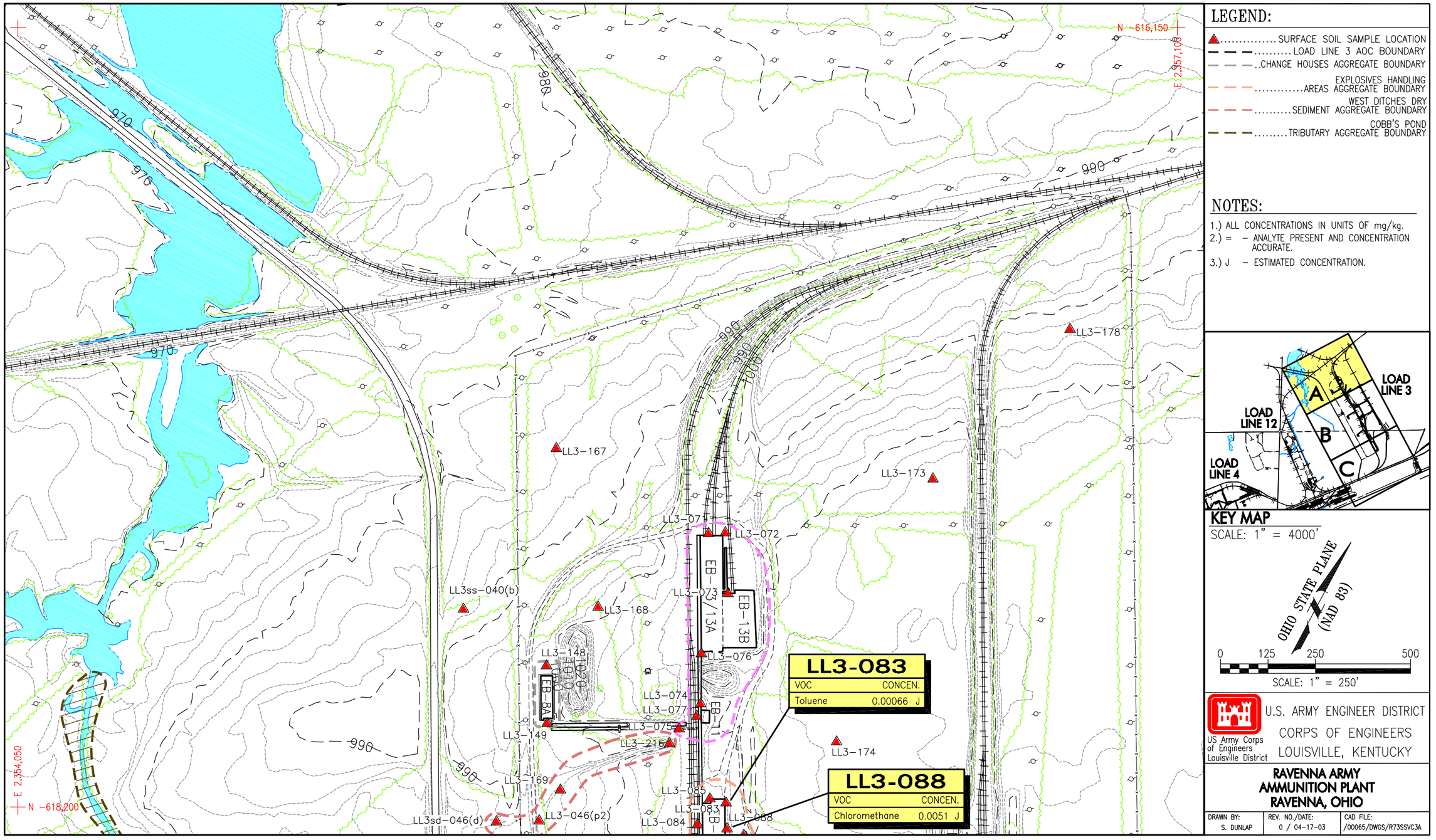


Figure 4-17. Distribution of Detected VOCs in Surface Soil at Load Line 3 - Northern Section

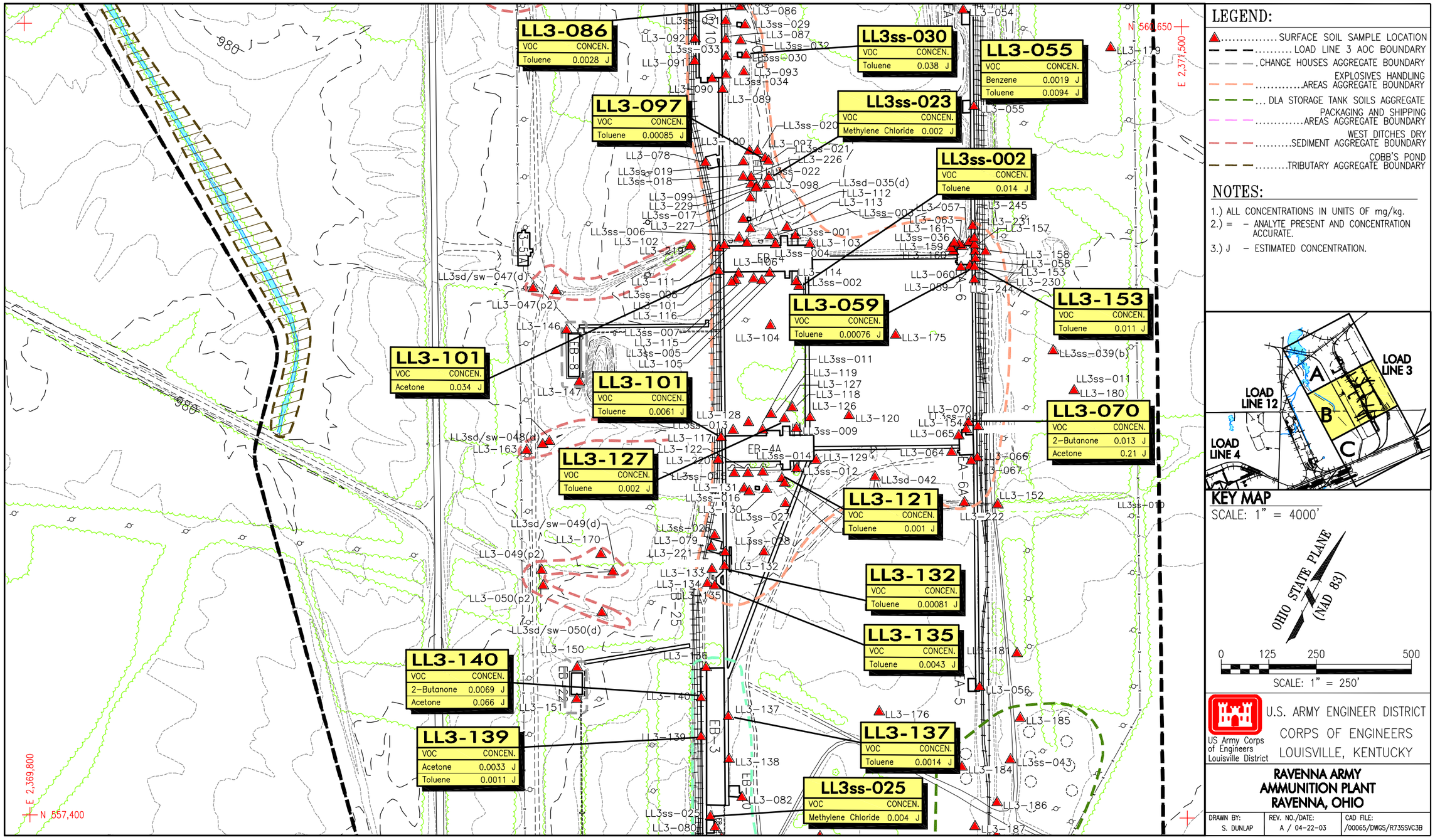


Figure 4-18. Distribution of Detected VOCs in Surface Soil at Load Line 3 - Central Section

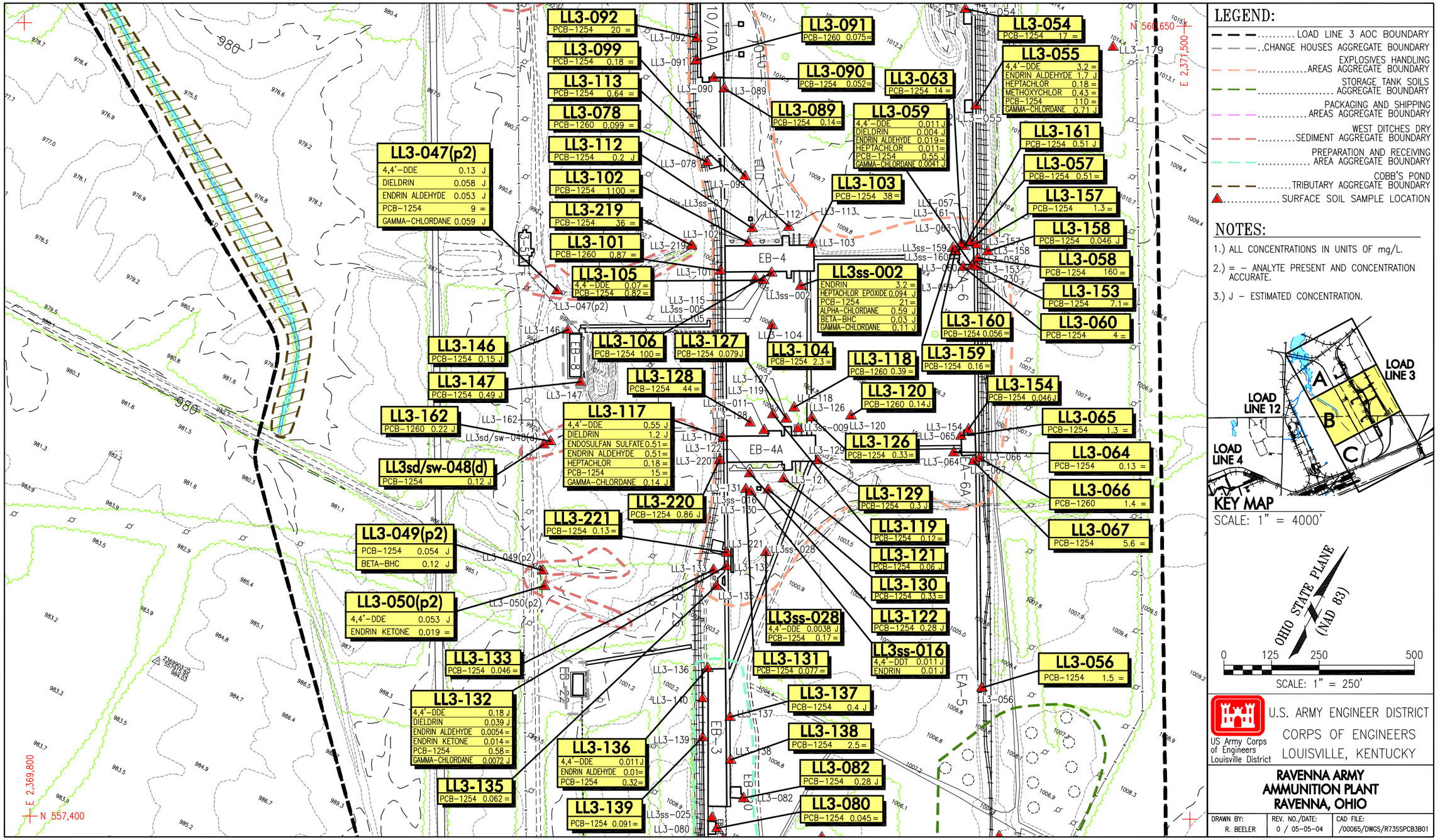
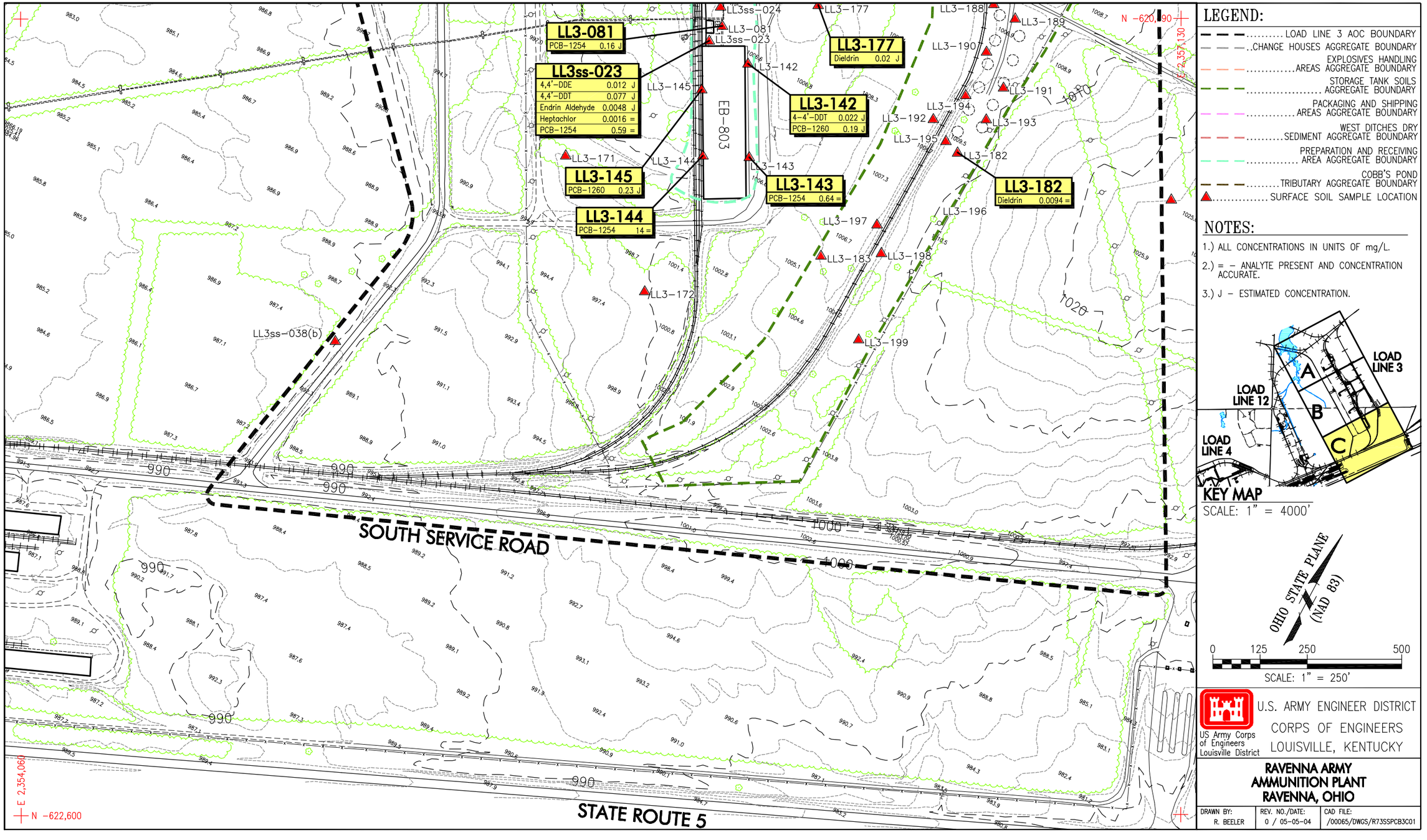


Figure 4-19. Distribution of Detected Pesticides and PCBs in Surface Soil at Load Line 3 - Central Section



LEGEND:

- LOAD LINE 3 AOC BOUNDARY
- CHANGE HOUSES AGGREGATE BOUNDARY
- EXPLOSIVES HANDLING AREAS AGGREGATE BOUNDARY
- STORAGE TANK SOILS AGGREGATE BOUNDARY
- PACKAGING AND SHIPPING AREAS AGGREGATE BOUNDARY
- WEST DITCHES DRY SEDIMENT AGGREGATE BOUNDARY
- PREPARATION AND RECEIVING AREA AGGREGATE BOUNDARY
- COBB'S POND TRIBUTARY AGGREGATE BOUNDARY
- SURFACE SOIL SAMPLE LOCATION

NOTES:

1.) ALL CONCENTRATIONS IN UNITS OF mg/L.

2.) = – ANALYTE PRESENT AND CONCENTRATION ACCURATE.

3.) J – ESTIMATED CONCENTRATION.

KEY MAP

SCALE: 1" = 4000'

OHIO STATE PLANE (NAD 83)

0 125 250 500

SCALE: 1" = 250'

US Army Corps of Engineers Louisville District

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
LOUISVILLE, KENTUCKY

RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO

DRAWN BY:	REV. NO./DATE:	CAD FILE:
R. BEELER	0 / 05-05-04	/00065/DWGS/R73SSPCB3C01

Figure 4-20. Distribution of Detected Pesticides and PCBs in Surface Soil at Load Line 3 - Southern Section

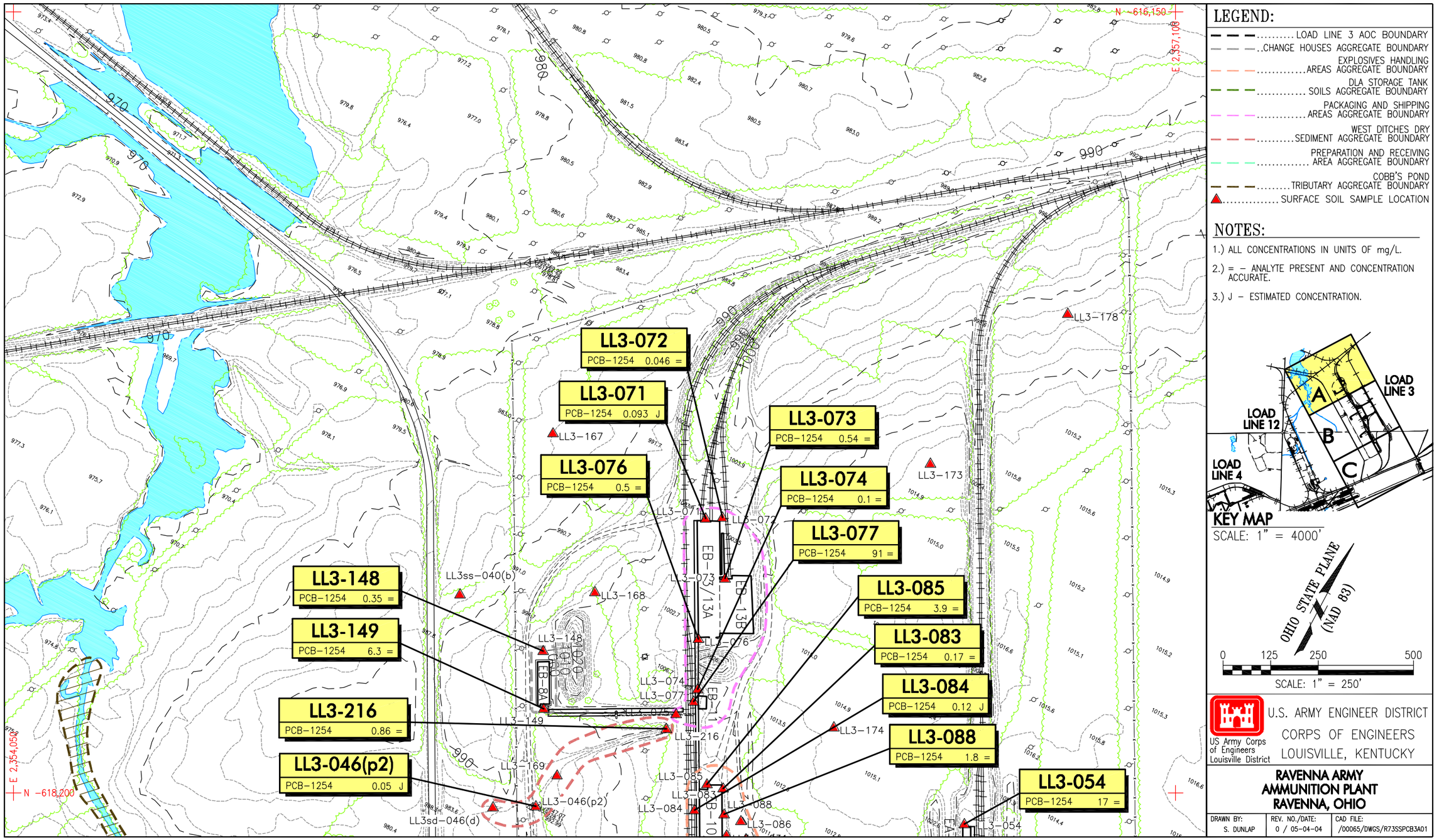


Figure 4-21. Distribution of Detected Pesticides and PCBs in Surface Soil at Load Line 3 - Northern Section

PCB-1254 was detected in 10 of 15 samples (Table 4-3). Concentrations ranged from 0.045 mg/kg at station LL3-080 to 14 mg/kg detected at station LL3-144. Station LL3-144 is located along the southwestern corner of Building EB-803. The remaining detected concentrations of PCBs were distributed around Buildings EB-803 and EB-3 (Figures 4-19 and 4-20). Table 4-27 provides a summary of all detected pesticides and PCBs and Figures 4-19, 4-20, and 4-21 illustrates each sample location and the detected concentrations of each.

4.2.5.2 Change Houses Aggregate

SVOCs

SVOCs were not analyzed in surface soil samples associated with the Change Houses Aggregate.

VOCs

VOCs were not analyzed in surface soil samples associated with the Change Houses Aggregate.

Pesticides and PCBs

Six surface soil samples were collected from the Change Houses Aggregate and analyzed for PCB compounds. PCB-1254 was detected in four of six soil samples with concentrations ranging from .15 mg/kg at station LL3-146 to 6.3 mg/kg at station LL3-149. Figures 4-20, 4-21, and 4-22 illustrate the distribution of PCB-1254 throughout the Load Line 3 surface soils. Table 4-28 provides a summary of detected concentrations of PCB-1254.

Pesticides were not analyzed in surface soil samples associated with the Change Houses Aggregate.

4.2.5.3 Explosives Handling Areas Aggregate

SVOCs

A total of 28 surface soil samples were analyzed for SVOCs in the surface soils associated with the Explosives Handling Areas Aggregate (Table 4-3). Twenty-one SVOCs were identified at least once in the surface samples collected. Of those, di-n-butyl phthalate, was eliminated as an SRC as it was detected in less than 5% of the samples collected (Table 4-3).

Although SVOCs were widely detected in several samples, SVOCS were not detected at 9 sample stations and all detects were less than 1 mg/kg at 13 sample stations (Table 4-29). The remaining six sample stations (LL3-058, LL3-057, LL3-063, LL3-064, LL3ss-028, and LL3ss-016) contained the majority of SVOCs detected. Specifically, Phase II RI sample station LL3-058 (Figure 4-15) contained all but one detected SVOC (acenaphthylene), with concentrations of individual SVOCs being the highest detected in the surface soil associated with the Explosives Handling Areas Aggregate.

Four analytes, pyrene, fluoranthene, chrysene, and benzo(*b*)fluoranthene, were most pervasive as each were detected in more than 50% of samples collected. As stated above, the highest concentrations of each were identified at station LL3-058. Station LL3-058 is located on the west side of the Building EA-6 footprint while stations LL3-057 and LL3-063 are located north and northwest of Building EA-6A, respectively. Phase I RI sampling stations LL3ss-028 and LL3ss-016 are located south of Building EB-48, as presented on Figure 4-15.

Table 4-27. Summary Data for Site-Related Pesticides and PCBs in Preparation and Receiving Areas Aggregate Surface Soils at Load Line 3 [a]

Functional Area		Preparation and Receiving Areas Aggregate	Preparation and Receiving Areas Aggregate	Preparation and Receiving Areas Aggregate	Preparation and Receiving Areas Aggregate	Preparation and Receiving Areas Aggregate
Station ID		**LL3-080**	**LL3-081**	**LL3-082**	**LL3-082**	**LL3-136**
Sample ID		**LL30754**	**LL30757**	**LL30760**	**LL31126**	**LL30902**
Date		**08/10/2001**	**08/09/2001**	**08/10/2001**	**08/10/2001**	**08/10/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Grab**	**Field Duplicate**	**Grab**
Analyte	**Units**					
Pesticides and PCBs						
4,4'-DDE	mg/kg	NA	NA	NA	NA	0.011 J
4,4'-DDT	mg/kg	NA	NA	NA	NA	0.0099 U
Endrin Aldehyde	mg/kg	NA	NA	NA	NA	0.01 =
Heptachlor	mg/kg	NA	NA	NA	NA	0.0099 U
PCB-1254	mg/kg	0.045 =	0.16 J	0.28 J	0.15 J	0.32 =
PCB-1260	mg/kg	0.038 U	0.039 U	0.036 UJ	0.036 UJ	0.039 U

Table 4-27. Summary Data for Site-Related Pesticides and PCBs in Preparation and Receiving Areas Aggregate Surface Soils at Load Line 3 [a] (continued)

Functional Area		Preparation and Receiving Areas Aggregate	Preparation and Receiving Areas Aggregate	Preparation and Receiving Areas Aggregate	Preparation and Receiving Areas Aggregate	Preparation and Receiving Areas Aggregate
Station ID		**LL3-137**	**LL3-138**	**LL3-139**	**LL3-139**	**LL3-140**
Sample ID		**LL30905**	**LL30908**	**LL30911**	**LL31133**	**LL30914**
Date		**08/10/2001**	**08/10/2001**	**08/11/2001**	**08/11/2001**	**08/11/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Grab**	**Field Duplicate**	**Grab**
Analyte	**Units**					
Pesticides and PCBs						
4,4'-DDE	mg/kg	NA	NA	NA	NA	NA
4,4'-DDT	mg/kg	NA	NA	NA	NA	NA
Endrin Aldehyde	mg/kg	NA	NA	NA	NA	NA
Heptachlor	mg/kg	NA	NA	NA	NA	NA
PCB-1254	mg/kg	0.4 J	2.5 =	0.091 =	0.066 =	0.039 U
PCB-1260	mg/kg	0.04 U	0.38 UJ	0.039 UJ	0.038 UJ	0.039 U

Table 4-27. Summary Data for Site-Related Pesticides and PCBs in Preparation and Receiving Areas Aggregate Surface Soils at Load Line 3 [a] (continued)

Functional Area		Preparation and Receiving Areas Aggregate	Preparation and Receiving Areas Aggregate	Preparation and Receiving Areas Aggregate	Preparation and Receiving Areas Aggregate	Preparation and Receiving Areas Aggregate
Station ID		**LL3-142**	**LL3-142**	**LL3-143**	**LL3-144**	**LL3-145**
Sample ID		**LL30918**	**LL31120**	**LL30921**	**LL30924**	**LL30927**
Date		**08/09/2001**	**08/09/2001**	**08/09/2001**	**08/09/2001**	**08/09/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Field Duplicate**	**Grab**	**Grab**	**Grab**
Analyte	**Units**					
Pesticides and PCBs						
4,4'-DDE	mg/kg	0.018 U	0.018 U	NA	NA	NA
4,4'-DDT	mg/kg	0.022 J	0.021 J	NA	NA	NA
Endrin Aldehyde	mg/kg	0.018 U	0.018 U	NA	NA	NA
Heptachlor	mg/kg	0.018 U	0.018 U	NA	NA	NA
PCB-1254	mg/kg	0.035 U	0.035 U	0.64 =	14 =	0.038 U
PCB-1260	mg/kg	0.19 J	0.15 J	0.18 U	1.9 U	0.23 J

Table 4-27. Summary Data for Site-Related Pesticides and PCBs in Preparation and Receiving Areas Aggregate Surface Soils at Load Line 3 [a] (continued)

Functional Area		Preparation and Receiving Areas Aggregate	Preparation and Receiving Areas Aggregate	Preparation and Receiving Areas Aggregate
Station ID		**LL3ss-023**	**LL3ss-024**	**LL3ss-025**
Sample ID		**LL3SS-023-0187-SO**	**LL3SS-024-0188-SO**	**LL3SS-025-0189-SO**
Date		**07/23/1996**	**07/23/1996**	**07/23/1996**
Depth (ft)		**0 - 2**	**0 - 2**	**0 - 2**
Sample Type		**Grab Composite**	**Grab Composite**	**Grab Composite**
Analyte	**Units**			
Pesticides and PCBs				
4,4'-DDE	mg/kg	0.012 J	0.0027 U	0.0026 U
4,4'-DDT	mg/kg	0.077 J	0.0027 U	0.0026 U
Endrin Aldehyde	mg/kg	0.0048 J	0.0027 U	0.0026 U
Heptachlor	mg/kg	0.0016 =	0.0014 U	0.0014 U
PCB-1254	mg/kg	0.59 =	0.073 U	0.071 U
PCB-1260	mg/kg	0.078 U	0.073 U	0.071 U

[a] Table presents both Phase I RI (1996 collection date) and Phase II RI (2001 collection date).
ID = Identification.
NA = Not analyzed.
PCB = Polychlorinated biphenyl.
= - Detected result.
J - Estimated result.
U - Not detected.

Table 4-28. Summary Data for Site-Related Pesticides and PCBs in Change House Aggregate Surface Soils at Load Line 3

Functional Area		Change Houses Aggregate	Change Houses Aggregate	Change Houses Aggregate	Change Houses Aggregate	Change Houses Aggregate	Change Houses Aggregate
Station ID		**LL3-146**	**LL3-147**	**LL3-148**	**LL3-149**	**LL3-150**	**LL3-151**
Sample ID		**LL30930**	**LL30933**	**LL30936**	**LL30939**	**LL30942**	**LL30945**
Date		**08/08/2001**	**08/08/2001**	**08/09/2001**	**08/09/2001**	**08/08/2001**	**08/08/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**
Analyte	**Units**						
Pesticides and PCBs							
PCB-1254	mg/kg	0.15 J	0.49 J	0.35 =	6.3 =	0.037 U	0.038 U

ID = Identification.
PCB = Polychlorinated biphenyl.
= - Detected result.
J - Estimated result.
U - Not detected.

