DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99
Revised 9/20/02

RCRA Corrective Action
Environmental Indicator (EI) RCRA Info code (CA750)
Migration of Contaminated Groundwater Under Control

Facility Name: **Kansas Army Ammunition Plan**t
Facility Address: **23018 Rooks Road**
Parsons, Kansas 67357-8403
Facility EPA ID #: **KS0213820467**

DETERMINATION RESULT: YE

1. Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

   X If yes - check here and continue with #2 below.

   _____ If no - re-evaluate existing data, or

   _____ if data are not available, skip to #8 and enter "IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Migration of Contaminated Groundwater Under Control" EI

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will

be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater" (for all groundwater "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated ground water and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRA Info national database ONLY as long as they remain true (i.e., RCRA Info status codes must be changed when the regulatory authorities become aware of contrary information).

Facility Information

The Kansas Army Ammunition Plant (KSAAP) is a Government-Owned Contractor-Operated (GOCO) installation under the jurisdiction of the US Army Operations Support Command (OSC). The installation is designated as inactive. The KSAAP property was acquired by the US Army in 1940 and was previously used as agricultural land, primarily for livestock grazing and farming. Construction of the facility began in August 1941. Production of artillery ammunition, bombs, and artillery shell components began in July 1942 and continued through World War II. After World War II, KSAAP's mission changed to encompass receipt, storage, and issuance of ammunition and explosives; equipment and site maintenance; and renovation and demilitarization of selected items. From 1950 through 1957, the plant produced bombs, ammunition, artillery components, and reworked 105-millimeter (mm) cartridge cases for the Korean conflict. In July 1957, the production lines were shut down, and the plant was placed on standby status that extended to December 1966, during which time responsibility for the plant lay with the government. Facilities not in use by the government become available for out leasing. Consequently, two cabinet manufacturers and a sheet metal company leased warehouse space at KSAAP, the Census Bureau occupied the Administrative Area, and unimproved land was leased for agricultural purposes (Refs. 1, 2, 7, 10).

In 1966, demand for ammunition for the Vietnam conflict prompted reactivation of the plant. All production lines except the 105-mm cartridge case rework area were reactivated. The plant produced cluster bombs, 105-mm shells, 81-mm mortars, detonators, fuses, primers, and lead cup assemblies. The lead azide area was constructed and, in September 1968, KSAAP began producing primary explosives used in primer mixtures, detonators, and fuses. After the Vietnam conflict ended, production output was reduced as ammunition demand fell. By 1975, only three of eight production lines remained active (Refs. 1, 2, 7, 10).

During the 1980s and 1990s, ammunition production at KSAAP was limited to the 300, 700, and 1100 Areas, which are identified in Attachments 1 and 2. The 300 Area produced the M864/155-mm Improved Convention Munition (ICM) round using composition A5 explosives (which contained hexahydro-1,3,5-trinitro-1,3,5-triazine [RDX] and stearic acid); the M219 lead assembly; and both inert and loaded expulsion charge assemblies for the M864 (is it 864 or 846?)/155-mm round. The 700 Area produced the M55 detonator using explosives such as lead axide and RDX. Combination effect munitions are produced at the 1100 Area by third-party contractors (Refs. 1, 2, 7, 10).

Areas now leased at KSAAP are used for crops, grazing, hay, and hayseed. KSAAP-operated facilities include a water filtration plant on the Neosho River; a sewage treatment plant; steam generation plants; and water, electrical, and steam distribution systems. The current mission at KSAAP is to load, assemble, and pack (LAP) ammunition items and maintain active and laid-away facilities. KSAAP surveys, renovates, demilitarizes, salvages, stores, inventories, and issues field service stocks. The plant is also involved with procuring, receiving, storing, and issuing necessary items for ammunition manufacturing (Refs. 1, 2, 7, 10).

KSAAP encompasses approximately 13,727 acres in Labette County in southeast Kansas. The Missouri and Oklahoma state lines are approximately 30 miles east and 20 miles south of the installation, respectively. The installation is comprised of 416 acres of improved land (active and standby production facilities), 1,630 acres of semi-improved land (railroads, storage areas, roads, and parking lots), and 11,681 acres of unimproved land (woodlands and agricultural land). The installation contains 123 miles of roadways and 33 miles of Union Pacific Railroad. KSAAP has over 2.5 million square feet of buildings and storage areas. Currently, KSAAP is comprised of 21 separate facilities where munitions are or were loaded, assembled, packed, and/or stored (Refs. 1, 2, 6). Agricultural land comprises approximately 92 percent of the unimproved land and approximately 78 percent of the total installation area. Areas out leased at the time of the RFI were using for crops, grazing, hay, and hayseed. The area surrounding the production plant is primarily privately owned agricultural or residential land. Farm crops currently grown in surrounding areas include milo, soybeans, sunflowers, winter wheat, oats, and fescue (grass and hay for livestock) (Refs. 1, 2, 7, 10).

The US Army conducted a number of investigations between 1978 and 1989 at KSAAP. A RCRA Facility Assessment (RFA) was prepared for USEPA Region 7 by A.T. Kearney. In 1989, a RCRA Part B permit was issued. This permit requires corrective action for selected Solid Waste Management Unit (SWMU) Groups in accordance with Section 3004(u) of RCRA. In 1994, Radian conducted a Phase I RCRA Facility Investigation (RFI). At EPA's request, a background metals study was completed in June 1994 for comparison against Phase I RFI data. Phase II RFI investigations were completed in September 1996, and final investigation reports were submitted in May 1998 (Refs. 1, 2).

