 52 Area

**Description**
AOC 1 was identified in the 1988 EPA Preliminary Assessment. The AOC is located along Medical Road approximately 2000 feet southeast of the TRC Administration Building at the base of a bermed wooded hillside. The concern at this AOC was the suspicion that mercury-treated-shell casings were buried within an earthen berm directly south of the Igloo 52 Area.

**Investigation History**
There have been three major site investigations in the Igloo 52 area. A USACE Confirmation Study completed in 1989 sampled soil and groundwater, and included a 1.3 acre electromagnetic survey, which detected no shell casings. In 1997, surface soil, subsurface soil, sediment, surface water, and groundwater samples were collected as part of the USACE Phase I RI effort. In 2001, additional water and soil samples were collected for the EPA Expanded Site Investigation (ESI).

Samples were analyzed for a variety of chemicals including VOCs, SVOCs, PAHs, PCBs, metals, and explosives.

**AOC 1 Conclusion**
The only chemical constituent detected in soil above background and EPA’s residential soil RSLs was arsenic. The detected concentrations are within the accepted cancer risk management range of E-04 to E-06 for residential soils.

Beryllium was detected in groundwater at a concentration of 5 µg/l which is well below the tap-water RSL of 16 µg/l. Although slightly above the MCL of 4 µg/l, the samples were not filtered and contained suspended material and thus are thought to be more indicative of beryllium in the soils. Although EPA has not revised its MCL at this time, the tap-water RSL of 16 µg/l is considered protective of human health.

Aluminum and lead were determined to be slightly above surface water background values and Ecological Screening Levels (ESL) in one surface water sample. The levels at AOC 1 are believed to not present a significant ecological risk and would not cause an adverse impact to the ecological community.

Based on the human health risk rescreening and ecological risk evaluation as reported in the 2014 RI Report Addendum, No Remedial Action is necessary to ensure protection of human health and the environment.

6.2 AOC 6: Firing Range/Quarry

**Description**
AOC 6, Firing Range/Quarry, is located off Mincke Hollow Road in the northwestern portion of the property. It is located near a limestone quarry bounded on the north by the quarry face, on the south by a steep
downward-sloping hillside located beyond quarry debris, on the east by a berm and heavily wooded area, and on the west by the quarry floor. This area was thought to be used for test firing of ammunition. The area surrounding the bullet trap was suspected of being contaminated by bullet fragment metals and other inorganic contaminants associated with the shells.

**Investigation History**

In 1997, as part of the USACE Phase I RI effort, surface soil samples were collected and analyzed for metals and phosphorus/phosphate.

AOC 6 was again sampled in June 2001 as part of the ESI conducted by EPA. Soil samples were collected for metals and PCB analyses at that time. No PCBs were detected in any of the samples. Numerous metals were detected at concentrations which were below the established risk levels. One sample had a detection of arsenic that exceeded the established level at that time.

A final field investigation was conducted at AOC 6 in November 2006 by USACE to collect additional data. The activities and results are reported in the USACE Supplemental Firing Point/Bullet Trap/Squib Shed Technical Memorandum (USACE 2008). Ten composite surface soil samples were analyzed for explosives (including PETN, nitroglycerin, and nitrocellulose), and metals. Six of the samples were also analyzed for SVOCs.

**AOC 6 Conclusion**

No explosives were detected. No concentrations of metals were detected above the residential soil RSLs.

Several PAH compounds were reported as estimated concentrations and were slightly above background and the residential RSL soil screening levels. The concentrations are within the accepted cancer risk management range of E-04 to E-06.

As previously described, PAH compounds are ubiquitous and may be derived from many sources including the burning of wood, coal and other materials. AOC 6 is located near the limestone quarry and the old town of Mincke. The detection of PAHs is thought to be linked to non-DoD industrial operations conducted in the late 1800’s to early 1900’s in this area. Limestone from the quarry was calcinated, (cooked at very high temperatures) in wood or coal fired kilns located near Mincke Hollow for the production of lime based material. In addition, PAHs may have come from the nearby railroad where coal burning steam engines were used.

The potential ecological risk was re-evaluated at AOC 6, and it was concluded that the detected compounds are not believed to present a significant ecological risk and would not cause an adverse impact to the ecological community.

Based on the human health risk rescreening effort and the ecological risk evaluation as reported in the 2014 RI Report Addendum, No Remedial Action is necessary to ensure protection of human health and the environment.

**6.3 AOC 12: PETN Vaults**

**Description**

The PETN Vaults included 10 vaults located on the site. Given proximity of the vaults to an intermittent stream, this AOC was selected by EPA to determine if there was any contamination due to prior use. The PETN vaults were used for the storage of a highly explosive material and are located along a road on the west side of Tyson.
Creek. All vaults were decontaminated in accordance with Army regulations prior to decommissioning of the facility.

**Investigation History**
In June 2001, samples were collected as part of the EPA ESI field effort. Samples were analyzed for VOCs, SVOCs, metals, explosives, dioxins, and U-radi nuclides.

**AOC 12 Conclusion**
No explosives were detected in any of the samples. Arsenic exceeded the residential soil RSL in 1 out of 32 samples. However, the reported concentration was below the non-cancer RSL for residential soil, and still within the accepted cancer risk management range of E-04 to E-06.

One sample contained 1920 mg/kg of manganese which is slightly greater than the residential soil RSL of 1800 mg/kg. Since this is the single exceedance among 32 samples, any exposure point concentration would result in an HI of less than 1 for manganese. Manganese is not a potential carcinogen and there are no cancer risk RSLs.

Six soil samples had detections of uranium-238 above the PRG of 0.69 picocurie per gram (pCi/g). The maximum concentration, 0.97 pCi/g, is within the accepted cancer risk management range of E-04 to E-06 with an approximate cancer risk of 1.4 E-06.