Table 4-29. Summary Data for Site-Related Semivolatiles in Explosives Handling Areas Aggregate Surface Soils at Load Line 3 [a]

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate
Station ID		**LL3-057**	**LL3-057**	**LL3-058**	**LL3-063**	**LL3-064**
Sample ID		**LL30693**	**LL31121**	**LL30696**	**LL30707**	**LL30710**
Date		**07/31/2001**	**07/31/2001**	**07/31/2001**	**07/31/2001**	**07/31/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Field Duplicate**	**Grab**	**Grab**	**Grab**
Analyte	**Units**					
Semivolatile Organics						
2,4-Dinitrotoluene	mg/kg	0.36 U	0.36 U	1.9 U	1.8 U	0.37 U
2,6-Dinitrotoluene	mg/kg	0.36 U	0.36 U	1.9 U	1.8 U	0.37 U
2-Methylnaphthalene	mg/kg	0.21 J	0.17 J	2.5 =	1.8 U	0.37 U
Acenaphthene	mg/kg	0.99 =	1.2 =	11 =	1.2 J	0.14 J
Acenaphthylene	mg/kg	0.36 U	0.36 U	1.9 U	1.8 U	0.37 U
Anthracene	mg/kg	3 =	3.6 =	22 =	3.3 =	0.28 J
Benzo(*a*)anthracene	mg/kg	4.8 J	6.3 =	29 =	5.7 =	0.79 =
Benzo(*a*)pyrene	mg/kg	5.8 J	5.8 =	23 =	5.4 =	0.6 =
Benzo(*b*)fluoranthene	mg/kg	7 J	6 =	29 =	5.5 =	0.67 =
Benzo(*g,h,i*)perylene	mg/kg	2.1 =	2.7 =	12 =	2.9 =	0.3 J
Benzo(*k*)fluoranthene	mg/kg	3.5 =	3.7 =	16 =	3.6 =	0.47 =
Bis(2-ethylhexyl)phthalate	mg/kg	0.36 U	0.36 U	1.2 =	1.8 U	0.37 U
Carbazole	mg/kg	1.4 =	1.9 =	13 =	2 =	0.17 J
Chrysene	mg/kg	4.9 J	6.5 =	28 =	5.9 =	0.88 =
Dibenzo(*a,h*)anthracene	mg/kg	0.74 =	1.1 =	4.1 =	0.93 J	0.12 J
Dibenzofuran	mg/kg	0.72 =	0.78 =	8.8 =	0.85 J	0.37 U
Fluoranthene	mg/kg	6.9 J	16 =	71 =	13 =	1.8 =
Fluorene	mg/kg	1.1 =	1.2 =	13 =	1.3 J	0.065 J
Indeno(1,2,3-*cd*)pyrene	mg/kg	2.4 =	3.2 =	12 =	3 =	0.31 J
Naphthalene	mg/kg	0.34 J	0.24 J	4.7 =	0.3 J	0.37 U
Phenanthrene	mg/kg	6.2 J	12 =	72 =	10 =	0.87 =
Pyrene	mg/kg	5.7 J	13 =	58 =	11 =	1.5 =

Table 4-29. Summary Data for Site-Related Semivolatiles in Explosives Handling Areas Aggregate Surface Soils at Load Line 3 [a] (continued)

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate		Explosives Handling Areas Aggregate
Station ID		**LL3-070**	**LL3-083**	**LL3-086**	**LL3-088**	**LL3-097**
Sample ID		**LL30724**	**LL30763**	**LL30772**	**LL30778**	**LL30799**
Date		**08/08/2001**	**08/06/2001**	**08/06/2001**	**08/06/2001**	**08/07/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**	**Grab**
Analyte	**Units**					
Semivolatile Organics						
2,4-Dinitrotoluene	mg/kg	0.37 UJ	0.39 UJ	0.38 UJ	0.38 UJ	0.36 UJ
2,6-Dinitrotoluene	mg/kg	0.37 UJ	0.39 UJ	0.38 UJ	0.38 UJ	0.36 UJ
2-Methylnaphthalene	mg/kg	0.37 UJ	0.39 UJ	0.1 J	0.38 UJ	0.36 UJ
Acenaphthene	mg/kg	0.37 UJ	0.39 UJ	0.38 UJ	0.38 UJ	0.36 UJ
Acenaphthylene	mg/kg	0.37 UJ	0.39 UJ	0.38 UJ	0.38 UJ	0.36 UJ
Anthracene	mg/kg	0.37 UJ	0.059 J	0.38 UJ	0.38 UJ	0.36 UJ
Benzo(*a*)anthracene	mg/kg	0.37 UJ	0.26 J	0.12 J	0.38 UJ	0.36 UJ
Benzo(*a*)pyrene	mg/kg	0.37 UJ	0.26 J	0.13 J	0.38 UJ	0.36 UJ
Benzo(*b*)fluoranthene	mg/kg	0.37 UJ	0.33 J	0.18 J	0.089 J	0.36 UJ
Benzo(*g,h,i*)perylene	mg/kg	0.37 UJ	0.13 J	0.38 UJ	0.38 UJ	0.36 UJ
Benzo(*k*)fluoranthene	mg/kg	0.37 UJ	0.15 J	0.062 J	0.38 UJ	0.36 UJ
Bis(2-ethylhexyl)phthalate	mg/kg	0.37 UJ	0.39 UJ	0.38 UJ	0.38 UJ	0.36 UJ
Carbazole	mg/kg	0.37 UJ	0.39 UJ	0.38 UJ	0.38 UJ	0.36 UJ
Chrysene	mg/kg	0.37 UJ	0.24 J	0.15 J	0.072 J	0.36 UJ
Dibenzo(*a,h*)anthracene	mg/kg	0.37 UJ	0.39 UJ	0.38 UJ	0.38 UJ	0.36 UJ
Dibenzofuran	mg/kg	0.37 UJ	0.39 UJ	0.38 UJ	0.38 UJ	0.36 UJ
Fluoranthene	mg/kg	0.37 UJ	0.68 J	0.2 J	0.1 J	0.36 UJ
Fluorene	mg/kg	0.37 UJ	0.084 J	0.38 UJ	0.38 UJ	0.36 UJ
Indeno(1,2,3-*cd*)pyrene	mg/kg	0.37 UJ	0.13 J	0.38 UJ	0.38 UJ	0.36 UJ
Naphthalene	mg/kg	0.37 UJ	0.39 UJ	0.1 J	0.38 UJ	0.36 UJ
Phenanthrene	mg/kg	0.37 UJ	0.36 J	0.16 J	0.068 J	0.36 UJ
Pyrene	mg/kg	0.37 UJ	0.52 J	0.23 J	0.12 J	0.36 UJ

Table 4-29. Summary Data for Site-Related Semivolatiles in Explosives Handling Areas Aggregate Surface Soils at Load Line 3 [a] (continued)

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate		Explosives Handling Areas Aggregate
Station ID		**LL3-097**	**LL3-099**	**LL3-101**	**LL3-103**	**LL3-105**
Sample ID		**LL31119**	**LL30805**	**LL30811**	**LL30817**	**LL30823**
Date		**08/07/2001**	**08/07/2001**	**08/11/2001**	**08/07/2001**	**08/08/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Field Duplicate**	**Grab**	**Grab**	**Grab**	**Grab**
Analyte	**Units**					
Semivolatile Organics						
2,4-Dinitrotoluene	mg/kg	0.39 UJ	4 UJ	0.37 UJ	0.39 UJ	0.38 UJ
2,6-Dinitrotoluene	mg/kg	0.39 UJ	4 UJ	0.37 UJ	0.39 UJ	0.38 UJ
2-Methylnaphthalene	mg/kg	0.39 UJ	4 UJ	0.37 UJ	0.39 UJ	0.38 UJ
Acenaphthene	mg/kg	0.39 UJ	4 UJ	0.37 UJ	0.39 UJ	0.38 UJ
Acenaphthylene	mg/kg	0.39 UJ	4 UJ	0.37 UJ	0.39 UJ	0.38 UJ
Anthracene	mg/kg	0.39 UJ	4 UJ	0.37 UJ	0.39 UJ	0.38 UJ
Benzo(*a*)anthracene	mg/kg	0.39 UJ	4 UJ	0.37 UJ	0.077 J	0.38 UJ
Benzo(*a*)pyrene	mg/kg	0.39 UJ	4 UJ	0.37 UJ	0.39 UJ	0.38 UJ
Benzo(*b*)fluoranthene	mg/kg	0.39 UJ	4 UJ	0.37 UJ	0.13 J	0.38 UJ
Benzo(*g,h,i*)perylene	mg/kg	0.39 UJ	4 UJ	0.37 UJ	0.39 UJ	0.38 UJ
Benzo(*k*)fluoranthene	mg/kg	0.39 UJ	4 UJ	0.37 UJ	0.39 UJ	0.38 UJ
Bis(2-ethylhexyl)phthalate	mg/kg	0.39 UJ	4 UJ	0.37 UJ	0.1 J	0.38 UJ
Carbazole	mg/kg	0.39 UJ	4 UJ	0.37 UJ	0.39 UJ	0.38 UJ
Chrysene	mg/kg	0.39 UJ	4 UJ	0.37 UJ	0.095 J	0.38 UJ
Dibenzo(*a,h*)anthracene	mg/kg	0.39 UJ	4 UJ	0.37 UJ	0.39 UJ	0.38 UJ
Dibenzofuran	mg/kg	0.39 UJ	4 UJ	0.37 UJ	0.39 UJ	0.38 UJ
Fluoranthene	mg/kg	0.39 UJ	4 UJ	0.37 UJ	0.098 J	0.38 UJ
Fluorene	mg/kg	0.39 UJ	4 UJ	0.37 UJ	0.39 UJ	0.38 UJ
Indeno(1,2,3-*cd*)pyrene	mg/kg	0.39 UJ	4 UJ	0.37 UJ	0.39 UJ	0.38 UJ
Naphthalene	mg/kg	0.39 UJ	4 U	0.37 UJ	0.39 UJ	0.38 UJ
Phenanthrene	mg/kg	0.39 UJ	4 UJ	0.37 UJ	0.39 UJ	0.38 UJ
Pyrene	mg/kg	0.39 UJ	4 UJ	0.058 J	0.12 J	0.38 UJ

Table 4-29. Summary Data for Site-Related Semivolatiles in Explosives Handling Areas Aggregate Surface Soils at Load Line 3 [a] (continued)

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate
Station ID		**LL3-114**	**LL3-117**	**LL3-121**	**LL3-127**	**LL3-127**
Sample ID		**LL30842**	**LL30851**	**LL30863**	**LL30875**	**LL31123**
Date		**08/08/2001**	**08/06/2001**	**08/06/2001**	**08/07/2001**	**08/07/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**	**Field Duplicate**
Analyte	**Units**					
Semivolatile Organics						
2,4-Dinitrotoluene	mg/kg	0.37 UJ	0.39 UJ	0.38 UJ	0.39 UJ	0.39 UJ
2,6-Dinitrotoluene	mg/kg	0.37 UJ	0.39 UJ	0.38 UJ	0.39 UJ	0.39 UJ
2-Methylnaphthalene	mg/kg	0.37 UJ	0.39 UJ	0.38 UJ	0.39 UJ	0.39 UJ
Acenaphthene	mg/kg	0.37 UJ	0.39 UJ	0.38 UJ	0.39 UJ	0.39 UJ
Acenaphthylene	mg/kg	0.37 UJ	0.39 UJ	0.38 UJ	0.39 UJ	0.39 UJ
Anthracene	mg/kg	0.37 UJ	0.39 UJ	0.38 UJ	0.39 UJ	0.39 UJ
Benzo(*a*)anthracene	mg/kg	0.37 UJ	0.39 UJ	0.38 UJ	0.39 UJ	0.39 UJ
Benzo(*a*)pyrene	mg/kg	0.37 UJ	0.39 UJ	0.38 UJ	0.39 UJ	0.39 UJ
Benzo(*b*)fluoranthene	mg/kg	0.37 UJ	0.08 J	0.38 UJ	0.39 UJ	0.39 UJ
Benzo(*g,h,i*)perylene	mg/kg	0.37 UJ	0.39 UJ	0.38 UJ	0.39 UJ	0.39 UJ
Benzo(*k*)fluoranthene	mg/kg	0.37 UJ	0.39 UJ	0.38 UJ	0.39 UJ	0.39 UJ
Bis(2-ethylhexyl)phthalate	mg/kg	0.37 UJ	0.12 J	0.38 UJ	0.39 UJ	0.39 UJ
Carbazole	mg/kg	0.37 UJ	0.39 UJ	0.38 UJ	0.39 UJ	0.39 UJ
Chrysene	mg/kg	0.37 UJ	0.39 UJ	0.38 UJ	0.39 UJ	0.39 UJ
Dibenzo(*a,h*)anthracene	mg/kg	0.37 UJ	0.39 UJ	0.38 UJ	0.39 UJ	0.39 UJ
Dibenzofuran	mg/kg	0.37 UJ	0.39 UJ	0.38 UJ	0.39 UJ	0.39 UJ
Fluoranthene	mg/kg	0.37 UJ	0.39 UJ	0.38 UJ	0.39 UJ	0.39 UJ
Fluorene	mg/kg	0.37 UJ	0.39 UJ	0.38 UJ	0.39 UJ	0.39 UJ
Indeno(1,2,3-*cd*)pyrene	mg/kg	0.37 UJ	0.39 UJ	0.38 UJ	0.39 UJ	0.39 UJ
Naphthalene	mg/kg	0.37 UJ	0.39 UJ	0.38 UJ	0.39 UJ	0.39 UJ
Phenanthrene	mg/kg	0.37 UJ	0.39 UJ	0.38 UJ	0.39 UJ	0.39 UJ
Pyrene	mg/kg	0.37 UJ	0.39 UJ	0.38 UJ	0.39 UJ	0.39 UJ

Table 4-29. Summary Data for Site-Related Semivolatiles in Explosives Handling Areas Aggregate Surface Soils at Load Line 3 [a] (continued)

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate
Station ID		**LL3-132**	**LL3-135**	**LL3-153**	**LL3-222**	**LL3ss-002**
Sample ID		**LL30890**	**LL30899**	**LL30951**	**LL31086**	**LL3SS-002-0162-SO**
Date		**08/10/2001**	**08/10/2001**	**08/13/2001**	**08/07/2001**	**07/24/1996**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 2**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**	**Grab Composite**
Analyte	**Units**					
Semivolatile Organics						
2,4-Dinitrotoluene	mg/kg	0.38 UJ	0.37 UJ	0.37 UJ	0.41 UJ	
2,6-Dinitrotoluene	mg/kg	0.38 UJ	0.37 UJ	0.37 UJ	0.41 UJ	
2-Methylnaphthalene	mg/kg	0.38 UJ	0.37 UJ	0.37 UJ	0.41 UJ	0.34 U
Acenaphthene	mg/kg	0.38 UJ	0.37 UJ	0.37 UJ	0.41 UJ	0.34 U
Acenaphthylene	mg/kg	0.38 UJ	0.37 UJ	0.37 UJ	0.41 UJ	0.34 U
Anthracene	mg/kg	0.38 UJ	0.37 UJ	0.37 UJ	0.41 UJ	0.34 U
Benzo(*a*)anthracene	mg/kg	0.38 UJ	0.073 J	0.37 UJ	0.41 UJ	0.34 U
Benzo(*a*)pyrene	mg/kg	0.38 UJ	0.078 J	0.37 UJ	0.41 UJ	0.036 J
Benzo(*b*)fluoranthene	mg/kg	0.38 UJ	0.13 J	0.091 J	0.41 UJ	0.035 J
Benzo(*g,h,i*)perylene	mg/kg	0.38 UJ	0.37 UJ	0.37 UJ	0.41 UJ	0.34 U
Benzo(*k*)fluoranthene	mg/kg	0.38 UJ	0.37 UJ	0.37 UJ	0.41 UJ	0.038 J
Bis(2-ethylhexyl)phthalate	mg/kg	0.38 UJ	0.37 UJ	0.062 J	0.41 UJ	0.098 J
Carbazole	mg/kg	0.38 UJ	0.37 UJ	0.37 UJ	0.41 UJ	0.34 U
Chrysene	mg/kg	0.38 UJ	0.082 J	0.069 J	0.41 UJ	0.045 J
Dibenzo(*a,h*)anthracene	mg/kg	0.38 UJ	0.37 UJ	0.37 UJ	0.41 UJ	0.34 U
Dibenzofuran	mg/kg	0.38 UJ	0.37 UJ	0.37 UJ	0.41 UJ	0.34 U
Fluoranthene	mg/kg	0.38 UJ	0.11 J	0.096 J	0.07 J	0.057 J
Fluorene	mg/kg	0.38 UJ	0.37 UJ	0.37 UJ	0.41 UJ	0.34 U
Indeno(1,2,3-*cd*)pyrene	mg/kg	0.38 UJ	0.37 UJ	0.37 UJ	0.41 UJ	0.34 U
Naphthalene	mg/kg	0.38 UJ	0.37 UJ	0.37 UJ	0.41 UJ	0.34 U
Phenanthrene	mg/kg	0.38 UJ	0.37 UJ	0.063 J	0.41 UJ	0.34 U
Pyrene	mg/kg	0.38 UJ	0.11 J	0.092 J	0.073 J	0.044 J

Table 4-29. Summary Data for Site-Related Semivolatiles in Explosives Handling Areas Aggregate Surface Soils at Load Line 3 [a] (continued)

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate
Station ID		**LL3ss-016**	**LL3ss-020**	**LL3ss-020**	**LL3ss-028**	**LL3ss-030**
Sample ID		**LL3SS-016-0179-SO**	**LL3SS-020-0183-SO**	**LL3SS-020-0184-FD**	**LL3SS-028-0194-SO**	**LL3SS-030-0196-SO**
Date		**07/24/1996**	**07/25/1996**	**07/25/1996**	**07/27/1996**	**07/26/1996**
Depth (ft)		**0 - 2**	**0 - 1**	**0 - 1**	**0 - 2**	**0 - 2**
Sample Type		**Grab Composite**	**Grab Composite**	**Field Duplicate**	**Grab Composite**	**Grab Composite**
Analyte	**Units**					
Semivolatile Organics						
2,4-Dinitrotoluene	mg/kg	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	mg/kg	NA	NA	NA	NA	NA
2-Methylnaphthalene	mg/kg	0.34 U	0.34 U	0.33 U	0.048 J	0.36 U
Acenaphthene	mg/kg	0.095 J	0.34 U	0.33 U	0.066 J	0.36 U
Acenaphthylene	mg/kg	0.054 J	0.34 U	0.33 U	0.058 J	0.36 U
Anthracene	mg/kg	0.32 J	0.34 U	0.33 U	0.16 J	0.36 U
Benzo(*a*)anthracene	mg/kg	1.2 =	0.34 U	0.33 U	0.64 =	0.039 J
Benzo(*a*)pyrene	mg/kg	1 =	0.34 U	0.33 U	0.88 =	0.36 U
Benzo(*b*)fluoranthene	mg/kg	1.1 =	0.34 U	0.33 U	0.83 =	0.042 J
Benzo(*g,h,i*)perylene	mg/kg	0.44 =	0.34 U	0.33 U	0.61 =	0.36 U
Benzo(*k*)fluoranthene	mg/kg	1 =	0.34 U	0.33 U	0.61 =	0.038 J
Bis(2-ethylhexyl)phthalate	mg/kg	0.34 U	0.44 =	0.33 U	0.37 U	0.36 U
Carbazole	mg/kg	0.25 J	0.34 U	0.33 U	0.11 J	0.36 U
Chrysene	mg/kg	1.5 =	0.34 U	0.33 U	0.67 =	0.046 J
Dibenzo(*a,h*)anthracene	mg/kg	0.25 J	0.34 U	0.33 U	0.15 J	0.36 U
Dibenzofuran	mg/kg	0.057 J	0.34 U	0.33 U	0.37 U	0.36 U
Fluoranthene	mg/kg	2.2 =	0.34 U	0.33 U	1.6 =	0.076 J
Fluorene	mg/kg	0.094 J	0.34 U	0.33 U	0.058 J	0.36 U
Indeno(1,2,3-*cd*)pyrene	mg/kg	0.46 =	0.34 U	0.33 U	0.59 =	0.36 U
Naphthalene	mg/kg	0.043 J	0.34 U	0.33 U	0.052 J	0.36 U
Phenanthrene	mg/kg	1.2 =	0.34 U	0.33 U	0.64 =	0.072 J
Pyrene	mg/kg	1.8 =	0.34 U	0.33 U	1.1 =	0.057 J

[a] Table presents both Phase I RI (1996 collection date) and Phase II RI (2001 collection date).
ID = Identification.
NA = Not analyzed.
= - Detected result.
J - Estimated result.
U - Not detected.

VOCs

Four VOCs (2-butanone, acetone, chlorometrane, and toluene) were detected in the surface soils associated with the Explosives Handling Areas Aggregate. 2-Butanone and chloromethane were eliminated as SRCs as they were detected at frequencies of less than 5%. Acetone and toluene were identified as SRCs. Acetone was detected in 2 of 26 samples and toluene was detected in 12 of 27 samples. All detected concentrations were reported at less than 1 mg/kg. Table 4-30 presents a summary of acetone and toluene concentrations identified.

Pesticides and PCBs

A total of 16 surface soil samples were analyzed for pesticide compounds and 71 surface soil samples were analyzed for PCB compounds within the Explosives Handling Areas Aggregate (Table 4-3).

Thirteen pesticide compounds were identified at least once in the surface samples collected. The most pervasive compound, being 4,4'-DDE, was detected in 5 of 16 samples. The highest concentration of 4,4'DDE was identified at station LL3-117 (0.55 mg/kg). Station LL3-117 also exhibited the highest detected concentrations of six additional pesticide compounds (Table 4-31). Phase I RI sampling station LL3ss-002 contained the highest detected concentrations of endrin (3.2 mg/kg), heptachlor epoxide (0.094 mg/kg), alpha-chlordane (0.59 mg/kg), and beta-benzene hexachloride (BHC) (0.03 mg/kg).

Station LL3-117 is located on the northwestern corner of the footprint of Building EB-4A while station LL3ss-002 is located south of Building EB-4. Table 4-31 provides a summary of all detected pesticides within Load Line 3 surface soils.

PCB-1254 and PCB-1260 were the only PCBs detected in the surface soil associated with the Explosives Handling Areas Aggregate. PCB-1254 was most pervasive, being identified in more than 50% of the samples collected. PCB-1260 was identified in less than 10% of samples collected. The highest concentration of PCB-1254 (1,100 mg/kg) was identified at sampling station LL3-102, which is located on the north side of Building EB-4. PCB-1260 was reported at the highest concentration of 1.4 mg/kg at station LL3-066, which is located southeast of Building EA-6A. Figure 4-19 illustrates the distribution of detected pesticides and PCBs within the Explosives Handling Areas Aggregate surface soils.

4.2.5.4 Packaging and Shipping Areas Aggregate

SVOCs and VOCs were analyzed on one sample collected from the Packaging and Shipping Areas Aggregate. Sampling station LL3-074 was located on the west side of Building EB-13B. PCBs were analyzed on seven surface soil samples collected from the Packaging and Shipping Areas Aggregate during the Phase II RI.

SVOCs

Twelve SVOC compounds were detected in the sample collected from station LL3-074. Figure 4-14 illustrates the surface soil sampling locations within the Packaging and Shipping Areas Aggregate and Table 4-32 provides a summary of detected semivolatile compounds.

VOCs

No VOCs were detected in the one sample submitted for VOC analysis.

Table 4-30. Summary Data for Site-Related VOCs in Explosives Handling Areas Aggregate Surface Soils at Load Line 3 [a]

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate
Station ID		**LL3-057**	**LL3-057**	**LL3-059**	**LL3-063**	**LL3-064**	**LL3-066**
Sample ID		**LL30693**	**LL31121**	**LL30699**	**LL30707**	**LL30710**	**LL30716**
Date		**07/31/2001**	**07/31/2001**	**07/31/2001**	**07/31/2001**	**07/31/2001**	**08/08/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Field Duplicate**	**Grab**	**Grab**	**Grab**	**Grab**
Analyte	**Units**						
Volatile Organics							
Acetone	mg/kg	0.022 U	0.022 U	0.021 U	0.022 U	0.023 U	0.023 UJ
Toluene	mg/kg	0.0055 U	0.0055 U	0.00076 J	0.0055 U	0.0057 U	0.0057 U

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate
Station ID		**LL3-070**	**LL3-083**	**LL3-086**	**LL3-088**	**LL3-097**	**LL3-097**
Sample ID		**LL30724**	**LL30763**	**LL30772**	**LL30778**	**LL30799**	**LL31119**
Date		**08/08/2001**	**08/06/2001**	**08/06/2001**	**08/06/2001**	**08/07/2001**	**08/07/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Field Duplicate**
Analyte	**Units**						
Volatile Organics							
Acetone	mg/kg	0.21 J	0.024 U	0.023 U	0.023 U	0.022 U	0.024 U
Toluene	mg/kg	0.0057 U	0.00066 J	0.0028 J	0.0058 U	0.00085 J	0.0059 U

Table 4-30. Summary Data for Site-Related VOCs in Explosives Handling Areas Aggregate Surface Soils at Load Line 3 [a] (continued)

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate
Station ID		**LL3-099**	**LL3-101**	**LL3-103**	**LL3-105**	**LL3-114**	**LL3-117**
Sample ID		**LL30805**	**LL30811**	**LL30817**	**LL30823**	**LL30842**	**LL30851**
Date		**08/07/2001**	**08/11/2001**	**08/07/2001**	**08/08/2001**	**08/08/2001**	**08/06/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**
Analyte	**Units**						
Volatile Organics							
Acetone	mg/kg	0.024 U	0.034 J	0.023 U	0.023 UJ	0.023 UJ	0.024 U
Toluene	mg/kg	0.006 U	0.0056 U	0.0059 U	0.0058 U	0.0057 U	0.0061 J

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate
Station ID		**LL3-121**	**LL3-127**	**LL3-127**	**LL3-132**	**LL3-135**	**LL3-153**
Sample ID		**LL30863**	**LL30875**	**LL31123**	**LL30890**	**LL30899**	**LL30951**
Date		**08/06/2001**	**08/07/2001**	**08/07/2001**	**08/10/2001**	**08/10/2001**	**08/13/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Field Duplicate**	**Grab**	**Grab**	**Grab**
Analyte	**Units**						
Volatile Organics							
Acetone	mg/kg	0.023 U	0.024 UJ	0.024 UJ	0.023 UJ	0.022 UJ	0.022 UJ
Toluene	mg/kg	0.001 J	0.002 J	0.0013 J	0.00081 J	0.0043 J	0.011 =

Table 4-30. Summary Data for Site-Related VOCs in Explosives Handling Areas Aggregate Surface Soils at Load Line 3 [a] (continued)

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate
Station ID		**LL3-222**	**LL3ss-002**	**LL3ss-016**	**LL3ss-020**	**LL3ss-020**	**LL3ss-028**
Sample ID		**LL31086**	**LL3SS-002-0162-SO**	**LL3SS-016-0179-SO**	**LL3SS-020-0183-SO**	**LL3SS-020-0184-FD**	**LL3SS-028-0194-SO**
Date		**08/07/2001**	**07/24/1996**	**07/24/1996**	**07/25/1996**	**07/25/1996**	**07/27/1996**
Depth (ft)		**0 - 1**	**0 - 2**	**0 - 2**	**0 - 1**	**0 - 1**	**0 - 2**
Sample Type		**Grab**	**Grab Composite**	**Grab Composite**	**Grab Composite**	**Field Duplicate**	**Grab Composite**
Analyte	**Units**						
Volatile Organics							
Acetone	mg/kg	0.025 U	0.005 U	0.005 UJ	0.005 UJ	0.005 UJ	0.006 R
Toluene	mg/kg	0.0063 U	0.014 J	0.005 UJ	0.005 UJ	0.017 J	0.006 UJ

Functional Area		Explosives Handling Areas Aggregate
Station ID		**LL3ss-030**
Sample ID		**LL3SS-030-0196-SO**
Date		**07/26/1996**
Depth (ft)		**0 - 2**
Sample Type		**Grab Composite**
Analyte	**Units**	
Volatile Organics		
Acetone	mg/kg	0.005 U
Toluene	mg/kg	0.038 J

[a] Table presents both Phase I RI (1996 collection date) and Phase II RI (2001 collection date).
ID = Identification.
= - Detected result.
J - Estimated result.
U - Not detected.

Table 4-31. Summary Data for Site-Related Pesticides and PCBs in Explosives Handling Areas Aggregate Surface Soils at Load Line 3 [a]

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate
Station ID		**LL3-057**	**LL3-057**	**LL3-058**	**LL3-059**	**LL3-060**	**LL3-063**
Sample ID		**LL30693**	**LL31121**	**LL30696**	**LL30699**	**LL30702**	**LL30707**
Date		**07/31/2001**	**07/31/2001**	**07/31/2001**	**07/31/2001**	**07/31/2001**	**07/31/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Field Duplicate**	**Grab**	**Grab**	**Grab**	**Grab**
Analyte	**Units**						
Pesticides and PCBs							
4,4'-DDE	mg/kg	0.19 U	0.093 U	NA	0.011 J	NA	NA
4,4'-DDT	mg/kg	0.19 U	0.093 U	NA	0.0036 U	NA	NA
Dieldrin	mg/kg	0.19 U	0.093 U	NA	0.004 J	NA	NA
Endosulfan Sulfate	mg/kg	0.19 U	0.093 U	NA	0.0036 U	NA	NA
Endrin	mg/kg	0.19 U	0.093 U	NA	0.0036 U	NA	NA
Endrin Aldehyde	mg/kg	0.19 U	0.093 U	NA	0.019 =	NA	NA
Endrin Ketone	mg/kg	0.19 UJ	0.093 UJ	NA	0.0036 UJ	NA	NA
Heptachlor	mg/kg	0.19 U	0.093 U	NA	0.011 =	NA	NA
Heptachlor Epoxide	mg/kg	0.19 U	0.093 U	NA	0.0036 U	NA	NA
PCB-1254	mg/kg	0.51 =	0.095 =	160 =	0.55 J	4 =	14 =
PCB-1260	mg/kg	0.036 U	0.036 U	38 UJ	0.035 U	0.72 UJ	3.7 UJ
alpha-Chlordane	mg/kg	0.19 U	0.093 U	NA	0.0036 U	NA	NA
beta-BHC	mg/kg	0.19 U	0.093 U	NA	0.0036 U	NA	NA
gamma-Chlordane	mg/kg	0.19 U	0.093 U	NA	0.0041 J	NA	NA

Table 4-31. Summary Data for Site-Related Pesticides and PCBs in Explosives Handling Areas Aggregate Surface Soils at Load Line 3 [a] (continued)

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate
Station ID		**LL3-064**	**LL3-065**	**LL3-065**	**LL3-066**	**LL3-067**	**LL3-070**
Sample ID		**LL30710**	**LL30713**	**LL31129**	**LL30716**	**LL30719**	**LL30724**
Date		**07/31/2001**	**08/07/2001**	**08/07/2001**	**08/08/2001**	**07/31/2001**	**08/08/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Field Duplicate**	**Grab**	**Grab**	**Grab**
Analyte	**Units**						
Pesticides and PCBs							
4,4'-DDE	mg/kg	0.0039 U	NA	NA	NA	NA	NA
4,4'-DDT	mg/kg	0.0039 U	NA	NA	NA	NA	NA
Dieldrin	mg/kg	0.0039 U	NA	NA	NA	NA	NA
Endosulfan Sulfate	mg/kg	0.0039 U	NA	NA	NA	NA	NA
Endrin	mg/kg	0.0039 U	NA	NA	NA	NA	NA
Endrin Aldehyde	mg/kg	0.0039 U	NA	NA	NA	NA	NA
Endrin Ketone	mg/kg	0.0039 UJ	NA	NA	NA	NA	NA
Heptachlor	mg/kg	0.0039 U	NA	NA	NA	NA	NA
Heptachlor Epoxide	mg/kg	0.0039 U	NA	NA	NA	NA	NA
PCB-1254	mg/kg	0.13 =	1.3 =	1.1 =	0.38 U	5.6 =	0.037 U
PCB-1260	mg/kg	0.037 U	0.39 U	0.39 U	1.4 =	0.35 UJ	0.037 U
alpha-Chlordane	mg/kg	0.0039 U	NA	NA	NA	NA	NA
beta-BHC	mg/kg	0.0039 U	NA	NA	NA	NA	NA
gamma-Chlordane	mg/kg	0.0039 U	NA	NA	NA	NA	NA

Table 4-31. Summary Data for Site-Related Pesticides and PCBs in Explosives Handling Areas Aggregate Surface Soils at Load Line 3 [a] (continued)

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate
Station ID		**LL3-078**	**LL3-079**	**LL3-083**	**LL3-084**	**LL3-085**	**LL3-086**
Sample ID		**LL30748**	**LL30751**	**LL30763**	**LL30766**	**LL30769**	**LL30772**
Date		**08/11/2001**	**08/10/2001**	**08/06/2001**	**08/11/2001**	**08/06/2001**	**08/06/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**
Analyte	**Units**						
Pesticides and PCBs							
4,4'-DDE	mg/kg	NA	NA	NA	NA	NA	0.0097 U
4,4'-DDT	mg/kg	NA	NA	NA	NA	NA	0.0097 U
Dieldrin	mg/kg	NA	NA	NA	NA	NA	0.0097 UJ
Endosulfan Sulfate	mg/kg	NA	NA	NA	NA	NA	0.0097 U
Endrin	mg/kg	NA	NA	NA	NA	NA	0.0097 UJ
Endrin Aldehyde	mg/kg	NA	NA	NA	NA	NA	0.0097 U
Endrin Ketone	mg/kg	NA	NA	NA	NA	NA	0.0097 U
Heptachlor	mg/kg	NA	NA	NA	NA	NA	0.0097 U
Heptachlor Epoxide	mg/kg	NA	NA	NA	NA	NA	0.0097 UJ
PCB-1254	mg/kg	0.037 U	0.035 U	0.17 =	0.12 J	3.9 =	0.038 U
PCB-1260	mg/kg	0.099 =	0.035 U	0.039 U	0.04 U	0.83 U	0.038 U
alpha-Chlordane	mg/kg	NA	NA	NA	NA	NA	0.0097 UJ
beta-BHC	mg/kg	NA	NA	NA	NA	NA	0.0097 U
gamma-Chlordane	mg/kg	NA	NA	NA	NA	NA	0.0097 UJ

Table 4-31. Summary Data for Site-Related Pesticides and PCBs in Explosives Handling Areas Aggregate Surface Soils at Load Line 3 [a] (continued)

