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Installation Restoration Program
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Subject: Final Technical Memorandum
July 2009 Soil Sampling Event
Pesticide Storage Facility (PSF)
Fort Riley, Kansas

This Technical Memorandum summarizes the July 2009 soil sampling event performed by CTI & Associates, Inc. (CTI) at the Pesticide Storage Facility (PSF), Fort Riley, Kansas. The on-site field activities were performed on July 7th and 8th, 2009, in accordance with the Performance Work Statement, Environmental Monitoring Services (CTI and Associates, Inc., Revised February 19, 2009). The field sampling personnel were Phil Riley and David Amir.

Project Summary

Prior to the sampling event, the soil boring locations were located and staked in accordance with the "Subsurface Soil Locations Sampled during the RI and Removal Action" figure provided by Fort Riley. The surface (RA-65) and the subsurface (SB-2, RA-16, RA-23, RA-29, RA-34, RA-41, RA-46 and RA-47) soil samples were collected utilizing a track mounted, direct-push rig (Geoprobe). Three (3) discrete subsurface soil samples were collected per boring location from the 6 to 18 inch interval, 2 to 2.5 foot interval and the 4 to 4.5 foot interval using a PVC lined sample barrel. Soils description and analytical sample information were recorded on field boring logs. Field documentation including the soil boring logs and the Daily Quality Control Reports (DQCR) are presented in Attachment A. Soil cuttings were returned to the open borehole prior to abandonment with bentonite. The soil sampling locations are identified on Figures 1 and 2.

Soil samples were collected from 9 locations and submitted to the laboratories for chemical analysis. Laboratory analytical testing for the soil samples collected at each location included the following:

- PCBs by EPA Methods 3510C, 3550B, and 8082
- Pesticides by EPA Methods 3550B and 8081A
- Lead by EPA Methods 3050B and 6020A



PSF_9_2_002



Trimatrix Laboratory located in Grand Rapids, Michigan, was the primary analytical laboratory for the soil and IDW samples. TestAmerica Laboratory in Earth City, Missouri analyzed 3 duplicate quality assurance samples collected from soil sample locations RA-41-24/30-09, RA-34-48/54-09 and RA-46-24/30-09.

Matrix spike/matrix spike duplicate (MS/MSD) and duplicate samples were collected from sample locations RA-23-24/30-09 and RA-47-24/30-09.

The Quality Control Summary Report for Pesticide Storage Facility, Building 348, Fort Riley, Kansas, (CTI, September 2009) presents the validated laboratory analytical results for the sampling event.

Laboratory analytical results with positive detections are compared to the Revised Adsorption Factors and Removal Action Goals table, page 2-4, Record of Decision (September 1997). The Revised Removal Action Goals are the values presented on Table 1. As shown on Table 1, only one exceedance of the Revised Removal Action Goals (Dieldrin - 127 ug/kg) occurred during the July 2009 soil sampling event at sample location RA-23 (Dieldrin 170 ug/kg) from the sample depth of 48 to 54 inches below ground surface.

Summary of Daily Activities

April 2, 2009 - Toured the PSF site with Dr. Richard Shields. Inspected the proposed boring locations and discussed placement of the IDW storage drum.

April 3, 2009 - Conducted a health and safety meeting. Measured and staked the soil sample locations according to the site plan provided by Fort Riley. Overgrown vegetation at the east edge of the PSF site was found to interfere with placement of the stakes and with equipment access to the soil sample locations.

July 7, 2009 - Met with Dr. Shields and discussed removal of vegetation from soil boring locations RA-34, RA-41 and RA-47. CTI was instructed to remove only the vegetation necessary for equipment access, with the exception of a sycamore tree, which was to be undisturbed. CTI and Environmental Priority Service (EPS) personnel met at the PSF Site to conduct a health and safety meeting, collect 24 soil samples, and collect the appropriate quality control and equipment rinse samples. Samples collected were placed on ice for overnight storage and packaged for shipment to the analytical laboratory on July 8, 2009.