Three soil samples contained low concentrations of the dioxin toxicity equivalency (TEQ) of 2,3,7,8 TCDD. The reported concentrations of 5.48, 6.32 and 7.06 nanograms/kilograms (ng/kg, one millionth of a mg/kg) are slightly above the cancer risk-based residential RSL of 4.5 ng/kg, but below the non-cancer residential soil RSL of 51 ng/kg. These concentrations are still well within the accepted cancer risk management range of E-04 to E-06 at approximate cancer risks of 1.4E-06 and 1.2E-06. For more information on the 2,3,7,8 TCDD TEQ process please refer to Section 5.0 of the Proposed Plan.

The potential ecological risk was re-evaluated at AOC 12 and it was concluded that the detected compounds are not believed to present a significant ecological risk and would not cause an adverse impact to the ecological community.

Based on the human health risk rescreening and ecological risk evaluation as presented in the 2014 RI Report Addendum, No Remedial Action is necessary to ensure protection of human health and the environment at AOC 12.

6.4 **AOC 13: Residences Along West Tyson Parcel**

**Description**
AOC 13, Residences along West Tyson Parcel, is located just east of the Meramec River and northeast of the Route 66 State Park area. The land is primarily undeveloped with sporadic residential developments and a golf course. This area is located northwest and west of the TVPF property and was never part of the former TVPF. It was not used by DoD. This AOC was recommended by EPA for evaluation due to the potential exposure of residents through the groundwater and surface water migration pathways.

**Investigation History**
Soil and water well samples were collected at three residences by the EPA during the ESI field effort. Access to the remaining seven residences was not provided and samples were not collected.
A total of 15 soil samples and 1 water sample were collected. Samples were analyzed for metals, VOCs, SVOCs, PCBs, and dioxins and furans.

**AOC 13 Conclusion**  
No VOCs or SVOCs were detected in any of the samples. Numerous metals were detected in the soil samples, but none of the concentrations of detected metals exceeded the risk screening levels.

The Arochlor 1254 detection of 1.7 mg/kg is above the cancer risk residential RSL of 0.22 mg/kg, and slightly above the non-cancer residential soil RSL of 1.1 mg/kg. Although above the cancer risk residential RSL, which is based on a 1E-06 cancer risk, the detected concentration would still be well within the accepted risk management range at approximately 7.7E-06 cancer risk. Since this is a single exceedance out of several samples, any exposure point concentration used in a BLRA would result in an HI of less than 1 and would be considered protective under CERCLA. The detected PCB 1254 is not related to DoD activities.

One subsurface soil sample contained 20 ng/kg of the dioxin toxicity equivalency (TEQ) of 2,3,7,8 TCDD. The reported concentration is above the cancer risk-based residential soil dioxin RSL of 4.5 ng/kg and has a cancer risk of about 4.4x10-6, which is within the accepted cancer risk management range of E-06 to E-04. The reported value of 20 ng/kg is below the non-cancer residential RSL of 51 ng/kg. For more information on the 2,3,7,8 TCDD TEQ process please refer to section 5.0 of the Proposed Plan. The detected 2,3,7,8 TCDD TEQ is not related to DoD activities.

The detected chemicals are not considered to be a human health risk and are within the accepted cancer risk management range of E-04 to E-06. This AOC is not part of the former TVPF property and no DoD activities took place here. The area is located just east of the Meramec River and the former Times Beach area.

The potential ecological risk was re-evaluated at AOC 13 and it was concluded that the detected compounds would neither cause a potentially significant ecological risk nor an adverse impact to the ecological community.

Based on the human health risk rescreening and ecological risk evaluation as presented in the 2014 RI Report Addendum, No Remedial Action is necessary to ensure protection of human health and the environment at AOC 13.

### 6.5 AOC 14: Pevely Farm Golf Course

**Description**  
AOC 14, Pevely Farm Golf Course, is located just east of the Meramec River and northeast of the Times Beach - Route 66 State Park area. This property borders the western side of the West Tyson County Park parcel and was never part of the former TVPF. This AOC was selected by EPA using aerial photographs dated 1958 and based on the possibility of storage or disposal activities. The disturbed areas were most likely due to construction or other farm activities on the Pevely Dairy Farm which occupied the site prior to the development of the golf course.

**Investigation History**  
AOC 14 was sampled as part of the ESI conducted by EPA. Soil samples were collected for VOCs, SVOCs, and PCBs, metals, and dioxins and furans.
AOC 14 Conclusion
This AOC is not part of the Tyson property, and no DoD activities took place here. No detected levels of constituents at AOC 14 exceed screening levels.

Based on the human health risk rescreening and ecological risk evaluation as presented in the 2014 RI Report Addendum, No Remedial Action is necessary to ensure protection of human health and the environment at AOC 14.

6.6 AOC 15: Easternmost Intermittent Stream
Description
AOC 15, Easternmost Intermittent Stream in the West Tyson County Park, is defined as an area where several intermittent streams come together to drain the narrow valleys of West Tyson County Park. Based on the northeasterly dip of the bedrock and the topographic divide which separates these two parcels of property, the intermittent streams in West Tyson County Park are not hydraulically connected to the former TVPF. The divide marks the Burlington Escarpment.

One stream parallels the main road in the park and no visual contamination was observed. AOC 15 is along this intermittent stream which drains south and east of the entrance road. The stream eventually discharges into Antire Creek off park property.

Investigation History
This stream was investigated by EPA during the ESI to determine if there was a potential for visitor exposure to the groundwater and surface water migration pathways. Sediment samples were collected and analyzed for VOCs, SVOCs, PCBs, metals and explosives. Surface water samples were collected and analyzed for metals, VOCs, SVOCs, PCBs, and explosives.

AOC 15 Conclusion
There are no known former DoD activities related to this AOC. Groundwater from the former TVPF is not found to discharge to this stream nor does the stream receive any runoff from the TRC parcel of property. No chemical constituents were detected above human health risk screening levels.

The potential ecological risk was reevaluated at AOC 15. It was concluded that the detected compounds would not be a significant ecological risk nor cause an adverse impact to the ecological community.

Based on the human health risk rescreening and ecological evaluation as presented in the 2014 RI Report Addendum, No Remedial Action is necessary to ensure protection of human health and the environment at AOC 15.