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate
Station ID		**LL3-087**	**LL3-088**	**LL3-089**	**LL3-090**	**LL3-090**	**LL3-091**
Sample ID		**LL30775**	**LL30778**	**LL30781**	**LL30784**	**LL31127**	**LL30787**
Date		**08/06/2001**	**08/06/2001**	**08/06/2001**	**08/01/2001**	**08/01/2001**	**08/11/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**	**Field Duplicate**	**Grab**
Analyte	**Units**						
Pesticides and PCBs							
4,4'-DDE	mg/kg	NA	NA	NA	NA	NA	NA
4,4'-DDT	mg/kg	NA	NA	NA	NA	NA	NA
Dieldrin	mg/kg	NA	NA	NA	NA	NA	NA
Endosulfan Sulfate	mg/kg	NA	NA	NA	NA	NA	NA
Endrin	mg/kg	NA	NA	NA	NA	NA	NA
Endrin Aldehyde	mg/kg	NA	NA	NA	NA	NA	NA
Endrin Ketone	mg/kg	NA	NA	NA	NA	NA	NA
Heptachlor	mg/kg	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	mg/kg	NA	NA	NA	NA	NA	NA
PCB-1254	mg/kg	0.037 U	1.8 =	0.14 =	0.052 =	0.036 U	0.038 U
PCB-1260	mg/kg	0.037 U	0.38 U	0.039 U	0.036 UJ	0.09 J	0.075 =
alpha-Chlordane	mg/kg	NA	NA	NA	NA	NA	NA
beta-BHC	mg/kg	NA	NA	NA	NA	NA	NA
gamma-Chlordane	mg/kg	NA	NA	NA	NA	NA	NA

Table 4-31. Summary Data for Site-Related Pesticides and PCBs in Explosives Handling Areas Aggregate Surface Soils at Load Line 3 [a] (continued)

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate
Station ID		**LL3-092**	**LL3-093**	**LL3-097**	**LL3-097**	**LL3-098**	**LL3-099**
Sample ID		**LL30790**	**LL30793**	**LL30799**	**LL31119**	**LL30802**	**LL30805**
Date		**08/07/2001**	**08/06/2001**	**08/07/2001**	**08/07/2001**	**08/07/2001**	**08/07/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Grab**	**Field Duplicate**	**Grab**	**Grab**
Analyte	**Units**						
Pesticides and PCBs							
4,4'-DDE	mg/kg	NA	NA	0.0037 U	0.004 U	NA	NA
4,4'-DDT	mg/kg	NA	NA	0.0037 U	0.004 U	NA	NA
Dieldrin	mg/kg	NA	NA	0.0037 U	0.004 U	NA	NA
Endosulfan Sulfate	mg/kg	NA	NA	0.0037 U	0.004 U	NA	NA
Endrin	mg/kg	NA	NA	0.0037 U	0.004 UJ	NA	NA
Endrin Aldehyde	mg/kg	NA	NA	0.0037 U	0.004 U	NA	NA
Endrin Ketone	mg/kg	NA	NA	0.0037 U	0.004 U	NA	NA
Heptachlor	mg/kg	NA	NA	0.0037 U	0.004 U	NA	NA
Heptachlor Epoxide	mg/kg	NA	NA	0.0037 U	0.004 U	NA	NA
PCB-1254	mg/kg	20 =	0.039 U	0.036 U	0.039 U	0.039 U	0.18 =
PCB-1260	mg/kg	4.1 U	0.039 U	0.036 U	0.039 U	0.039 U	0.04 U
alpha-Chlordane	mg/kg	NA	NA	0.0037 U	0.0083 J	NA	NA
beta-BHC	mg/kg	NA	NA	0.0037 U	0.016 J	NA	NA
gamma-Chlordane	mg/kg	NA	NA	0.0037 U	0.004 U	NA	NA

Table 4-31. Summary Data for Site-Related Pesticides and PCBs in Explosives Handling Areas Aggregate Surface Soils at Load Line 3 [a] (continued)

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate
Station ID		**LL3-100**	**LL3-101**	**LL3-102**	**LL3-103**	**LL3-104**	**LL3-105**
Sample ID		**LL30808**	**LL30811**	**LL30814**	**LL30817**	**LL30820**	**LL30823**
Date		**08/07/2001**	**08/11/2001**	**08/07/2001**	**08/07/2001**	**08/08/2001**	**08/08/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**
Analyte	**Units**						
Pesticides and PCBs							
4,4'-DDE	mg/kg	NA	0.095 U	NA	NA	NA	0.07 =
4,4'-DDT	mg/kg	NA	0.095 U	NA	NA	NA	0.02 U
Dieldrin	mg/kg	NA	0.095 U	NA	NA	NA	0.02 UJ
Endosulfan Sulfate	mg/kg	NA	0.095 U	NA	NA	NA	0.02 U
Endrin	mg/kg	NA	0.095 U	NA	NA	NA	0.02 UJ
Endrin Aldehyde	mg/kg	NA	0.095 U	NA	NA	NA	0.02 U
Endrin Ketone	mg/kg	NA	0.095 U	NA	NA	NA	0.02 U
Heptachlor	mg/kg	NA	0.095 U	NA	NA	NA	0.02 U
Heptachlor Epoxide	mg/kg	NA	0.095 U	NA	NA	NA	0.02 UJ
PCB-1254	mg/kg	0.041 U	0.18 U	1100 =	38 =	2.3 =	0.82 =
PCB-1260	mg/kg	0.041 U	0.87 =	78 U	3.9 U	0.4 U	0.19 U
alpha-Chlordane	mg/kg	NA	0.095 U	NA	NA	NA	0.02 UJ
beta-BHC	mg/kg	NA	0.095 U	NA	NA	NA	0.02 U
gamma-Chlordane	mg/kg	NA	0.095 U	NA	NA	NA	0.02 UJ

Table 4-31. Summary Data for Site-Related Pesticides and PCBs in Explosives Handling Areas Aggregate Surface Soils at Load Line 3 [a] (continued)

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate
Station ID		**LL3-106**	**LL3-111**	**LL3-112**	**LL3-112**	**LL3-113**	**LL3-114**
Sample ID		**LL30826**	**LL30833**	**LL30836**	**LL31128**	**LL30839**	**LL30842**
Date		**08/08/2001**	**08/08/2001**	**08/07/2001**	**08/07/2001**	**08/07/2001**	**08/08/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Grab**	**Field Duplicate**	**Grab**	**Grab**
Analyte	**Units**						
Pesticides and PCBs							
4,4'-DDE	mg/kg	NA	NA	NA	NA	NA	NA
4,4'-DDT	mg/kg	NA	NA	NA	NA	NA	NA
Dieldrin	mg/kg	NA	NA	NA	NA	NA	NA
Endosulfan Sulfate	mg/kg	NA	NA	NA	NA	NA	NA
Endrin	mg/kg	NA	NA	NA	NA	NA	NA
Endrin Aldehyde	mg/kg	NA	NA	NA	NA	NA	NA
Endrin Ketone	mg/kg	NA	NA	NA	NA	NA	NA
Heptachlor	mg/kg	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	mg/kg	NA	NA	NA	NA	NA	NA
PCB-1254	mg/kg	100 =	3.7 U	0.2 J	0.24 J	0.64 =	0.037 U
PCB-1260	mg/kg	7.9 U	3.7 U	0.038 U	0.077 U	0.19 U	0.037 U
alpha-Chlordane	mg/kg	NA	NA	NA	NA	NA	NA
beta-BHC	mg/kg	NA	NA	NA	NA	NA	NA
gamma-Chlordane	mg/kg	NA	NA	NA	NA	NA	NA

Table 4-31. Summary Data for Site-Related Pesticides and PCBs in Explosives Handling Areas Aggregate Surface Soils at Load Line 3 [a] (continued)

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate
Station ID		**LL3-115**	**LL3-116**	**LL3-117**	**LL3-118**	**LL3-119**	**LL3-120**
Sample ID		**LL30845**	**LL30848**	**LL30851**	**LL30854**	**LL30857**	**LL30860**
Date		**08/08/2001**	**08/08/2001**	**08/06/2001**	**08/07/2001**	**08/07/2001**	**08/06/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**
Analyte	**Units**						
Pesticides and PCBs							
4,4'-DDE	mg/kg	NA	NA	0.55 J	NA	NA	NA
4,4'-DDT	mg/kg	NA	NA	0.1 U	NA	NA	NA
Dieldrin	mg/kg	NA	NA	1.2 J	NA	NA	NA
Endosulfan Sulfate	mg/kg	NA	NA	0.51 =	NA	NA	NA
Endrin	mg/kg	NA	NA	0.1 UJ	NA	NA	NA
Endrin Aldehyde	mg/kg	NA	NA	0.51 =	NA	NA	NA
Endrin Ketone	mg/kg	NA	NA	0.1 U	NA	NA	NA
Heptachlor	mg/kg	NA	NA	0.18 =	NA	NA	NA
Heptachlor Epoxide	mg/kg	NA	NA	0.1 UJ	NA	NA	NA
PCB-1254	mg/kg	0.036 U	0.037 U	15 =	0.19 U	0.12 =	0.039 U
PCB-1260	mg/kg	0.036 U	0.037 U	2 U	0.39 =	0.039 U	0.14 J
alpha-Chlordane	mg/kg	NA	NA	0.1 UJ	NA	NA	NA
beta-BHC	mg/kg	NA	NA	0.1 U	NA	NA	NA
gamma-Chlordane	mg/kg	NA	NA	0.14 J	NA	NA	NA

Table 4-31. Summary Data for Site-Related Pesticides and PCBs in Explosives Handling Areas Aggregate Surface Soils at Load Line 3 [a] (continued)

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate
Station ID		**LL3-121**	**LL3-122**	**LL3-126**	**LL3-127**	**LL3-127**	**LL3-128**
Sample ID		**LL30863**	**LL30866**	**LL30872**	**LL30875**	**LL31123**	**LL30878**
Date		**08/06/2001**	**08/01/2001**	**08/07/2001**	**08/07/2001**	**08/07/2001**	**08/07/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**	**Field Duplicate**	**Grab**
Analyte	**Units**						
Pesticides and PCBs							
4,4'-DDE	mg/kg	0.004 U	NA	NA	NA	NA	NA
4,4'-DDT	mg/kg	0.004 U	NA	NA	NA	NA	NA
Dieldrin	mg/kg	0.004 U	NA	NA	NA	NA	NA
Endosulfan Sulfate	mg/kg	0.004 U	NA	NA	NA	NA	NA
Endrin	mg/kg	0.004 U	NA	NA	NA	NA	NA
Endrin Aldehyde	mg/kg	0.004 U	NA	NA	NA	NA	NA
Endrin Ketone	mg/kg	0.004 U	NA	NA	NA	NA	NA
Heptachlor	mg/kg	0.004 U	NA	NA	NA	NA	NA
Heptachlor Epoxide	mg/kg	0.004 U	NA	NA	NA	NA	NA
PCB-1254	mg/kg	0.06 J	0.28 J	0.33 =	0.079 J	0.082 J	44 =
PCB-1260	mg/kg	0.038 U	0.036 U	0.18 U	0.039 U	0.039 U	3.6 U
alpha-Chlordane	mg/kg	0.004 U	NA	NA	NA	NA	NA
beta-BHC	mg/kg	0.004 U	NA	NA	NA	NA	NA
gamma-Chlordane	mg/kg	0.004 U	NA	NA	NA	NA	NA

Table 4-31. Summary Data for Site-Related Pesticides and PCBs in Explosives Handling Areas Aggregate Surface Soils at Load Line 3 [a] (continued)

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate
Station ID		**LL3-129**	**LL3-130**	**LL3-131**	**LL3-132**	**LL3-133**	**LL3-134**
Sample ID		**LL30881**	**LL30884**	**LL30887**	**LL30890**	**LL30893**	**LL30896**
Date		**08/06/2001**	**08/06/2001**	**08/06/2001**	**08/10/2001**	**08/10/2001**	**08/10/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**
Analyte	**Units**						
Pesticides and PCBs							
4,4'-DDE	mg/kg	NA	NA	NA	0.018 J	NA	NA
4,4'-DDT	mg/kg	NA	NA	NA	0.0039 U	NA	NA
Dieldrin	mg/kg	NA	NA	NA	0.039 J	NA	NA
Endosulfan Sulfate	mg/kg	NA	NA	NA	0.0039 U	NA	NA
Endrin	mg/kg	NA	NA	NA	0.0039 U	NA	NA
Endrin Aldehyde	mg/kg	NA	NA	NA	0.0054 J	NA	NA
Endrin Ketone	mg/kg	NA	NA	NA	0.014 J	NA	NA
Heptachlor	mg/kg	NA	NA	NA	0.0039 U	NA	NA
Heptachlor Epoxide	mg/kg	NA	NA	NA	0.0039 U	NA	NA
PCB-1254	mg/kg	0.3 J	0.33 =	0.077 =	0.58 =	0.046 =	0.036 U
PCB-1260	mg/kg	0.036 U	0.077 U	0.039 U	0.19 U	0.036 U	0.036 U
alpha-Chlordane	mg/kg	NA	NA	NA	0.0039 U	NA	NA
beta-BHC	mg/kg	NA	NA	NA	0.0039 U	NA	NA
gamma-Chlordane	mg/kg	NA	NA	NA	0.0072 J	NA	NA

Table 4-31. Summary Data for Site-Related Pesticides and PCBs in Explosives Handling Areas Aggregate Surface Soils at Load Line 3 [a] (continued)

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate
Station ID		**LL3-135**	**LL3-153**	**LL3-153**	**LL3-154**	**LL3-157**	**LL3-158**
Sample ID		**LL30899**	**LL30951**	**LL31134**	**LL30954**	**LL30963**	**LL30966**
Date		**08/10/2001**	**08/13/2001**	**08/13/2001**	**08/13/2001**	**08/13/2001**	**08/13/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Field Duplicate**	**Grab**	**Grab**	**Grab**
Analyte	**Units**						
Pesticides and PCBs							
4,4'-DDE	mg/kg	NA	NA	NA	NA	NA	NA
4,4'-DDT	mg/kg	NA	NA	NA	NA	NA	NA
Dieldrin	mg/kg	NA	NA	NA	NA	NA	NA
Endosulfan Sulfate	mg/kg	NA	NA	NA	NA	NA	NA
Endrin	mg/kg	NA	NA	NA	NA	NA	NA
Endrin Aldehyde	mg/kg	NA	NA	NA	NA	NA	NA
Endrin Ketone	mg/kg	NA	NA	NA	NA	NA	NA
Heptachlor	mg/kg	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	mg/kg	NA	NA	NA	NA	NA	NA
PCB-1254	mg/kg	0.062 =	7.1 =	10 =	0.046 J	1.3 =	0.046 J
PCB-1260	mg/kg	0.037 U	0.37 U	0.74 U	0.037 U	0.37 U	0.036 U
alpha-Chlordane	mg/kg	NA	NA	NA	NA	NA	NA
beta-BHC	mg/kg	NA	NA	NA	NA	NA	NA
gamma-Chlordane	mg/kg	NA	NA	NA	NA	NA	NA

Table 4-31. Summary Data for Site-Related Pesticides and PCBs in Explosives Handling Areas Aggregate Surface Soils at Load Line 3 [a] (continued)

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate
Station ID		**LL3-159**	**LL3-160**	**LL3-161**	**LL3-175**	**LL3-220**	**LL3-221**
Sample ID		**LL30969**	**LL30972**	**LL30975**	**LL31001**	**LL31075**	**LL31081**
Date		**08/13/2001**	**08/13/2001**	**08/13/2001**	**08/09/2001**	**08/07/2001**	**08/07/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**
Analyte	**Units**						
Pesticides and PCBs							
4,4'-DDE	mg/kg	NA	NA	NA	NA	NA	NA
4,4'-DDT	mg/kg	NA	NA	NA	NA	NA	NA
Dieldrin	mg/kg	NA	NA	NA	NA	NA	NA
Endosulfan Sulfate	mg/kg	NA	NA	NA	NA	NA	NA
Endrin	mg/kg	NA	NA	NA	NA	NA	NA
Endrin Aldehyde	mg/kg	NA	NA	NA	NA	NA	NA
Endrin Ketone	mg/kg	NA	NA	NA	NA	NA	NA
Heptachlor	mg/kg	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	mg/kg	NA	NA	NA	NA	NA	NA
PCB-1254	mg/kg	0.16 =	0.056 =	0.51 J	0.039 U	0.86 J	0.13 =
PCB-1260	mg/kg	0.038 U	0.04 U	0.036 U	0.039 UJ	0.15 U	0.04 U
alpha-Chlordane	mg/kg	NA	NA	NA	NA	NA	NA
beta-BHC	mg/kg	NA	NA	NA	NA	NA	NA
gamma-Chlordane	mg/kg	NA	NA	NA	NA	NA	NA

Table 4-31. Summary Data for Site-Related Pesticides and PCBs in Explosives Handling Areas Aggregate Surface Soils at Load Line 3 [a] (continued)

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate
Station ID		**LL3-222**	**LL3ss-002**	**LL3ss-016**	**LL3ss-020**	**LL3ss-020**	**LL3ss-028**
Sample ID		**LL31086**	**LL3SS-002-0162-SO**	**LL3SS-016-0179-SO**	**LL3SS-020-0183-SO**	**LL3SS-020-0184-FD**	**LL3SS-028-0194-SO**
Date		**08/07/2001**	**07/24/1996**	**07/24/1996**	**07/25/1996**	**07/25/1996**	**07/27/1996**
Depth (ft)		**0 - 1**	**0 - 2**	**0 - 2**	**0 - 1**	**0 - 1**	**0 - 2**
Sample Type		**Grab**	**Grab Composite**	**Grab Composite**	**Grab Composite**	**Field Duplicate**	**Grab Composite**
Analyte	**Units**						
Pesticides and PCBs							
4,4'-DDE	mg/kg	0.0021 U	0.0026 U	0.0026 U	0.0026 U	0.0025 U	0.0038 J
4,4'-DDT	mg/kg	0.0021 U	0.0026 U	0.011 J	0.0026 UJ	0.0025 UJ	0.0028 UJ
Dieldrin	mg/kg	0.0021 U	0.0026 U	0.0026 U	0.0026 U	0.0025 U	0.0028 U
Endosulfan Sulfate	mg/kg	0.0021 U	0.0026 U	0.0026 U	0.0026 U	0.0025 U	0.0028 UJ
Endrin	mg/kg	0.0021 U	3.2 =	0.01 J	0.0026 U	0.0025 U	0.0028 UJ
Endrin Aldehyde	mg/kg	0.0021 U	0.0026 U	0.0026 U	0.0026 U	0.0025 U	0.0028 UJ
Endrin Ketone	mg/kg	0.0021 U	0.0026 U	0.0026 U	0.0026 UJ	0.0025 UJ	0.0028 UJ
Heptachlor	mg/kg	0.0021 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0015 UJ
Heptachlor Epoxide	mg/kg	0.0021 U	0.094 J	0.0013 U	0.0013 U	0.0013 U	0.0015 U
PCB-1254	mg/kg	0.041 U	21 =	0.069 U	0.068 U	0.067 U	0.17 =
PCB-1260	mg/kg	0.041 U	0.068 U	0.069 U	0.068 U	0.067 U	0.075 U
alpha-Chlordane	mg/kg	0.0021 U	0.59 J	0.0013 U	0.0013 U	0.0013 U	0.0015 U
beta-BHC	mg/kg	0.0021 U	0.03 J	0.0013 U	0.0013 U	0.0013 U	0.0015 U
gamma-Chlordane	mg/kg	0.0021 U	0.11 J	0.0013 U	0.0013 U	0.0013 U	0.0015 U

Table 4-31. Summary Data for Site-Related Pesticides and PCBs in Explosives Handling Areas Aggregate Surface Soils at Load Line 3 [a] (continued)

Functional Area		Explosives Handling Areas Aggregate
Station ID		**LL3ss-030**
Sample ID		**LL3SS-030-0196-SO**
Date		**07/26/1996**
Depth (ft)		**0 - 2**
Sample Type		**Grab Composite**
Analyte	**Units**	
Pesticides and PCBs		
4,4'-DDE	mg/kg	0.0027 U
4,4'-DDT	mg/kg	0.0027 UJ
Dieldrin	mg/kg	0.0027 U
Endosulfan Sulfate	mg/kg	0.0027 U
Endrin	mg/kg	0.0027 U
Endrin Aldehyde	mg/kg	0.0027 U
Endrin Ketone	mg/kg	0.0027 UJ
Heptachlor	mg/kg	0.0014 U
Heptachlor Epoxide	mg/kg	0.0014 U
PCB-1254	mg/kg	0.074 U
PCB-1260	mg/kg	0.074 U
alpha-Chlordane	mg/kg	0.0014 U
beta-BHC	mg/kg	0.0014 U
gamma-Chlordane	mg/kg	0.0014 U

[a] Table presents both Phase I RI (1996 collection date) and Phase II RI (2001 collection date).
DDE = Dichlorodiphenyldichloroethylene.
DDT = Dichlorodiphenytrichloroethane.
ID = Identification.
NA = Not analyzed.
PCB = Polychlorinated biphenyl.
= - Detected result.
J - Estimated result.
U - Not detected.

Table 4-32. Summary Data for Site-Related SVOCs in Packaging and Shipping Area Surface Soils at Load Line 3[a]

Functional Area		Packaging and Shipping Areas Aggregate	Packaging and Shipping Areas Aggregate
Station ID		**LL3-074**	**LL3-074**
Sample ID		**LL30736**	**LL31124**
Date		**08/09/2001**	**08/09/2001**
Depth (ft)		**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Field Duplicate**
Analyte	**Units**		
Semivolatile Organics			
2,4-Dinitrotoluene	mg/kg	0.39 UJ	0.39 UJ
Benzo(*a*)anthracene	mg/kg	0.17 J	0.2 J
Benzo(*a*)pyrene	mg/kg	0.21 J	0.21 J
Benzo(*b*)fluoranthene	mg/kg	0.32 J	0.34 J
Benzo(*g,h,i*)perylene	mg/kg	0.099 J	0.12 J
Benzo(*k*)fluoranthene	mg/kg	0.12 J	0.1 J
Benzoic Acid	mg/kg	0.21 J	1.9 UJ
Chrysene	mg/kg	0.2 J	0.28 J
Fluoranthene	mg/kg	0.44 J	0.52 J
Fluorene	mg/kg	0.074 J	0.39 UJ
Indeno(1,2,3-*cd*)pyrene	mg/kg	0.1 J	0.11 J
Phenanthrene	mg/kg	0.26 J	0.3 J
Pyrene	mg/kg	0.49 J	0.5 J

[a] All data from the Phase II (2001) investigation.
ID = Identification.
SVOC = Semivolatile organic compound.
= = Detected result.
J = Estimated result.
U = Not detected.

Pesticides and PCBs

PCB-1254 was the only pesticide or PCB detected in the seven surface soil samples for the Packaging and Shipping Areas Aggregate. PCB-1254 was detected in samples from six stations with concentrations ranging from .046 to 91 mg/kg (Table 4-33). Figures 4-19, 4-20, and 4-21 illustrate the distribution of PCBs in the Load Line 3 surface soils.

4.2.5.5 DLA Storage Tanks Area Aggregate

Of the 16 Phase I and Phase II surface soil samples collected from the DLA Storage Tanks Area Aggregate, 5 were submitted for analysis of SVOCs, VOCs, and pesticides/PCBs. Submitted samples include stations LL3-182 through LL3-185 from the Phase II RI and station LL3ss-043 from the Phase I RI.

SVOCs

A total of eight SVOC compounds were detected in the five surface soil samples. Four were detected in the sample collected from station LL3-185. Fluoranthene, benzo(*b*)fluoranthene, pyrene, and chrysene, were each detected at concentrations less than the laboratory method detection limit (MDL), but above the practical quantitation limit. Station LL3-185 is located near the northern extent of the DLA storage tank area. Figures 4-15 and 4-16 illustrate the surface soil sampling locations associated with the DLA Storage Tanks Area Aggregate along with the detected concentrations of SVOCs. Table 4-34 provides a summary of detected compounds and concentrations.

VOCs

No VOCs were detected in any of the surface soil samples collected for the DLA Storage Tanks Area Aggregate.

Pesticides and PCBs

Dieldrin, detected at a low concentration (0.0094 mg/kg), was the only pesticide or PCB found in five samples. It was detected in LL3-182.

4.2.5.6 West Ditches Aggregate

SVOCs

A total of five surface soil/dry ditch sediment samples were collected from the West Ditches Aggregate and analyzed for SVOCs. As presented in Table 4-3, 18 semivolatile compounds were detected across the aggregate and retained as SRCs. Benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*g,h,i*)perylene, fluoranthene, phenanthrene, and pyrene were detected at the highest frequency being detected in five of five samples collected. Acenaphthalene, benzoic acid, and dibenzofuran were detected at the least frequency with one detection each. Table 4-35 presents a summary of all detected SVOCs in the West Ditches Aggregate.

Although several SVOCs were detected in each sample collected, station LL3-049(p2), which was located in the southernmost West Ditch (Figure 4-15) just northwest of Building EB-22, contained the highest concentration of 15 of the 18 SVOCs detected. All SVOCs detected at sample stations LL3sd/dw-048(d) and LL3-047(p2) were reported at less than 1 mg/kg each.

Table 4-33. Summary Data for Site-Related Pesticides and PCBs in Packaging and Shipping Areas Aggregate Surface Soils at Load Line 3[a]

Functional Area		Packaging and Shipping Areas Aggregate	Packaging and Shipping Areas Aggregate	Packaging and Shipping Areas Aggregate	Packaging and Shipping Areas Aggregate	Packaging and Shipping Areas Aggregate
Station ID		**LL3-071**	**LL3-072**	**LL3-073**	**LL3-074**	**LL3-074**
Sample ID		**LL30727**	**LL30730**	**LL30733**	**LL30736**	**LL31124**
Date		**08/08/2001**	**08/09/2001**	**08/09/2001**	**08/09/2001**	**08/09/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**	**Field Duplicate**
Analyte	**Units**					
Pesticides and PCBs						
PCB-1254	mg/kg	0.093 J	0.046 =	0.54 =	0.1 =	0.12 =

Functional Area		Packaging and Shipping Areas Aggregate	Packaging and Shipping Areas Aggregate	Packaging and Shipping Areas Aggregate	Packaging and Shipping Areas Aggregate
Station ID		**LL3-075**	**LL3-076**	**LL3-077**	**LL3-077**
Sample ID		**LL30739**	**LL30742**	**LL30745**	**LL31131**
Date		**08/09/2001**	**08/09/2001**	**08/10/2001**	**08/10/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Grab**	**Field Duplicate**
Analyte	**Units**				
Pesticides and PCBs					
PCB-1254	mg/kg	0.037 U	0.5 =	91 =	90 =

[a] All data from the Phase II (2001) investigation.
ID = Identification.
PCB = Polychlorinated biphenyl.
= - Detected result.
J - Estimated result.
U - Not detected.

Table 4-34. Summary Data for Site-Related SVOCs in DLA Storage Tank Aggregate Surface Soils at Load Line 3 [a]

Functional Area		DLA Tanks Aggregate	DLA Tanks Aggregate	DLA Tanks Aggregate	DLA Tanks Aggregate	DLA Tanks Aggregate
Station ID		**LL3-182**	**LL3-183**	**LL3-184**	**LL3-185**	**LL3ss-043**
Sample ID		**LL31008**	**LL31009**	**LL31010**	**LL31011**	**LL3SS-043-0210-SO**
Date		**08/10/2001**	**08/10/2001**	**08/10/2001**	**08/10/2001**	**08/20/1996**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**	**Grab Composite**
Analyte	**Units**					
Semivolatile Organics						
Benz(*a*)anthracene	mg/kg	0.38 UJ	0.37 UJ	0.37 UJ	0.39 UJ	0.082 J
Benzo(*a*)pyrene	mg/kg	0.38 UJ	0.37 UJ	0.37 UJ	0.39 UJ	0.054 J
Benzo(*b*)fluoranthene	mg/kg	0.38 UJ	0.37 UJ	0.37 UJ	0.079 J	0.054 J
Benzo(*k*)fluoranthene	mg/kg	0.38 UJ	0.37 UJ	0.37 UJ	0.39 UJ	0.05 J
Chrysene	mg/kg	0.38 UJ	0.37 UJ	0.37 UJ	0.075 J	0.083 J
Fluoranthene	mg/kg	0.38 UJ	0.37 UJ	0.37 UJ	0.073 J	0.13 J
Phenanthrene	mg/kg	0.38 UJ	0.37 UJ	0.37 UJ	0.39 UJ	0.074 J
Pyrene	mg/kg	0.38 UJ	0.37 UJ	0.37 UJ	0.08 J	0.089 J

[a] Table presents both Phase I RI (1996 collection date) and Phase II RI (2001 collection date).
DLA = Defense Logistics Agency.
ID = Identification.
SVOC = Semivolatile organic compound.
= = Detected result.
J = Estimated result.
U = Not detected.

Table 4-35. Summary Data for Site-Related SVOCs in West Ditch Aggregate Surface Soil/Dry Ditch Sediment at Load Line 3[a]

Functional Area		West Ditches Aggregate	West Ditches Aggregate	West Ditches Aggregate	West Ditches Aggregate	West Ditches Aggregate
Station ID		**LL3-046(p2)**	**LL3-047(p2)**	**LL3-049(p2)**	**LL3-050(p2)**	**LL3sd/sw-048(d)**
Sample ID		**LL31065**	**LL31069**	**LL31082**	**LL31084**	**LL31077**
Date		**08/08/2001**	**08/08/2001**	**08/08/2001**	**08/08/2001**	**08/08/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**	**Grab**
Analyte	**Units**					
Semivolatile Organics						
2,4-Dinitrotoluene	mg/kg	0.4 UJ	0.42 UJ	0.44 UJ	0.84 UJ	0.41 UJ
Acenaphthene	mg/kg	0.088 J	0.42 UJ	0.093 J	0.18 J	0.41 UJ
Acenaphthylene	mg/kg	0.4 UJ	0.42 UJ	0.21 J	0.84 UJ	0.41 UJ
Anthracene	mg/kg	0.18 J	0.42 UJ	0.86 J	0.53 J	0.41 UJ
Benzo(*a*)anthracene	mg/kg	0.82 J	0.11 J	5.3 J	2.8 J	0.28 J
Benzo(*a*)pyrene	mg/kg	0.84 J	0.099 J	4.5 J	3 J	0.26 J
Benzo(*b*)fluoranthene	mg/kg	1.2 J	0.18 J	6.5 J	4.2 J	0.37 J
Benzo(*g,h,i*)perylene	mg/kg	0.52 J	0.071 J	1.6 J	1.3 J	0.15 J
Benzo(*k*)fluoranthene	mg/kg	0.49 J	0.42 UJ	2.6 J	1.7 J	0.12 J
Benzoic Acid	mg/kg	1.9 UJ	2 UJ	0.3 J	4.1 UJ	2 UJ
Carbazole	mg/kg	0.21 J	0.42 UJ	0.19 J	0.29 J	0.41 UJ
Chrysene	mg/kg	1.1 J	0.15 J	5.5 J	2.7 J	0.33 J
Dibenzo(*a,h*)anthracene	mg/kg	0.14 J	0.42 UJ	0.67 J	0.41 J	0.41 UJ
Dibenzofuran	mg/kg	0.4 UJ	0.42 UJ	0.11 J	0.84 UJ	0.41 UJ
Fluoranthene	mg/kg	1.8 J	0.22 J	10 J	6.7 J	0.59 J
Fluorene	mg/kg	0.073 J	0.42 UJ	0.27 J	0.32 J	0.41 UJ
Indeno(1,2,3-*cd*)pyrene	mg/kg	0.5 J	0.42 UJ	1.9 J	1.3 J	0.15 J
Phenanthrene	mg/kg	1.1 J	0.091 J	3.3 J	2.9 J	0.32 J
Pyrene	mg/kg	1.7 J	0.21 J	8 J	5.5 J	0.61 J

[a] All data from the Phase II (2001) investigation.
ID = Identification.
SVOC = Semivolatile organic compound.
= - Detected result.
J - Estimated result.
U - Not detected.

VOCs

VOCs were not analyzed as part of the Phase II RI field activities for the West Ditches Aggregate.

Pesticides and PCBs

A total of five surface soil/dry ditch sediment samples were collected for analysis of pesticides in the West Ditches Aggregate. An additional four samples were collected for analysis of PCBs (Table 4-3).