July 8, 2009 - Conducted a health and safety meeting. Collected the surface soil sample from location RA-65 and collected a sample of the IDW for laboratory analysis of pesticides. CTI met with Fort Riley representative Dr. Shields to discuss the project. CTI departed the post and shipped the samples to the laboratories from the UPS Depot in Kansas City, Kansas.

Soil Sampling Methods

Soil samples were collected from the 8 boring locations. Samples from each boring location were collected from the intervals specified in the Work Plan; 6" to 18", 24" to 30" and 48" to 54". The direct-push soil boring method was used to collect the samples. An acetate lined sample tube was driven to depth and withdrawn. The sample collected in the acetate liner was examined, classified and separated into appropriate intervals. Each soil interval was then placed in a stainless steel bowl and mixed until homogenized. A representative sample of the homogenized soil was then placed into a laboratory supplied soil collection jar. The soil sample jars were bagged and placed on wet ice in a cooler, awaiting shipment to the laboratory.



Decontamination Methods

The sample contacting equipment was decontaminated prior to the site work, between borings and upon completion of soil sampling. The following procedure was used:

- 1) Scrub soil from the equipment using a stiff bristled brush in a pail containing a detergent solution.
- 2) Rinse the equipment with distilled water.
- 3) Rinse the equipment with pesticide grade hexane.
- 4) Rinse again with distilled water.

The rinsate from the above operations was collected and placed in the IDW drum.

Equipment that did not have direct contact with site soils was decontaminated with a hot water, high pressure washer (Hotsy). The decontamination water was collected in a trough and transferred to the IDW drum.

Equipment Rinsate Sample Collection

Two equipment rinsate samples were collected during this soil sampling event; one sample was obtained before soil sampling operations had begun (EB070709-1) and another between boring locations RA-29 and RA-47 (EB070709-2) following decontamination of the sampling equipment. The sample was obtained by pouring contaminant free water, supplied by Trimatrix, through the decontaminated direct-push soil sample tube. The sample tube rinsate was collected in a stainless steel soil mixing bowl. The hand trowels were then submersed in the sample tube rinsate and the rinse water was transferred to laboratory supplied bottles.

Analytical results of the equipment rinsate water for equipment rinsate sample EB070709-2 indicate 4,4-DDT (0.004ug/l) and Lead (0.36ug/l). No action was taken during validation of the laboratory analytical data as any detectable 4,4-DDT and Lead in project samples exceeded the concentration by more than a factor of 10.

Investigation Derived Waste (IDW) Management

The decontamination water was considered IDW and was placed in a labeled 55 gallon drum. A sample of the decontamination wash / rinse water was collected on July 7, 2009 and submitted to Trimatrix for the laboratory analysis of pesticides. Results of the laboratory analyses for the IDW were reviewed and approved by Dr. Shields prior to disposal of the liquid to the Fort Riley Public Works sanitary sewer system at the Manhole 96 location.