During these previous investigations, a number of areas were identified as having possible contamination resulting from past activities at KSAAP. The 1989 RCRA Part B permit identified 25 SWMU Groups requiring investigation of surface water, groundwater, and surface and subsurface soils. Table 1 identifies these SWMU Groups and detailed descriptions are provided in the CA725 Documentation of EI Determination prepared and signed by EPA on September 30, 2003. Attachments 1 and 2 illustrate the location of these SWMUs and many of the groundwater monitoring wells installed during ongoing site investigations. Additional wells installed in 2004 are not identified on Figures 1 and 2, but are presented on figures included in the Final Site-Wide Semiannual Groundwater Monitoring Report dated October 4, 2004 (Refs. 1, 2, 7, 10).

Table 1. SWMU Groups at KSAAP

Group Number	Name
1	Building 112 Sump, Ditch, and Oxidation Pond
2	Oil and Water Separator (OWS) at 200 Area
3	Oil Land Farm at 200 Area
4	Building 314 Waste Oil-Toluene Storage Tank
5	300 Area Sumps, Ditches, Pink-Water Ditches, and Oxidation Ponds
6	500 Area Sumps and Ditches
7	800 Area Sumps, Ditches, and Oxidation Pond
8	900 Area Sumps, Ditches, Pink-Water Ditches, and Oxidation Ponds
9	1000 Area Sumps, Ditches, Pink-Water Ditches, and Oxidation Ponds
10	1100 Area Sumps, Ditches, and Oxidation Pond
11	Open Burning Pads Numbered 1, 2, 3, and 4
12	Classification Area at 100 Area by Gate 3
13	Closed Landfill Near the Quarry
14	Closed Landfill and Refuse Burn Pits Near 200 Area
15	Current Landfill, Including Asbestos and Grenade Disposal Areas
16	Closed Landfill Near the Open Detonation Area
17	Open Detonation Field
18	Sewage Treatment Plant Wastewater Sludge Drying Beds
19	Coal Pile Run-Off Catchment Device and Associated Ditches
20	Explosive Waste Incinerator (EWI)
21	Container Storage Units
22	Contaminated Waste Processor (CWP)
23	Burning Cages No. 14, 17, and 22
24	Open Burning Pads No. 5 and 6
25	700 Area Washwater Sumps and Discharge Points
	Pistol Range
	Sludge Lagoons
	Water Towers

According to the EPA-approved Final Site-Wide Semiannual Groundwater Monitoring Report dated October 4, 2004, a semiannual monitoring program was instituted at KSAAP in 2001. This monitoring program addresses eleven locations: the Landfills and Open Detonation Site (LF/OD) (SWMU Groups 13, 14, 15, 16, and 17); the 300, 500, and 800 Areas (SWMU Groups 5, 6, and 7); and the 900, 1,000, and Open Burn Pad (OBP) Areas (SWMU Groups 8, 9, and 11). In addition, monitored natural attenuation (MNA) was selected as the remedy to address contaminated groundwater at the 700 Area (SWMU Group 25). Site-wide groundwater monitoring is limited to these units because, according to the Phase II RFI Report and the 2001 Corrective Measures Study groundwater contamination has not been identified at any of the other SWMU Groups. As a result, only the SWMU groups referenced above will be considered further in this EI determination (Refs. 8, 10, 13).

References:

1. Final Report, Phase II RCRA Facility Investigation, Kansas Army Ammunition Plant. Radian International. May 1998.

2. Final Phase II RCRA Facility Investigation Report, Kansas Army Ammunition Plant. LAW Engineering and Environmental Services, Inc. June 1998.
3. Final Corrective Measures Study for the Kansas Army Ammunition Plant. US Army Corps of Engineers. February 2001.
4. Risk-Based Standards for Kansas. Kansas Department of Health and Environment. March 1, 2003.
5. 1100 Area Supplemental Groundwater Investigation, Final Report. U.S. Army Corps of Engineers. April 2003.
6. National Primary Drinking Water Standards, Maximum Contaminant Levels. US Environmental Protection Agency. June 2003.
7. Documentation of EI Determination, RCRA Corrective Action EI RCRA Info Code (CA725), Current Human Exposures Under Control. U.S. Environmental Protection Agency. September 30, 2003.
8. Final Groundwater Monitoring System Operations and Maintenance (O&M) Inspection Report. Kansas Department of Health and Environment. December 30, 2004.
9. Final 2003 Annual Groundwater Monitoring Report, Landfills and Open Detonation Site – Kansas Army Ammunition Plant. Department of the Army. September 22, 2004.
10. Final Site-Wide Semiannual Groundwater Monitoring Report, March 2004 – Kansas Army Ammunition Plant. Department of the Army. October 4, 2004.
11. FY2005 Kansas Army Ammunition Plant Installation Action Plan. Department of the Army. October 7, 2004.
12. Final SWMU 11 Groundwater Corrective Measures Study Report – Kansas Army Ammunition Plant. Department of the Army. November 23, 2004.
13. 800 Area Supplemental Groundwater Investigation, Kansas Army Ammunition Plant. U.S. Army Corps of Engineers. February 2005.

2. Is **groundwater** known or reasonably suspected to be **"contaminated"**[1] above appropriately protective "levels" (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria [e.g., Maximum Contaminant Levels (MCLs), the maximum permissible level of a contaminant in water delivered to any user of a public water system under the Safe Drinking Water Act]) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

__X__ If yes - continue after identifying key contaminants, citing appropriate "levels," and referencing supporting documentation.