Six pesticide compounds were detected, all at concentrations less than 1 mg/kg. Sample station LL3-047(p2) contained the most pesticide compounds, at four, each representing the highest or only detected concentration (Table 4-36).

Two PCB compounds, PCB-1254 and PCB-1260, were identified in the surface soil/sediment in the West Ditches Aggregate. PCB-1254 being the most pervasive as it was detected in six of nine samples. PCB-1260 was detected in one of nine samples. The highest concentration of PCB-1254 was identified at sample station LL3-219 at a concentration of 36 mg/kg. This location can be found on Figures 4-20, 4-21, and 4-22 on the east end of the ditch positioned just north of Building EB-8. Sample Station LL3-047(p2) contained the second highest concentration (9 mg/kg) of PCB-1254 and is located down stream of LL3-219 and (Figure 4-21).

4.2.5.7 Perimeter Area Aggregate

SVOCs

A total of three surface soil samples were collected and analyzed for SVOCs from the Perimeter Area Aggregate. Fourteen semivolatile compounds were identified and retained as SRCs in the Aggregate. None were detected in all samples collected, but 11 were identified in at least 2 samples collected (Table 4-3).

Sample station LL3-152 contained all but two identified SVOCs, with each detected concentration being the highest detected in the Perimeter Area Aggregate. With the exception of anthracene, all SVOCs identified were also detected at sample station LL3-055 (Figure 4-15). There were no SVOCs detected in the sample collected from Station LL3-177. Table 4-37 provides a summary of all SVOCs detected in the surface soils associated with the Perimeter Area Aggregate. Figures 4-14, 4-15, and 4-16 illustrate the distribution of SVOCs in the Load Line 3 surface soils.

VOCs

A total of four surface soil samples were collected and analyzed for VOCs from the Perimeter Area Aggregate. Two VOCs, benzene, and toluene, were identified and retained as SRCs in the aggregate. Each VOC was detected in a single occurrence, both from sample station LL3-055, which is depicted on Figure 4-18, to the east of Building EA-21 near the railroad track. Reported values for each analyte were below 0.01 mg/kg.

Pesticides and PCBs

Two surface soil samples were collected and analyzed for pesticides and PCBs from the Perimeter Area Aggregate. An additional six samples were analyzed exclusively for PCBs (Table 4-3).

Table 4-36. Summary Data for Site-Related Pesticides and PCBs in the West Ditches Aggregate Surface Soils at Load Line 3[a]

Functional Area		West Ditches Aggregate	West Ditches Aggregate	West Ditches Aggregate	West Ditches Aggregate	West Ditches Aggregate	West Ditches Aggregate	West Ditches Aggregate
Station ID		**LL3-046(p2)**	**LL3-047(p2)**	**LL3-049(p2)**	**LL3-050(p2)**	**LL3-162**	**LL3-163**	**LL3-216**
Sample ID		**LL31065**	**LL31069**	**LL31082**	**LL31084**	**LL30978**	**LL30981**	**LL31064**
Date		**08/08/2001**	**08/08/2001**	**08/08/2001**	**08/08/2001**	**08/13/2001**	**08/13/2001**	**08/07/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**
Analyte	**Units**							
Pesticides and PCBs								
4,4'-DDE	mg/kg	0.021 U	0.13 J	0.11 U	0.053 J	NA	NA	NA
Dieldrin	mg/kg	0.021 U	0.058 J	0.11 U	0.011 U	NA	NA	NA
Endrin Aldehyde	mg/kg	0.021 U	0.053 J	0.11 U	0.011 U	NA	NA	NA
Endrin Ketone	mg/kg	0.021 U	0.043 U	0.11 U	0.019 =	NA	NA	NA
PCB-1254	mg/kg	0.05 J	9 =	0.054 J	0.042 U	0.04 U	0.04 U	0.86 =
PCB-1260	mg/kg	0.04 U	0.84 U	0.044 U	0.042 U	0.22 J	0.04 U	0.4 U
beta-BHC	mg/kg	0.021 U	0.043 U	0.12 J	0.011 UJ	NA	NA	NA
gamma-Chlordane	mg/kg	0.021 U	0.059 J	0.11 U	0.011 U	NA	NA	NA

Table 4-36. Summary Data for Site-Related Pesticides and PCBs in the West Ditches Aggregate Surface Soils at Load Line 3 [a] (continued)

Functional Area		West Ditches Aggregate	West Ditches Aggregate
Station ID		**LL3-219**	**LL3sd/sw-048(d)**
Sample ID		**LL31068**	**LL31077**
Date		**08/07/2001**	**08/08/2001**
Depth (ft)		**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**
Analyte	**Units**		
Pesticides and PCBs			
4,4'-DDE	mg/kg	NA	0.11 U
Dieldrin	mg/kg	NA	0.11 U
Endrin Aldehyde	mg/kg	NA	0.11 U
Endrin Ketone	mg/kg	NA	0.11 U
PCB-1254	mg/kg	36 =	0.12 J
PCB-1260	mg/kg	4.1 U	0.041 U
beta-BHC	mg/kg	NA	0.11 UJ
gamma-Chlordane	mg/kg	NA	0.11 U

[a] All data from the Phase II (2001) investigation.
BHC = Benzene hexachloride.
DDE = Dichlorodiphenyldichloroethylene.
ID = Identification.
NA = Not analyzed.
PCB = Polychlorinated biphenyl.
= - Detected result.
J - Estimated result.
U - Not detected.

Table 4-37. Summary Data for Site-Related SVOCs in Perimeter Area Aggregate Surface Soils at Load Line 3[a]

Functional Area		Perimeter Area Aggregate	Perimeter Area Aggregate	Perimeter Area Aggregate
Station ID		**LL3-055**	**LL3-152**	**LL3-177**
Sample ID		**LL30687**	**LL30948**	**LL31003**
Date		**08/10/2001**	**08/13/2001**	**08/10/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Grab**
Analyte	**Units**			
Semivolatile Organics				
Anthracene	mg/kg	0.35 UJ	0.15 J	0.37 UJ
Benzo(*a*)anthracene	mg/kg	0.23 J	0.69 J	0.37 UJ
Benzo(*a*)pyrene	mg/kg	0.27 J	0.7 J	0.37 UJ
Benzo(*b*)fluoranthene	mg/kg	0.84 J	0.98 J	0.37 UJ
Benzo(*g,h,i*)perylene	mg/kg	0.2 J	0.36 J	0.37 UJ
Benzo(*k*)fluoranthene	mg/kg	0.21 J	0.35 J	0.37 UJ
Bis(2-ethylhexyl)phthalate	mg/kg	0.11 J	0.38 UJ	0.37 UJ
Chrysene	mg/kg	0.52 J	0.76 J	0.37 UJ
Di-n-butyl phthalate	mg/kg	0.31 J	0.38 UJ	0.37 UJ
Dibenzo(*a,h*)anthracene	mg/kg	0.066 J	0.097 J	0.37 UJ
Fluoranthene	mg/kg	0.41 J	1.2 J	0.37 UJ
Indeno(1,2,3-*cd*)pyrene	mg/kg	0.19 J	0.35 J	0.37 UJ
Phenanthrene	mg/kg	0.14 J	0.5 J	0.37 UJ
Pyrene	mg/kg	0.41 J	1.2 J	0.37 UJ

[a] All data from the Phase II (2001) investigation.
ID = Identification.
SVOC = Semivolatile organic compound.
= - Detected result.
J - Estimated result.
U - Not detected.

Six pesticide compounds were identified in the surface soil, all as single occurrences. With the exception of dieldrin, each pesticide compound was identified in the sample collected from sample station LL3-055. Dieldrin was the single pesticide compound identified in the sample collected from sampling station LL3-177. With the exception of endrin aldehyde detected at a concentration of 1.7 mg/kg, all remaining pesticide compounds were reported at concentrations less than 1 mg/kg.

PCB-1254 was detected in three of eight samples collected, with the highest concentration (110 mg/kg) being identified in the sample collected from LL3-055. Table 4-38 provides a summary of all pesticides and PCBs identified in the surface soil within the Perimeter Area Aggregate. Figures 4-20, 4-21, and 4-22 illustrate the distribution of PCBs in the surface soil at Load Line 3.

4.2.6 Summary

The chemical analyses discussed above, and the interpretation thereof, are summarized as follows.

4.2.6.1 Explosives and propellants

Explosive and propellant compounds were identified within each aggregate with the exception of the Change Houses (no fixed-base laboratory confirmatory analysis performed) and the DLA Storage Tanks Area Aggregate (no detectable concentrations identified). 2,4,6-TNT appeared most pervasive with the highest concentration being localized around the vacuum pump structure near Building EB-10. Additionally, 2,4,6-TNT appeared consistently near Buildings EA-6 and EB-4. The accessory explosive compounds and propellants appeared to be less pervasive; however, they were consistently detected at lower concentrations (i.e., less than 1 mg/kg).

4.2.6.2 Inorganics

Inorganic constituents were detected throughout the Load Line 3 surface soils. The most pervasive compounds (i.e. detected at the highest frequency above background) were cadmium, lead, thallium, and zinc. Cadmium, lead, and zinc are each indicative of the past RVAAP operations. The highest concentrations appear to be localized near the process Buildings EA-6, EB-4, and EB-10. Lower concentrations of nearly all metals within the TAL metals list were identified in every aggregate with widespread distribution. Specifically, arsenic, antimony, barium, and manganese were consistently detected throughout the surface soils of Load Line 3 with higher concentrations being associated more closely near buildings or structures.

4.2.6.3 SVOCs, VOCs, and PCBs/pesticides

SVOCs and VOCs were detected at relatively low concentrations throughout the Load Line 3 surface soils. Detects of SVOCs and VOCs generally appeared as localized detects within certain samples, typically located near the process buildings or railroad tracks. VOCs do not appear to be present within the DLA Storage Tanks Aggregate surface soils.

PCB-1254 was the most pervasive PCB detected within the surface soils of Load Line 3. Concentrations were widely distributed with higher concentrations being localized around Buildings EB-4, EB-11, EB-803, EB-6A, and EB-8A. PCB-1254 was identified in each aggregate with the exception of the DLA Storage Tanks Aggregate.

Table 4-38. Summary Data for Site-Related Pesticides and PCBs in Perimeter Area Surface Soils at Load Line 3[a]

Functional Area		Perimeter Area Aggregate	Perimeter Area Aggregate	Perimeter Area Aggregate	Perimeter Area Aggregate	Perimeter Area Aggregate	Perimeter Area Aggregate
Station ID		**LL3-054**	**LL3-055**	**LL3-056**	**LL3-152**	**LL3-173**	**LL3-173**
Sample ID		**LL30684**	**LL30687**	**LL30690**	**LL30948**	**LL30999**	**LL31132**
Date		**08/10/2001**	**08/10/2001**	**08/10/2001**	**08/13/2001**	**08/10/2001**	**08/10/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Field Duplicate**
Analyte	**Units**						
Pesticides and PCBs							
4,4'-DDE	mg/kg	NA	3.2 =	NA	NA	NA	NA
Dieldrin	mg/kg	NA	0.18 U	NA	NA	NA	NA
Endrin Aldehyde	mg/kg	NA	1.7 J	NA	NA	NA	NA
Heptachlor	mg/kg	NA	0.18 =	NA	NA	NA	NA
Methoxychlor	mg/kg	NA	0.43 =	NA	NA	NA	NA
PCB-1254	mg/kg	17 =	110 =	1.5 =	0.038 U	0.042 U	0.042 U
gamma-Chlordane	mg/kg	NA	0.71 J	NA	NA	NA	NA

Table 4-38. Summary Data for Site-Related Pesticides and PCBs in Perimeter Area Surface Soils at Load Line 3 [a] (continued)

Functional Area		Perimeter Area Aggregate	Perimeter Area Aggregate	Perimeter Area Aggregate
Station ID		**LL3-174**	**LL3-176**	**LL3-177**
Sample ID		**LL31000**	**LL31002**	**LL31003**
Date		**08/11/2001**	**08/10/2001**	**08/10/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Grab**
Analyte	**Units**			
Pesticides and PCBs				
4,4'-DDE	mg/kg	NA	NA	0.0019 U
Dieldrin	mg/kg	NA	NA	0.02 J
Endrin Aldehyde	mg/kg	NA	NA	0.0019 U
Heptachlor	mg/kg	NA	NA	0.0019 UJ
Methoxychlor	mg/kg	NA	NA	0.0037 U
PCB-1254	mg/kg	0.038 U	0.038 U	0.037 U
gamma-Chlordane	mg/kg	NA	NA	0.0019 U

[a] All data from the Phase II (2001) investigation.
DDE = Dichlorodiphenyldichloroethylene.
ID = Identification.
NA = Not analyzed.
PCB = Polychlorinated biphenyl.
= - Detected result.
J - Estimated result.
U - Not detected.

4.3 SUBSURFACE SOILS

4.3.1 Summary of Phase I Remedial Investigation Data

Subsurface soil characterization was not performed in the Phase I RI. Characterization of this medium was identified as a data need to determine if leaching processes may be a potential mechanism for contaminant migration to groundwater. Subsurface soil in all process areas was targeted for characterization using biased sampling in conjunction with that for surface soil.

4.3.2 Geotechnical Results

Subsurface geotechnical samples were collected from perimeter trenches and during the installation of all monitoring wells. Samples collected from perimeter trenches were disturbed and those collected from monitoring well locations were undisturbed. Table 4-39 provides a summary of the geotechnical results.

Table 4-39. Geotechnical Results in the Subsurface Soils

Station ID	Depth (ft)	Moisture Content	Atterberg Limits		Grain Size				Specific Gravity	USCS
			LL	PI	Gravel (%)	Sand (%)	Silt (%)	Clay (%)		
Trench										
LL3-203	1.8 to 2.4	23.1	22	8	0.4	28.7	60.5	10.4	2.709	CL
LL3-203	3.5	12.9	28	11	5.5	25.9	41.6	27.0	2.819	CL
LL3-205	11.4	17.7	39	20	2.0	4.9	42.4	50.7	2.835	CL
LL3-205	32.40	10.3	34	16	3.1	41.2	40.6	7.56	2.853	CL
Monitoring Well										
LL3-239	3.5 to 5.5	14.3	36	19	0.3	12.9	36.9	49.9	2.743	CL
LL3-234	1.5 to 3.0	16.9	38	19	0.6	17.6	37.3	44.5	2.706	CL
LL3-232	13.5 to 15.2	15.7	34	17	1.3	16.9	36.5	45.3	2.704	CL
LL3-243	6 to 12	12.0	32	15	1.2	13.7	36.4	48.7	2.719	CL
LL3-236	3.5 to 5.5	13.4	41	23	13.0	18.0	28.8	40.2	2.698	CL

LL = Liquid limit.
PI = Plasticity index.
USCS = Unified Soil Classification System.

Grain size distribution identified each sample as a clay (CL). Moisture content of the samples ranged from 12.0 to 23.1%. All samples analyzed for Atterberg Limits were identified as having some degree of plasticity, consistent with clay soils. The complete analytical data report for the geotechnical analysis is provided in Appendix K.

4.3.3 Explosives and Propellants

Explosives analysis within the subsurface soils of Load Line 3 were driven by the results of the surface soils field explosives analysis within each aggregate. Following the sampling strategy outlined in Chapter 3.0, for surface soil samples exhibiting a field explosive concentration of TNT and/or RDX exceeding 1 mg/kg, additional subsurface field characterization would be performed. In the event the subsurface sample exhibited concentrations of TNT and/or RDX in excess of 1 mg/kg, additional subsurface samples would be collected until all TNT and/or RDX were no longer detected or until refusal on bedrock, whichever came first. At least one explosive was detected in each of the eight subsurface soil

samples sent for laboratory analysis. Target depths were not attained for many Load Line 3 subsurface soil samples due to refusal of hand auger borings on bedrock or float. Within the subsurface soils of Load Line 3, boring refusal disallowed subsurface soil samples from being collected deeper than the 1- to 3-ft interval.

4.3.3.1 Preparation and Receiving Area Aggregate

Field explosives analysis was performed on three subsurface samples (LL3-080, LL3-136, and LL3-137) collected from the Preparation and Receiving Area Aggregate during the Phase II RI. Field analyses for explosive compounds were analyzed in the surface interval for each location, and, following the rational outlined in Chapter 3.0, as TNT and/or RDX were identified at concentrations exceeding 1 mg/kg, further assessment of the subsurface soil was warranted. Each sample was collected from the 1- to 3-ft interval and analyzed for TNT and RDX by the field explosives laboratory. Neither TNT nor RDX were identified in any sample at a concentration exceeding the 1-mg/kg action level; therefore, additional explosives analysis was not performed.

4.3.3.2 Change Houses Aggregate

Field explosives analysis performed on surface soils within the Change Houses Aggregate did not identify concentrations of TNT and/or RDX at concentrations exceeding the 1-mg/kg action level. Therefore, further characterization of the subsurface soils, as they relate to explosives, was not performed.

4.3.3.3 Explosives Handling Areas Aggregate

Field explosives analysis was performed on 28 subsurface samples collected from the Explosives Handling Areas Aggregate during the Phase II RI. Field analysis for explosive compounds (TNT and/or RDX) were analyzed in the surface interval for each location, and, following the rational outlined in Chapter 3.0, if TNT and/or RDX were identified at concentrations exceeding 1 mg/kg, further assessment of the subsurface soil was warranted. Each subsurface sample was collected from the 1- to 3-ft interval and analyzed for TNT and/or RDX by the field explosives laboratory. TNT was identified in 15 of the subsurface samples at a concentration exceeding 1 mg/kg.

In order to confirm the field explosives analysis, 13 subsurface samples were analyzed by a fixed-base analytical laboratory for a full suite analysis of explosive compounds (Table 4-4). A total of 10 explosive compounds were identified and retained as SRCs in the subsurface soils of the aggregate (Table 4-37). None of the explosive analytes were detected in all samples; however, 2,4,6-TNT and 2-amino-4,6-DNT were identified in 12 of the 13 subsurface samples. Table 4-40 provides a summary of all explosive compounds detected in the subsurface soil within the Explosives Handling Areas Aggregate.

With the exception of subsurface sample station LL3-101, at least one explosive compound was detected in each sample. Sample station LL3-157 contained concentrations of nine explosive compounds at the highest detected values in the subsurface soils (Table 4-40). The distribution of explosive compounds at Load Line 3 in the subsurface soils is illustrated on Figure 4-22.

In comparison to the explosive results detected in the corresponding surface soil samples, several specific compounds did exhibit slightly higher concentrations. This may be attributed to varying detection limits for specific samples. 2,4,6-TNT was identified at sample station LL3-153 at a surface soil concentration of 21 mg/kg. The subsurface soil sample collected from the 1- to 3-ft interval exhibited a concentration of 210 mg/kg, 10 times higher than the surface sample. Refusal on bedrock prevented sampling below the 1- to 3-ft interval at this ration. In general, however, concentrations and frequency of detection of explosives contaminants decreased from surface soil to subsurface soil intervals.

Table 4-40. Summary Data for Site-Related Explosives and PCBs/Pesticides in Explosive Handling Areas Aggregate Subsurface Soils at Load Line 3[a]

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate
Station ID		**LL3-058**	**LL3-063**	**LL3-067**	**LL3-090**	**LL3-101**
Sample ID		**LL30697**	**LL30708**	**LL30720**	**LL30785**	**LL30812**
Date		**08/07/2001**	**08/07/2001**	**08/08/2001**	**08/07/2001**	**08/12/2001**
Depth (ft)		**1 - 3**	**1 - 3**	**1 - 3**	**1 - 3**	**1 - 3**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**	**Grab**
Analyte	**Units**					
Explosives						
1,3,5-Trinitrobenzene	mg/kg	2.9 =	2 =	0.25 U	0.25 U	0.98 =
1,3-Dinitrobenzene	mg/kg	0.25 U	0.75 U	0.25 U	0.25 U	0.25 U
2,4,6-Trinitrotoluene	mg/kg	51 =	240 =	0.54 =	0.25 U	33 =
2,4-Dinitrotoluene	mg/kg	0.86 =	0.38 J	0.25 U	0.25 U	0.25 U
2-Amino-4,6-dinitrotoluene	mg/kg	1.5 =	3.1 J	0.39 =	0.25 U	1.8 =
4-Amino-2,6-dinitrotoluene	mg/kg	11 U	69 U	0.4 =	0.25 U	9.1 U
HMX	mg/kg	0.5 U	1.5 U	0.5 U	0.5 U	0.5 U
Nitrobenzene	mg/kg	0.25 U	0.75 U	0.25 U	0.25 U	0.25 U
RDX	mg/kg	0.5 U	2 U	0.5 U	0.5 U	0.17 J
Tetryl	mg/kg	0.65 U	2 U	0.65 U	0.65 U	0.65 U
Pesticides and PCBs						
PCB-1254	mg/kg	NA	NA	NA	NA	NA

Table 4-40. Summary Data for Site-Related Explosives and PCBs/Pesticides in Explosive Handling Areas Aggregate Subsurface Soils at Load Line 3[a] (continued)

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate
Station ID		**LL3-102**	**LL3-106**	**LL3-111**	**LL3-153**	**LL3-157**
Sample ID		**LL30815**	**LL30827**	**LL30834**	**LL30952**	**LL30964**
Date		**08/09/2001**	**08/11/2001**	**08/11/2001**	**08/20/2001**	**08/20/2001**
Depth (ft)		**1 - 3**	**1 - 3**	**1 - 3**	**1 - 3**	**1 - 3**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**	**Grab**
Analyte	**Units**					
Explosives						
1,3,5-Trinitrobenzene	mg/kg	0.25 U	0.25 U	0.39 =	2.2 =	9.3 =
1,3-Dinitrobenzene	mg/kg	0.25 U	0.25 U	0.25 U	0.75 U	1.4 =
2,4,6-Trinitrotoluene	mg/kg	0.28 =	0.31 =	1.5 =	210 =	270 =
2,4-Dinitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.28 J	1.5 =
2-Amino-4,6-dinitrotoluene	mg/kg	0.42 =	0.14 J	0.82 =	2.3 =	5.8 =
4-Amino-2,6-dinitrotoluene	mg/kg	0.35 =	0.21 J	1.1 =	20 U	35 U
HMX	mg/kg	0.5 U	0.5 U	0.5 U	1.5 U	3.9 =
Nitrobenzene	mg/kg	0.25 U	0.25 U	0.15 J	0.75 U	0.65 J
RDX	mg/kg	0.5 U	0.5 U	0.5 U	0.85 J	3.3 =
Tetryl	mg/kg	0.65 U	0.65 U	0.65 U	2 U	3 J
Pesticides and PCBs						
PCB-1254	mg/kg	NA	NA	35 =	4.9 =	0.037 U

Table 4-40. Summary Data for Site-Related Explosives and PCBs/Pesticides in Explosive Handling Areas Aggregate Subsurface Soils at Load Line 3[a] (continued)

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate
Station ID		**LL3-226**	**LL3-230**	**LL3-231**
Sample ID		**LL31097**	**LL31085**	**LL31100**
Date		**08/25/2001**	**08/25/2001**	**08/25/2001**
Depth (ft)		**1 - 3**	**1 - 3**	**1 - 3**
Sample Type		**Grab**	**Grab**	**Grab**
Analyte	**Units**			
Explosives				
1,3,5-Trinitrobenzene	mg/kg	0.091 J	0.15 J	2.3 =
1,3-Dinitrobenzene	mg/kg	0.25 U	0.25 U	0.5 U
2,4,6-Trinitrotoluene	mg/kg	1.3 =	0.69 =	120 =
2,4-Dinitrotoluene	mg/kg	0.25 U	0.25 U	0.61 =
2-Amino-4,6-dinitrotoluene	mg/kg	1.4 =	0.82 =	4.6 =
4-Amino-2,6-dinitrotoluene	mg/kg	1.4 =	0.67 =	23 U
HMX	mg/kg	0.5 U	0.5 U	1 U
Nitrobenzene	mg/kg	0.25 U	0.25 U	0.5 U
RDX	mg/kg	0.5 U	0.5 U	1 U
Tetryl	mg/kg	0.65 U	0.65 U	1.3 U
Pesticides and PCBs				
PCB-1254	mg/kg	NA	NA	NA

[a] All data from the Phase II (2001) investigation.
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID = Identification.
NA = Not analyzed.
PCB = Polychlorinated biphenyl.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
= - Detected result.
J - Estimated result.
U - Not detected.

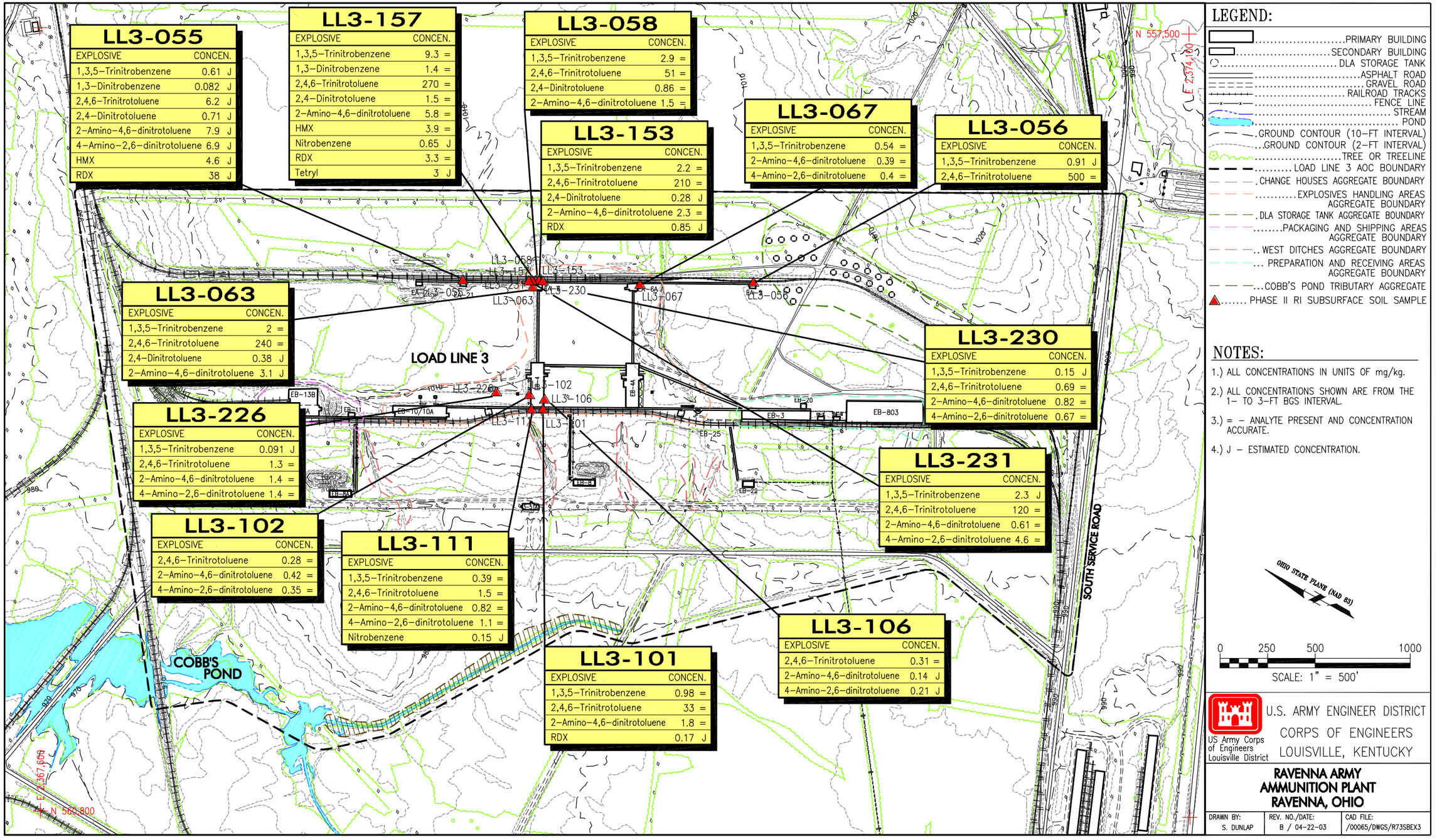


Figure 4-22. Distribution of Explosives in Subsurface Soil at Load Line 3

4.3.3.4 Packaging and Shipping Areas Aggregate

Field explosives analysis of one surface sample (LL3-077) indicated the presence of TNT at a concentration of 848 mg/kg. Additional field explosives analysis was not performed at this location due to borehole refusal.

4.3.3.5 DLA Storage Tanks Area Aggregate

Field explosives analysis performed on surface soils within the DLA Storage Tanks Area Aggregate did not identify concentrations of TNT and/or RDX at concentrations exceeding the 1-mg/kg action level. Therefore, further characterization of the subsurface soils, as they relate to explosives, was not performed.

4.3.3.6 West Ditches Aggregate

Field explosives analysis performed on surface soils within the West Ditches Aggregate did not identify concentrations of TNT and/or RDX at concentrations exceeding the 1-mg/kg action level. Therefore, further characterization of the subsurface soils, as they relate to explosives, was not performed.

4.3.3.7 Perimeter Area Aggregate

Field explosives analysis was performed on two subsurface samples (LL3-055 and LL3-056) collected from the Perimeter Area Aggregate during the Phase II RI. Field analyses for explosive compounds were analyzed in the surface interval for each location, and, following the rational outlined in Chapter 3.0, if TNT and/or RDX were identified at concentrations exceeding 1 mg/kg, further assessment of the subsurface soil was warranted. Each sample was collected from the 1- to 3-ft interval and analyzed for TNT and RDX by the field explosives laboratory. TNT was identified in each sample at a concentration exceeding the 1-mg/kg action level.

In order to confirm the field explosives analysis, each sample was analyzed by a fixed-base analytical laboratory for a full suite analysis of explosive and propellant compounds (Table 4-4). A total of eight explosive compounds were identified and retained as SRCs in the subsurface soils of the aggregate (Table 4-41). 1,3,5-TNT and 2,4,6-TNT were identified in each of the samples. The remaining explosive compounds were identified as single occurrences in the sample collected from station LL3-055 (Figure 4-22).

2,4,6-TNT was reported at a concentration of 0.83 mg/kg in the surface sample collected from LL3-056. In the corresponding subsurface sample, 2,4,6-TNT was reported at a concentration of 500 mg/kg, 602 times greater than the surface sample. In the surface soil sample collected from station LL3-055, 2,4,6-TNT was reported at a concentration of 2.4 mg/kg. In the corresponding subsurface sample, 2,4,6-TNT was reported at a concentration of 6.2 mg/kg, 2.5 times greater than the surface sample. Due to the adsorptive properties of the explosive compounds, the discrepancies may be attributed to reworking of surface soils in the area of Buildings EA-21 and EA-5.

4.3.4 Inorganic Constituents

4.3.4.1 Preparation and Receiving Areas Aggregate

A total of three subsurface soil samples were collected for analysis of inorganic parameters within the Preparation and Receiving Area Aggregate. As presented in Table 4-4, 14 metals were detected in the subsurface soils. With the exception of arsenic, cadmium, lead, and zinc, all metals were eliminated as SRCs, as all detected concentrations were below the established background criteria.

Table 4-41. Summary Data for Site-Related Explosives in Perimeter Area Subsurface Soils at Load Line 3

Functional Area		Perimeter Area Aggregate	Perimeter Area Aggregate
Station ID		**LL3-055**	**LL3-056**
Sample ID		**LL30688**	**LL30691**
Date		**08/12/2001**	**08/12/2001**
Depth (ft)		**1 - 3**	**1 - 3**
Sample Type		**Grab**	**Grab**
Analyte	**Units**		
Explosives			
1,3,5-Trinitrobenzene	mg/kg	0.61 J	0.91 J
1,3-Dinitrobenzene	mg/kg	0.082 J	2.5 U
2,4,6-Trinitrotoluene	mg/kg	6.2 J	500 =
2,4-Dinitrotoluene	mg/kg	0.71 J	2.5 U
2-Amino-4,6-dinitrotoluene	mg/kg	7.9 J	4.8 U
4-Amino-2,6-dinitrotoluene	mg/kg	6.9 J	100 U
HMX	mg/kg	4.6 J	5 U
RDX	mg/kg	38 J	5 U

HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID = Identification.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
= - Detected result.
J - Estimated result.
U - Not detected.