6.7 AOC 16: Westernmost Intermittent Stream
Description
AOC 16, Westernmost Intermittent Stream in West Tyson County Park Parcel, is defined as an intermittent stream which enters West Tyson County Park and drains the west side of the park. This stream merges with the easternmost intermittent stream (AOC 15) along the park main road. There was no observed visual contamination in this area. Based on the northeasterly dip of the bedrock and the topographic divide which separates these two parcels of property, the intermittent streams in West Tyson County Park are not hydraulically connected to the former TVPF. The divide marks the Burlington Escarpment.

This stream was identified by EPA as an AOC to evaluate potential for visitor
exposure to the groundwater and surface water migration pathways.

**Investigation History**
AOC 16 was not sampled during the EPA ESI effort since it merges with an intermittent stream, designated as AOC 15, which was sampled.

**AOC 16 Conclusion**
As with AOC 15, there are no known former DoD activities related specifically to this AOC. No chemical constituents above human health risk screening levels were detected at AOC 15. Since AOC 15 merges with AOC 16, there is no human health or ecological risk at AOC 16.

Groundwater from the former TVPF is not found to discharge to this stream nor does the stream receive any runoff from the TRC parcel of property.

Based on the evaluation presented in the 2014 RI Report Addendum for AOC 15 and the fact that AOC 15 merges with AOC 16, no further action is necessary at AOC 16 to ensure protection of human health and the environment.

### 6.8 AOC 17: Bluegrass Spring

**Description**
AOC 17, Bluegrass Spring, is a spring located near the southern boundary of TVPF along I-44 (see Figure 1). EPA identified this spring as an AOC and selected it for sampling.

**Investigation History**
AOC 17 was sampled as part of the ESI conducted by EPA. Sediment, surface water, and surface soil samples were collected and analyzed for VOCs, SVOCs, PCBs, metals, dioxins, and explosives.

**AOC 17 Conclusion**
No chemical constituents were detected in soil or sediment above the residential soil RSLs. No chemical constituents were detected in the surface water samples above the tap-water RSLs or the MCLs. No ecological sensitive habitat is located at or near AOC 17 and no known threatened or endangered fish have been identified.

Based on the human health risk rescreening and ecological evaluation presented in the 2014 RI Report Addendum, No Remedial Action is necessary to ensure protection of human health and the environment.

### 6.9 AOC 19: Roadside Northwest of Popping Kettle Area

**Description**
AOC 19 is a roadside area located approximately 700 feet northwest of AOC 3 (Popping Kettle area). AOC 19 is situated within the Meramec River 100-year floodplain. Given proximity to AOC 3, the EPA sought to determine if contamination from AOC 3 had migrated to AOC 19. AOC 3 is not covered by this Proposed Plan. Please refer to the Phase IV RI Report in the Administrative Record for more information on AOC 3.

**Investigation History**
Soil samples collected at AOC 19 by EPA during the ESI were analyzed for VOCs, SVOCs, PCBs, metals, and explosives.

**AOC 19 Conclusion**
No chemical constituents were detected above the residential soil RSLs. Based on the human health risk rescreening and ecological evaluation reported in the 2014 RI Report Addendum, No Remedial Action is necessary to ensure protection of human health and the environment.
6.10 AOC 21: Railroad Spur Path

**Description**
AOC 21, Railroad Spur Path throughout Tyson Valley Parcel, was evaluated as part of the EPA ESI effort. Investigation of this area by EPA was executed given prior use of Tyson for munitions transport including receiving, storing, and the loading and unloading of munitions in this area. According to the ESI report, scrap brass from the manufacturing of munitions at St. Louis Ordnance Plant is thought to have been disposed of along the railroad right-of-way.

**Investigation History**
Soil samples collected at AOC 21 by EPA during the ESI were analyzed for VOCs, SVOCs, metals, PCBs, and explosives.

**AOC 21 Conclusion**
No organic chemical constituents were detected above the residential RSL levels. Only one of the soil samples analyzed for metals exceeded a residential RSL. Iron was reported for one subsurface soil sample at 148,001 mg/kg. This level is above the non-cancer residential soil RSL of 55,000 mg/kg. Since this is a single exceedence among the eight samples analyzed for metals, any exposure point concentration calculated for a BLRA for the AOC would result in an HI of well below 1.

Based on the human health risk rescreening and ecological evaluation presented in the 2014 RI Report Addendum, No Remedial Action is necessary to ensure the protection of human health and the environment.

6.11 AOC 22: Railroad Gate Entrance

**Description**
AOC 22 is located within close proximity to the Railroad Pond. Investigation of this area by EPA was executed given prior use of Tyson for munitions transport including receiving, storing, and the loading and unloading of munitions in this area.

**Investigation History**
Soil samples collected at AOC 22 by EPA during the ESI were analyzed for VOCs, SVOCs, metals, and explosives.

**AOC 22 Conclusion**
No VOCs, SVOCs, or explosives were detected. No detected metal constituents exceeded the residential soil RSLs.

Based on the human health risk rescreening and ecological evaluation results reported in the 2014 RI Report Addendum, No Remedial Action is necessary to ensure the protection of human health and the environment.

6.12 AOC 23: Meramec River

**Description**
AOC 23, Meramec River, is located north of the TVPF site. This AOC is within the floodplain of the Meramec River and is frequently flooded during times of elevated river flow.

**Investigation History**
As part of the EPA ESI effort in June 2001, samples were collected from the Meramec River environment. Surface water samples were analyzed for VOCs, SVOCs, PCBs, explosives, and metals. Surface and subsurface soil samples were collected and analyzed for VOCs, SVOCs, and PCBs. Sediment samples were analyzed for VOCs, SVOCs, PCBs, explosives, and metals.

**AOC 23 Conclusion**
No chemical constituents were detected above the residential soil RSLs in the sediment or soil samples. None of the water samples exceeded the tap-water RSLs or MCLs.
Based on the human health risk rescreening and ecological evaluation results presented in the 2014 RI Report Addendum, No Remedial Action is necessary to ensure the protection of human health and the environment.