_____ If no - skip to #8 and enter "YE" status code, after citing appropriate "levels," and referencing supporting documentation to demonstrate that groundwater is not "contaminated."

_____ If unknown - skip to #8 and enter "IN" status code.

Rationale:

KSAAP lies in the southeastern part of the Osage Cuesta Physiographic Division of the Central Lowland Province. The region is a plain of low relief, interrupted intermittently by east-facing escarpments of limestone beds with relatively weaker beds of shale. Surficial geology generally consists of terrace and floodplain alluvial deposits in the lowlands, and residual soils weathered from bedrock in the uplands. Regional dip of the geologic strata is to the west-northwest at approximately 20 feet per mile (ft/mi) (Refs. 1, 2, 10).

KSAAP is situated on Pleistocene terrace clays and recent floodplain clays, sands, and gravels. The alluvial clays, sands, and gravels occur along major streams such as Labette Creek and the Neosho River. Between major streams, the upland soils consist of residual silts and clay derived from the weathered underlying shales and limestones. These clay soils may contain lenses of sand and gravel resulting from more resistant bedrock units. Pleistocene-age loess is also present on the uplands (Refs. 1, 2, 10).

Table 2 provides a summary of the site-wide maximum contaminant concentrations detected during the March 2004 sampling round (the most recent KSAAP groundwater sampling round for which data are available). Only concentrations that exceed either EPA's Safe Drinking Water Act Maximum Contaminant Levels (MCLs) or the Kansas Department of Health and Environment (KDHE) Risk-Based Standards for Kansas (RSKs) are presented. A unit by unit discussion of contaminated groundwater is provided below (Refs. 4, 6).

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[1] "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriate "levels" (appropriate for the protection of the groundwater resource and its beneficial uses).

Table 2. Maximum Contaminant Concentrations Exceeding Screening Criteria in KSAAP Groundwater September 2003 and March 2004

Contaminant	MCL / RSK (µg/L)	Max. Conc. (µg/L)	SWMU Group
Trichloroethene (TCE)	5/5	78.9	7
Tetrachloroethene (PCE)	5/5	219.54	7
RDX	8/30	103.7	10
Bis(2ethylhexyl)phthalate	6/6	194	10
1,1,2-trichlorotrifluoroethane	N/A	3,724 J	9
Contaminant	**MCL / RSK (mg/L)**	**Max. Conc. (mg/L)**	**SWMU Group**
Beryllium (total)	0.004	0.006 J	6

MCLs obtained from EPA's Safe Drinking Water Act Regulations and Health Advisories.
KDHE's RSKs were used as the screening criteria for compounds with no established MCL.
N/A – Screening criteria not available
J - Estimated concentration
Data are from the References 5, 10, 13.

LF/OD SWMU Groups

During the March 2004 sampling event, groundwater samples from 25 monitoring wells (located among SWMU Groups 13 through 17) were sampled and analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), explosives, and metals.

SWMU Group 13 – During the March 2004 sampling event, the inferred direction of groundwater flow at SWMU Group 13 was south-southwest, and depth to groundwater ranged from 2.2 to 3.7 ft. The hydraulic gradient was approximately 0.0112 (59 ft/mi). The flow pattern and gradient were very similar to those observed in September 2001. No VOCs, SVOCs, or explosives were detected during the March 2004 sampling event at concentrations greater than their respective MCL and/or RSK values. In addition, no metals were detected above both background and their respective MCL and/or RSK values (Ref. 10).

SWMU Group 14 – During the March 2004 sampling event, the inferred direction of groundwater flow at SWMU Group 14 was south, and depth to groundwater ranged from 0.8 to 6.7 ft. The hydraulic gradient was approximately 0.0058 (30 ft/mi). TCE was detected in monitoring well BH-3, in both the field sample (5.85 micrograms per liter [µg/L]) and the duplicate (6.61 µg/L). These concentrations are slightly above the MCL (5 µg/L) and RSK value (5 µg/L) for TCE. No other VOCs, SVOCs, or explosives exceedances were reported for this SWMU Group during the March 2004 sampling event. In addition, no metals were detected above both background and their respective MCL and/or RSK values (Ref. 10).

SWMU Group 15 – During the March 2004 sampling event, the inferred direction of groundwater flow at SWMU Group 15 was south, with minor divergence to the south-southeast in the eastern part of the site. Depth to groundwater ranged mostly from 2.51 to 6.89 ft. The hydraulic gradient was approximately 0.0107 (56 ft/mi) in the western part of the site and 0.0152 (80 ft/mi) in the eastern part. The flow pattern and gradient were very similar to those observed in September 2001. No VOCs, SVOCs, or explosives were detected during the March 2004 sampling event at

concentrations greater than their respective MCL and/or RSK values. In addition, no metals were detected above both background and applicable MCL and/or RSK values (Ref. 10).