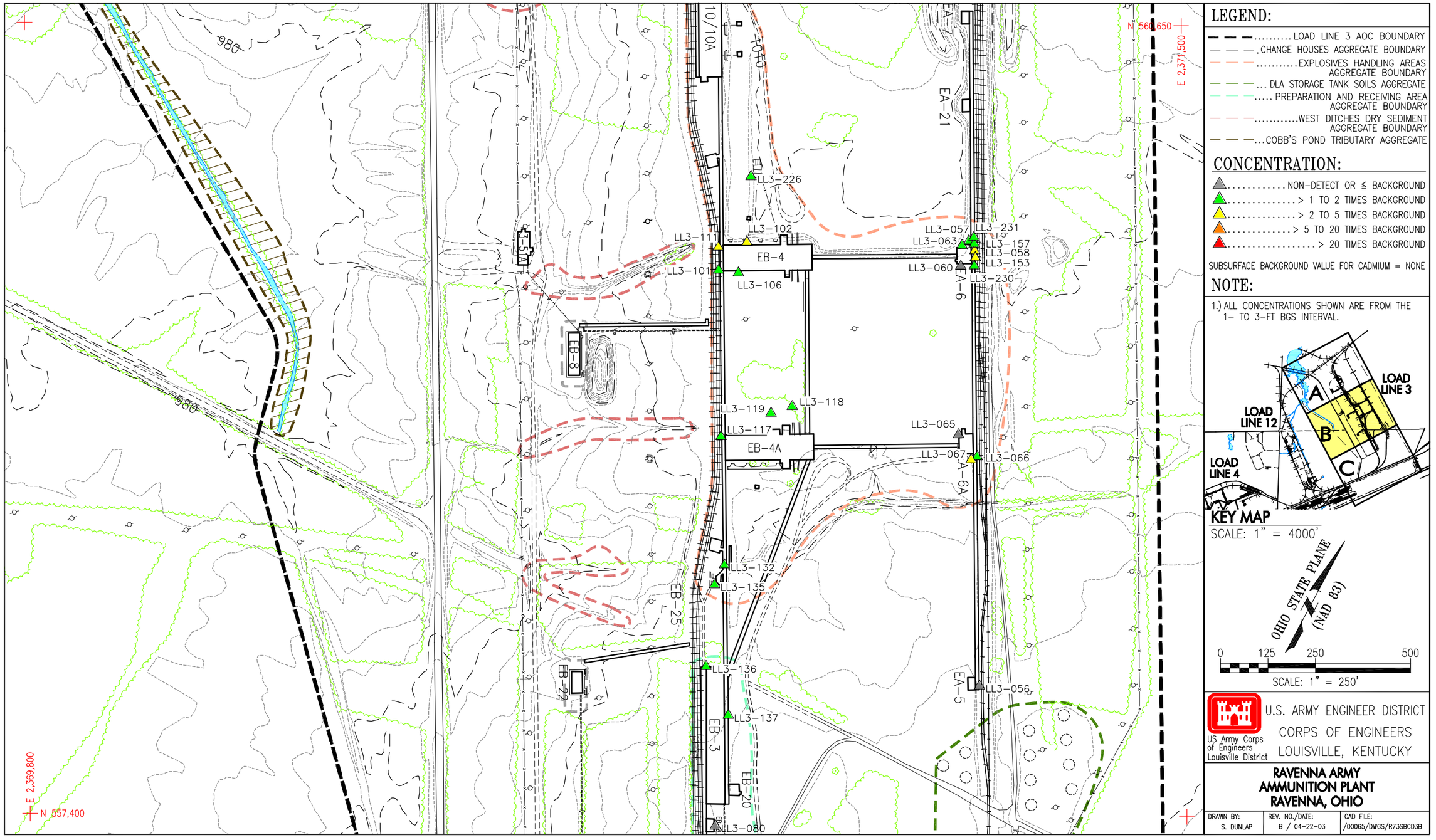
Arsenic, lead, and zinc were each detected in three of three samples with cadmium being detected in two of three samples (Table 4-42). The following table presents a summary of the SRC metals detected in the subsurface soil associated with the Preparation Area Aggregate.

Table 4-42. Summary Data for Site-Related Inorganics in Preparation and Receiving Areas Aggregate Subsurface Soils at Load Line 3

Functional Area		Preparation and Receiving Areas Aggregate	Preparation and Receiving Areas Aggregate	Preparation and Receiving Areas Aggregate
Station ID		**LL3-080**	**LL3-136**	**LL3-137**
Sample ID		**LL30755**	**LL30903**	**LL30906**
Date		**08/12/2001**	**08/12/2001**	**08/12/2001**
Depth (ft)		**1 - 3**	**1 - 3**	**1 - 3**
Sample Type		**Grab**	**Grab**	**Grab**
Analyte	**Units**			
Inorganics				
Arsenic	mg/kg	13.1 =	15.6 =	23.9 = *
Cadmium	mg/kg	0.58 U	0.32 J *	0.13 J *
Lead	mg/kg	11.2 =	41.3 = *	23.9 = *
Zinc	mg/kg	58.4 =	101 = *	60.9 =

ID = Identification.
* - Exceeds Ravenna Army Ammunition Plant background criteria.
= - Detected result.
J - Estimated result.
U - Not detected.

As presented in the above table, with the exception of arsenic, the highest detected concentrations for each inorganic SRC were identified in the sample collected from station LL3-136, which is located on the northwestern corner of Building EB-3. The extent and relative concentration of cadmium, lead, and zinc in subsurface soils are shown on Figures 4-23, 4-24, and 4-25, respectively.



LEGEND:

- LOAD LINE 3 AOC BOUNDARY
- CHANGE HOUSES AGGREGATE BOUNDARY
- EXPLOSIVES HANDLING AREAS AGGREGATE BOUNDARY
- DLA STORAGE TANK SOILS AGGREGATE
- PREPARATION AND RECEIVING AREA AGGREGATE BOUNDARY
- WEST DITCHES DRY SEDIMENT AGGREGATE BOUNDARY
- COBB'S POND TRIBUTARY AGGREGATE

CONCENTRATION:

- NON-DETECT OR ≦ BACKGROUND
- > 1 TO 2 TIMES BACKGROUND
- > 2 TO 5 TIMES BACKGROUND
- > 5 TO 20 TIMES BACKGROUND
- > 20 TIMES BACKGROUND

SUBSURFACE BACKGROUND VALUE FOR CADMIUM = NONE

NOTE:

1.) ALL CONCENTRATIONS SHOWN ARE FROM THE 1- TO 3-FT BGS INTERVAL.

KEY MAP

SCALE: 1" = 4000'

OHIO STATE PLANE (NAD 83)

0 125 250 500

SCALE: 1" = 250'

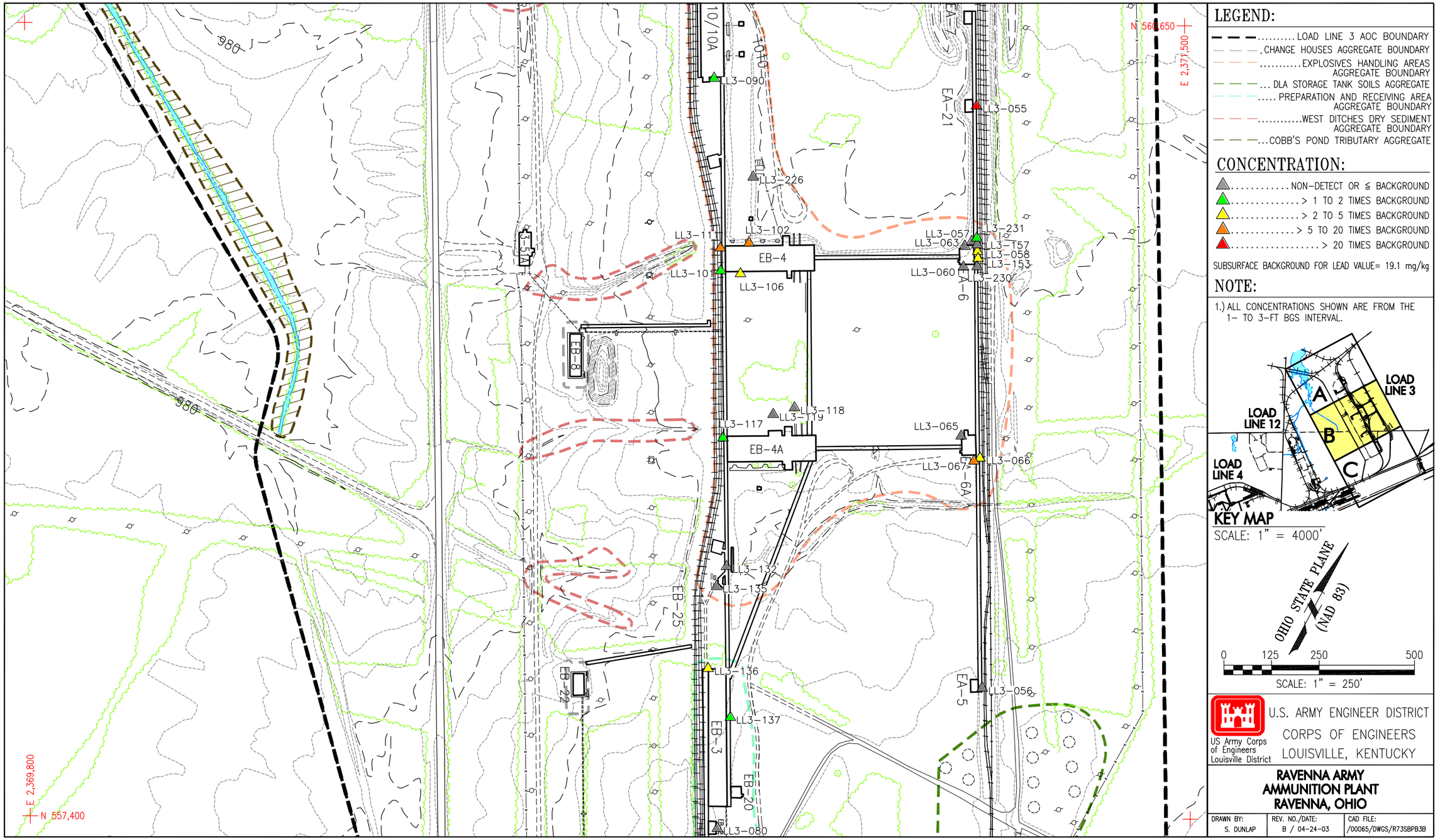
US Army Corps of Engineers Louisville District

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
LOUISVILLE, KENTUCKY

RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO

DRAWN BY:	REV. NO./DATE:	CAD FILE:
S. DUNLAP	B / 04-22-03	/00065/DWGS/R73SBCD3B

Figure 4-23. Distribution of Cadmium in Subsurface Soil at Load Line 3 - Central Section



LEGEND:

- ..... LOAD LINE 3 AOC BOUNDARY
- . CHANGE HOUSES AGGREGATE BOUNDARY
- ..... EXPLOSIVES HANDLING AREAS AGGREGATE BOUNDARY
- ... DLA STORAGE TANK SOILS AGGREGATE
- ..... PREPARATION AND RECEIVING AREA AGGREGATE BOUNDARY
- ..... WEST DITCHES DRY SEDIMENT AGGREGATE BOUNDARY
- ... COBB'S POND TRIBUTARY AGGREGATE

CONCENTRATION:

- ..... NON-DETECT OR ≦ BACKGROUND
- ..... > 1 TO 2 TIMES BACKGROUND
- ..... > 2 TO 5 TIMES BACKGROUND
- ..... > 5 TO 20 TIMES BACKGROUND
- ..... > 20 TIMES BACKGROUND

SUBSURFACE BACKGROUND FOR LEAD VALUE= 19.1 mg/kg

NOTE:

1.) ALL CONCENTRATIONS SHOWN ARE FROM THE 1– TO 3–FT BGS INTERVAL.

KEY MAP

SCALE: 1" = 4000'

OHIO STATE PLANE (NAD 83)

0 125 250 500

SCALE: 1" = 250'

US Army Corps of Engineers Louisville District

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
LOUISVILLE, KENTUCKY

RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO

DRAWN BY:	REV. NO./DATE:	CAD FILE:
S. DUNLAP	B / 04-24-03	/00065/DWGS/R73SBPB3B

Figure 4-24. Distribution of Lead in Subsurface Soil at Load Line 3 - Central Section

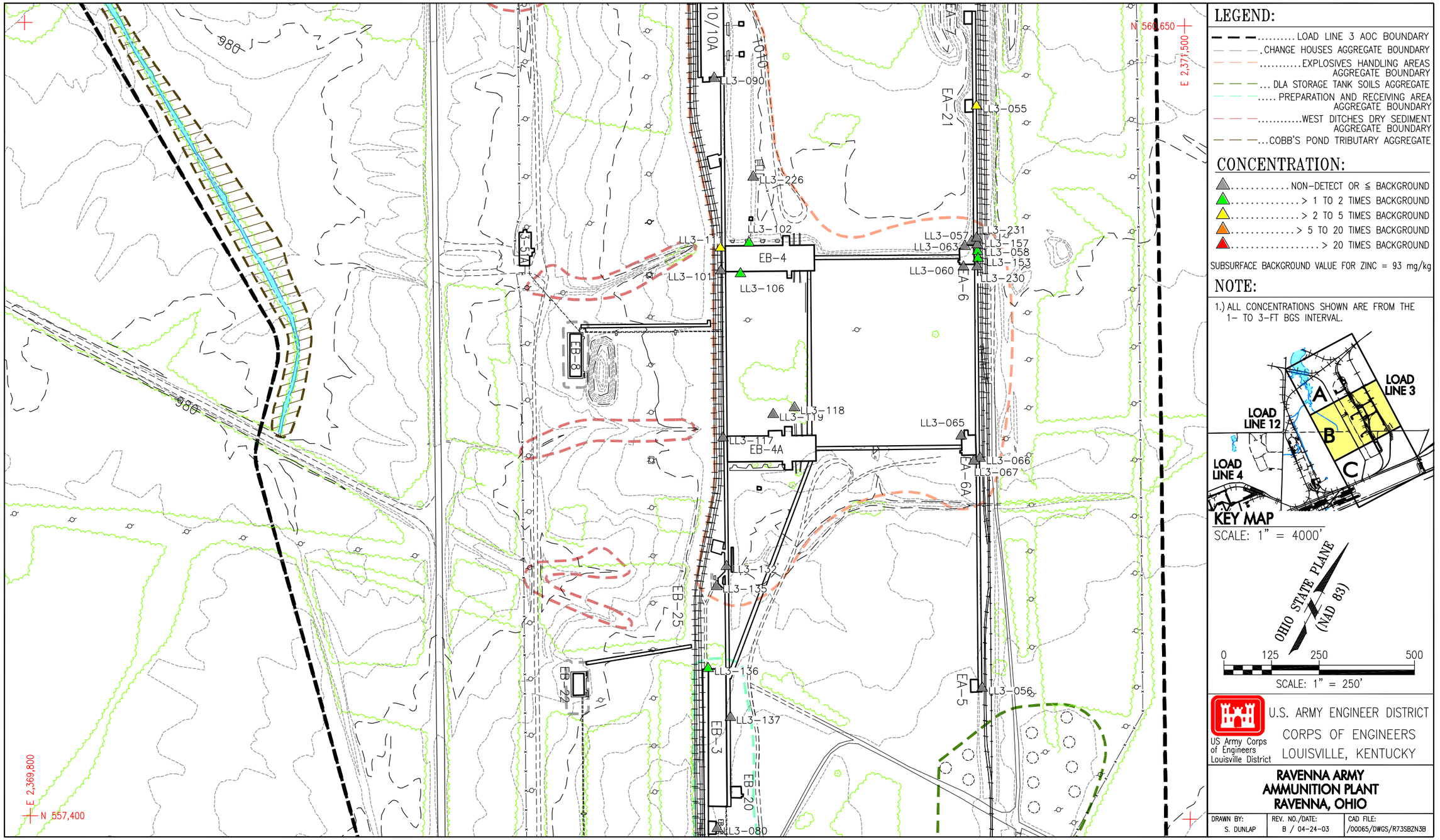


Figure 4-25. Distribution of Zinc in Subsurface Soil at Load Line 3 - Central Section

Although several detected metal concentrations were identified as exceeding the applicable background criteria, arsenic concentrations identified in the subsurface slightly exceeded those concentrations identified in the corresponding surface samples.

4.3.4.2 Change Houses Aggregate

Subsurface soils were not investigated during the Phase II RI field activities at the Change Houses Aggregate.

4.3.4.3 Explosives Handling Areas Aggregate

A total of 22 subsurface soil samples were collected for analysis of inorganic parameters within the Preparation and Receiving Area Aggregate. As presented in Table 4-4, 17 metals were detected in the subsurface soils. Aluminum, antimony, cobalt, manganese, nickel, selenium, thallium, and vanadium were eliminated as SRCs, as all detected concentrations were below the established background criteria.

Of the 9 metals retained as SRCs, 6 were identified in 22 of 22 samples (Table 4-4). Exceptions were beryllium, cadmium, and mercury. Cadmium and lead were most pervasive (i.e., detected above background in 50% or more samples). Arsenic, chromium, barium, and mercury were detected above background in less than 15% of the samples collected. Concentrations of all detected SRC metals in the subsurface soils, associated with the Explosives Handling Areas Aggregate, are presented in Table 4-43.

Cadmium was identified in 20 of 22 samples with 18 of those detected being above the established background criterion. Reported values ranged between 0.054 (LL3-119) to 3.1 mg/kg (LL3-111) (Figure 4-23).

Lead was identified in 22 of 22 samples with 11 of those detects being above the established background criterion. Reported values ranged between 11.9 mg/kg (LL3-057) to 277 mg/kg (LL3-067) (Figure 4-24).

Although several SRC metals were detected in every sample collected, sample station LL3-111 contained detectable concentrations of every SRC metal. Furthermore, concentrations of five metal compounds were the highest detected concentrations in the subsurface soil associated with the Explosives Handling Areas Aggregate. LL3-111 is located along the western boundary of Building EB-4, near the railroad tracks (Figure 4-23).

4.3.4.4 Packaging and Shipping Areas Aggregate

Subsurface soils were not investigated during the Phase II RI field activities at the Packaging and Shipping Areas Aggregate.

4.3.4.5 DLA Storage Tanks Area Aggregate

Subsurface soils were not investigated during the Phase II RI field activities at the DLA Storage Tanks Area Aggregate.

4.3.4.6 West Ditches Aggregate

Subsurface soils were not investigated during the Phase II RI field activities at the West Ditches Aggregate.

Table 4-43. Summary Data for Site-Related Inorganics in Explosive Handling Areas Aggregate Subsurface Soils at Load Line 3[a]

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate
Station ID		**LL3-057**	**LL3-058**	**LL3-060**	**LL3-063**
Sample ID		**LL30694**	**LL30697**	**LL30703**	**LL30708**
Date		**08/07/2001**	**08/07/2001**	**08/07/2001**	**08/07/2001**
Depth (ft)		**1 - 3**	**1 - 3**	**1 - 3**	**1 - 3**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**
Analyte	**Units**				
Inorganics					
Arsenic	mg/kg	12 =	11.4 =	11.5 =	11 J
Barium	mg/kg	33 =	72.7 =	39.1 =	33.9 J
Beryllium	mg/kg	0.3 =	0.42 =	0.39 =	0.34 U
Cadmium	mg/kg	0.22 = *	1.4 = *	0.56 U	0.22 = *
Chromium	mg/kg	9.8 =	15.3 =	13.6 =	10 =
Copper	mg/kg	20.1 =	22.7 =	18.4 =	17.8 =
Lead	mg/kg	11.9 J	70.7 J *	13.5 J	17.4 J
Mercury	mg/kg	0.014 UJ	0.017 UJ	0.018 UJ	0.01 J
Zinc	mg/kg	60.9 =	158 = *	49.6 =	62.7 =

Table 4-43. Summary Data for Site-Related Inorganics in Explosive Handling Areas Aggregate Subsurface Soils at Load Line 3 [a] (continued)

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate
Station ID		**LL3-065**	**LL3-066**	**LL3-067**	**LL3-090**
Sample ID		**LL30714**	**LL30717**	**LL30720**	**LL30785**
Date		**08/12/2001**	**08/12/2001**	**08/08/2001**	**08/07/2001**
Depth (ft)		**1 - 3**	**1 - 3**	**1 - 3**	**1 - 3**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**
Analyte	**Units**				
Inorganics					
Arsenic	mg/kg	12.9 =	14.7 =	12.5 =	13.2 =
Barium	mg/kg	39.3 =	77.1 =	141 = *	55.8 =
Beryllium	mg/kg	0.55 J	1 = *	0.41 =	0.51 =
Cadmium	mg/kg	0.15 U	0.46 J *	2.1 = *	0.39 = *
Chromium	mg/kg	14.3 =	24.2 =	23.4 =	17.2 =
Copper	mg/kg	14 =	23.5 =	14.4 =	13.9 =
Lead	mg/kg	17.9 =	50.8 = *	277 J *	28.5 J *
Mercury	mg/kg	0.11 U	0.018 J	0.028 J	0.027 UJ
Zinc	mg/kg	59 =	90.1 =	71.5 J	57.9 =

Table 4-43. Summary Data for Site-Related Inorganics in Explosive Handling Areas Aggregate Subsurface Soils at Load Line 3 [a] (continued)

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate
Station ID		**LL3-101**	**LL3-102**	**LL3-106**	**LL3-111**
Sample ID		**LL30812**	**LL30815**	**LL30827**	**LL30834**
Date		**08/12/2001**	**08/09/2001**	**08/11/2001**	**08/11/2001**
Depth (ft)		**1 - 3**	**1 - 3**	**1 - 3**	**1 - 3**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**
Analyte	**Units**				
Inorganics					
Arsenic	mg/kg	9 =	14.5 =	23.5 = *	6 =
Barium	mg/kg	48.6 =	79.6 =	67.4 =	429 = *
Beryllium	mg/kg	0.64 =	0.47 J	0.95 = *	2.6 = *
Cadmium	mg/kg	0.29 J *	1.2 = *	0.48 = *	3.1 = *
Chromium	mg/kg	8.4 =	40.4 = *	23.2 J	23.5 J
Copper	mg/kg	14.2 =	55.1 J *	29.5 =	36 = *
Lead	mg/kg	21.3 = *	149 J *	91.1 J *	233 J *
Mercury	mg/kg	0.023 J	0.035 J	0.019 J	0.67 = *
Zinc	mg/kg	53.2 =	154 = *	144 J *	220 J *

Table 4-43. Summary Data for Site-Related Inorganics in Explosive Handling Areas Aggregate Subsurface Soils at Load Line 3 [a] (continued)

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate
Station ID		**LL3-111**	**LL3-117**	**LL3-118**	**LL3-119**
Sample ID		**LL31137**	**LL30852**	**LL30855**	**LL30858**
Date		**08/11/2001**	**08/08/2001**	**08/12/2001**	**08/12/2001**
Depth (ft)		**1 - 3**	**1 - 3**	**1 - 3**	**1 - 3**
Sample Type		**Field Duplicate**	**Grab**	**Grab**	**Grab**
Analyte	**Units**				
Inorganics					
Arsenic	mg/kg	10.5 =	12.7 =	12.9 =	17.1 =
Barium	mg/kg	405 = *	67.7 =	83.7 =	34 =
Beryllium	mg/kg	2.4 = *	0.46 =	1.1 = *	0.85 =
Cadmium	mg/kg	3.1 = *	0.68 = *	0.38 J *	0.054 J *
Chromium	mg/kg	25.4 J	20.7 =	15.6 =	32.8 = *
Copper	mg/kg	37.5 = *	23.1 =	17.9 =	18.9 =
Lead	mg/kg	177 J *	25.5 J *	14.3 =	16.5 =
Mercury	mg/kg	0.57 = *	0.064 J *	0.029 J	0.013 J
Zinc	mg/kg	218 J *	56.9 J	59 =	63.1 =

Table 4-43. Summary Data for Site-Related Inorganics in Explosive Handling Areas Aggregate Subsurface Soils at Load Line 3 [a] (continued)

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate
Station ID		**LL3-132**	**LL3-135**	**LL3-153**	**LL3-157**
Sample ID		**LL30891**	**LL30900**	**LL30952**	**LL30964**
Date		**08/12/2001**	**08/12/2001**	**08/20/2001**	**08/20/2001**
Depth (ft)		**1 - 3**	**1 - 3**	**1 - 3**	**1 - 3**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**
Analyte	**Units**				
Inorganics					
Arsenic	mg/kg	12.4 =	15.1 =	8.7 =	15.2 =
Barium	mg/kg	54.1 =	55 =	103 =	39.1 =
Beryllium	mg/kg	0.68 =	0.67 =	1.2 = *	0.57 =
Cadmium	mg/kg	0.15 = *	0.11 = *	1.4 = *	0.19 J *
Chromium	mg/kg	11.6 =	12.1 =	15.8 =	13.1 =
Copper	mg/kg	15.7 =	13.6 =	17.4 =	18.9 =
Lead	mg/kg	17.7 =	18.9 =	89.1 J *	16.8 J
Mercury	mg/kg	0.12 U	0.032 J	0.011 J	0.0097 J
Zinc	mg/kg	53.5 =	70.5 =	131 = *	60.1 =

Table 4-43. Summary Data for Site-Related Inorganics in Explosive Handling Areas Aggregate Subsurface Soils at Load Line 3[a] (continued)

Functional Area		Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate	Explosives Handling Areas Aggregate
Station ID		**LL3-226**	**LL3-230**	**LL3-231**
Sample ID		**LL31097**	**LL31085**	**LL31100**
Date		**08/25/2001**	**08/25/2001**	**08/25/2001**
Depth (ft)		**1 - 3**	**1 - 3**	**1 - 3**
Sample Type		**Grab**	**Grab**	**Grab**
Analyte	**Units**			
Inorganics				
Arsenic	mg/kg	18.5 =	11 =	17.4 =
Barium	mg/kg	64.8 =	29.9 =	77.6 =
Beryllium	mg/kg	0.9 = *	0.31 U	0.77 =
Cadmium	mg/kg	0.19 J *	0.39 J *	0.37 J *
Chromium	mg/kg	17.8 =	8.6 =	16.4 =
Copper	mg/kg	26.5 =	16.4 =	21.5 =
Lead	mg/kg	18.4 J	16.9 J	26.7 J *
Mercury	mg/kg	0.033 J	0.021 J	0.024 J
Zinc	mg/kg	58.6 =	68.2 =	58.4 =

[a] All data from the Phase II (2001) investigation.
ID = Identification.
* - Exceeds Ravenna Army Ammunition Plant background criteria.
= - Detected result.
J - Estimated result.
U - Not detected.

4.3.4.7 Perimeter Area Aggregate

A total of two subsurface soil samples were collected for analysis of inorganic parameters within the Perimeter Area Aggregate. As presented in Table 4-4, 15 metals were detected in the subsurface soils. With the exception of arsenic, barium, beryllium, cadmium, chromium, copper, lead, and zinc, all metals were eliminated as SRCs, as all detected concentrations were below the established background criteria.

Cadmium, lead, and zinc distribution is shown on Figures 4-23, 4-24, and 4-25, respectively.

Cadmium was detected as a single occurrence while the remaining inorganic SRCs were detected in each sample collected. Table 4-44 presents a summary of inorganic SRCs detected in the Perimeter Area Aggregate.

Table 4-44. Summary Data for Site-Related Inorganics in Perimeter Area Aggregate Subsurface Soil at Load Line 3

Functional Area		Perimeter Area Aggregate	Perimeter Area Aggregate
Station ID		**LL3-055**	**LL3-056**
Sample ID		**LL30688**	**LL30691**
Date		**08/12/2001**	**08/12/2001**
Depth (ft)		**1 - 3**	**1 - 3**
Sample Type		**Grab**	**Grab**
Analyte	**Units**		
Inorganics			
Arsenic	mg/kg	24.2 = *	9.3 =
Barium	mg/kg	280 = *	95.6 =
Beryllium	mg/kg	1.5 = *	0.69 J
Cadmium	mg/kg	20.6 = *	0.16 U
Chromium	mg/kg	48 = *	21.2 =
Copper	mg/kg	32.4 = *	13 =
Lead	mg/kg	530 = *	18.2 J
Zinc	mg/kg	379 = *	47 J

ID = Identification.
* - Exceeds Ravenna Army Ammunition Plant background criteria.
= - Detected result.
J - Estimated result.
U - Not detected.

As presented in Table 4-44, nearly all inorganic SRCs were identified in both samples; however, all metals were detected above their respective established background concentrations in the sample collected from station LL3-055. Subsurface soil concentrations of inorganics are consistent with those detected in the corresponding surface sample, with the exception of arsenic and beryllium where subsurface concentrations exceed the surface concentration. Arsenic was identified in the subsurface sample at 3.2 times the concentration identified in the corresponding surface sample. Beryllium was identified in the subsurface sample at 2.7 times the corresponding surface sample.

4.3.5 SVOCs, VOCs, and PCBs

4.3.5.1 Preparation and Receiving Areas Aggregate

SVOCs, VOCs, and pesticides/PCBs were not analyzed in subsurface soil samples collected from the Preparation and Receiving Area Aggregate.

4.3.5.2 Change Houses Aggregate

Subsurface soils were not investigated during the Phase II RI field activities at the Change Houses Aggregate.

4.3.5.3 Explosives Handling Areas Aggregate

SVOCs, VOCs, and pesticides were not analyzed in subsurface soil samples collected from the Explosives Handling Areas Aggregate.

Three subsurface soil samples were collected from the Explosives Handling Areas Aggregate and analyzed exclusively for PCBs, with each sample being collected from the 1- to 3-ft interval. PCB-1254 was the only PCB compound detected with concentrations ranging from 4.9 (LL3-153) to 35 mg/kg (LL3-111). PCBs were not detected in the sample collected from sample station LL3-157.

PCB-1254 was not detected in the surface sample collected from Station LL3-111 and the reported value for the subsurface sample was 35 mg/kg.

4.3.5.4 Packaging and Shipping Areas Aggregate

Subsurface soils were not investigated during the Phase II RI field activities at the Packaging and Shipping Areas Aggregate.

4.3.5.5 DLA Storage Tanks Area Aggregate

Subsurface soils were not investigated during the Phase II RI field activities at the DLA Storage Tanks Area Aggregate.

4.3.5.6 West Ditches Aggregate

Subsurface soils were not investigated during the Phase II RI field activities at the West Ditches Aggregate.

4.3.5.7 Perimeter Area Aggregate

SVOCs, VOCs, and pesticides/PCBs were not analyzed in subsurface soil samples collected from the Perimeter Area Aggregate.

4.3.6 Summary

4.3.6.1 Explosives and propellants

Explosive compounds were identified in the subsurface soils within the Explosives Handling Areas Aggregate and the Perimeter Area Aggregate. As in the surface soils, 2,4,6-TNT was the most pervasive explosive constituent detected. Of special note were the reported values for 2,4,6-TNT in the subsurface as compared to the corresponding surface samples. In samples analyzed near Buildings EA-6, EA-21 and EA-5, 2,4,6-TNT concentrations in the subsurface exceeded the detected concentrations in the corresponding surface samples. Due to the adsorptive properties of the explosive compounds, the inconsistencies may be attributed to reworking of the surface soils with the Explosives Handling Areas and Perimeter Area Aggregates. Concentrations and frequency of detection of explosives contaminants generally decreased from surface soil to subsurface soil intervals.

4.3.6.2 Inorganics

Several inorganic constituents were identified as SRCS in the subsurface soils within Load Line 3. Within the limited number of subsurface soil samples collected, inorganic constituents above background were common throughout the load line; however, generally, concentrations appear lower than the identified surface interval. Arsenic, cadmium, and lead were identified in all subsurface samples collected. Arsenic concentrations were identified at slightly higher concentrations than the corresponding surface samples in several samples from the Explosives Handling Areas Aggregate and in one sample collected from the Perimeter Area Aggregate. At sample station LL3-055, located near Building EA-21, all inorganic SRCs concentrations exceeded their respective background concentrations.

4.3.6.3 SVOCs, VOCs, and PCBs/pesticides

Organic constituents in subsurface soils characterized during the Phase II RI included PCB analysis within the Explosives Handling Areas Aggregate. PCB-1254 was identified in the subsurface soils at two locations. Location LL3-111, which is located on the west side of Building EB-4, exhibited the highest concentration of PCB-1254 in the subsurface soils. At this location, the subsurface soil concentration was 35 times higher than the corresponding surface soil sample. Refusal occurred at LL3-111 at 3 ft bgs. Concentrations and frequency of detection of explosives contaminants decreased from surface soil to subsurface soil intervals.