6.13 AOC 24: Antire Creek

Description
AOC 24, Antire Creek, is defined as the main stem creek into which several drainages or springs discharge. The creek is located on the south side of I-44 and discharges to the Meramec River near Eureka, Missouri. This AOC was sampled to determine how it relates to other surface water pathways in and near TVPF.

Investigation History
Sediment, surface soil, and surface water samples collected at AOC 24 by EPA during the ESI were analyzed for VOCs, SVOCs, PCBs, metals, and explosives.

AOC 24 Conclusion
None of the detected constituents in soil or sediment samples exceeded the residential soil RSLs. None of the water samples exceeded the tap-water RSLs or MCLs.

Based on the human health risk rescreening and ecological evaluation reported in the 2014 RI Report Addendum, No Remedial Action is necessary to ensure the protection of human health and the environment.

6.14 AOC 25: Wildlife Pond at Lone Elk County Parcel

Description
AOC 25, Wildlife Pond at LECP, is located in the southwestern portion of the park.

Investigation History
Lead has a tendency to persist in soils with high organic content and was a contaminant of potential concern at the test firing ranges at LECP. This AOC was selected by EPA because, if used as a fishery, it could be a potential for food chain contamination.

Sampling at AOC 25 was initially conducted in 2001 by EPA during the ESI. Six sediment samples and four surface water samples were collected. The sediment samples were analyzed for VOCs, SVOCs, PCBs, metals, and explosives. The surface water samples were analyzed for VOCs, SVOCs, PCBs, metals, and explosives. The only chemical constituent of concern detected was lead.

USACE conducted a confirmation study in 2004. The objectives of this study were to verify the ESI findings; analyze and determine the degree of lead contamination in this watershed at LECP; determine if lead is dissolved in water or is associated with suspended solids or sediment; determine areas not impacted by DoD operations; and evaluate potential impacts to the ecosystem. USACE personnel collected three surface water and two sediment samples at AOC 25. The report documenting this sampling effort is provided as Appendix A13 of the Phase IV RI Report.

Results for the three surface water samples collected by USACE were below the detection limit of the laboratory instrument, 0.5 µg/L. The results did not verify those from the ESI, and the lead reported in the ESI was attributed to apparent sediment suspension. Concentrations of lead in the sediment samples were below background level for lead and ranged from 21.5 mg/kg to 41 mg/kg. The report concluded that pond sediments are being impacted by normal surface soil background lead concentrations in the area and not specifically from DoD operations conducted in the 1940s.
In 2009, USACE re-evaluated the lead data from an ecological standpoint. The results are provided in Appendix A4 of the Phase IV RI Report. Results of the re-evaluation of potential lead contamination of surface water and sediment for AOC 25 indicate that lead in these media is not a significant concern for sensitive ecological receptors and would not adversely impact the ecological community. This conclusion is based on comparisons of measured concentrations of lead in surface water and sediment to conservative ecological screening levels and, for sediment, to site-specific background levels.

Results from the USACE investigation in 2004 for sediment and surface water samples indicate that none of the sediment samples had levels of metals above background or the residential soil RSL. Lead was not detected in the surface water samples above the Safe Drinking Water Act action level. As with other surface water features in LECP, natural background levels of lead in area soils are thought to contribute to the levels of lead detected at AOC 25.

**AOC 25 Conclusion**
Based on the results from the 2004 USACE study, the 2009 USACE ecological risk evaluation, and the rescreening of lead levels against the April 2012 human health screening levels as reported in the 2014 RI Report Addendum, No Remedial Action is necessary to ensure protection of human health and the environment.

**6.15 AOC 26: Tyson Hollow**

**Description**
AOC 26, Tyson Hollow, is located east-southeast of the TRC headquarters building and next to an intermittent streambed that drains this area. During periods of high rainfall the intermittent creek receives heavy runoff from the southeast area before discharging to Tyson Creek. This AOC was selected by EPA due to the potential of the intermittent stream receiving runoff from the site and eventually discharging to the Meramec River.

**Investigation History**
In June 2001, as part of the EPA ESI, sediment and surface water sample were collected at AOC 26. The sediment samples were analyzed for VOCs, SVOCs, PCBs, and explosives. The surface water sample was analyzed for SVOCs, PCBs, and metals.

**AOC 26 Conclusion**
No chemical constituents were detected above background or above residential soil RSLs. Lead was detected in a surface water sample at a concentration of 19.5 µg/l. The Safe Drinking Water Act action level is 15 µg/l. Based on the detection of lead in area soils, the detection of lead in the surface water sample is attributed to background levels of lead in soils.

The potential ecological risk was re-evaluated at AOC 26 and it was concluded that the detected levels of constituents are not believed to present a potentially significant ecological risk or result in an adverse impact to the ecological community.

Based on the human health risk rescreening and ecological evaluation reported in the 2014 RI Report Addendum, No Remedial Action is necessary to ensure the protection of human health and the environment.

**6.16 AOC 27: Mincke Hollow**

**Description**
AOC 27, Mincke Hollow, is an intermittent stream in the north/south valley parallel and just west of the main Tyson Valley. The town of Mincke Hollow was originally established to support the mining of limestone at a quarry located near AOC 6.
The limestone was calcinated (cooked at very high temperatures) in kilns located near Mincke Hollow for the production of lime based material. This AOC was investigated due to the potential for contaminants in the surrounding area to enter the intermittent stream during heavy rainfall events.

**Investigation History**
Sediment and surface water samples collected at AOC 26 by EPA during the ESI were analyzed for VOCs, SVOCs, PCBs, metals, and explosives.

**AOC 27 Conclusion**
None of the detected constituents in the sediment samples exceeded the residential soil RSLs. None of the water samples exceeded the tap-water RSLs or MCLs.

Based on the human health risk rescreening and ecological evaluation reported in the 2014 RI Report Addendum, No Remedial Action is necessary to ensure the protection of human health and the environment.