SWMU Group 16 – During the March 2004 sampling event, the inferred direction of groundwater flow at SWMU Group 16 was west-northwest, and the depth to groundwater ranged mostly from 0.57 to 2.15 ft. The hydraulic gradient was approximately 0.0406 (214 ft/mi). The flow pattern and gradient were very similar to those observed in September 2001 (Ref. 1). TCE was detected in monitoring well MW13-7, in both the field sample (9.52 µg/L) and the duplicate (9.17 µg/L). These concentrations are greater than the MCL and RSK value for TCE (5 µg/L). PCE was also detected in monitoring well MW13-7, in both the field sample (12.2 µg/L) and the duplicate (11.14 µg/L). These concentrations are also greater than the MCL and RSK value for PCE (both set at 5 µg/L). No other VOCs, SVOCs, or explosives exceeded their respective MCL and/or RSK values during the March 2004 sampling round. Furthermore, no metals were detected above both background and applicable MCL and/or RSK values (Ref. 10).

SWMU Group 17 – During the March 2004 sampling event, the inferred direction of groundwater flow at SWMU Group 17 was to the east-southeast. Depth to groundwater in the northeast and east parts of the site ranged from 1.34 to 2.86 ft. Depth to groundwater in the west and south portions of the site ranged from 6.37 to 10.39 ft. The hydraulic gradient was approximately 0.0214 (113 ft/mi). The flow pattern and gradient were very similar to those observed in September 2001. No VOCs, SVOCs, or explosives were detected during the March 2004 sampling event at concentrations greater than their respective MCL and/or RSK values. In addition, no metals were reported above both background and applicable MCL and/or RSK values (Ref. 10).

SWMU Group 5 – 300 Area

During the March 2004 sampling event, four groundwater monitoring wells were sampled at SWMU Group 5 (MW1-7, MW2-5, MW3-5, and MW4-1). The inferred direction of groundwater flow at SWMU Group 5 was eastward, with some northeast and southeast divergence in the east part of the site. Depth to groundwater ranged from 1.1 to 5.8 ft. The hydraulic gradients were approximately 0.0158 (83 ft/mi) in the north part of the site, 0.0053 (28 ft/mi) in the central and east portions, and 0.0123 (65 ft/mi) in the southeast area. Samples from these wells were analyzed for VOCs, explosives, and dissolved and total metals. No VOCs or explosives were detected during the March 2004 sampling event. In addition, no metals were detected above both background and their respective MCL and/or RSK values (Ref. 10).

SWMU Group 6 – 500 Area

During the March 2004 sampling event, four groundwater monitoring wells were sampled at SWMU Group 6 (MW3-7, MW5-5, MW6-5, and MW7-5). The inferred direction of groundwater flow at SWMU Group 6 was generally southeastward. In the central part of the site, the groundwater flow was inferred to diverge northeast from monitoring well MW7-5 and south from well MW6-5. Depth to groundwater ranged from 2.4 to 6.3 ft. The average hydraulic gradient was approximately 0.0136 (72 ft/mi). Samples from these wells were analyzed for VOCs, explosives, and dissolved and total metals during the March 2004 sampling event. No VOCs, explosives, or dissolved metals were detected above their respective MCL and/or RSK values. Total beryllium was detected only in monitoring well MW3-7 at an estimated concentration of 0.006 milligrams per liter (mg/L), which exceeds both the site-specific background concentration (0.002 mg/L) and the MCL and RSK values (both set at 0.004 mg/L) (Ref. 10).

SWMU Group 7 – 800 Area

During the March 2004 sampling event, four groundwater monitoring wells were sampled at SWMU Group 7 (MW8-5, MW9-5, MW10-5, and MW11-5). The groundwater flow was generally south-southeast across most of the site, and northeast in the north part of the site. Groundwater flow was inferred to diverge to the northeast in the area of Buildings 804 and 812, and to the south-southeast in the areas of Buildings 816 and 809. Depth to groundwater ranged from 2.0 to 11.7 ft. The average hydraulic gradient was approximately 0.0085 (45 ft. mi). Samples from these wells were analyzed for VOCs, explosives, and dissolved and total metals (Ref. 13).

PCE was detected in monitoring well MW10-5 at 219.54 µg/L in the field sample and 205.36 µg/L in the duplicate. These concentrations are greater than the MCL and RSK values for PCE (both set at 5 µg/L). TCE was also reported in monitoring well MW10-5 at 78.9 µg/L in the field sample and 77.14 µg/L in the duplicate. These concentrations are greater than the MCL and RSK values for TCE (also both set at 5 µg/L). Several other VOCs and explosives were detected at this SWMU Group, but only at concentrations less than applicable screening criteria. No metals were detected above both background and applicable MCL and/or RSK values (Ref. 13).

SWMU Group 8 – 900 Area

During the March 2004 sampling event, six groundwater monitoring wells were sampled at SWMU Group 8 (MW12-5, MW13-5, MW15-3, MW15-5, MW21-3, and MW22-3). Groundwater flow at the 900 Area was generally northward, with minor divergence to the northwest in the area of monitoring well MW21-3. Depth to groundwater ranged from 2.4 to 6.0 ft in March 2004. The average hydraulic gradient was approximately 0.0065 (34 ft/mi). Samples from these wells were analyzed for VOCs, explosives, and dissolved and total metals. No VOC or explosive exceedances were reported, and no metals concentrations exceeded both background and applicable MCL and/or RSK values (Ref. 10).