4.4 SEDIMENT

Sediment samples were collected from 0.0 to 0.3 m (0 to 1 ft) from a total of 27 locations during the Phase II RI to determine the nature and extent of contamination (Figure 3-5). Sampling occurred within the western drainage ditches and the Cobb's Pond Tributary.

All sample collection and analyses for the Phase II RI were conducted in accordance with the SAP (USACE 2000), and as described in Chapter 3.0 of this report. Sediment samples were analyzed for field explosives, explosives, propellants, TAL metals, VOCs, SVOCs, pesticides/PCBs, cyanide, TOC, and grain size distribution.

The complete analytical results for sediment samples collected at Load Line 3 are presented by aggregate, station, and analyte group in Appendix I. Table 4-5 presents the summary statistics and determination of SRCs in stream and pond Load Line 3 sediment. The following sections describe major findings from the Phase I RI, as well as the distribution of explosives, propellants, and inorganic and organic constituents in the four aggregate areas, as determined in the Phase II RI. Sediment samples collected from the sewer system are discussed in Section 4.7.

4.4.1 Summary of Phase I Remedial Investigation Data

For the Phase I RI, three ditch sediment samples were collected (Figure 1-7) and analyzed for the following parameters:

- three samples were analyzed for explosives and 11 site-related metals; and
- one sample was analyzed for TAL metals, cyanide, VOCs, SVOCs, and pesticides/PCBs.

TNT was the only explosive found in ditch sediment and was detected at concentrations an order of magnitude or greater below those observed in the surface soil. TNT was present in the most downgradient location of the main stream that drains Load Line 3 and discharges into Upper Cobb's Pond.

Metal analytes were detected that are possible site-related constituents. However, mercury and thallium were the only constituents identified exceeding their respective background concentrations.

Several inorganic SRCs were reported in the sediments of the Cobb's Pond Tributary. Minor concentrations of several SVOCs, specifically PAHs, VOCs, and pesticides were also identified in the downgradient sampling location of the Cobb's Pond Tributary.

4.4.2 Geotechnical Results

Geotechnical samples were collected from all stations and submitted for grain size distribution and TOC. All of the sediment samples were disturbed or grab samples. Table 4-45 presents summary results of the grain size distribution.

Table 4-45. Summary of Geotechnical Analysis of Sediment

	Station ID		
Analysis	**LL3sd/sw-051(d)**	**LL3-052(p2)**	**LL3-053(p2)**
	08/08/2001	**08/08/2001**	**08/08/2001**
Grain Size Distribution			
%Gravel	2.7	12	0.0
%Sand	48.9	49.3	35
%Silt	26.6	22.6	38.6
%Clay	21.8	16.1	26.4

ID = Identification.

Appendix K provides the complete geotechnical laboratory results.

4.4.3 Explosives and Propellants

4.4.3.1 Cobb's Pond Tributary Aggregate

Two sediment samples from the Cobb's Pond Tributary Aggregate [from stations LL3sd/sw-052(d) and LL3sd/sw-053(d)] were collected during the Phase I RI and analyzed exclusively for TNT. During the Phase II RI, an additional sample from location LL3-053 was collected and analyzed for explosives and propellants.

During the Phase I RI, 2,4,6-TNT was detected (at 1.4 mg/kg) only at station LL3sd/sw-053(d). This same explosive plus 4-amino-2,5-dinitrotulene was detected in the Phase II RI sample (Table 4-46).

Propellant compounds were not detected in the sediment samples collected from the Cobb's Pond Tributary.

4.4.4 Inorganic Constituents

4.4.4.1 Cobb's Pond Tributary Aggregate

Four sediment samples were analyzed for TAL metals within the Cobb's Pond Tributary. A total of 18 metals were detected at least once in sediment during the Phase II RI field effort. Of those 18 detected, 11 were retained as SRCs in the Load Line 3 sediments of the Cobb's Pond Tributary. Table 4-5 identifies

Table 4-46. Summary Data for Site-Related Explosives and Propellants in the Cobb's Pond Tributary Aggregate Sediment[a]

Functional Area		Cobb's Pond Tributary Aggregate	Cobb's Pond Tributary Aggregate	Cobb's Pond Tributary Aggregate
Station ID		**LL3-053(p2)**	**LL3sd/sw-052(d)**	**LL3sd/sw-053(d)**
Sample ID		**LL31073**	**LL3SD-052(D)-0219-SD**	**LL3SD-053(D)-0220-SD**
Date		**08/08/2001**	**07/27/1996**	**07/27/1996**
Depth (ft)		**0 - 1**	**0 - 2**	**0 - 2**
Sample Type		**Grab**	**Grab Composite**	**Grab Composite**
Analyte	**Units**			
Explosives				
2,4,6-Trinitrotoluene	mg/kg	0.65 =	0.25 U	1.4 =
4-Amino-2,6-dinitrotoluene	mg/kg	0.37 =	NA	NA

[a] Table presents both Phase I RI (1996 collection date) and Phase II RI (2001 collection date).
ID = Identification.
NA = Not analyzed.
= - Detected result.
U - Not detected.

each SRC and the rationale for the selection of each compound. Table 4-47 presents an analytical summary of inorganic compounds detected in the Cobb's Pond Tributary Aggregate.

As presented in Table 4-47, sample LL3sd/sw-051(d), which is located at the mouth of the Cobb's Pond Tributary, contained the majority of compounds at concentrations exceeding their respective background values. This sampling location also exhibited the only detected concentrations of antimony and silver. The higher concentrations detected at this location are consistent with its proximity to receive drainage from all of the Load Line 3 process areas. Concentrations of cadmium, chromium, copper, lead, mercury, nickel, and zinc are indicative of past process operations at RVAAP.

4.4.5 SVOCs, VOCs, and PCBs

4.4.5.1 Cobb's Pond Tributary Aggregate

SVOCs

SVOCs were not analyzed during the Phase II RI field effort. Detected SVOC concentrations identified in Table 4-48 represent those from a sample collected during the Phase I RI. Eleven SVOCs were detected all in low concentrations (<1 mg/kg). The maximum concentration of any SVOC was 0.240 mg/kg of fluoranthene.

VOCs

Toluene (Phase I RI) was the only VOC detected in the sediments of the Cobb's Pond Tributary. At a concentration of 0.004 mg/kg, the low reported value is likely an isolated outlier.

Pesticides and PCBs

The pesticide compounds identified in Table 4-49 were identified in a sample collected during the Phase I RI field effort. PCBs but not pesticides were analyzed during the Phase II RI. Four pesticide compounds were identified and retained as SRCs in the Cobb's Pond Tributary Sediment.

Table 4-47. Summary Data for Site-Related Inorganics in the Cobb's Pond Tributary Aggregate Sediment[a]

Functional Area		Cobb's Pond Tributary Aggregate	Cobb's Pond Tributary Aggregate	Cobb's Pond Tributary Aggregate	Cobb's Pond Tributary Aggregate	Cobb's Pond Tributary Aggregate	Cobb's Pond Tributary Aggregate
Station ID		**LL3-052(p2)**	**LL3-053(p2)**	**LL3-156**	**LL3sd/sw-051(d)**	**LL3sd/sw-052(d)**	**LL3sd/sw-053(d)**
Sample ID		**LL31071**	**LL31073**	**LL30960**	**LL31079**	**LL3SD-052(D)-0219-SD**	**LL3SD-053(D)-0220-SD**
Date		**08/08/2001**	**08/08/2001**	**08/08/2001**	**08/08/2001**	**07/27/1996**	**07/27/1996**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 2**	**0 - 2**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**	**Grab Composite**	**Grab Composite**
Analyte	**Units**						
Inorganics							
Antimony	mg/kg	1.3 UJ	2.8 UJ	1 UJ	18.2 J *	NA	0.97 J *
Beryllium	mg/kg	0.56 J *	0.57 U	0.66 = *	0.53 J *	NA	0.68 = *
Cadmium	mg/kg	0.43 J *	0.77 J *	0.2 J *	3.5 = *	0.04 U	0.06 J *
Chromium	mg/kg	10.6 =	12.9 =	15 =	20.1 = *	9.3 =	14 =
Cobalt	mg/kg	10.4 = *	7.8 =	10.9 = *	15.3 = *	NA	6.5 =
Copper	mg/kg	12.8 J	11.9 J	13.7 J	222 J *	NA	18.3 =
Lead	mg/kg	16.3 J	26.6 J	16.4 J	91.6 J *	8.8 =	20.2 =
Mercury	mg/kg	0.13 U	0.056 J	0.034 J	0.049 J	0.05 =	0.06 = *
Nickel	mg/kg	13.8 =	14.8 =	13.1 =	42 = *	NA	16 =
Silver	mg/kg	0.65 U	0.97 U	0.63 U	10.5 = *	0.21 U	0.22 U
Zinc	mg/kg	67.8 =	122 =	45.8 =	2,190 = *	45.2 =	56.8 =

[a] Table presents both Phase I RI (1996 collection date) and Phase II RI (2001 collection date).
ID = Identification.
NA = Not analyzed.
* - Exceeds Ravenna Army Ammunition Plant background criteria.
= - Detected result.
J - Estimated result.
U - Not detected.

Table 4-48. Data Summary for Site-Related SVOCs in the Cobb's Pond Tributary Aggregate Sediment

Functional Area		Cobb's Pond Tributary Aggregate
Station ID		LL3sd/sw-053(d)
Sample ID		LL3SD-053(D)-0220-SD
Date		07/27/1996
Depth (ft)		0 - 2
Sample Type		Grab Composite
Analyte	Units	
Semivolatile Organics		
Benzo(*a*)anthracene	mg/kg	0.1 J
Benzo(*a*)pyrene	mg/kg	0.14 J
Benzo(*b*)fluoranthene	mg/kg	0.13 J
Benzo(*g,h,i*)perylene	mg/kg	0.088 J
Benzo(*k*)fluoranthene	mg/kg	0.14 J
Bis(2-ethylhexyl)phthalate	mg/kg	0.054 J
Chrysene	mg/kg	0.13 J
Dibenzo(*a,h*)anthracene	mg/kg	0.055 J
Fluoranthene	mg/kg	0.24 J
Indeno(1,2,3-*cd*)pyrene	mg/kg	0.11 J
Phenanthrene	mg/kg	0.091 J
Pyrene	mg/kg	0.18 J

ID = Identification.
SVOC = Semivolatile organic compound.
J - Estimated result

Four samples were collected from the Cobb's Pond Tributary and analyzed for PCBs. One PCB compound, PCB-1254, was identified and retained as an SRC in the Cobb's Pond Tributary sediment. As presented in the Table 4-49, PCB-1254 was detected at a single sampling station LL3-052(p2) at a concentration 0.18 mg/kg. Station LL3-052(p2) is located approximately 275 ft north of the mouth of the Cobb's Pond Tributary (Figure 3-7). 4,4'-DDE, 4,4'-DDT, endrin, and gamma-chlordane were identified in one sample collected from station LL3sd/sw-053(d), located near the tributary entrance into Cobb's Pond (Figure 3-7).

There was no evidence identified in the area of sampling station LL3-052(p2) indicative of a source for PCBs. As this location was previously sampled during the Phase I RI and PCBs were not detected originally, the detection is considered anomalous.

4.4.6 Summary

- Two explosive compounds (2,4,6-TNT and 4-amino-2,6-DNT) were identified in sediments of the Cobb's Pond Tributary. The explosive compounds exhibited low concentrations and were identified in only one sample, the most downgradient location. As explosives were not identified in the upgradient sediment locations, the detections may be attributed to sediments mobilized during rain events over time, with no continuing source to feed the upgradient locations.

Table 4-49. Summary Data for Site-Related Pesticides and PCBs in the Cobb's Pond Tributary Aggregate Sediment[a]

Functional Area		Cobb's Pond Tributary Aggregate	Cobb's Pond Tributary Aggregate	Cobb's Pond Tributary Aggregate	Cobb's Pond Tributary Aggregate	Cobb's Pond Tributary Aggregate
Station ID		**LL3-052(p2)**	**LL3-053(p2)**	**LL3-156**	**LL3sd/sw-051(d)**	**LL3sd/sw-053(d)**
Sample ID		**LL31071**	**LL31073**	**LL30960**	**LL31079**	**LL3SD-053(D)-0220-SD**
Date		**08/08/2001**	**08/08/2001**	**08/08/2001**	**08/08/2001**	**07/27/1996**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 2**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**	**Grab Composite**
Analyte	**Units**					
Pesticides and PCBs						
4,4'-DDE	mg/kg	NA	NA	NA	NA	0.0032 J
4,4'-DDT	mg/kg	NA	NA	NA	NA	0.0081 J
Endrin	mg/kg	NA	NA	NA	NA	0.01 J
PCB-1254	mg/kg	0.18 J	0.064 U	0.042 U	0.047 U	0.077 U
gamma-Chlordane	mg/kg	NA	NA	NA	NA	0.0029 J

[a] Table presents both Phase I RI (1996 collection date) and Phase II RI (2001 collection date).
DDE = Dichlorodiphenyldichloroethylene.
DDT = Dichlorodiphenyltrichloroethane.
ID = Identification.
NA = Not analyzed.
PCB = Polychlorinated biphenyl.
J - Estimated result.
U - Not detected.

- Inorganic analytes are most abundant and most concentrated in sediments collected from station LL3sd/sw-051(d). In lesser concentrations, inorganics are distributed throughout the sediments of the Cobb's Pond Tributary.

- Some organic constituents (SVOCs and VOCs), at low concentrations, were detected in one sediment sample collected from the Cobb's Pond Tributary in 1996. All concentrations of SVOCs and toluene were less than 1 mg/kg.

- Pesticides were identified at low concentrations (i.e., less than 1 mg/kg) in one sediment sample collected during the Phase I RI. PCB-1254 was the only sediment SRC identified, with an isolated detect at station LL3-052(p2).

4.5 SURFACE WATER

Two surface water samples (co-located with sediment sampling stations) were collected from the Cobb's Pond Tributary Aggregate during the Phase II RI (Table 4-6).

Additionally, one surface water sample was collected form the Miscellaneous Surface Water Aggregate (Figure 3-5 and Table 4-7). Surface water samples planned for collection on the West Ditches Aggregate were not collected, as this drainage was found to be typically dry.

4.5.1 Summary of Phase I Remedial Investigation Data

Surface water was not investigated during the Phase I RI.

4.5.2 Explosives and Propellants

4.5.2.1 Cobb's Pond Tributary

No explosives were identified at detectable concentrations within the Cobb's Pond Tributary Aggregate surface waters.

4.5.2.2 Miscellaneous Surface Water Aggregate

One surface water sample was collected from the Miscellaneous Surface Water Aggregate. Sample station LL3-222 was located southwest of Building EA-6A (Figure 3-2). Four explosive compounds were detected (1,3,5-TNT; 2,4,6-TNT; 2-amino-4,6-DNT; and 4-amini-2,6-DNT). 2,4,6-TNT was identified as the highest explosive compound concentration at 0.026 mg/L. All detected explosive compounds were reported at less than 1 mg/L.

4.5.3 Target Analyte List Metals and Cyanide

4.5.3.1 Cobb's Pond Tributary

Two surface water samples were collected from the Cobb's Pond Tributary and analyzed for TAL metals. Nine metals were detected in the surface water samples collected from the Cobb's Pond tributary and of those detected, seven were retained as SRCs in the Load Line 3 surface water (Table 4-6). Table 4-50 presents a summary of TAL metals detected in the Cobb's Pond Tributary.

Table 4-50. Summary Data for Site-Related Inorganics in the Cobb's Pond Tributary Aggregate Surface Water

Functional Area		Cobb's Pond Tributary Aggregate	Cobb's Pond Tributary Aggregate	Cobb's Pond Tributary Aggregate
Station ID		**LL3-052(p2)**	**LL3-053(p2)**	**LL3-053(p2)**
Sample ID		**LL31072**	**LL31074**	**LL31140**
Date		**08/09/2001**	**08/08/2001**	**08/08/2001**
Filtered		**Total**	**Total**	**Total**
Sample Type		**Grab**	**Grab**	**Field Duplicate**
Analyte	**Units**			
Inorganics				
Antimony	mg/L	0.0025 J *	0.01 U	0.0023 J *
Arsenic	mg/L	0.0043 J *	0.0047 J *	0.0051 = *
Barium	mg/L	0.08 = *	0.054 = *	0.056 = *
Cobalt	mg/L	0.0065 = *	0.0026 U	0.0027 U
Manganese	mg/L	7.8 J *	3.5 J *	3.6 J *
Nickel	mg/L	0.0087 J *	0.0028 U	0.0032 U
Vanadium	mg/L	0.0015 J *	0.007 U	0.007 U

ID = Identification.
* - Exceeds Ravenna Army Ammunition Plant background criteria.
= - Detected result.
J - Estimated result.
U - Not detected.

As presented above, several metals were identified at concentrations exceeding their respective background criteria, with all metals detected in the sample collected from LL3-052(p2) exceeding the RVAAP background concentration. Sample station LL3-052 is the most upgradient surface water sample located approximately 275 ft north of the mouth of the Cobb's Pond Tributary (Figure 3-7). With the exception of manganese, all detected concentrations were less than 1 mg/L.

4.5.3.2 Miscellaneous Surface Water Aggregate

Two metals were identified and retained as SRCs in the surface water sample collected from Station LL3-222. Antimony and barium contained reported values of 0.013 and 0.054 mg/L, respectively. Each detected concentration was above their established background criteria. Table 4-7 provides summary statistics and determination of SRCs in Load Line 3 miscellaneous water.

4.5.4 SVOCs, VOCs, and PCBs

4.5.4.1 Cobb's Pond Tributary Aggregate

SVOCs

There were no detectable concentrations of SVOCs identified in the one sample from the Cobb's Pond Tributary Aggregate analyzed for SVOCs.

VOCs

2-Butanone was the only VOC detected in the one sample [station LL3-053 (p2)] analyzed for VOCs. The detected concentration of 2-butanone was less than 0.001 mg/L, as presented in Table 4-51. Station LL3-053-(p2) is located near the northern end of the tributary where it enters Cobb's Pond. As 2-butanone was not detected in any of the upgradient surface water samples, the low detected concentration appears to be an isolated outlier.

Table 4-51. Summary Data for Site-Related VOCs in the Cobb's Pond Tributary Aggregate Surface Water

Functional Area		Cobb's Pond Tributary Aggregate	Cobb's Pond Tributary Aggregate
Station ID		**LL3-053(p2)**	**LL3-053(p2)**
Sample ID		**LL31074**	**LL31140**
Date		**08/08/2001**	**08/08/2001**
Filtered		**Total**	**Total**
Sample Type		**Grab**	**Field Duplicate**
Analyte	**Units**		
Volatile Organics			
2-Butanone	mg/L	0.0007 J	0.00066 J

ID = Identification.
VOC = Volatile organic compound.
J - Estimated result.

Pesticides and PCBs

There were no detectable concentrations of pesticides or PCBs in the one sample from the Cobb's Pond Tributary Aggregate analyzed for pesticides or PCBs.

4.5.4.2 Miscellaneous Surface Water Aggregate

There were no detectable concentrations of SVOCs, VOCs, pesticides, or PCBs in the one sample analyzed for these compounds. Table 4-7 provides summary statistics and determination of SRCs in Load Line 3 miscellaneous water.

4.5.5 Summary

- Seven metals, antimony, arsenic, barium, cobalt, manganese, nickel, and vanadium, were identified in the surface water associated with the Cobb's Pond Tributary. Detected concentrations were relatively low with concentrations remaining constant or decreasing at the downgradient location. Antimony and barium were also detected in the miscellaneous surface water sample collected, although at low concentrations. As the miscellaneous sample station LL3-222 was a standing pool of surface water in the proximity Building EA-6A, the detected metals may indicate leaching of the surrounding surface soils. All metals detected in the Load Line 3 surface waters are consistent with those identified in the Load Line 3 surface and subsurface soil.

- An isolated occurrence of 2-butanone was identified in the downgradient location LL3-053(p2). As the detected concentration was relatively low and 2-butanone was not detected in any other media during the Phase II RI, this detect appears to be an isolated outlier. Other organic constituents were not identified in the Load Line 3 surface waters.

4.6 GROUNDWATER

The following section summarizes the nature and extent of groundwater contamination at Load Line 3. As no historical groundwater data exists for Load Line 3, all groundwater analytical data presented in Section 4.6 were derived solely from the Phase II RI field activities. During the Phase II RI field investigation, groundwater samples were collected from 12 new monitoring wells (Figure 3-6) each analyzed for explosives and propellants, TAL metals, VOCs, SVOCs, and Pesticides/PCBs. Table 4-8 presents summary

statistics for constituents detected in Load Line 3 groundwater. The data in Table 4-8 are organized into categories based on analytical groupings (i.e., metals, organics – explosives, organics – pesticides/PCBs, organics – semivolatiles, and organics – volatiles). The following discussion is organized in a similar manner.

4.6.1 Explosives and Propellants

The groundwater at Load Line 3 contained detectable levels of seven explosive and propellant compounds. Table 4-52 provides a summary of the explosives and propellants concentrations detected.

As presented in the Table 4-52 and on Figure 4-26, the highest concentrations and most frequent occurrence of explosives and propellants were associated with samples collected form the central portion of the AOC, south of Building EB-4 (Figure 4-27). Station LL3mw-241, which is located downgradient of LL3mw-238, also contained several explosive compounds. With the exception of 1,3,5-TNT, all concentrations were significantly lower than those detected in the upgradient well. Several explosive compounds were identified in the surface and subsurface soils in the areas of LL3mw-238 and LL3mw-241; however, they had relatively low detected concentrations, which were inconsistent with those detected in the groundwater.

4.6.2 Target Analyte List Metals and Cyanide

All groundwater samples were analyzed for filtered TAL metals and cyanide. Facility-wide background criteria for metals were established prior to the Phase II RI efforts and only detections above background are discussed below. TAL metals were widely detected in the site-wide groundwater while cyanide was not detected at concentrations exceeding the laboratory MDL.

As presented in Table 4-8, two metals were identified and retained as SRCs, cobalt and manganese. Cobalt was identified as an SRC since it was not detected in the background dataset. However, all detected concentrations are less than 1 mg/L.

Manganese was identified as an SRC due to several detected concentrations above the established background level. However, concentrations exceeding background were less than 2 times the background concentration.

Table 4-53 presents a summary of detected concentrations of cobalt and manganese. Distributions of cobalt and manganese in the Load Line 3 groundwater are presented in Figure 4-27.

4.6.3 SVOCs, VOCs, and PCBs

4.6.3.1 SVOCs

With the exception of bis(2-ethylhexyl)phthalate detected in monitoring well LL3mw-241, there were no SVOCs detected in the groundwater associated with Load Line 3.

4.6.3.2 VOCs

Seven VOCs were detected in the Load Line 3 site-wide groundwater. Table 4-8 and 4-54 provide summaries of the site-related volatile organic constituents. Figure 4-28 illustrates the spatial distribution of organics detected in the site-wide groundwater.

Table 4-52. Load Line 3 Groundwater Aggregate – Explosives – Site Related Contaminants

Functional Area		Load Line 3	Load Line 3	Load Line 3	Load Line 3	Load Line 3	Load Line 3	Load Line 3
Station ID		LL3mw-232	LL3mw-233	LL3mw-234	LL3mw-235	LL3mw-236	LL3mw-237	LL3mw-238
Sample ID		LL31101	LL31102	LL31103	LL31104	LL31105	LL31106	LL31107
Date		09/11/2001	02/25/2002	09/11/2001	01/22/2002	09/18/2001	09/19/2001	09/18/2001
Filtered		Total	Total	Total	Total	Total	Total	Total
Sample Type		Grab	Grab	Grab	Grab	Grab	Grab	Grab
Analyte	Units							
Explosives								
1,3,5-Trinitrobenzene	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.05 =
1,3-Dinitrobenzene	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
2,4,6-Trinitrotoluene	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.082 =
2-Amino-4,6-dinitrotoluene	mg/L	0.0002 U	0.0002 U	0.00012 J	0.0002 U	0.0002 U	0.0002 U	0.032 =
4-Amino-2,6-dinitrotoluene	mg/L	0.0002 U	0.0002 U	0.00023 =	0.0002 U	0.0002 U	0.0002 U	0.054 =
HMX	mg/L	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.002 =
RDX	mg/L	0.0005 U	0.0005 U	0.00079 =	0.0005 U	0.0005 U	0.0005 U	0.0077 =

Functional Area		Load Line 3	Load Line 3	Load Line 3	Load Line 3	Load Line 3	Load Line 3
Station ID		LL3mw-239	LL3mw-240	LL3mw-241	LL3mw-242	LL3mw-243	LL3mw-243
Sample ID		LL31108	LL31109	LL31110	LL31111	LL31112	LL31138
Date		09/18/2001	09/18/2001	09/21/2001	09/20/2001	09/10/2001	09/10/2001
Filtered		Total	Total	Total	Total	Total	Total
Sample Type		Grab	Grab	Grab	Grab	Grab	Field Duplicate
Analyte	Units						
Explosives							
1,3,5-Trinitrobenzene	mg/L	0.0002 U	0.0002 U	0.0019 =	0.0002 U	0.0002 UJ	0.0002 UJ
1,3-Dinitrobenzene	mg/L	0.0002 U	0.0002 U	0.00012 J	0.0002 U	0.0002 UJ	0.0002 UJ
2,4,6-Trinitrotoluene	mg/L	0.0002 U	0.0002 U	0.00092 =	0.0002 U	0.0002 UJ	0.0002 UJ
2-Amino-4,6-dinitrotoluene	mg/L	0.0002 U	0.0002 U	0.0019 =	0.0002 U	0.0002 UJ	0.0002 UJ
4-Amino-2,6-dinitrotoluene	mg/L	0.0002 U	0.0002 U	0.0012 =	0.0002 U	0.0002 UJ	0.0002 UJ
HMX	mg/L	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 UJ	0.0005 UJ
RDX	mg/L	0.00047 J	0.0005 U	0.0017 U	0.0005 U	0.0005 UJ	0.0005 UJ

HMX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
ID = Identification.
RDX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
= - Detected result.
J - Estimated result.
U - Not detected.

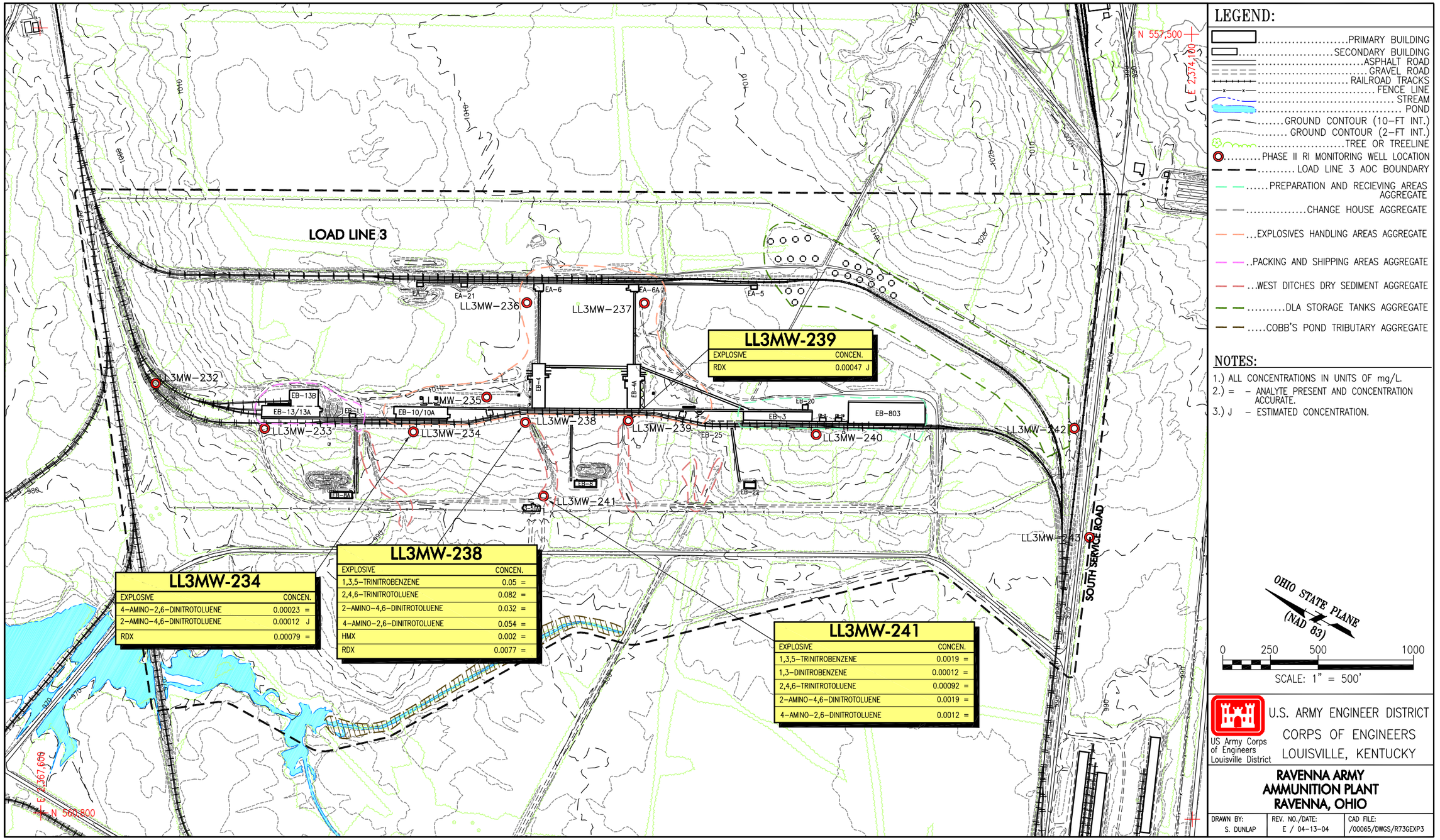


Figure 4-26. Distribution of Explosives in Groundwater at Load Line 3

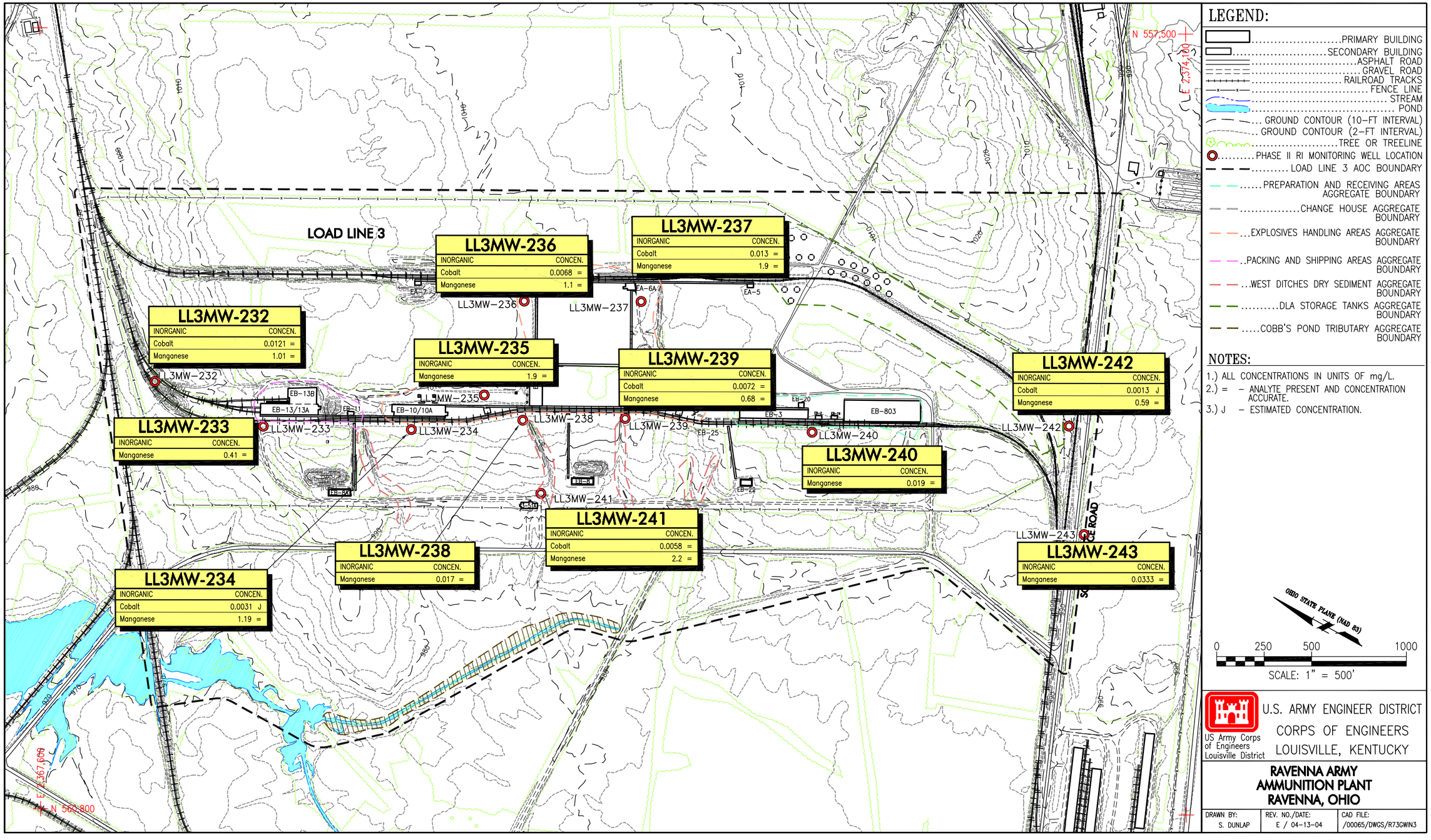


Figure 4-27. Distribution of Inorganics in Groundwater at Load Line 3

Table 4-53. Summary Data for Site-Related Inorganics in Load Line 3 Groundwater

Functional Area		Load Line 3	Load Line 3	Load Line 3	Load Line 3	Load Line 3	Load Line 3	Load Line 3
Station ID		LL3mw-232	LL3mw-233	LL3mw-234	LL3mw-235	LL3mw-236	LL3mw-237	LL3mw-238
Sample ID		LL31101	LL31102	LL31103	LL31104	LL31105	LL31106	LL31107
Date		09/11/2001	02/25/2002	09/11/2001	01/22/2002	09/18/2001	09/19/2001	09/18/2001
Filtered		Dissolved	Dissolved	Dissolved	Dissolved	Dissolved	Dissolved	Dissolved
Sample Type		Grab	Grab	Grab	Grab	Grab	Grab	Grab
Analyte	Units							
Inorganics								
Cobalt	mg/L	0.0121 = *	0.0016 U	0.0031 J *	0.007 U	0.0068 = *	0.013 = *	0.005 U
Manganese	mg/L	1.01 =	0.41 =	1.19 =	1.9 = *	1.1 =	1.9 = *	0.017 =

Functional Area		Load Line 3	Load Line 3	Load Line 3	Load Line 3	Load Line 3	Load Line 3
Station ID		LL3mw-239	LL3mw-240	LL3mw-241	LL3mw-242	LL3mw-243	LL3mw-243
Sample ID		LL31108	LL31109	LL31110	LL31111	LL31112	LL31138
Date		09/18/2001	09/18/2001	09/21/2001	09/20/2001	09/10/2001	09/10/2001
Filtered		Dissolved	Dissolved	Dissolved	Dissolved	Dissolved	Dissolved
Sample Type		Grab	Grab	Grab	Grab	Grab	Field Duplicate
Analyte	Units						
Inorganics							
Cobalt	mg/L	0.0072 = *	0.005 U	0.0058 = *	0.0013 J *	0.005 U	0.005 U
Manganese	mg/L	0.68 =	0.019 =	2.2 = *	0.59 =	0.0333 =	0.0334 =

ID = Identification.
* - Exceeds Ravenna Army Ammunition Plant background criteria.
= - Detected result.
J - Estimated result.
U - Not detected.