Enclosures

Figure 1
 Surface Soil Sample Location
 July 2009 Sample Event

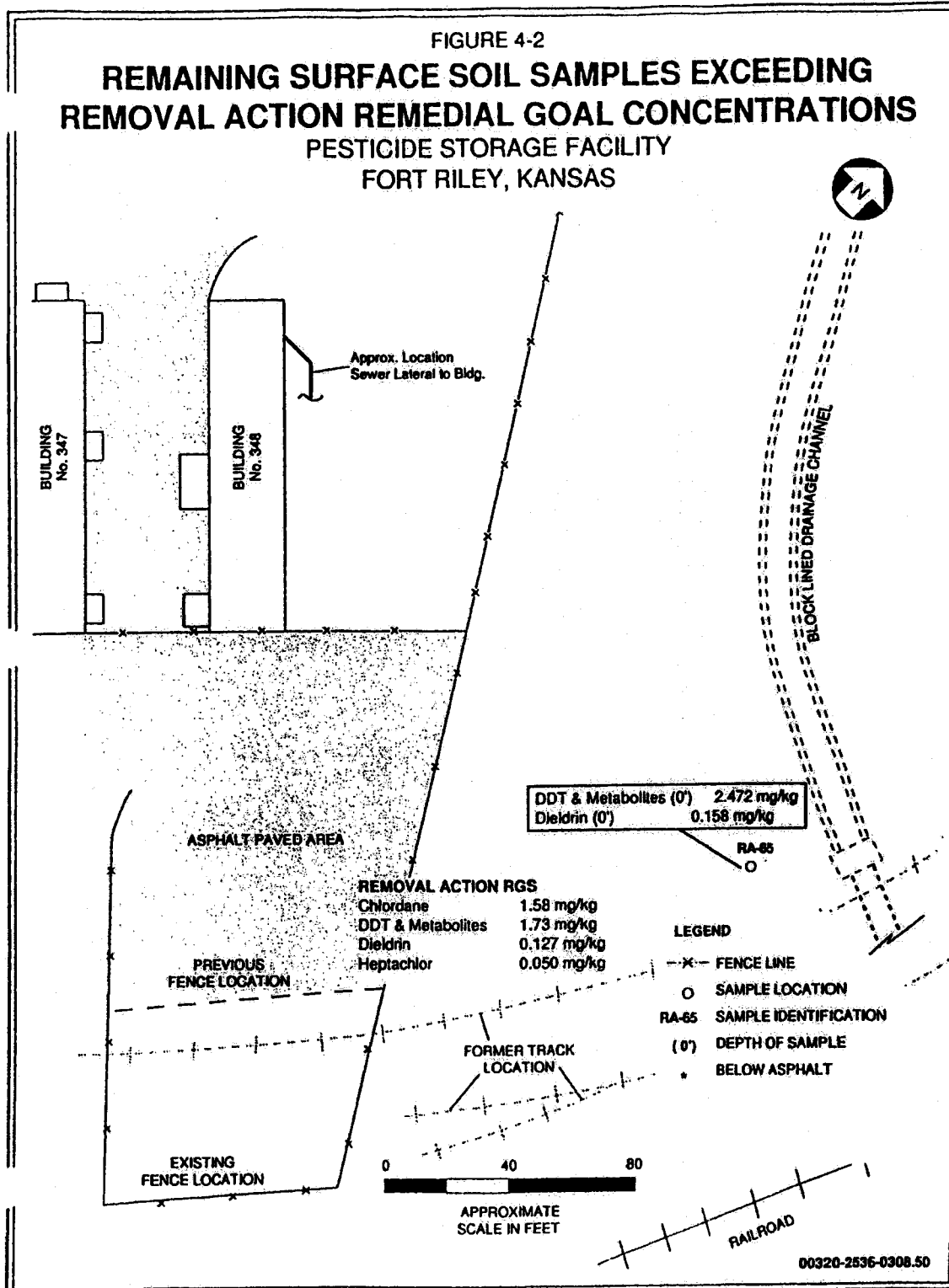


Figure 2

Subsurface Soil Sample Locations