SWMU Group 9 – 1,000 Area

During the March 2004 sampling event, eight groundwater monitoring wells were sampled at SWMU Group 9 (MW2-3, MW3-3, MW4-3, MW4-7S, MW5-7D, MW16-5, MW17-5, and MW18-5). Groundwater flow at the 1,000 Area was generally southward. Depth to groundwater in the shallow monitoring wells ranged from 2.0 to 6.2 ft. The average hydraulic gradient was approximately 0.0175 (92 ft/mi). Samples from these wells were analyzed for VOCs, explosives, and dissolved and total metals (Ref. 1). The only VOC detected in the 1,000 Area was 1,1,2-trichlorotrifluoroethane (3,724 J µg/L) in well MW3-3. This well is located approximately midway between Buildings 1017 and 1009. There is no MCL, RSK, or EPA Region 9 Preliminary Remediation Goal (PRG) for 1,1,2-trichlorotrifluoroethane. However, the concentration reported in April 2003 (2,930 µg/L) is similar to the concentration detected during the March 2004 sampling event, which suggests that the concentration is stable. Several other VOCs and explosives were detected, but only at concentrations less than their respective MCL and/or RSK values. No metals contaminant concentrations were detected above both background and applicable MCL and/or RSK values (Ref. 10).

SWMU Group 10 – 1,100 Area

Groundwater flow at the 1,100 Area is generally south-southwest across the site with a hydraulic gradient from 0.018 to 0.021. In October 2003, the depth to shallow groundwater at the 1,100 Area ranged from 4 to 15 ft below the ground surface. Samples were collected from 14 shallow monitoring wells at the 1,100 Area in 2002 as part of a site-specific supplemental groundwater investigation. No VOCs were detected in shallow groundwater above their respective MCL or RSK values. Similarly, no metals were reported

above both background and applicable MCL and/or RSK values. RDX was the only explosive contaminant that exceeded screening criteria. The maximum detected concentration of RDX was reported at 103.7 µg/L in monitoring well MW10-3. This concentration exceeds the RSK of 8 µg/L. In addition, bis(2ethylhexyl)phthalate was also detected in 13 of the 14 wells at concentrations ranging from 3.04 µg/L in well MW10-3 to 194 µg/L in well MW2-9. With the exception of the two downgradient wells (MW3-9 and MW4-9), concentrations exceeded the MCL and RSK of 6 µg/L. Two relatively deep monitoring wells at SWMU Group 10 have shown no historical contamination (Refs. 3, 5).

SWMU Group 11 – Open Burn Pads (OBPs) Area

During the March 2004 sampling event, five groundwater monitoring wells were sampled at SWMU Group 11 (MW11-3, MW12-3, MW13-3, MW19-6, and MW24-3). Groundwater flow at the OBPs Area was generally northeast, with some divergence to the southeast in the area east of Pad 3. Depth to groundwater wells ranged from 2.6 to 11.3 ft. The average hydraulic gradient at the OBPs Area was approximately 0.0082 (44 ft/mi). Samples from these wells were analyzed for explosives and dissolved and total metals. Explosive compounds detected during April 2003 were not detected during the March 2004 sampling event. No metals contaminant concentrations were detected above both background and applicable MCL and/or RSK values (Ref. 10, 12).

SWMU Group 23 – Burning Cages No. 14, 17, and 22

During the Phase II RFI investigation completed in June 1998, groundwater samples were collected from four wells associated with SWMU Group 23 (MW18-6, MW12-1, MW20-6, and MW22-6). Groundwater was measured between 1.8 and 9.2 feet below the ground surface and flows in an easterly direction. Analytical results from this area indicated that antimony was present in well MW20-6 at 6 µg/L, which is equal to the MCL and RSK of 6 µg/L. Bis(2ethylhexyl)phthalate was also detected in MW22-6 (117 µg/L) and in well MW22-6 (6.42 µg/L) at concentrations that exceeded the MCL and RSK of 6 µg/L. No other VOCs, SVOCs or explosives were detected at concentrations above their respective MCL or RSK values. In addition, no metals contaminant concentrations were detected above both background and applicable MCL and/or RSK values (Refs. 1, 2, 3).

SWMU Group 25 – 700 Area

During a separate March 2004 Operations and Maintenance sampling event, eight groundwater monitoring wells were sampled at SWMU Group 25 (MW6-1, MW7-1, MW5-4, MW6-4, MW7-4, MW2-2, MW1-2, and MW5-2). The groundwater flow in this area was generally toward the south-southwest. According to the Final Groundwater Monitoring System Operation and Maintenance (O&M) Inspection Report for the 700 Area dated December 2004, TCE, tetrachloroethene, 1,1,2-trichloroethane, 1,2-dichloroethane, and 1,2,3-trichloropropane are contaminants of concern at this unit and concentrations in groundwater exceeding their respective MCLs (Refs. 8, 11).

<u>References:</u>

1. Final Report, Phase II RCRA Facility Investigation, Kansas Army Ammunition Plant. Radian International. May 1998.
2. Final Phase II RCRA Facility Investigation Report, Kansas Army Ammunition Plant. LAW Engineering and Environmental Services, Inc. June 1998.
3. Final Corrective Measures Study for the Kansas Army Ammunition Plant. US Army Corps of Engineers. February 2001.
4. Risk-Based Standards for Kansas. Kansas Department of Health and Environment. March 1, 2003.