6.17 **AOC 28: Probable Point of Entry for Intermittent Stream**

**Description**
AOC 28, Probable Point of Entry for Intermittent Stream, is an AOC that was selected by EPA since the intermittent stream drains the northwestern corner of TVPF before discharging to the Meramec River. This AOC is not located on the TVPF property and is within the floodplain of the Meramec River. This area is located downstream of AOC5 and frequently floods during times of elevated flow in the Meramec River.

**Investigation History**
Sediment samples collected at AOC 28 by EPA during the ESI were analyzed for VOCs, SVOCs, PCBs, metals, and dioxins and furans.

**AOC 28 Conclusion**
None of the detected constituents in the sediment samples were above the residential soil RSLs.

The potential ecological risk was re-evaluated at AOC 28 and it was concluded that the detected compounds are not believed to present a potentially significant ecological risk or have an adverse impact on the ecological communities.

Based on the human health risk rescreening and ecological evaluation as presented in the 2014 RI Report Addendum, No Remedial Action is necessary to ensure protection of human health and the environment.

6.18 **AOC 29: Lake at Lone Elk Parcel**

**Description**
AOC 29, Lake at Lone Elk Parcel, is the large lake located in LECP. Lead was a contaminant of potential concern at the test firing ranges (AOC 9), which is also located at LECP. Lead has a tendency to persist in soils with high organic content. The lake was identified by EPA as an AOC because if used as a fishery there could be a potential for food chain contamination. Given proximity to AOC 9, the EPA sought to determine if contamination from AOC 9 had migrated to AOC 29. AOC 9 is not covered by this Proposed Plan. Please refer to the Phase IV RI Report in the Administrative Record for more information on AOC 9.

**Investigation History**
In June 2001 EPA conducted an ESI at AOC 29. This effort included the collection of two sediment samples and one surface water sample. The sediment samples were analyzed for metals. Numerous metals were detected in the sediment samples at low concentrations. The surface water sample was also analyzed for metals. Lead was
detected above the established risk level at that time.

USACE conducted confirmation sampling for surface water and sediment at AOC 29 in 2004. The objectives of this study were to: verify the ESI findings; analyze and determine the degree of lead contamination in this watershed at LECP; determine if lead is dissolved in water or is associated with suspended solids or sediment; determine areas not impacted by DoD operations; and evaluate potential impacts to the ecosystem. Appendix A13 of the Phase IV RI Report documents the sampling effort.

During this study USACE collected six sediment samples and four surface water samples and analyzed the samples for metals. Concentrations of lead in the sediments ranged from 13.6 to 19.7 mg/kg, which are below background levels of lead in soils. All surface water results for lead were reported below the detection limit of the laboratory instrument, 0.5 µg/L. The results did not verify results from the ESI. Lead reported in the ESI was attributed to apparent sediment suspension. The report concluded that sediments are being impacted by normal surface soil background lead concentrations in the area and not specifically from DoD operations conducted in the 1940s. From the water quality measurements, it was concluded that the ecosystem does not appear to be impacted from previous DoD activities.

In 2009, USACE re-evaluated the lead data from an ecological standpoint. The results of this effort are reported in Appendix A4 of the Phase IV RI Report. The results of the re-evaluation of potential lead contamination of surface water and sediment for AOC 29 indicate that lead in these media is not a significant concern for sensitive ecological receptors and that there would not be an adverse impact on the ecological community. This conclusion is based on comparisons of measured concentrations of lead in surface water and sediment to conservative ecological screening levels and, for sediment, to site-specific background levels.

Results from the USACE investigation in 2004 for sediment and surface water samples indicate that none of the sediment samples had levels of metals above background in soils or the residential soil RSL. Lead was not detected in the surface water samples above the Safe Drinking Water Act action level of 15 µg/L. As with other surface water features in LECP, natural background levels of lead in area soils are thought to contribute to the levels of lead detected at AOC 29.

**AOC 29 Conclusion**
Based on the results from the 2004 USACE study, the 2009 USACE ecological risk evaluation, and the rescreening of lead levels against the April 2012 human health screening levels as reported in the 2014 RI Report Addendum, No Remedial Action is necessary to ensure protection of human health and the environment.

**6.19 AOC 30: Spring Pond at Lone Elk Park**

**Description**
AOC 30, Spring Pond at Lone Elk Parcel, is the smallest body of water on the park. It may support aquatic life and transient wildlife may drink from its waters. This pond is fed by a spring and is located west of and down slope from the main road that circles through LECP.

**Investigation History**
This AOC was sampled by the EPA as part of the ESI in 2001. One sediment sample and one unfiltered surface water sample
were collected for metals analysis. Lead was detected above the established risk level at that time.

USACE personnel collected surface water and sediment samples at AOC 30 in 2004. The objectives of these activities were to: verify the ESI findings; analyze and determine the degree of lead contamination in this watershed; determine if lead is dissolved in water or associated with suspended solids or sediment; determine areas not impacted by DoD operations; and evaluate potential impact to the ecosystem. The report documenting this sampling effort is in Appendix B13 of the Phase IV RI Report.

The reported concentration of lead in the sediment sample was 26.4 mg/kg, which is below the background level of lead in soils and less than the residential soil RSL. Lead was detected in the non-filtered water sample at 2.27 $\mu$g/L and at an estimated concentration of 0.7 $\mu$g/L in the filtered water sample. These results are less than the Safe Drinking Water Act action level of 15 $\mu$g/L. The detection of lead in the non-filtered sample was attributed to suspended material during the sample collection procedure. Samplers waded into the center of the pond due to extensive duckweed near the edges in order to collect both the sediment and surface water samples. The reported turbidity measurement of the sample was elevated when compared to the other surface water samples that were collected as part of this study. The elevated turbidity is an indication of the presence of suspended material.