July 2009 Sampling Event

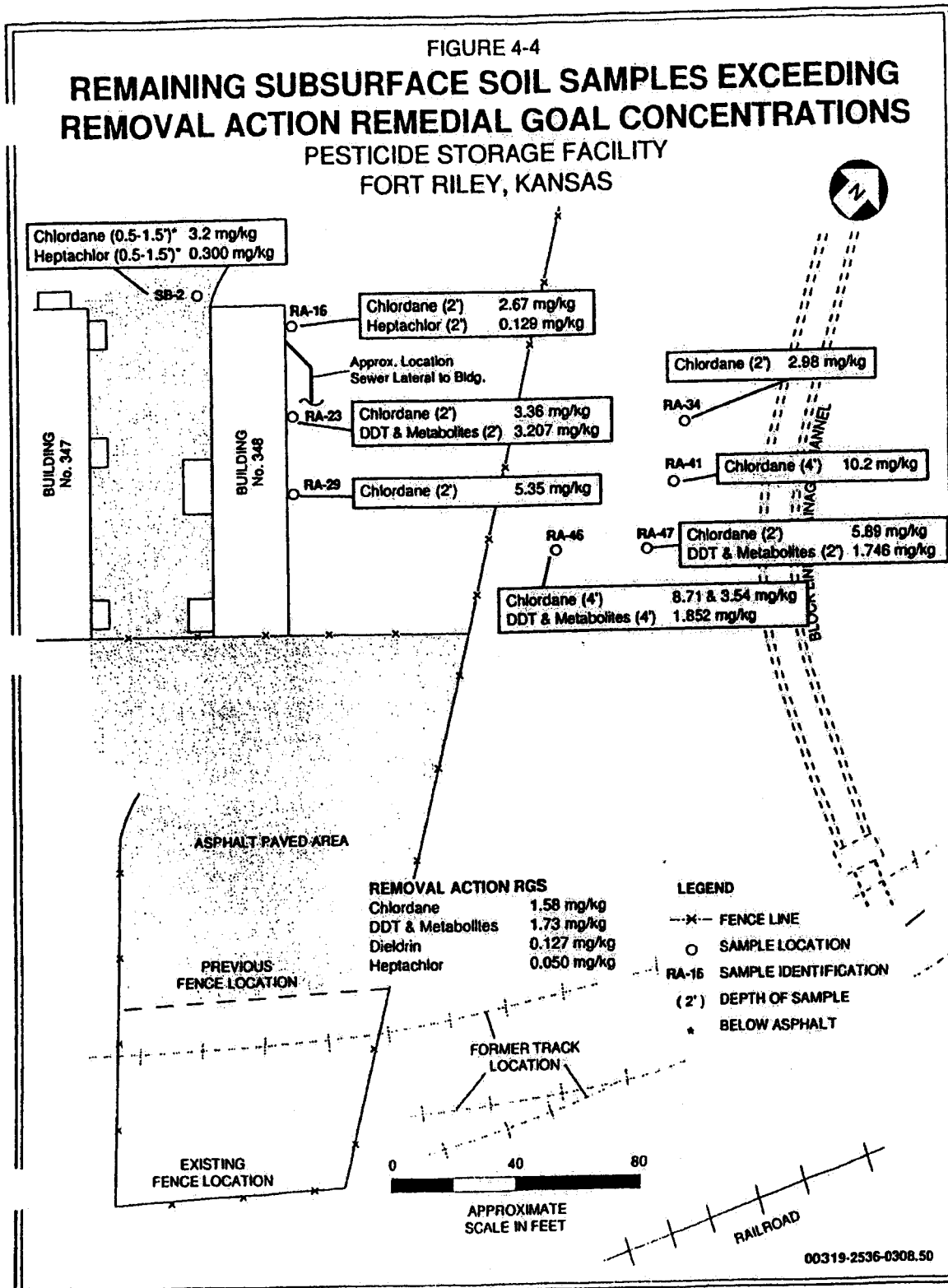


Table 1
Analytical Laboratory Results
Pesticide Storage Facility
Fort Riley, Kansas