Table 4-54. Summary of Site-Related Organics in the Groundwater Aggregate

Functional Area		Load Line 3	Load Line 3	Load Line 3	Load Line 3	Load Line 3	Load Line 3	Load Line 3	Load Line 3	Load Line 3
Station ID		LL3mw-232	LL3mw-233	LL3mw-234	LL3mw-235	LL3mw-236	LL3mw-237	LL3mw-238	LL3mw-239	LL3mw-240
Sample ID		LL31101	LL31102	LL31103	LL31104	LL31105	LL31106	LL31107	LL31108	LL31109
Date		09/11/2001	02/25/2002	09/11/2001	01/22/2002	09/18/2001	09/19/2001	09/18/2001	09/18/2001	09/18/2001
Filtered		Total	Total	Total	Total	Total	Total	Total	Total	Total
Sample Type		Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Analyte	Units									
Pesticides and PCBs										
Heptachlor Epoxide	mg/L	0.00005 U	0.00005 U	0.00005 U	0.00005 U	0.00005 U	0.00005 U	0.00005 U	0.000075 J	0.00005 U
beta-BHC	mg/L	0.00005 U	0.00005 U	0.00005 U	0.00005 U	0.00005 U	0.00005 U	0.00015 J	0.00005 U	0.00005 U
Semivolatile Organics										
Bis(2-ethylhexyl)phthalate	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 UJ	0.01 U	0.01 U	0.01 U	0.01 U
Volatile Organics										
Acetone	mg/L	0.0076 UJ	0.0067 J	0.01 UJ	0.01 U	0.0037 J	0.0021 J	0.0022 J	0.0035 J	0.0025 J
Carbon Disulfide	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.0014 =	0.001 U	0.001 U	0.001 U	0.001 U
Carbon Tetrachloride	mg/L	0.001 U	0.001 U	0.00025 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00015 J
Chloroform	mg/L	0.001 U	0.001 U	0.0002 J	0.001 U	0.001 U	0.001 U	0.001 U	0.0012 =	0.001 U
Chloromethane	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00019 J	0.001 U
Tetrachloroethene	mg/L	0.001 U	0.001 UJ	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00049 J
Toluene	mg/L	0.001 U	0.0002 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U

Table 4-54. Summary of Site-Related Organics in the Groundwater Aggregate (continued)

Functional Area		Load Line 3	Load Line 3	Load Line 3	Load Line 3
Station ID		LL3mw-241	LL3mw-242	LL3mw-243	LL3mw-243
Sample ID		LL31110	LL31111	LL31112	LL31138
Date		09/21/2001	09/20/2001	09/10/2001	09/10/2001
Filtered		Total	Total	Total	Total
Sample Type		Grab	Grab	Grab	Field Duplicate
Analyte	Units				
Pesticides and PCBs					
Heptachlor Epoxide	mg/L	0.00005 U	0.00005 U	0.00005 U	0.00005 U
beta-BHC	mg/L	0.00005 U	0.00005 U	0.00005 U	0.00005 U
Semivolatile Organics	mg/L				
Bis(2-ethylhexyl)phthalate	mg/L	0.0047 J	0.01 U	0.01 U	0.01 U
Volatile Organics					
Acetone	mg/L	0.012 U	0.01 U	0.01 UJ	0.01 UJ
Carbon Disulfide	mg/L	0.001 U	0.001 U	0.001 U	0.001 U
Carbon Tetrachloride	mg/L	0.001 U	0.001 U	0.001 U	0.001 U
Chloroform	mg/L	0.001 U	0.001 U	0.001 U	0.001 U
Chloromethane	mg/L	0.00023 J	0.00015 J	0.001 U	0.001 U
Tetrachloroethene	mg/L	0.001 U	0.001 U	0.001 U	0.001 U
Toluene	mg/L	0.001 U	0.001 U	0.001 U	0.001 U

BHC = Benzene hexachloride.
ID = Identification.
PCB = Polychlorinated biphenyl.
= - Detected result.
J - Estimated result.
U - Not detected.

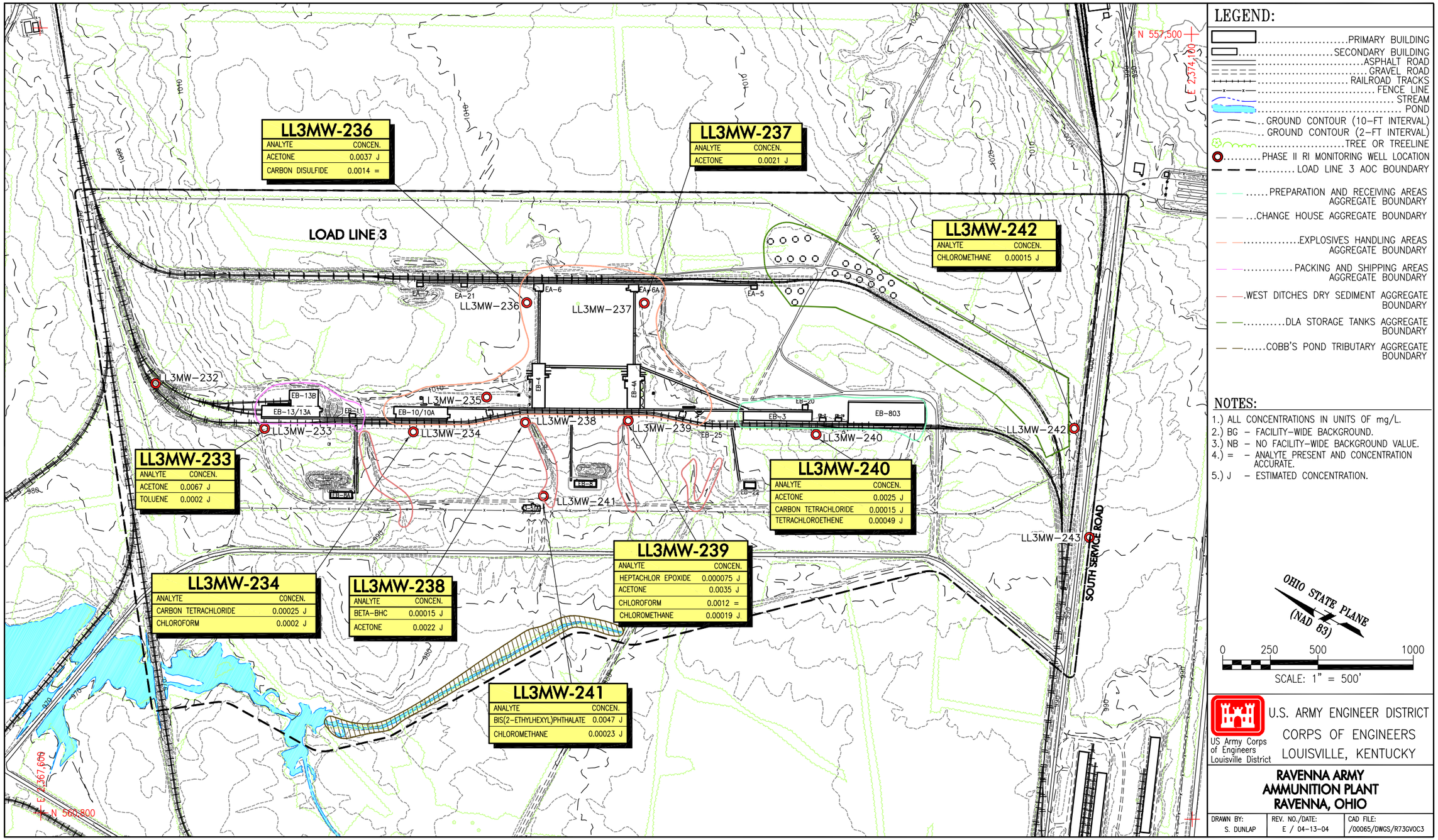


Figure 4-28. Distribution of SVOCs, VOCs, and Pesticides/PCBs in Groundwater at Load Line 3

Acetone was identified in 50% of the primary samples collected and in several trip blanks and laboratory method blanks. As all detected concentrations were below the laboratory reporting limit, and given that acetone was additionally identified in several trip blanks and laboratory method blanks, the acetone occurrences may be attributed to laboratory cross-contamination.

The remaining VOCs were detected in less than 50% of the samples collected and all detected concentrations were below the established maximum contaminant levels (MCLs).

4.6.3.3 Pesticides and PCBs

Two pesticide compounds, beta-BHC and heptachlor epoxide, were detected at single locations, LL3mw-238 and LLmw-239, respectively (Table 4-54). The isolated occurrences and relatively low concentrations do not indicate a continuing nearby source or significant leaching from the overlying soils. Figure 4-28 provides an illustration of the detected pesticides, along with the contaminant concentration, and the monitoring wells from which the samples were collected.

There were no PCBs detected in the Load Line 3 groundwater at concentrations exceeding the laboratory MDL.

4.6.4 Summary

The interpretation of chemical data obtained from Load Line 3 is summarized as follows:

- Seven explosive compounds were identified in the Load Line 3 groundwater. The highest concentrations of each individual compound were identified in monitoring wells LL3mw-238 and LL3mw-241. All detected concentrations were identified in the areas west and downgradient of the Load Line 3 Explosives Handling Areas Aggregate.

- Two metals, cobalt and manganese, were identified in the Load Line 3 groundwater. Detected concentrations of cobalt were all less than 1 mg/L and all concentrations of manganese were less than 2.2 mg/L.

- One semivolatile compound [bis(2-ethylhexyl)phthalate], seven VOCs, and two pesticides were identified in the groundwater samples collected from Load Line 3.

- With the exception of the explosives compounds identified in monitoring well LL3MW-241, the detected concentrations of metals, SVOCs, VOCs, and pesticide constituents likely reflect impacts from the general site operations and the relatively low detected concentrations do not indicate a nearby continuing source or leaching from the overlying soils.

4.7 SEWER SYSTEM CHARACTERIZATION

4.7.1 Storm/Sanitary Sewer Video Survey Results

As discussed in Chapter 3.0, a video survey of the storm and sanitary sewers was conducted at Load Line 3. Approximately 1,100 ft of sewer line was surveyed. This represents 5% of the total footage of underground utilities for the storm and sanitary sewers. The sanitary and storm sewer system was found to be cracked with heavy debris and roots throughout. Some portions of the system had noted corrosion. The inspection records of the survey are found in Appendix N and are summarized in Table 4-55.

Table 4-55. Summary of Sewer Line Video Survey Results

Manhole	Direction	Condition of Pipe
EB20	North	Cracks
	East	Heavy debris, too dirty to pass
EB 21	North	Heavy debris
	South	Heavy debris, blocked by large rock
	East	None
EH 13	North	Cracks
	South	Fracture, crack, large bolt
	East	Crack
	East	Heavy debris
	West	Heavy debris
EB 4	North	Heavy debris
	South	Crack
EH 5	to EH 4	Multiple cracks
	to EH 6	Cracks, end at manhole
EH 4	to EH 3	Heavy debris, blocked by heavy rocks
EH 6	to EH 7	Heavy debris
409	West	Roots, blocked by heavy roots
	East	None
419	South	Hole in pipe, pipe collapsed
	East	Good
424	West	Cracks and fracture; blocked by debris
	South	Good
404	West	Crack, heavy roots
	East	Crack, medium corrosion, changes from VCP to cast iron
427	West	Heavy roots, blocked by piece of pipe
	North	Heavy roots, blocked by roots

4.7.2 Storm/Sanitary Sewer Water Samples

Water samples were collected from two storm/sanitary sewer manholes during the Phase II RI to determine whether residual contamination exists within the system and whether the pipelines may be functioning as a preferential migration pathway or source of contaminants to groundwater. Table 4-9 presents summary statistics and determination of SRCs in storm/sanitary sewer water. Table 4-56 contains summary data for water samples collected from the storm/sanitary sewer. Background values for surface water were used conservatively to screen for SRCs. One water sample (LL3-225) was analyzed for explosives, TAL metals, and PCBs; the other sample was analyzed for the full suite of parameters. The analytical results are presented in their entirety in Appendix I. Figure 4-29 presents the distributions of selected pervasive explosives and metals SRCs in sanitary sewer system water.

Explosives

Five explosives were detected in water from the two sampling locations. Most frequently detected compounds were RDX 2-amino-4,6-DNT; and 4-amino-2,6-DNT, each with two detections (Figure 4-30). The highest concentrations of explosives detected occurred at MH-413. The highest detection for explosives was 0.0034 mg/L of 4-amino-2,6-DNT at MH-413.

Table 4-56. Summary Data for Site-Related Explosives and Propellants in the Storm/Sewer Aggregate for Water

Functional Area		Storm/Sanitary Sewers Water Samples Aggregate	Storm/Sanitary Sewers Water Samples Aggregate
Station ID		**LL3-225**	**LL3-228**
Sample ID		**LL31091**	**LL31095**
Date		**08/09/2001**	**08/09/2001**
Depth (ft)		**0 - 0**	**0 - 0**
Sample Type		**Grab**	**Grab**
Analyte	**Units**		
Explosives			
2,4,6-Trinitrotoluene	mg/L	0.0018 =	0.0002 U
2-Amino-4,6-dinitrotoluene	mg/L	0.0023 =	0.00075 =
4-Amino-2,6-dinitrotoluene	mg/L	0.0034 =	0.0017 =
HMX	mg/L	0.0005 U	0.00027 J
RDX	mg/L	0.00034 J	0.0005 =

HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID = Identification.
RDX =Hexahydro-1,3,5-trinitro-1,3,5-triazine.
= - Detected result.
J - Estimated result.
U - Not detected.

Inorganic Constituents

Only the sewer water sample collected at MH-413 contained inorganic SRCs. Lead, nickel, and silver were the only SRCs in surface water at the Load Line 3 sewer system (Table 4-57). Lead was detected at 0.0032 mg/L, nickel was detected at 0.0058 mg/L, and silver was detected at .0067 mg/L (Figure 4-30).

Table 4-57. Summary Data for Site-Related Inorganics in the Storm/Sewer Aggregate for Water

Functional Area		Storm/Sanitary Sewers Water Samples Aggregate
Station ID		**LL3-225**
Sample ID		**LL31091**
Date		**08/09/2001**
Depth (ft)		**0 - 0**
Sample Type		**Grab**
Analyte	**Units**	
Inorganics		
Lead	mg/L	0.0032 J *
Nickel	mg/L	0.0058 J *
Silver	mg/L	0.0067 = *

ID = Identification.
* - Exceeds Ravenna Army Ammunition Plant background criteria.
= - Detected result.

SVOCs, VOCs, and PCBs/Pesticides

No SVOCs, VOCs, pesticides, or PCBs were detected in the storm/sanitary sewer water samples at Load Line 3.

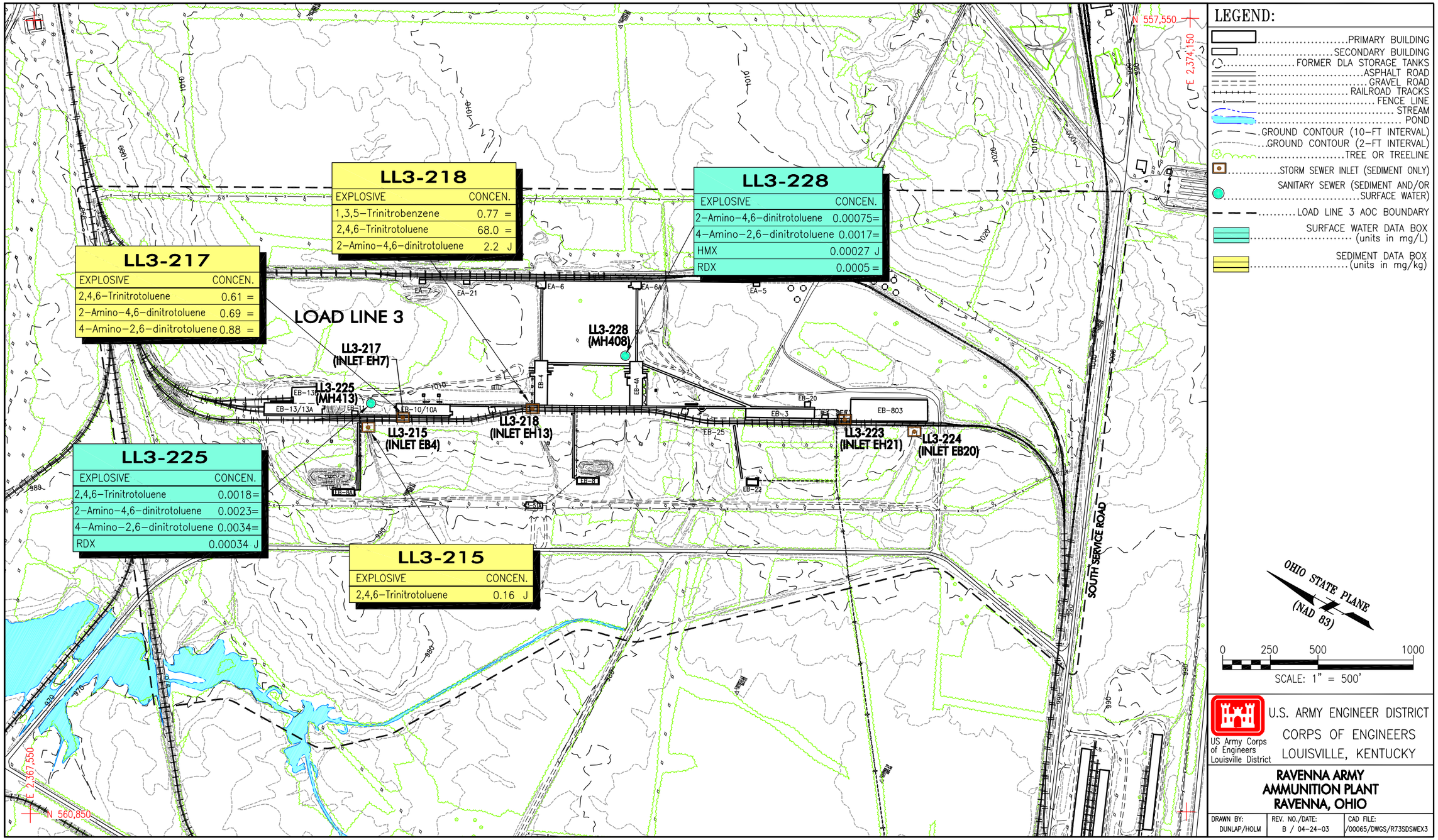


Figure 4-29. Distribution of Detected Explosives in the Sanitary Sewer System at Load Line 3

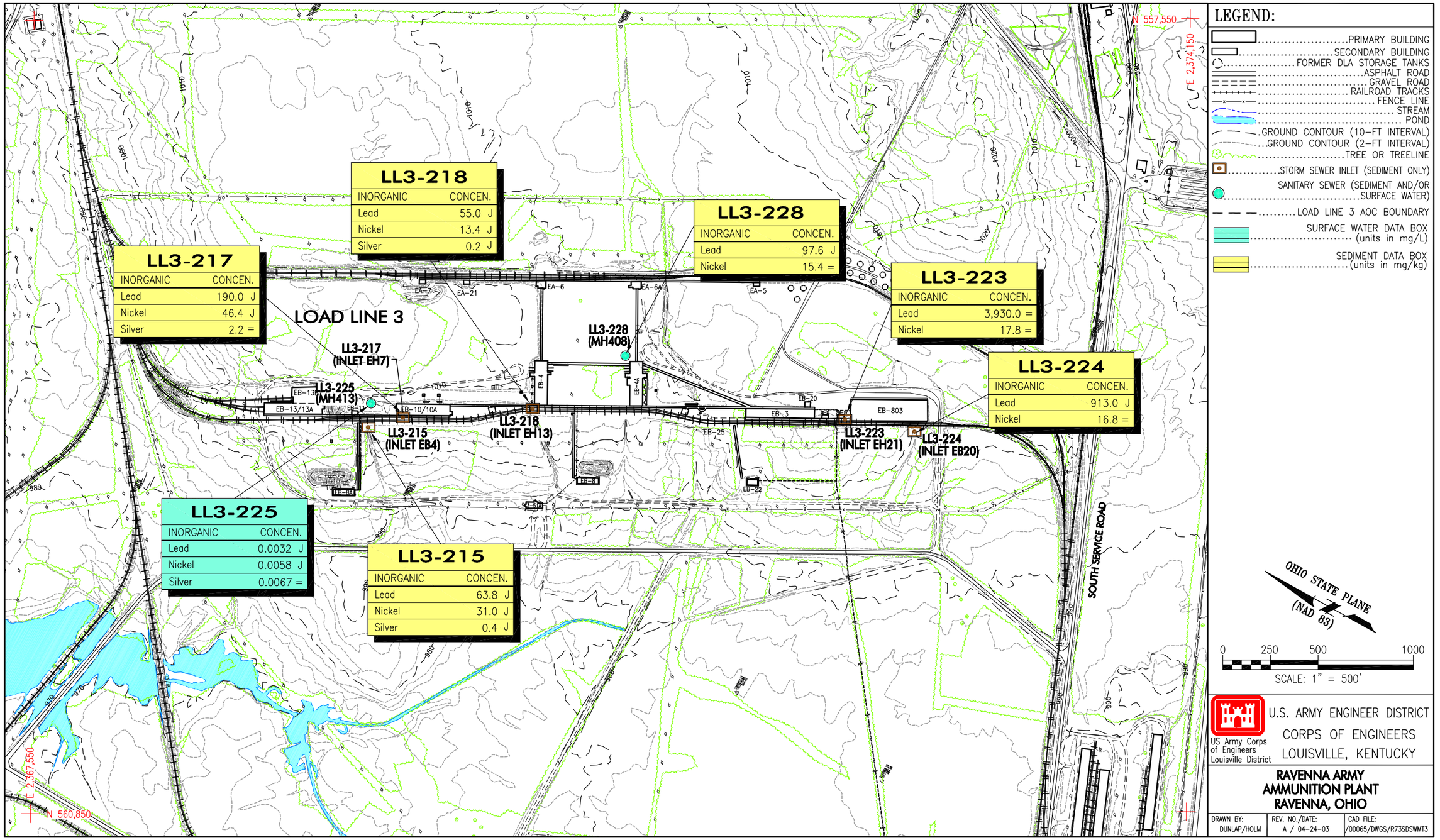


Figure 4-30. Distribution of Lead, Nickel, and Silver in the Sanitary Sewer System at Load Line 3

4.7.3 Sewer Line Sediment Samples

Sediment samples were collected from six storm/sanitary sewer manholes during the Phase II RI to characterize the nature and extent of contamination. One sediment sample at MH-408 was co-located with storm/sanitary sewer water samples; MH-413 contained insufficient sediment to obtain a sample. Five of the sediment samples were analyzed for TAL metals, explosives, and PCBs. One sample at Inlet EB-4 included cyanide analysis. One sample at the MH-408 was analyzed for the full suite of parameters except explosives. Table 4-10 presents summary statistics and determination of SRCs in storm/sanitary sewer sediment. The analytical results are presented in their entirety in Appendix N.

Explosives

Four explosives compounds were detected in sediment in the storm/sanitary sewer (Table 4-58). The most compounds and highest concentrations were detected at Inlet EH-13. The highest concentration was 68 mg/kg of 2,4,6-TNT. Inlet EH-13 is near the melt-pour Building EB-4. No explosives compounds were detected at Inlets EH-21, EB-20, and MH-408.

Inorganic Constituents

Fourteen TAL metals were detected above background criteria at least once in sediment among the six storm/sanitary sewer stations. Ten of these metals were detected at every station. The most compounds and highest concentrations were detected near Building EB-803 at Inlets EH-21 and EB-20 (Figure 4-30). For metals with background criteria, concentrations at EH-21 exceeded background by factors of 1 (nickel) to 145.6 times background (lead), and at EB-20 by factors of 1 (nickel) to 54 times background (copper). Inlet EH-7 had the highest concentrations of cadmium, mercury, nickel, and silver. The highest concentrations of zinc and beryllium were at Inlet EB-4 (Table 4-59).

MH-505 exceeded background by factors of 1.2 times background (selenium) to 266.7 times background (mercury). Nickel was detected above sediment background at all three stations. Manganese was present above sediment background in two of the three samples (Figure 4-30). The maximum concentration of copper was detected at MH-504A, and maximum concentrations of cobalt, manganese, and silver were detected at MH-511. Cyanide was not detected in any of the storm/sanitary sewer sediment samples.

SVOCs, VOCs, and PCBs/Pesticides

Only one sediment sample was submitted for full suite analysis collected at the Ejector Station (LL2-259). No SVOCs, VOC, or pesticides were detected. PCBs were collected and detected at all six sediment stations. PCB-1254 was detected in six of the six sediment samples at a high concentration of 15 mg/kg at Inlet EH-13 (Figure 4-31).

4.8 BUILDINGS AND STRUCTURES

As described in Section 4.1, samples collected from various buildings and structures included soil beneath building floor slabs, sediment/sludges and accumulated water from sedimentation and washout basins, and floor sweep samples from several former production buildings. Table 4-60 summarizes samples collected from buildings and structures; locations of these samples are shown on Figures 3-1 through 3-3 and Figure 3-7. The evaluation of these data is limited in that summary statistics and screening to identify SRCs are not conducted for this data aggregate. Comparisons of floor sweep sample TCLP results to their respective hazardous waste criteria are presented in Section 4.8.3.

Table 4-58. Summary Data for Site-Related Explosives and Propellants in the Storm/Sewer Aggregate for Sediment

Functional Area		Storm/Sanitary Sewers Sediment Samples Aggregate	Storm/Sanitary Sewers Sediment Samples Aggregate	Storm/Sanitary Sewers Sediment Samples Aggregate	Storm/Sanitary Sewers Sediment Samples Aggregate	Storm/Sanitary Sewers Sediment Samples Aggregate	Storm/Sanitary Sewers Sediment Samples Aggregate	Storm/Sanitary Sewers Sediment Samples Aggregate
Station ID		**LL3-215**	**LL3-217**	**LL3-218**	**LL3-223**	**LL3-224**	**LL3-224**	**LL3-228**
Sample ID		**LL31063**	**LL31066**	**LL31067**	**LL31088**	**LL31089**	**LL31130**	**LL31094**
Date		**08/07/2001**	**08/07/2001**	**08/07/2001**	**08/08/2001**	**08/07/2001**	**08/07/2001**	**08/09/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Field Duplicate**	**Grab**
Analyte	**Units**							
Explosives								
1,3,5-Trinitrobenzene	mg/kg	0.25 U	0.35 U	0.77 =	0.25 U	0.25 U	NA	NA
2,4,6-Trinitrotoluene	mg/kg	0.16 J	0.61 =	68 =	0.25 U	0.25 U	NA	NA
2-Amino-4,6-dinitrotoluene	mg/kg	0.25 U	0.69 =	2.2 J	0.25 U	0.25 U	NA	NA
4-Amino-2,6-dinitrotoluene	mg/kg	0.25 U	0.88 =	21 U	0.25 U	0.25 U	NA	NA
Pesticides and PCBs								
PCB-1254	mg/kg	0.58 =	6.2 =	15 =	2.5 =	0.86 =	1.3 =	0.056 =

ID = Identification.
NA = Not analyzed.
PCB = Polychlorinated biphenyl.
= - Detected result.
J - Estimated result.
U - Not detected.

Table 4-59. Summary Data for Site-Related Inorganics in the Storm/Sewer Aggregate for Sediment

Functional Area		Storm/Sanitary Sewers Sediment Samples Aggregate	Storm/Sanitary Sewers Sediment Samples Aggregate	Storm/Sanitary Sewers Sediment Samples Aggregate	Storm/Sanitary Sewers Sediment Samples Aggregate	Storm/Sanitary Sewers Sediment Samples Aggregate	Storm/Sanitary Sewers Sediment Samples Aggregate	Storm/Sanitary Sewers Sediment Samples Aggregate
Station ID		**LL3-215**	**LL3-217**	**LL3-218**	**LL3-223**	**LL3-224**	**LL3-224**	**LL3-228**
Sample ID		**LL31063**	**LL31066**	**LL31067**	**LL31088**	**LL31089**	**LL31130**	**LL31094**
Date		**08/07/2001**	**08/07/2001**	**08/07/2001**	**08/08/2001**	**08/07/2001**	**08/07/2001**	**08/09/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 0.5**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Field Duplicate**	**Grab**
Analyte	**Units**							
Inorganics								
Antimony	mg/kg	2.5 UJ	1.9 J *	1.2 UJ	756 J *	201 J *	200 J *	1.5 UJ
Arsenic	mg/kg	14.4 J	8.7 =	9.9 =	13.8 =	24.4 = *	30 = *	10.2 =
Barium	mg/kg	108 J	178 = *	51.8 =	2,010 = *	95 =	135 = *	37.4 =
Beryllium	mg/kg	1.1 = *	0.68 = *	0.49 = *	0.63 J *	0.58 = *	0.7 = *	0.37 U
Cadmium	mg/kg	4.3 = *	9.3 = *	2.1 = *	5 = *	1.5 = *	1.7 = *	0.35 J *
Chromium	mg/kg	37.3 = *	33.8 = *	10.7 =	464 J *	148 = *	141 = *	26.3 = *
Cobalt	mg/kg	6.9 J	9.1 =	5.5 =	21.1 = *	11.5 = *	14.5 = *	7 =
Copper	mg/kg	182 = *	90.1 = *	32.4 = *	158 = *	1,340 = *	1,510 = *	23.5 J
Lead	mg/kg	63.8 J *	190 J *	55 J *	3,930 = *	913 J *	1,010 J *	97.6 J *
Mercury	mg/kg	0.024 J	0.23 = *	0.033 J	0.13 J *	0.16 J *	0.21 J *	0.016 J
Nickel	mg/kg	31 J *	46.4 J *	13.4 J	17.8 = *	16.8 =	18.9 = *	15.4 =
Selenium	mg/kg	5 U	3.8 = *	0.62 =	0.83 J	4.5 = *	5.5 = *	3 U
Silver	mg/kg	0.44 J *	2.2 = *	0.22 J *	0.72 U	0.73 U	0.81 U	0.74 U
Zinc	mg/kg	1,230 = *	515 J	778 J *	846 = *	283 =	334 =	115 =

ID = Identification.
* - Exceeds Ravenna Army Ammunition Plant background criteria.
= - Detected result.
J - Estimated result.
U - Not detected.