In 2009, USACE re-evaluated the lead data from an ecological standpoint. The results of this effort are reported in Appendix A4 of the Phase IV RI Report. The results of the re-evaluation of potential lead contamination of surface water and sediment for AOC 30 indicate that lead in these media is not a significant concern for sensitive ecological receptors and that there would not be an adverse impact on the ecological community. This conclusion is based on comparisons of measured concentrations of lead in surface water and sediment to conservative ecological screening levels and, for sediment, to site-specific background levels.

Results from the USACE investigation in 2004 for sediment and surface water samples indicate that none of the sediment samples had levels of metals above background in soils or above the residential soil RSL. The lead detected in the surface water sample is most likely the result of suspended material as indicated by the sample turbidity. As with AOC 25 and 29, natural background levels of lead in area soils are thought to contribute to the levels of lead detected at AOC 30.

**AOC 30 Conclusion**
Metals were not detected above the residential soil RSLs in the sediment samples. Based on the comparative lead study and sample results for the surface water, the 2009 USACE ecological risk evaluation, and the rescreening of lead levels against the April 2012 human health screening levels as reported in the 2014 RI Report Addendum, No Remedial Action is necessary to ensure protection of human health and the environment.

**6.20 AOC 31: Administration Building**
**Description**
AOC 31, Administrative Building, is located immediately east of Tyson Creek. AOC 31 was selected due to the presence of two water supply wells.
Investigation History
Water samples collected at AOC 31 by EPA during the ESI were analyzed for VOCs, SVOCs, PCBs, metals, and radionuclides. Four samples were collected from the two drinking water wells at AOC 31.

AOC 31 Conclusion
Metals were not detected above the tap-water RSLs or MCLs. Low concentrations of uranium-234 and uranium-238 were below EPA’s tap-water preliminary remedial goals of 0.748 picocurie per liter (pCi/l) U-234 and 0.607 pCi/l for U-238, and also below the MCL of 30 µg/l for total uranium.

Since this AOC represents a drinking water supply, there is no ecological exposure pathway and therefore no ecological risk. Based on the human health risk rescreening of these constituents against the April 2012 human health screening levels as reported in the 2014 RI Report Addendum, No Remedial Action is necessary to ensure protection of human health and the environment.

6.21 AOC 33: Additional Igloos
Description
AOC 33, Additional Igloos, consists of several groupings of igloos across the TRC. These igloos were designated as an AOC given their past use.

Investigation History
Soil samples collected at AOC 33 by EPA during the ESI were analyzed for metals, VOCs, SVOCs, PCBs, and explosives.

EPA also included radioactivity analysis as two of the igloos had been used by the Atomic Energy Commission (AEC). Igloos 48 and 49 were the primary storage structures used by AEC. Radioactive materials stored at TVPF were considered potential sources for uranium that had strategic reclamation value to the United States government. Therefore, C Special, C Slag, 306 residue, and C-4 were subject to strict accounting procedures and controls. The materials stored by AEC were non-enriched uranium (U-natural) bearing mineral materials. The surveys conducted have examined all 52 igloos and no elevated levels of radioactive materials of concern were found. More detailed information is provided in Appendix A of the Phase IV RI Report and the 2004 AEC Material Storage Concerns Technical Memorandum.

AOC 33 Conclusion
No chemical constituents were detected in any of the samples above the residential soil RSLs.

Based on the human health risk rescreening of these constituents against the April 2012 human health screening levels and ecological evaluation as reported in the 2014 RI Report Addendum, No Remedial Action is necessary to ensure protection of human health and the environment.

6.22 AOC 34: Antire Creek Spring Park
Description
AOC 34, Antire Creek Spring Park, was identified by EPA during the groundwater tracing investigation conducted as part of the ESI. Antire Creek lies to the south and west of the TVPF property and south of I-44. AOC 17 and AOC 24, also covered in this Proposed Plan, are located in the same drainage and flow in the same direction towards Antire Creek. AOC 34 is not part of the property utilized by DoD.

Investigation History
AOC 34 was not sampled during the EPA ESI effort due to the presence of fiber optic cable and underground pipelines located parallel to I-44 on both sides of the highway.
However, AOC 17 and AOC 24 were both sampled and neither AOC had chemical constituents detected in the soil or sediment samples above the residential soil RSLs or above the tap water RSLs or MCLs.

No ecologically sensitive habitat has been identified near AOC 34. No threatened or endangered fish or aquatic species have been identified at or near this AOC.

**AOC 34 Conclusion**
This AOC is outside of the former TVPF property boundary. DoD did not historically use this AOC and there are no suspected migration pathways from other impacted AOCs to this AOC. No Remedial Action is necessary to ensure protection of human health and the environment.

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**6.23 AOC 36: South Railroad Ditches**

**Description**
AOC 36, South Railroad Ditches, bounds the southern edge of the Burlington Northern right-of-way and is within the 100-year flood plain of the Meramec River. An intermittent stream emanates from the Tyson Valley parcel partly draining into this site and eventually becoming a probable point of entry for the Meramec River.

**Investigation History**
Soil samples collected at AOC 36 by EPA during the ESI were analyzed for metals, VOCs, SVOCs, PCBs, and explosives.

**AOC 36 Conclusion**
None of the detected constituents were above the residential soil RSLs. Based on the human health risk rescreening and ecological evaluation as reported in the 2014 RI Report Addendum, No Remedial Action is necessary to ensure protection of human health and the environment.

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**6.24 AOI: Former Solvent Storage Building**

**Description**
The location of the former solvent building is approximately 400 feet to the south-southeast of the existing TRC Administration Building. A gravel pad at the site was identified during field reconnaissance work. No specific use or description of this building was identified in other archived data reviewed for the Historical Site Use Report (HSUR). The use of this small building is assumed to be related to the title of the building provided on historical plot plans. No obvious soil staining or signs of stressed vegetation were observed during field reconnaissance.

**Investigation History**
This AOI was reviewed during the archive research for the HSUR and recommended for investigation. One borehole was drilled at the center of the footprint of the former building during the Phase IV RI field work. Four subsurface soil samples were collected at five foot intervals down to bedrock and submitted for VOCs analysis. Because a release of solvents of any significance to soil could potentially contaminate groundwater, one temporary groundwater well was installed downgradient of the former solvent storage building and the former paint shed. Groundwater samples were collected and analyzed for VOCs.