Compound	Revised Removal		RA-16-06/18-09	RA-16-24/30-09	RA-16-48/54-09	RA-23-06/18-09	RA-23-24/30-09	RA-23-48/54-09
	Action Goals	Units						
alpha-BHC		ug/kg	20 U	21 U	410 U	20 U	21 U	490 U
beta-BHC		ug/kg	20 U	21 U	410 U	20 U	21 U	490 U
gamma-BHC (Lindane)		ug/kg	20 U	21 U	410 U	20 U	21 U	490 U
delta-BHC		ug/kg	20 U	21 U	410 U	20 U	21 U	490 U
alpha-Chlordane	1,580	ug/kg	20 U	21 U	280 J	20 U	2.5 J	600 J
gamma-Chlordane	1,580	ug/kg	20 U	21 U	250 J	20 U	2.3 J	550
4,4'-DDD	1,730	ug/kg	20 U	21 U	38 J	20 U	21 U	140 J
4,4'-DDE	1,730	ug/kg	0.72 J	21 U	240 J	20 U	2.2 J	170 J
4,4'-DDT	1,730	ug/kg	2.1 J	21 U	1000	20 U	4.5 J	1000
Aldrin		ug/kg	20 U	21 U	410 U	20 U	21 U	490 U
Dieldrin	127	ug/kg	20 U	21 U	21 J	20 U	21 U	170
Endosulfan I		ug/kg	20 U	21 U	410 U	20 U	21 U	490 U
Endosulfan II		ug/kg	20 U	21 U	410 U	20 U	21 U	490 U
Endosulfan Sulfate		ug/kg	20 U	21 U	410 U	20 U	21 U	490 U
Endrin		ug/kg	20 U	21 U	410 U	20 U	21 U	490 U
Endrin Aldehyde		ug/kg	20 U	21 U	410 U	20 U	21 U	490 U
Endrin Ketone		ug/kg	20 U	21 U	410 U	20 U	21 U	490 U
Heptachlor	50	ug/kg	20 U	21 U	23 J	20 U	21 U	16 J
Heptachlor Epoxide		ug/kg	20 U	21 U	410 U	20 U	21 U	36 J
Methoxychlor		ug/kg	20 U	21 U	410 U	20 U	21 U	490 U
Toxaphene		ug/kg	200 U	210 U	4100 U	200 U	210 U	4900 U
Arochlor 1016		ug/kg	400 U	410 U	400 U	390 U	410 U	380 U
Arochlor 1221		ug/kg	400 U	410 U	400 U	390 U	410 U	380 U
Arochlor 1232		ug/kg	400 U	410 U	400 U	390 U	410 U	380 U
Arochlor 1242		ug/kg	400 U	410 U	400 U	390 U	410 U	380 U
Arochlor 1248		ug/kg	400 U	410 U	400 U	390 U	410 U	380 U
Arochlor 1254		ug/kg	400 U	410 U	400 U	390 U	410 U	380 U
Arochlor 1260		ug/kg	400 U	410 U	400 U	390 U	410 U	380 U
Lead		mg/kg	24	96	15	20	9.8	19

Notes:

U code - Analyte not detected at a concentration greater than the method detection limit (MDL)

J code - Estimated: the analyte was detected at a concentration greater than the method detection limit (MDL) but less than the method reporting limit (MRL).

Method detection limit for Dieldrin ranges from 0.30 to 7.2 ug/kg.

Table 1
Analytical Laboratory Results
Pesticide Storage Facility
Fort Riley, Kansas