5. 1100 Area Supplemental Groundwater Investigation, Final Report. U.S. Army Corps of Engineers. April 2003.
6. National Primary Drinking Water Standards, Maximum Contaminant Levels. US Environmental Protection Agency. June 2003.
7. Documentation of EI Determination, RCRA Corrective Action EI RCRA Info Code (CA725), Current Human Exposures Under Control. U.S. Environmental Protection Agency. September 30, 2003.
8. Final Groundwater Monitoring System Operations and Maintenance (O&M) Inspection Report. Kansas Department of Health and Environment. December 30, 2004.
9. Final 2003 Annual Groundwater Monitoring Report, Landfills and Open Detonation Site – Kansas Army Ammunition Plant. Department of the Army. September 22, 2004.
10. Final Site-Wide Semiannual Groundwater Monitoring Report, March 2004 – Kansas Army Ammunition Plant. Department of the Army. October 4, 2004.
11. FY2005 Kansas Army Ammunition Plant Installation Action Plan. Department of the Army. October 7, 2004.
12. Final SWMU 11 Groundwater Corrective Measures Study Report – Kansas Army Ammunition Plant. Department of the Army. November 23, 2004.
13. 800 Area Supplemental Groundwater Investigation, Kansas Army Ammunition Plant. U.S. Army Corps of Engineers. February 2005.

3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"[2] as defined by the monitoring locations designated at the time of this determination)?

__X__ If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"[2]).

_____ If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"[2]) - skip to #8 and enter "NO" status code, after providing an explanation.

_____ If unknown - skip to #8 and enter "IN" status code.

Rationale:

Groundwater contaminant concentrations at SWMU Groups 6, 7, 10, 14, 16, 23, and 25 exceeded their respective screening criteria. An evaluation of the stability of contaminated groundwater for these SWMU Groups has been completed for purposes of this EI Determination. This evaluation indicated that migration of contaminated groundwater at the KSAAP facility is stable. Specific discussion supporting this conclusion is provided below with regard to each of the SWMU Groups exhibiting groundwater contaminant exceedances.

In general however, contaminated groundwater has not migrated beyond KSAAP property boundaries, and an extensive well network has been installed to monitor groundwater migration at the many SWMU Groups located throughout the property. Attachments 1 and 2 identify many of the groundwater monitoring wells installed at the KSAAP property. Wells installed in 2004 are identified on figures included in the Final Site-Wide Semiannual Groundwater Monitoring Report dated October 4, 2004 (Refs. 1, 2, 10)

SWMU Group 6 – 500 Area

Total beryllium was detected during the March 2004 sampling event only in monitoring well MW3-7 (0.006 J mg/L). This concentration slightly exceeded background (0.002 mg/L) and MCL and RSK values (both set at 0.004 mg/L). However, downgradient wells associated with the 700 Production Area did not contain concentrations of total beryllium above background. In addition, dissolved beryllium was not detected in the analysis of groundwater samples from SWMU Group 6. Thus, total beryllium concentrations in groundwater do not appear to be migrating from the 500 Area (Refs. 1, 2, 10).

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[2] "existing area of contaminated groundwater" is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of "contamination" that can and will be sampled/tested in the future to physically verify that all "contaminated" groundwater remains within this area, and that the further migration of "contaminated" groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

SWMU Group 7 – 800 Area

Significant concentrations of TCE and PCE were detected in monitoring well MW10-5 at SWMU Group 7. TCE and PCE were also detected in well MW10-5 during the 2001 Data Gap Study at concentrations of 15.8 and 7.3 µg/L, respectively. This data show significant increases in VOC contamination in well MW10-5 between 2001 and March 2004. However, in September 2004, no VOCs or explosives were detected in groundwater samples collected from three newly-installed downgradient wells (MW1-11, MW2-11, and MW3-11). Therefore, although significant VOC contamination is present in groundwater at SWMU Group 7, the downgradient extent of contamination has been defined by the three downgradient wells and migration of contaminated groundwater appears to have stabilized to the area adjacent to and downgradient of well MW10-5 (Ref. 10, 13).

SWMU Group 10 – 1,100 Area

RDX was detected at concentrations exceeding the RSK in monitoring well MW10-3 at the 1,100 Area. However, explosives concentrations at the 1,100 Area appear to have been stable since the 1998 Phase II RFI and have generally shown a decreasing trend since 2003. This downward concentration trend is expected to continue, and possibly increase, due to the removal of explosives-contaminated soil in 2003. In addition, because RDX and bis(2ethylhexyl)phthalate were not detected in downgradient monitoring wells (MW3-9 and MW4-9) it appears that the extent of contaminated groundwater in this area is both stable and defined for purposes of this EI Determination (Refs. 5, 10).

LF/OD SWMU Groups

SWMU Group 14 – TCE was detected in SWMU Group 14 monitoring well BH-3 at concentrations exceeding the established MCL of 5 µg/L. However, according to the Final Site-Wide Semiannual Groundwater Monitoring Report, the concentration of TCE detected in this well decreased moderately from September 2003 to March 2004. Furthermore, wells located downgradient of SWMU Group 14 – associated with SWMU Group 15 – contained no detectable concentrations of TCE (Refs. 1, 2, 10).

SWMU Group 16 –TCE and PCE were detected in SWMU Group 16 monitoring well MW13-7 at concentrations exceeding their respective MCL and RSK values. However, according to the Final Site-Wide Semiannual Groundwater Monitoring Report, the recent (March 2004) concentrations of TCE and PCE reported in this well were similar to those reported for the September 2003 sampling event, and there was little apparent change in the occurrence of these contaminants. In addition, downgradient wells (MW18-3 and MW13-6) contained no detectable concentrations of TCE or PCE. It should be noted that vinyl chloride (2.2 µg/L) was detected above applicable screening criteria in well MW13-7 during the March 2003 sampling event, but not during the March 2004 sampling round. The occasional presence of vinyl chloride in this well suggests that TCE in SWMU Group 16 groundwater is being effectively degraded via natural environmental processes (Refs. 1, 2, 10).