**Former Solvent Storage Building Conclusion**
No constituents in soils were detected above the residential soil RSLs. No constituents in groundwater were detected above the tap-water RSLs or the MCLs. Based on the human health risk rescreening and ecological evaluation as reported in the 2014 RI Report Addendum, No Remedial Action is necessary to ensure protection of human health and the environment.
6.25 AOI: Former Electric Shop Building

Description
The location of the former electric shop is approximately 300 feet to the south-southeast of the existing TRC Administration Building. A drive-up access and concrete foundation confirm that the structure existed at this location. No specific use or description of this building was identified in other archived data reviewed for the HSUR. Therefore, the use of this building is assumed to be related to the title of the building provided on historical plot plans.

It is not known if there was a historic release of waste constituents at this building. Field reconnaissance noted the presence of a concrete foundation but no obvious soil staining or signs of stressed vegetation were observed.

Investigation History
This AOI was reviewed during the archive research for the HSUR and recommended for investigation. Surface soil samples were collected during the Phase IV RI field work. Three surface soil composite samples collected on the north side and the two adjacent sides of the former structure were analyzed for PCBs and metals.

Former Electric Shop Building Conclusion
PCBs were not detected in any of the samples. Metals were not detected in the soil samples above the residential soil RSLs.

The potential ecological risk at this AOI was re-evaluated and it was concluded that exposure point concentrations for the metals were below background levels. Detected metals would not cause an adverse impact to the ecological community.

Based on the human health risk rescreening and ecological risk evaluation as presented in the 2014 RI Report Addendum, No Remedial Action is necessary to ensure protection of human health and the environment.

6.26 AOI: Former TNT Bunkers

Description
Five former buildings were identified as TNT bunkers (Buildings 307-1 through 307-5). The bunkers were reportedly used for storing small amounts of TNT. Bunkers 307-3, 307-4, and 307-5 were located to the northeast of the warehouse buildings (360-1 and 360-2) in an area that is currently used by the Endangered Wolf Center. Bunkers 307-1 and 307-2 were located approximately 1,000 feet farther to the north of the center.

During the Phase IV RI field activities bunkers 307-1 and 307-2 were visually assessed. Only the concrete foundations of the bunkers remain. Based on the presence of metal flanges attached to the foundations, the front of the bunkers were most likely used as loading docks.

The bunkers were reportedly burned down to remove any TNT residue. The concrete foundation at one bunker showed visible red staining on the chert cobbles within the concrete, with faint red staining on the cement matrix. This may be indicative of TNT, however no obvious soil staining or signs of stressed vegetation were observed.

Investigation History
This AOI was reviewed during the archive research for the HSUR and recommended for investigation. No previous sampling had been conducted at the former TNT bunkers. As part of the Phase IV RI field effort, two surface soil composite samples were collected immediately down slope from the foundations at former bunkers 307-1 and...
307-2 located north of the wild canid pens. These samples were tested for nitrocellulose and explosives and were considered to be representative of the five TNT bunker areas.

**Former TNT Bunkers Conclusion**
Explosives were not detected in any of the soil samples. Nitrocellulose was detected well below the residential soil RSL.

Based on the human health risk rescreening and ecological evaluation as presented in the 2014 RI Report Addendum, No Remedial Action is necessary to ensure protection of human health and the environment.

### 6.27 AOI: Former Canning House

**Description**
During the review of historical plot plans, one building was identified as a re-canning house (Building 326). The building was reportedly used for the repackaging of explosives from larger containers into smaller containers when needed during the manufacturing processes. No reported releases of explosive materials at the canning house were found during archive research. The building was located approximately 200 feet south-southwest of the warehouse buildings 360-1 and 360-2 (see Figure 2). Remnants of the building were not located during field reconnaissance and no obvious soil staining or signs of stressed vegetation were observed.

**Investigation History**
This AOI was reviewed during the archive research for the HSUR and recommended for investigation. A site reconnaissance was performed as part of the Phase IV RI field effort. While building remnants were not found, sampling was conducted at the geo-referenced location. Five surface soil composite samples were collected surrounding the center of the former building footprint and analyzed for nitrocellulose and explosives.

**Former Canning House Conclusion**
Explosives were not detected in the five soil samples that were collected at the former canning house location. Nitrocellulose was detected at levels well below the residential soil RSL.

Based on the human health risk rescreening and ecological evaluation as presented in the 2014 RI Report Addendum, No Remedial Action is necessary to ensure protection of human health and the environment.

### 7.0 PROPOSED ALTERNATIVE

Information currently available (comparison and risk screening of analysis for soil, sediment, and water samples, rescreening of the results against background levels and the EPA April 2012 human health screening levels, ecological risk evaluations and evaluation of past DoD activity) demonstrates the selected 23 AOCs & 4 AOIs:

- Have had no DoD activity which released contamination; or
- Do not contain contamination above background levels or risk screening levels; or
- Do not contain contamination that exceeds the accepted risk management range for cancer consistent with the NCP; and
- Present no unacceptable ecological risk or adverse impact to ecological communities.

Therefore, No Remedial Action by the DoD is necessary to ensure protection of public health or welfare or the environment at the selected 23 AOCs and 4 AOIs listed in Table 1.
8.0 COMMUNITY PARTICIPATION

The public is encouraged to participate in the process by providing comments on this Proposed Plan and by attending the public meeting. The USACE will consider all comments received during the public comment period.

8.1 Public Comment Period

The public comment period begins on May 7, 2014 and ends on June 5, 2014. The purpose of the public comment period is to offer members of the public an opportunity to provide to USACE their views on this Proposed Plan and the DoD evaluation that No Remedial Action by the DoD is necessary to ensure protection of human health and the environment at the selected 23 AOCs and 4 AOIs.

Comments received during the Public Comment Period will be reviewed by USACE and will be considered prior to final decision on the 23 AOCs and 4 AOIs. Responses to substantive comments will be documented in the Responsiveness Summary in the Decision Document. All comments will be incorporated into the Administrative Record.