Compound	Revised Removal		RA-29-06/18-09	RA-29-24/30-09	RA-29-48/54-09	RA-34-06/18-09	RA-34-24/30-09	RA-34-48/54-09
	Action Goals	Units						
alpha-BHC		ug/kg	19 U	21 U	19 U	18 U	20 U	20 U
beta-BHC		ug/kg	19 U	21 U	19 U	18 U	20 U	20 U
gamma-BHC (Lindane)		ug/kg	19 U	21 U	19 U	18 U	20 U	20 U
delta-BHC		ug/kg	19 U	21 U	19 U	18 U	20 U	20 U
alpha-Chlordane	1,580	ug/kg	19 U	21 U	19 U	18 U	20 U	21
gamma-Chlordane	1,580	ug/kg	19 U	9.3 J	19 U	18 U	20 U	16 J
4,4'-DDD	1,730	ug/kg	19 U	21 U	19 U	18 U	20 U	5.2 J
4,4'-DDE	1,730	ug/kg	19 U	4.8 J	19 U	18 U	20 U	16 J
4,4'-DDT	1,730	ug/kg	2.2 J	16 J	19 U	2 J	20 U	5.8 J
Aldrin		ug/kg	19 U	21 U	19 U	18 U	20 U	20 U
Dieldrin	127	ug/kg	19 U	21 U	19 U	18 U	20 U	20 U
Endosulfan I		ug/kg	19 U	21 U	19 U	18 U	20 U	20 U
Endosulfan II		ug/kg	19 U	21 U	19 U	18 U	20 U	20 U
Endosulfan Sulfate		ug/kg	19 U	21 U	19 U	18 U	20 U	20 U
Endrin		ug/kg	19 U	21 U	19 U	18 U	20 U	20 U
Endrin Aldehyde		ug/kg	19 U	21 U	19 U	18 U	20 U	20 U
Endrin Ketone		ug/kg	19 U	21 U	19 U	18 U	20 U	20 U
Heptachlor	50	ug/kg	19 U	21 U	19 U	18 U	20 U	20 U
Heptachlor Epoxide		ug/kg	19 U	21 U	19 U	18 U	20 U	20 U
Methoxychlor		ug/kg	19 U	21 U	19 U	18 U	20 U	20 U
Toxaphene		ug/kg	190 U	210 U	190 U	180 U	200 U	200 U
Arochlor 1016		ug/kg	370 U	410 U	370 U	360 U	390 U	400 U
Arochlor 1221		ug/kg	370 U	410 U	370 U	360 U	390 U	400 U
Arochlor 1232		ug/kg	370 U	410 U	370 U	360 U	390 U	400 U
Arochlor 1242		ug/kg	370 U	410 U	370 U	360 U	390 U	400 U
Arochlor 1248		ug/kg	370 U	410 U	370 U	360 U	390 U	400 U
Arochlor 1254		ug/kg	370 U	410 U	370 U	360 U	390 U	400 U
Arochlor 1260		ug/kg	370 U	410 U	370 U	360 U	390 U	17 J
Lead		mg/kg	32	10	24	9.4	13	15

Notes:

U code - Analyte not detected at a concentration greater than the method detection limit (MDL)

J code - Estimated: the analyte was detected at a concentration greater than the method detection limit (MDL) but less than the method reporting limit (MRL).

Method detection limit for Dieldrin ranges from 0.30 to 7.2 ug/kg.

Bold - Analyte concentration exceeding the Revised Removal Action Goals.

Table 1
Analytical Laboratory Results
Pesticide Storage Facility
Fort Riley, Kansas

Compound	Revised Removal		RA-34X-48/54-09	RA-41-06/18-09	RA-41-24/30-09	RA-41X-24/30-09	RA-41-48/54-09	RA-46-06/18-09
	Action Goals	Units						
alpha-BHC		ug/kg	20 U	19 U	20 U	20 U	20 U	18 U
beta-BHC		ug/kg	20 U	19 U	20 U	20 U	20 U	18 U
gamma-BHC (Lindane)		ug/kg	20 U	19 U	20 U	20 U	20 U	18 U
delta-BHC		ug/kg	20 U	19 U	20 U	20 U	20 U	18 U
alpha-Chlordane	1,580	ug/kg	25J	19 U	20 U	20 U	20 U	18 U
gamma-Chlordane	1,580	ug/kg	20	19 U	20 U	20 U	20 U	18 U
4,4'-DDD	1,730	ug/kg	4.6 J	19 U	20 U	20 U	20 U	18 U
4,4'-DDE	1,730	ug/kg	14 J	19 U	20 U	20 U	20 U	8.1 J
4,4'-DDT	1,730	ug/kg	4.6 J	3.4 J	20 U	20 U	20 U	5.1 J
Aldrin		ug/kg	20 U	19 U	20 U	20 U	20 U	18 U
Dieldrin	127	ug/kg	20 U	19 U	20 U	20 U	20 U	18 U
Endosulfan I		ug/kg	20 U	19 U	20 U	20 U	20 U	18 U
Endosulfan II		ug/kg	20 U	19 U	20 U	20 U	20 U	18 U
Endosulfan Sulfate		ug/kg	20 U	19 U	20 U	20 U	20 U	18 U
Endrin		ug/kg	20 U	19 U	20 U	20 U	20 U	18 U
Endrin Aldehyde		ug/kg	20 U	19 U	20 U	20 U	20 U	18 U
Endrin Ketone		ug/kg	20 U	19 U	20 U	20 U	20 U	18 U
Heptachlor	50	ug/kg	20 U	19 U	20 U	20 U	20 U	18 U
Heptachlor Epoxide		ug/kg	20 U	19 U	20 U	20 U	20 U	18 U
Methoxychlor		ug/kg	20 U	19 U	20 U	20 U	20 U	18 U
Toxaphene		ug/kg	200 U	190 U	200 U	200 U	200 U	180 U
Arochlor 1016		ug/kg	390 U	380 U	390 U	390 U	400 U	360 U
Arochlor 1221		ug/kg	390 U	380 U	390 U	390 U	400 U	360 U
Arochlor 1232		ug/kg	390 U	380 U	390 U	390 U	400 U	360 U
Arochlor 1242		ug/kg	390 U	380 U	390 U	390 U	400 U	360 U
Arochlor 1248		ug/kg	390 U	380 U	390 U	390 U	400 U	360 U
Arochlor 1254		ug/kg	390 U	380 U	390 U	390 U	400 U	360 U
Arochlor 1260		ug/kg	390 J	380 U	390 U	390 U	400 U	360 U
Lead		mg/kg	17	10	11	9.4 J	15 J	15