SWMU Group 23 – Burning Cages No. 14, 17, and 22

Bis(2-ethylhexyl)phthalate was detected in SWMU Group 23 at concentrations that exceeded the MCL and RSK. However, downgradient wells associated with the 2,700 Area and SWMU Group 24 contained no detectable concentrations of bis(2-ethylhexyl)phthalate, which suggests that groundwater contamination associated with SWMU Group 23 is both defined and stable (1, 2, 10).

SWMU Group 25 – 700 Area

PCE, TCE, 1,1,2-trichloroethane, 1,2-dichloroethane, and 1,2,3-trichloropropane were detected in the 700 Area at concentrations exceeding their respective MCLs. To address contaminated groundwater, KSAAP initiated a MNA remedial approach at the 700 Area in September 2003. According to the 700 Area Final Groundwater Monitoring System Operation and Maintenance (O&M) Inspection Report, at the time of the O&M inspection in December 2004, no contaminant plume growth was identified and downgradient wells associated with the 900 and 1000 Areas contained no exceedances of MCLs for the contaminants identified in 700 Area wells. Thus, contaminated groundwater at the 700 Area appears to be stable (Refs. 1, 2, 8, 10).

References:

1. Final Report, Phase II RCRA Facility Investigation, Kansas Army Ammunition Plant. Radian International. May 1998.
2. Final Phase II RCRA Facility Investigation Report, Kansas Army Ammunition Plant. LAW Engineering and Environmental Services, Inc. June 1998.
3. Final Corrective Measures Study for the Kansas Army Ammunition Plant. US Army Corps of Engineers. February 2001.
4. Risk-Based Standards for Kansas. Kansas Department of Health and Environment. March 1, 2003.
5. 1100 Area Supplemental Groundwater Investigation, Final Report. U.S. Army Corps of Engineers. April 2003.
6. National Primary Drinking Water Standards, Maximum Contaminant Levels. US Environmental Protection Agency. June 2003.
7. Documentation of EI Determination, RCRA Corrective Action EI RCRA Info Code (CA725), Current Human Exposures Under Control. U.S. Environmental Protection Agency. September 30, 2003.
8. Final Groundwater Monitoring System Operations and Maintenance (O&M) Inspection Report. Kansas Department of Health and Environment. December 30, 2004.
9. Final 2003 Annual Groundwater Monitoring Report, Landfills and Open Detonation Site – Kansas Army Ammunition Plant. Department of the Army. September 22, 2004.
10. Final Site-Wide Semiannual Groundwater Monitoring Report, March 2004 – Kansas Army Ammunition Plant. Department of the Army. October 4, 2004.
11. FY2005 Kansas Army Ammunition Plant Installation Action Plan. Department of the Army. October 7, 2004.
12. Final SWMU 11 Groundwater Corrective Measures Study Report – Kansas Army Ammunition Plant. Department of the Army. November 23, 2004.
13. 800 Area Supplemental Groundwater Investigation, Kansas Army Ammunition Plant. U.S. Army Corps of Engineers. February 2005.

4. Does "contaminated" groundwater **discharge** into **surface water** bodies?

_____ If yes - continue after identifying potentially affected surface water bodies.

__X__ If no - skip to #7 (and enter a "YE" status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination" does not enter surface water bodies.

_____ If unknown - skip to #8 and enter "IN" status code.

Rationale:

According to the Final Phase II RFI Report, a base wide groundwater elevation map was developed from water levels measured in October 1996. This map shows a somewhat north/south trending groundwater divide running though the facility and roughly mimicking the surface water divide. This coincides with the findings of the Phase I RFI Report. Based on this information, the Phase II RFI Report concludes that:

- Groundwater flow in the western portion of KSAAP flows west/southwest toward Labette Creek
- Groundwater flow in the eastern portion of KSAAP flows toward the Neosho River and its tributaries in the vicinity
- Groundwater flow in the southeastern portion of KSAAP flows southeast toward the tributaries of Labette Creek.

Groundwater does appear to discharge into several of these surface water bodies in the vicinity of KSAAP (Refs. 1, 2, 3). However, as discussed in the response to Question 3, all known areas of significant groundwater contamination have been defined, with wells between key impact areas and surface water receptors showing no contaminant exceedances and, often, non-detected analytical results. Therefore, contaminated groundwater from KSAAP does not appear to be discharging to surface water (Refs. 1, 2, 3, 5, 8, 10).

References:

1. Final Report, Phase II RCRA Facility Investigation, Kansas Army Ammunition Plant. Radian International. May 1998.
2. Final Phase II RCRA Facility Investigation Report, Kansas Army Ammunition Plant. LAW Engineering and Environmental Services, Inc. June 1998.
3. Final Corrective Measures Study for the Kansas Army Ammunition Plant. US Army Corps of Engineers. February 2001.
4. Risk-Based Standards for Kansas. Kansas Department of Health and Environment. March 1, 2003.
5. 1100 Area Supplemental Groundwater Investigation, Final Report. U.S. Army Corps of Engineers. April 2003.
6. National Primary Drinking Water Standards, Maximum Contaminant Levels. US Environmental Protection Agency. June 2003.
7. Documentation of EI Determination, RCRA Corrective Action EI RCRA Info Code (CA725), Current Human Exposures Under Control. U.S. Environmental Protection Agency. September 30, 2003.
8. Final Groundwater Monitoring System Operations and Maintenance (O&M) Inspection Report. Kansas Department of Health and Environment. December 30, 2004.