Comments may be provided in a letter, e-mail, or at the Public Meeting. Oral comments will be recorded during the Public Meeting. Written comments must be submitted electronically, by mail with postmark not later than June 5, 2014, or at the Public Meeting. All written comments on this Proposed Plan should be sent to the USACE, as noted in Section 8.4.

8.2 Public Meeting

As part of the public comment period, USACE will host a public meeting to provide information and discuss this

Proposed Plan. Details of the meeting are provided below:

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<td></td>
<td>Manchester, Missouri 63021</td>
</tr>
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At the meeting, the public can submit written or oral comments. Oral comments will be recorded. Responses to substantive comments will be documented in the Responsiveness Summary in the Decision Document. All comments will be incorporated into the Administrative Record.

8.3 Administrative Record

The Administrative Record contains the Phase I-IV RI Reports and other documents and materials that form the basis for the No Action remedy presented in this Proposed Plan. A copy of the Administrative Record is located at the Eureka Hills Public Library located at 156 Eureka Towne Center Dr, Eureka, MO 63025. Non-holiday library hours are:

Monday-Thursday 9:00 a.m. - 9:00 p.m., and Friday-Saturday 9:00 a.m. - 5:00 p.m.

8.4 Point of Contact

If you have any questions about this Proposed Plan, or wish to submit comments, please contact the following USACE personnel:

United States Army Corps of Engineers
ATTN: Edwin Louis
CENWK-PM-E
601 East 12th Street
Kansas City, MO 64106-2896
(816) 389-3563
edwin.g.louis@usace.army.mil
<table>
<thead>
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<th>Abbreviation</th>
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<tr>
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<td>ng/kg</td>
<td>nanograms/kilogram (one millionth of a mg/kg)</td>
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<td>AOC</td>
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10.0 GLOSSARY OF TERMS USED IN THIS PROPOSED PLAN

This glossary defines technical terms used in this Proposed Plan. The 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 CERCLA program. These terms may have other meanings when used in a different context.

**Administrative Record:** A file containing the body of documents that form the basis for the selection of a particular response at a site.

**Aquifer:** A geologic formation that is water bearing. It can be a layer of soil, sand, gravel, or rock that will yield economically significant quantities of water to a well or spring.

**Baseline Risk Assessment (BLRA):** A study of the actual or potential danger to human health and welfare from hazardous substances at a specific site. The BLRA estimates human health risks at a site, as it exists with no response action taken.

**Cancer Risk:** Incremental probability of an individual developing cancer over a lifetime as a result of site-related exposure to potential carcinogens. The NCP’s acceptable cancer risk range for site-related exposures is $1 \times 10^{-4}$ to $1 \times 10^{-6}$ (1 in 10,000 to 1 in 1,000,000).

**Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA):** The CERCLA as amended by the Superfund Amendments and Reauthorization Act (SARA), and other amendments, 42 U.S.C. 9601 et seq., also referred to as “Superfund.”

**Decision Document:** A legal document issued after a Remedial Investigation that sets forth the selected remedy for cleanup of a site as decided by the authorized decision maker for the lead federal agency.

**Ecological Risk Assessment (ERA):** A study of the actual or potential danger to the environment from hazardous substances at a specific site. The ERA estimates nonhuman health risks at a site, as it exists with no response action taken.

**Formerly Used Defense Sites (FUDS):** FUDS are properties that were previously owned by the DoD or its predecessors. The FUDS program was established by Section 211 of the Superfund Amendments and Reauthorization Act (SARA) of 1986 by establishing the Defense Environmental Restoration Program (DERP). USACE is the lead agency on all FUD sites.

**Groundwater:** Underground water that fills pores in soils, sands, or openings in rocks to the point of saturation. Groundwater is often used as a source of drinking water via municipal or domestic wells.

**Hazard Index:** A measure of the adverse health effects associated with exposure to chemicals that are not known to cause cancer. A Hazard Index of 1 or less is considered highly unlikely to cause non-cancer adverse effects even if exposure continues for a lifetime.

**Maximum Contaminant Level (MCL):** The maximum allowable concentration of a chemical in drinking water established by the EPA.

**Micrograms per Liter:** Units of concentration corresponding to $1 \times 10^{-6}$ grams per liter of liquid (1 µg/L).

**Monitoring Well:** A groundwater well installed in an aquifer for measuring the water table elevations, collecting groundwater samples for detection of contaminants, and observing contaminant movement.

**National Contingency Plan (NCP):** Federal regulations specifying the methods and criteria
for cleaning up sites under CERCLA, codified at 40 Code of Federal Regulations Part 300.

**Overburden:** The unconsolidated geologic material that lies above bedrock.

**Piezometer:** A temporary monitoring well installed for the collection of groundwater samples or groundwater levels.

**Preliminary Remediation Goals (PRG):** Specific cleanup concentrations or levels are based upon federal and state environmental laws and regulations or the health risk on a given site.

**Proposed Plan:** The preferred plan for a site, as identified by the lead agency, is presented in the Proposed Plan for public review and comment. The Proposed Plan summarizes all relevant project information documenting the decision making process.

**Regional Screening Levels:** U.S. EPA health based screening values that are based on the April 2012 human health toxicity values and standard exposure factors. These values estimate contaminant concentrations in soil, water and air that are thought to be protective of human exposures.

**Remedial Investigation:** A study that determines how much and what kind of contamination exists at a site. A Remedial Investigation generally involves collecting and analyzing samples of groundwater, surface water, soil, sediment, and air.

**Volatile Organic Compound (VOC):** A group of organic compounds that tend to change from liquids to gas easily.
11.0 REFERENCES


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USACE 2008. Former Tyson Valley Powder Farm Supplemental Firing Point/Bullet Drop/Squib
Shed Technical Memorandum, Lone Elk County Park & AOC 6, Former Tyson Valley Powder
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USACE 2009. Summary of Environmental Work and Current Status of Area of Concern 6,
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