Notes:

U code - Analyte not detected at a concentration greater than the method detection limit (MDL)

J code - Estimated: the analyte was detected at a concentration greater than the method detection limit (MDL) but less than the method reporting limit (MRL).

Method detection limit for Dieldrin ranges from 0.30 to 7.2 ug/kg.

Bold - Analyte concentration exceeding the Revised Removal Action Goals.

Table 1
Analytical Laboratory Results
Pesticide Storage Facility
Fort Riley, Kansas

Compound	Revised Removal Action Goals	Units	RA-46-24/30-09	RA-46X-24/30-09	RA-46-48/54-09	RA-47-06/18-09	RA-47-24/30-09	RA-47-48/54-09
alpha-BHC		ug/kg	19 U	19 U	20 U	20 U	20 U	20 U
beta-BHC		ug/kg	19 U	19 U	20 U	20 U	20 U	20 U
gamma-BHC (Lindane)		ug/kg	19 U	19 U	20 U	20 U	20 U	20 U
delta-BHC		ug/kg	19 U	19 U	20 U	20 U	20 U	20 U
alpha-Chlordane	1,580	ug/kg	4.7 J	19 J	12 J	20 U	20 U	20 U
gamma-Chlordane	1,580	ug/kg	3.3 J	19 J	8.4 J	20 U	20 U	2.2 J
4,4'-DDD	1,730	ug/kg	19 U	19 U	20 U	20 U	20 U	20 U
4,4'-DDE	1,730	ug/kg	6.2 J	4.2 J	15 J	20 U	20 U	5.8 J
4,4'-DDT	1,730	ug/kg	6 J	5.4 J	12 J	20 U	20 U	20 U
Aldrin		ug/kg	19 U	19 U	20 U	20 U	20 U	20 U
Dieldrin	127	ug/kg	19 U	19 U	1.8 J	20 U	20 U	20 U
Endosulfan I		ug/kg	19 U	19 U	20 U	20 U	20 U	20 U
Endosulfan II		ug/kg	19 U	19 U	20 U	20 U	20 U	20 U
Endosulfan Sulfate		ug/kg	19 U	19 U	20 U	20 U	20 U	20 U
Endrin		ug/kg	19 U	19 U	20 U	20 U	20 U	20 U
Endrin Aldehyde		ug/kg	19 U	19 U	20 U	20 U	20 U	20 U
Endrin Ketone		ug/kg	19 U	19 U	20 U	20 U	20 U	20 U
Heptachlor	50	ug/kg	19 U	19 U	20 U	20 U	20 U	20 U
Heptachlor Epoxide		ug/kg	19 U	19 U	20 U	20 U	20 U	20 U
Methoxychlor		ug/kg	19 U	19 U	20 U	20 U	20 U	20 U
Toxaphene		ug/kg	190 U	190 U	200 U	200 U	200 U	200 U
Arochlor 1016		ug/kg	380 U	380 U	390 U	390 U	390 U	390 U
Arochlor 1221		ug/kg	380 U	380 U	390 U	390 U	390 U	390 U
Arochlor 1232		ug/kg	380 U	380 U	390 U	390 U	390 U	390 U
Arochlor 1242		ug/kg	380 U	380 U	390 U	390 U	390 U	390 U
Arochlor 1248		ug/kg	380 U	380 U	390 U	390 U	390 U	390 U
Arochlor 1254		ug/kg	380 U	380 U	390 U	390 U	390 U	390 U
Arochlor 1260		ug/kg	380 U	380 U	390 U	390 U	390 U	390 U
Lead		mg/kg	13	11	17	10	10	15