9. Final 2003 Annual Groundwater Monitoring Report, Landfills and Open Detonation Site – Kansas Army Ammunition Plant. Department of the Army. September 22, 2004.
10. Final Site-Wide Semiannual Groundwater Monitoring Report, March 2004 – Kansas Army Ammunition Plant. Department of the Army. October 4, 2004.
11. FY2005 Kansas Army Ammunition Plant Installation Action Plan. Department of the Army. October 7, 2004.
12. Final SWMU 11 Groundwater Corrective Measures Study Report – Kansas Army Ammunition Plant. Department of the Army. November 23, 2004.
13. 800 Area Supplemental Groundwater Investigation, Kansas Army Ammunition Plant. U.S. Army Corps of Engineers. February 2005.

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be **"insignificant"** (i.e., the maximum concentration[3] of each contaminant discharging into surface water is less than 10 times their appropriate groundwater "level," and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

_____ If yes - skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration[3] of key contaminants discharged above their groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgment/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.

_____ If no - (the discharge of "contaminated" groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration[3] of each contaminant discharged above its groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations[3] greater than 100 times their appropriate groundwater "levels," the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.

_____ If unknown - enter "IN" status code in #8.

Rationale:

Not applicable. See the response to Question 4.

[3] As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

6. Can the **discharge** of "contaminated" groundwater into surface water be shown to be "**currently acceptable**" (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented[4])?

_____ If yes - continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site's surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR 2) providing or referencing an interim-assessment[5], appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment "levels," as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

_____ If no - (the discharge of "contaminated" groundwater can not be shown to be "**currently acceptable**") - skip to #8 and enter "NO" status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems.

_____ If unknown - skip to 8 and enter "IN" status code.

Rationale:

Not applicable. See the response to Question 4.

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[4] Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

[5] The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the "existing area of contaminated groundwater?"

   X If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the "existing area of groundwater contamination."

   _____ If no - enter "NO" status code in #8.

   _____ If unknown - enter "IN" status code in #8.

Rationale:

The FY2005 KSAAP Installation Action Plan (IAP) outlines the complete multi-year restoration program for KSAAP. The IAP indicates that future groundwater monitoring is planned, and in some cases required, for the various areas of contaminated groundwater identified at KSAAP as part of the Army's plans to conduct long-term operations/long-term monitoring at KSAAP. In addition, a semiannual groundwater monitoring program was initiated for SWMU Groups 5, 6, 7, 13, 14, and 15 in 2001. Annual monitoring was designated for SWMU Groups 8, 9, 11, 16, and 17. This semiannual and annual monitoring program was developed in response to a request made by US EPA Region 7. The most recent results from this monitoring program were submitted in the Final Semiannual Groundwater Monitoring Report dated October 2004. It should also be noted that a required component of the remedy selected for SWMU Group 25, MNA, is regular groundwater monitoring and analysis (Ref. 10).

References:

1. Final Report, Phase II RCRA Facility Investigation, Kansas Army Ammunition Plant. Radian International. May 1998.
2. Final Phase II RCRA Facility Investigation Report, Kansas Army Ammunition Plant. LAW Engineering and Environmental Services, Inc. June 1998.
3. Final Corrective Measures Study for the Kansas Army Ammunition Plant. US Army Corps of Engineers. February 2001.
4. Risk-Based Standards for Kansas. Kansas Department of Health and Environment. March 1, 2003.
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9. Final 2003 Annual Groundwater Monitoring Report, Landfills and Open Detonation Site – Kansas Army Ammunition Plant. Department of the Army. September 22, 2004.

10. Final Site-Wide Semiannual Groundwater Monitoring Report, March 2004 – Kansas Army Ammunition Plant. Department of the Army. October 4, 2004.
11. FY2005 Kansas Army Ammunition Plant Installation Action Plan. Department of the Army. October 7, 2004.
12. Final SWMU 11 Groundwater Corrective Measures Study Report – Kansas Army Ammunition Plant. Department of the Army. November 23, 2004.
13. 800 Area Supplemental Groundwater Investigation, Kansas Army Ammunition Plant. U.S. Army Corps of Engineers. February 2005.

8. Check the appropriate RCRA Info status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

__**X**__ YE - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the **Kansas Army Ammunition Plant** facility, EPA ID #**KS0213820467**, located in **Parsons, Kansas**. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater." This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

_____ NO - Unacceptable migration of contaminated groundwater is observed or expected.

_____ IN - More information is needed to make a determination.

Completed by //signature on original// Date _6/10/2005__
Ken Herstowski
EPA Project Manager

Supervisor //signature on original// Date _6/10/2005__
Donald Toensing
EPA Branch Manager

Locations where References may be found:

EPA Region 7 RCRA Records Center
901 N. 5th Street
Kansas City, KS 66101

Contact telephone and e-mail numbers

Ken Herstowski
(913) 551-7631
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Attachment 1

Figure 1:
SWMU Group and Groundwater Monitoring Well Location Map

Resource: Final Report, Phase II RCRA Facility Investigation, Kansas Army Ammunition Plant. Radian International. May 1998.

Attachment 2

Figure 2:
Additional SWMU Groups and Groundwater Monitoring Well Location Map

Resource: Final Report, Phase II RCRA Facility Investigation, Kansas Army Ammunition Plant. Radian International. May 1998.