Notes:

U code - Analyte not detected at a concentration greater than the method detection limit (MDL)

J code - Estimated: the analyte was detected at a concentration greater than the method detection limit (MDL) but less than the method reporting limit (MRL).

Method detection limit for Dieldrin ranges from 0.30 to 7.2 ug/kg.

Bold - Analyte concentration exceeding the Revised Removal Action Goals.

Table 1
Analytical Laboratory Results
Pesticide Storage Facility
Fort Riley, Kansas

Compound	Revised Removal Action Goals		RA-65-00/01-09	SB-02-02/2_5-09	SB-02-04/4_5-09	SB-02-06/18-09
	Goals	Units				
alpha-BHC		ug/kg	22 U	17 U	18 U	17 J
beta-BHC		ug/kg	22 U	17 U	18 U	17 J
gamma-BHC (Lindane)		ug/kg	22 U	17 U	18 U	17 J
delta-BHC		ug/kg	22 U	17 U	18 U	17 J
alpha-Chlordane	1,580	ug/kg	22 U	25 J	18 U	17 J
gamma-Chlordane	1,580	ug/kg	22 U	23	18 U	17 J
4,4'-DDD	1,730	ug/kg	22 U	17 U	18 U	17 J
4,4'-DDE	1,730	ug/kg	10 J	61J	1.8 J	17 J
4,4'-DDT	1,730	ug/kg	9.6 J	56	2.2 J	17 J
Aldrin		ug/kg	22 U	17 U	18 U	17 J
Dieldrin	127	ug/kg	2.8 J	17 U	18 U	17 J
Endosulfan I		ug/kg	22 U	17 U	18 U	17 J
Endosulfan II		ug/kg	22 U	17 U	18 U	17 J
Endosulfan Sulfate		ug/kg	22 U	17 U	18 U	17 J
Endrin		ug/kg	22 U	17 U	18 U	17 J
Endrin Aldehyde		ug/kg	22 U	17 U	18 U	17 J
Endrin Ketone		ug/kg	22 U	17 U	18 U	17 J
Heptachlor	50	ug/kg	22 U	17 U	18 U	17 J
Heptachlor Epoxide		ug/kg	22 U	17 U	18 U	17 J
Methoxychlor		ug/kg	22 U	17 U	18 U	17 J
Toxaphene		ug/kg	220 U	170 U	180 U	170 J
Arochlor 1016		ug/kg	430 U	340 U	360 U	330 U
Arochlor 1221		ug/kg	430 U	340 U	360 U	330 U
Arochlor 1232		ug/kg	430 U	340 U	360 U	330 U
Arochlor 1242		ug/kg	430 U	340 U	360 U	330 U
Arochlor 1248		ug/kg	430 U	340 U	360 U	330 U
Arochlor 1254		ug/kg	430 U	340 U	360 U	330 U
Arochlor 1260		ug/kg	8.1 J	340 U	360 U	330 U
Lead		mg/kg	29	18	62	28

Notes:

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J code - Estimated: the analyte was detected at a concentration greater than the method detection limit (MDL) but less than the method reporting limit (MRL).

Method detection limit for Dieldrin ranges from 0.30 to 7.2 ug/kg.

Bold - Analyte concentration exceeding the Revised Removal Action Goals.