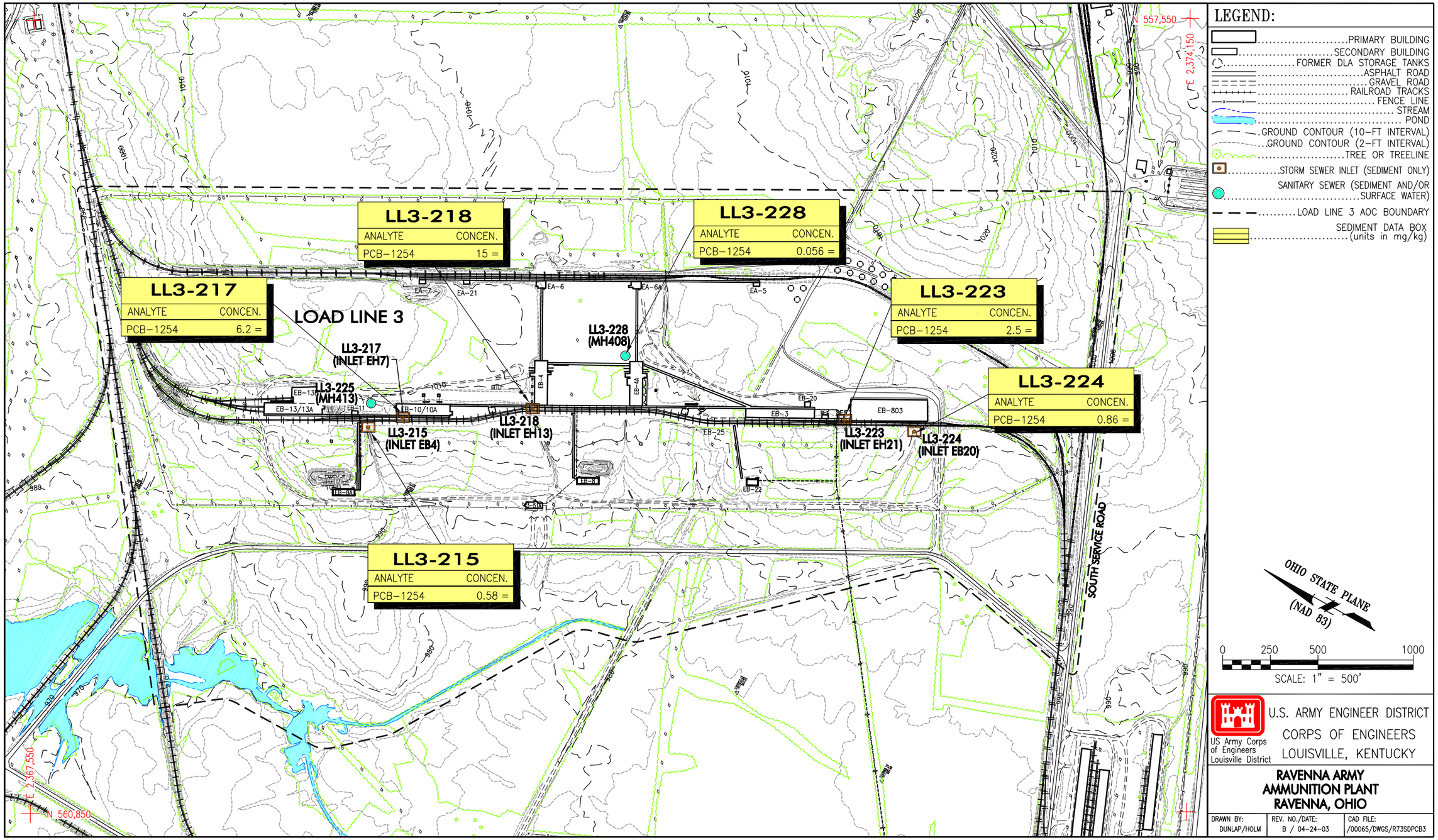


Figure 4-31. Distribution of Detected Pesticides and PCBs in the Sanitary Sewer System Sediment at Load Line 3

Table 4-60. Load Line 3 Phase II RI Summary of Samples Collected from Buildings and Structures

Location	Station ID	Sample Type
Building Sub-floor Samples		
EA-6 Explosive Preparation	LL3-061	Sub-floor Soil
	LL3-062	Sub-floor Soil
EA-6A Explosive Preparation	LL3-068	Sub-floor Soil
	LL3-069	Sub-floor Soil
EB-10 Drilling and Assembly	LL3-094	Sub-floor Soil
	LL3-095	Sub-floor Soil
EB-4 Melt-Pour Building	LL3-107	Sub-floor Soil
	LL3-108	Sub-floor Soil
	LL3-109	Sub-floor Soil
EB-4A Melt-Pour Building	LL3-123	Sub--floor Soil
	LL3-124	Sub-floor Soil
	LL3-125	Sub-floor Soil
Washout Annexes and Sedimentation/Filter Basins		
Building EA-6 Sedimentation Basin	LL3-155	Sediment sample only; no water present
Building EB-4 Sedimentation Basin	LL3-208	Sediment sample only; no water present
EB-4 Melt-Pour Building North Washout Annex	LL3-209	Water sample only; insufficient sediment present
EB-4 Melt-Pour Building South Washout Annex	LL3-210	Sediment sample only; no water present
EB-4A Melt-Pour Building North Washout Annex	LL3-211	Sediment and water samples
EB-4A Melt-Pour Building South Washout Annex	LL3-212	Sediment and water samples
EB-4A Melt-Pour Building Northeast Water Supply Basin	LL3-213	Water sample only
	LL3-214	Water sample only
Floor Sweep Samples		
EB-10 Drilling and Assembly	LL3-096	Floor sweep sample; As+3, TCLP also collected
EB-4 Melt-Pour Building	LL3-110	Floor sweep sample; As+3, TCLP also collected
EB-3 Shell Receiving Building	LL3-141	Floor sweep sample; As+3, TCLP also collected

RI = Remedial Investigation.

4.8.1 Building Sub-floor Samples

As noted in Table 4-60, 12 samples of soil beneath building floor slabs were collected and analyzed for field explosives, TAL metals, and PCBs. Four stations were analyzed for explosives. In addition, sample station LL3-062 beneath the Building EA-6 floor slab was analyzed for cyanide.

Table 4-61 presents results for inorganics detected at least once in the sub-floor soil aggregate. Table 4-62 presents results for detected organic constituents. TAL metals concentrations in all samples generally reflect an absence of inorganic contamination that may be attributed to facility operations. Slight exceedances of RVAAP surface soil background values were noted for copper and zinc. Low detectable concentrations of cadmium and thallium were also observed in some samples.

Field analytical results were 8.9 mg/kg for RDX at station LL3-069 and 1.3 mg/kg for station LL3-123; thus, these samples were submitted for fixed-base laboratory analysis of explosives. The laboratory analysis for station LL3-069 did not detect any explosives. Trace levels of 2,4- DNT and 2,4,6-TNT were detected in the sample collected from station LL3-123 (Building EB-4A). Two additional samples from station LL3-061 and LL3-094 were also submitted for laboratory analysis of explosives for confirmation purposes; trace levels of 2,4-DNT and 2,4,6-TNT were detected in these samples (Table 4-62).

A few detections of low concentrations of Arochlor-1254 were observed in the samples collected at stations LL3-094 and -095 in Building EB-10 and station LL3-123.

4.8.2 Washout Annexes and Sedimentation Basins

Sediment and/or water samples were collected from washout sumps located inside of Buildings EB-4 (Stations LL3-209 and LL3-210) and EB-4A (Stations LL3-211 and LL3-212), as noted in Table 4-60. Inorganic constituents, in particular cadmium, chromium, copper, lead, and zinc, were detected at high concentrations in all samples, with station LL3-210 in Building EB-4 exhibiting the highest concentrations and number of constituents (Table 4-63). Elevated beryllium and silver were also detected in Building EB-4 sumps.

The washout annex basins for EB-4 was observed with standing water and no sediment for LL3-209. No water was observed, only sediment for LL3-210, and it was dry at approximately 0.2 ft containing black moist sludge. EB-4A was observed to have up to 4 in. of sediment for LL3-211. Water and approximately 0.03 ft of saturated reddish silt with some sand particles was observed at LL3-21 and LL3-212. Washout annex basins are to be pumped and mucked out as part of building decontamination and decommissioning activities.

Sediment samples collected from the Building EB-4 washout annexes contained elevated quantities of several explosive and propellant compounds (Table 4-64), in particular 2,4,6-TNT and RDX. The Building EB-4A washout annexes contained few detectable explosives or propellants. Field analyses of TNT and RDX in the Building EB-4A north washout annex detected no explosives; thus, no samples were submitted for laboratory analyses. A number of pesticides were detected in all four washout basins at low concentrations. Arochlor-1254 was prevalent in the basins in Building EB-4, ranging from 95 to 110 mg/kg. Low, estimated concentrations of a few SVOCs, primarily PAHs, and VOCs were also detected. Water samples from the washout annex basins showed detectable concentrations of metals and explosives corresponding to those observed at high concentrations in sediment (Tables 4-65 and 4-66).

Sediment samples were collected from two sedimentation basins, including the primary basin located north of Building EB-4 (Station LL3-208) and a small basin located adjacent to Building EA-6 (LL3-155). The primary sedimentation basin was dry. The concrete structure was observed to be largely intact, although a large crack on the northwest side of the structure was observed. A minimal amount of sediment was

Table 4-61. Summary Results for Load Line 3 Building Sub-floor Soils – Inorganics

Functional Area		Soil Beneath Building Floor Slabs Aggregate	Soil Beneath Building Floor Slabs Aggregate	Soil Beneath Building Floor Slabs Aggregate	Soil Beneath Building Floor Slabs Aggregate	Soil Beneath Building Floor Slabs Aggregate	Soil Beneath Building Floor Slabs Aggregate
Station ID		**LL3-061**	**LL3-062**	**LL3-068**	**LL3-069**	**LL3-094**	**LL3-095**
Sample ID		**LL3ss-061-0705-SO**	**LL3ss-062-0706-SO**	**LL3ss-068-0722-SO**	**LL3ss-069-0723-SO**	**LL3ss-094-0796-SO**	**LL3ss-095-0797-SO**
Date		**07/31/2001**	**07/31/2001**	**07/31/2001**	**07/31/2001**	**08/01/2001**	**08/01/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**
Analyte	**Units**						
Inorganics							
Aluminum	mg/kg	7,150 =	7,570 =	6,340 =	6,350 =	6,730 =	6,090 =
Arsenic	mg/kg	10.8 J	14.8 J	13.1 J	12.6 J	12.4 J	12.9 J
Barium	mg/kg	31.5 =	31.3 =	33.5 =	32.1 =	36.4 =	41.4 =
Beryllium	mg/kg	0.33 J	0.31 J	0.3 J	0.31 J	0.36 J	0.3 J
Cadmium	mg/kg	0.16 J	0.19 J	0.15 J	0.19 J	0.16 J	0.17 J
Calcium	mg/kg	1,050 =	1,260 =	1,080 =	1,050 =	1,190 =	2,010 =
Chromium	mg/kg	8.3 =	9 =	8.7 =	7.8 =	8.4 =	10.5 =
Cobalt	mg/kg	6.2 =	7.5 =	7 =	7.1 =	8 =	7.8 =
Copper	mg/kg	18.5 =	19.2 =	21.3 =	21.5 =	22.3 =	23.8 =
Iron	mg/kg	17,500 =	17,700 =	17,400 =	18,200 =	19,100 =	18,100 =
Lead	mg/kg	11.4 J	16.4 J	14.5 J	11.8 J	14.3 J	16.1 J
Magnesium	mg/kg	1,760 =	2,060 =	1,820 =	1,650 =	1,760 =	2,090 =
Manganese	mg/kg	319 =	324 =	376 =	374 =	388 =	436 =
Mercury	mg/kg	0.016 J	0.025 J	0.11 U	0.11 U	0.025 J	0.11 U
Nickel	mg/kg	14.1 =	15.3 =	14.5 =	14.6 =	15.5 =	18 =
Potassium	mg/kg	649 =	792 =	692 =	629 =	753 =	752 =
Selenium	mg/kg	2.2 U	0.43 J	0.39 J	2.2 U	2.2 U	2.2 U
Sodium	mg/kg	550 U	545 U	530 U	544 U	541 U	538 U
Thallium	mg/kg	0.37 U	0.31 =	0.33 U	0.37 U	0.39 U	0.46 U
Vanadium	mg/kg	12.5 =	12.8 =	12 =	12.4 =	12.6 =	10.2 =
Zinc	mg/kg	56.1 =	56.4 =	54 =	61.7 =	72.7 =	75.8 =

Table 4-61. Summary Results for Load Line 3 Building Sub-floor Soils – Inorganics (continued)

Functional Area		Soil Beneath Building Floor Slabs Aggregate	Soil Beneath Building Floor Slabs Aggregate	Soil Beneath Building Floor Slabs Aggregate	Soil Beneath Building Floor Slabs Aggregate	Soil Beneath Building Floor Slabs Aggregate	Soil Beneath Building Floor Slabs Aggregate
Station ID		**LL3-107**	**LL3-108**	**LL3-109**	**LL3-123**	**LL3-124**	**LL3-125**
Sample ID		**LL3ss-107-0829-SO**	**LL3ss-108-0830-SO**	**LL3ss-109-0831-SO**	**LL3ss-123-0869-SO**	**LL3ss-124-0870-SO**	**LL3ss-125-0871-SO**
Date		**08/07/2001**	**08/07/2001**	**08/08/2001**	**08/01/2001**	**08/01/2001**	**08/01/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**
Analyte	**Units**						
Inorganics							
Aluminum	mg/kg	6,300 =	5,800 =	5,790 =	11,900 =	13,200 =	15,100 =
Arsenic	mg/kg	12.5 =	10.4 =	9.1 =	6.8 J	13.6 J	11.4 J
Barium	mg/kg	35.6 =	37.1 =	27.6 =	133 =	53.8 =	66.3 =
Beryllium	mg/kg	0.27 =	0.25 =	0.27 J	1.2 =	0.57 J	0.87 =
Cadmium	mg/kg	0.24 =	0.21 =	0.1 J	0.42 J	0.36 J	0.16 J
Calcium	mg/kg	1,530 =	2,550 =	2,520 =	80,000 =	3,400 =	14,200 =
Chromium	mg/kg	9 =	8.5 =	8.3 J	9.6 =	15.9 =	14.9 =
Cobalt	mg/kg	8.8 =	6.1 =	5.6 =	4 =	7.1 =	6.4 =
Copper	mg/kg	20 =	16.4 =	16.5 =	18.8 =	25.5 =	15.3 =
Iron	mg/kg	18,900 =	15,300 =	14,700 =	11,300 =	25,000 =	23,600 =
Lead	mg/kg	14.8 J	13.1 J	10.1 =	56.8 J	28.8 J	11 J
Magnesium	mg/kg	1,870 =	1,800 =	2,180 =	6,610 =	2,870 =	4,550 =
Manganese	mg/kg	327 =	321 =	267 =	698 =	251 =	374 =
Mercury	mg/kg	0.01 UJ	0.028 UJ	0.11 U	0.026 J	0.13 U	0.012 J
Nickel	mg/kg	13 =	11.6 =	13.1 =	8.2 =	18.3 =	16.4 =
Potassium	mg/kg	681 =	653 =	657 =	1,450 =	841 =	1,160 =
Selenium	mg/kg	2.2 U	2.1 U	2.1 U	2.2 U	2.5 U	2.4 U
Sodium	mg/kg	540 U	527 U	533 U	253 J	627 U	98.1 J
Thallium	mg/kg	0.25 =	0.27 =	0.21 =	0.31 U	0.5 U	0.51 U
Vanadium	mg/kg	11.8 =	11 =	9.2 =	11.5 =	20.5 =	19.3 =
Zinc	mg/kg	60.2 =	62.2 =	47.2 =	124 =	93 =	43.8 =

ID = Identification.
= - Detected result.
J - Estimated result.
U - Not detected.

Table 4-62. Summary Results for Load Line 3 Building Sub-floor Soils - Organics

Functional Area		Soil Beneath Building Floor Slabs Aggregate	Soil Beneath Building Floor Slabs Aggregate	Soil Beneath Building Floor Slabs Aggregate	Soil Beneath Building Floor Slabs Aggregate	Soil Beneath Building Floor Slabs Aggregate	Soil Beneath Building Floor Slabs Aggregate
Station ID		**LL3-061**	**LL3-062**	**LL3-068**	**LL3-069**	**LL3-094**	**LL3-095**
Sample ID		**LL3ss-061-0705-SO**	**LL3ss-062-0706-SO**	**LL3ss-068-0722-SO**	**LL3ss-069-0723-SO**	**LL3ss-094-0796-SO**	**LL3ss-095-0797-SO**
Date		**07/31/2001**	**07/31/2001**	**07/31/2001**	**07/31/2001**	**08/01/2001**	**08/01/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**
Analyte	**Units**						
Explosives							
2,4,6-Trinitrotoluene	mg/kg	0.063 J	NA	NA	0.25 U	0.13 J	NA
2,4-Dinitrotoluene	mg/kg	0.35 =	NA	NA	0.25 U	0.31 =	NA
2,6-Dinitrotoluene	mg/kg	0.25 U	NA	NA	0.25 U	0.25 U	NA
Pesticides and PCBs							
PCB-1254	mg/kg	0.036 U	0.036 U	0.035 U	0.036 U	0.54 =	0.14 =

Functional Area		Soil Beneath Building Floor Slabs Aggregate	Soil Beneath Building Floor Slabs Aggregate	Soil Beneath Building Floor Slabs Aggregate	Soil Beneath Building Floor Slabs Aggregate	Soil Beneath Building Floor Slabs Aggregate	Soil Beneath Building Floor Slabs Aggregate
Station ID		**LL3-107**	**LL3-108**	**LL3-109**	**LL3-123**	**LL3-124**	**LL3-125**
Sample ID		**LL3ss-107-0829-SO**	**LL3ss-108-0830-SO**	**LL3ss-109-0831-SO**	**LL3ss-123-0869-SO**	**LL3ss-124-0870-SO**	**LL3ss-125-0871-SO**
Date		**08/07/2001**	**08/07/2001**	**08/08/2001**	**08/01/2001**	**08/01/2001**	**08/01/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**
Analyte	**Units**						
Explosives							
2,4,6-Trinitrotoluene	mg/kg	NA	NA	NA	0.98 =	NA	NA
2,4-Dinitrotoluene	mg/kg	NA	NA	NA	0.38 =	NA	NA
2,6-Dinitrotoluene	mg/kg	NA	NA	NA	0.11 J	NA	NA
Pesticides and PCBs							
PCB-1254	mg/kg	0.036 U	0.035 U	0.035 U	0.21 J	0.041 U	0.04 U

ID = Identification.
NA - Not analyzed.
= - Detected result.
U - Not detected.
J - Estimated result.

Table 4-63. Summary Sediment Results for Load Line 3 Washout Basins – Inorganics

Functional Area		Process Effluent Sumps Inside Buildings Aggregate	Process Effluent Sumps Inside Buildings Aggregate	Process Effluent Sumps Inside Buildings Aggregate	Process Effluent Sumps Inside Buildings Aggregate
Station ID		**LL3-210**	**LL3-210**	**LL3-211**	**LL3-212**
Sample ID		**LL3sd-210-1053-SD**	**LL3sd-210-1122-SD**	**LL3sd-211-1055-SD**	**LL3sd-212-1057-SD**
Date		**08/06/2001**	**08/06/2001**	**08/06/2001**	**08/06/2001**
Sample Type		**Grab**	**Field Duplicate**	**Grab**	**Grab**
Analyte	**Units**				
Inorganics					
Aluminum	mg/kg	17,300 J	16,700 J	15,900 J	8,740 =
Antimony	mg/kg	5.6 J	5.2 J	6.2 UJ	5.7 UJ
Arsenic	mg/kg	27.5 J	26.4 J	37 J	18.1 J
Barium	mg/kg	1,170 J	1,0 J	467 J	126 J
Beryllium	mg/kg	1.4 =	1.3 =	0.96 U	0.5 U
Cadmium	mg/kg	37.7 =	39.2 =	7.6 =	2.1 =
Calcium	mg/kg	19,800 J	18,400 J	273,000 J	126,000 J
Chromium	mg/kg	423 J	296 J	280 J	103 =
Cobalt	mg/kg	25.5 J	30 J	507 J	180 J
Copper	mg/kg	922 J	920 J	306 J	113 =
Iron	mg/kg	94,200 J	97,700 J	218,000 J	77,800 J
Lead	mg/kg	4,710 J	3,260 J	788 J	21.6 J
Magnesium	mg/kg	13,900 J	14,000 J	11,800 J	6,070 =
Manganese	mg/kg	837 J	907 J	2,110 J	841 J
Mercury	mg/kg	0.56 J	0.55 J	0.62 J	0.054 J
Nickel	mg/kg	114 J	114 J	220 J	92.1 J
Potassium	mg/kg	1,160 =	1,090 J	847 J	1,830 J
Selenium	mg/kg	3.1 J	1.9 J	12.5 U	11.3 U
Silver	mg/kg	52.7 =	2.1 =	3.1 U	2.8 U
Sodium	mg/kg	133 J	131 J	3,110 U	542 J
Thallium	mg/kg	1.1 =	0.8 J	1.2 U	0.9 U
Vanadium	mg/kg	31.9 J	30.6 J	51.4 J	20.9 J
Zinc	mg/kg	5,770 J	5,860 J	278 J	106 =

ID = Identification.

Table 4-64. Summary Sediment Results for Load Line 3 Washout Basins – Organics

Functional Area		Process Effluent Sumps Inside Buildings Aggregate	Process Effluent Sumps Inside Buildings Aggregate	Process Effluent Sumps Inside Buildings Aggregate	Process Effluent Sumps Inside Buildings Aggregate
Station ID		**LL3-210**	**LL3-210**	**LL3-211**	**LL3-212**
Sample ID		**LL3sd-210-1053-SD**	**LL3sd-210-1122-SD**	**LL3sd-211-1055-SD**	**LL3sd-212-1057-SD**
Date		**08/06/2001**	**08/06/2001**	**08/06/2001**	**08/06/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Field Duplicate**	**Grab**	**Grab**
Analyte	**Units**				
Explosives					
1,3,5-Trinitrobenzene	mg/kg	2.4 J	2.1 J	NA	0.25 U
1,3-Dinitrobenzene	mg/kg	0.24 J	0.54 J	NA	0.25 U
2,4,6-Trinitrotoluene	mg/kg	380 =	380 =	NA	0.25 U
2-Amino-4,6-dinitrotoluene	mg/kg	170 =	180 =	NA	0.25 U
4-Amino-2,6-dinitrotoluene	mg/kg	260 =	260 =	NA	0.25 U
HMX	mg/kg	50 =	18 J	NA	0.5 U
Nitrocellulose	mg/kg	190 =	NA	2 =	8.9 =
Nitroguanidine	mg/kg	0.25 UJ	NA	0.059 J	0.25 UJ
RDX	mg/kg	350 =	95 =	NA	0.5 U
Pesticides and PCBs					
4,4'-DDE	mg/kg	1.3 J	1.2 J	0.048 J	0.01 J
4,4'-DDT	mg/kg	0.32 J	0.31 J	0.011 U	0.0096 U
Aldrin	mg/kg	0.091 J	0.19 U	0.011 U	0.0096 U
Dieldrin	mg/kg	0.15 J	0.19 U	0.011 =	0.0096 U
Endrin Aldehyde	mg/kg	0.55 J	0.67 J	0.022 =	0.01 =
Heptachlor	mg/kg	0.078 U	0.19 U	0.024 =	0.023 =
Methoxychlor	mg/kg	0.39 =	0.49 J	0.021 U	0.019 U
PCB-1254	mg/kg	110 =	95 =	2.2 =	0.39 =
beta-BHC	mg/kg	0.1 J	0.19 U	0.011 U	0.0096 U
Semivolatile Organics					
2,4-Dinitrotoluene	mg/kg	1.3 J	1.2 J	2.1 UJ	1.9 UJ
2,6-Dinitrotoluene	mg/kg	2.2 J	1.8 J	2.1 UJ	1.9 UJ
Benzo(*b*)fluoranthene	mg/kg	1.9 J	2.2 J	2.1 UJ	1.9 UJ
Benzoic Acid	mg/kg	37 UJ	36 UJ	0.91 J	9 UJ
Bis(2-ethylhexyl)phthalate	mg/kg	2.5 J	2.3 J	2.1 UJ	1.9 UJ
Chrysene	mg/kg	1.5 J	1 J	2.1 UJ	1.9 UJ
Fluoranthene	mg/kg	7.6 UJ	1.4 J	2.1 UJ	1.9 UJ
Pyrene	mg/kg	2 J	2.4 J	2.1 UJ	1.9 UJ
Volatile Organics					
Acetone	mg/kg	0.046 U	0.044 U	0.031 J	0.019 J
Dimethylbenzene	mg/kg	0.011 U	0.011 U	0.018 J	0.028 U
Toluene	mg/kg	0.011 U	0.011 U	0.0066 J	0.028 U

BHC = Benzene hexachloride.
DDE = Dichlorodiphenyldichloroethylene.
DDT = Dichlorodiphenyltrichloroethane
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID = Identification.
PCB = Polychlorinated biphenyl.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
= - Detected result.
J - Estimated result.
NA - Not analyzed.

Table 4-65. Summary Water Results for Load Line 3 Washout Basins - Inorganics

Functional Area		Process Effluent Sumps Inside Buildings Aggregate	Process Effluent Sumps Inside Buildings Aggregate	Process Effluent Sumps Inside Buildings Aggregate	Process Effluent Sumps Inside Buildings Aggregate
Station ID		**LL3-209**	**LL3-209**	**LL3-211**	**LL3-212**
Sample ID		**LL3sw-209-1052-SW**	**LL3sw-209-1139-SW**	**LL3sw-211-1056-SW**	**LL3sw-212-1058-SW**
Date		**08/06/2001**	**08/06/2001**	**08/06/2001**	**08/06/2001**
Sample Type		**Grab**	**Field Duplicate**	**Grab**	**Grab**
Analyte	**Units**				
Inorganics					
Aluminum	mg/L	0.11 U	0.11 U	0.15 J	0.21 J
Antimony	mg/L	0.0027 J	0.01 U	0.01 U	0.01 U
Arsenic	mg/L	0.015 U	0.015 U	0.015 U	0.019 =
Barium	mg/L	0.027 =	0.028 =	0.019 =	0.0098 J
Cadmium	mg/L	0.00052 J	0.00054 J	0.00034 J	0.005 U
Calcium	mg/L	24.6 =	25 =	18.6 =	10.8 =
Copper	mg/L	0.02 =	0.021 =	0.014 =	0.048 =
Iron	mg/L	0.3 U	0.3 U	0.11 =	0.24 =
Lead	mg/L	0.01 U	0.01 U	0.0074 =	0.009 =
Magnesium	mg/L	0.95 J	0.96 J	0.54 J	0.38 J
Manganese	mg/L	0.0017 U	0.0016 U	0.0034 J	0.0047 J
Nickel	mg/L	0.025 U	0.025 U	0.025 U	0.0039 J
Potassium	mg/L	32.9 =	33.3 =	19 =	69 =
Sodium	mg/L	10.9 =	11.2 =	7.2 =	50.9 =
Vanadium	mg/L	0.007 U	0.007 U	0.007 U	0.0031 J
Zinc	mg/L	0.056 =	0.064 =	0.046 =	0.035 =

ID = Identification.
= - Detected result.
J - Estimated result.
U - Not detected.

Table 4-66. Summary Water Results for Load Line 3 Washout Basins – Organics

Functional Area		Process Effluent Sumps Inside Buildings Aggregate	Process Effluent Sumps Inside Buildings Aggregate	Process Effluent Sumps Inside Buildings Aggregate	Process Effluent Sumps Inside Buildings Aggregate
Station ID		**LL3-209**	**LL3-209**	**LL3-211**	**LL3-212**
Sample ID		**LL3sw-209-1052-SW**	**LL3sw-209-1139-SW**	**LL3sw-211-1056-SW**	**LL3sw-212-1058-SW**
Date		**08/06/2001**	**08/06/2001**	**08/06/2001**	**08/06/2001**
Sample Type		**Grab**	**Field Duplicate**	**Grab**	**Grab**
Analyte	**Units**				
Explosives					
1,3,5-Trinitrobenzene	mg/L	0.00022 U	0.0003 =	0.001 =	0.0002 U
2,4,6-Trinitrotoluene	mg/L	0.075 =	0.067 =	0.18 =	0.0013 =
2-Amino-4,6-dinitrotoluene	mg/L	0.038 =	0.044 =	0.05 =	0.005 =
4-Amino-2,6-dinitrotoluene	mg/L	0.083 =	0.091 =	0.13 =	0.015 =
HMX	mg/L	0.0047 U	0.0032 =	0.0015 U	0.0005 U
Nitroguanidine	mg/L	0.009 J	0.012 J	0.02 U	0.02 U
RDX	mg/L	0.012 =	0.014 =	0.0018 =	0.0004 J
Pesticides and PCBs					
Endrin Ketone	mg/L	0.0025 U	0.0025 U	0.000055 =	0.00005 U
PCB-1254	mg/L	0.0005 U	0.0005 U	0.00065 =	0.0005 U
beta-BHC	mg/L	0.0025 U	0.0025 U	0.00005 U	0.000069 J
Volatile Organics					
Acetone	mg/L	0.01 UJ	0.00092 J	0.01 UJ	0.00083 J

ID = Identification.
PCB = Polychlorinated biphenyl.
= - Detected result.
J - Estimated result.
U - Not detected.

observed in the bottom of the structure (about 0.2 ft). Sediment consisted of wet, dark gray, fine material with abundant algae and moss. The small basin at Building EA-6 was intact but dry. Approximately 0.3 ft of wet silt material was present in the bottom of the basin with abundant decomposed organic material. Sediment from the primary basin contained concentrations of several metals (cadmium, chromium, copper, lead, and silver) that were slightly elevated above RVAAP background values for soil and sediment (Table 4-67). The small basin located at Building EB-6 contained much higher concentrations of these inorganics. Field analysis of TNT and RDX for samples collected from the Building EB-4 sedimentation indicated no detectable quantities of these compounds and laboratory analyses were not conducted. Low levels of 2,4,6-TNT and Arochlor-1254 were detected in the small sedimentation basin at Building EA-6 (Table 4-68). Neither of these basins had sufficient accumulated water for sampling.

Table 4-67. Summary Sediment Results for Load Line 3 Sedimentation Basins - Inorganics

Functional Area		Pink Water and Washdown Sedimentation Sumps Aggregate	Pink Water and Washdown Sedimentation Sumps Aggregate	Pink Water and Washdown Sedimentation Sumps Aggregate
Station ID		**LL3-155**	**LL3-155**	**LL3-208**
Sample ID		**LL3sd-155-0957-SD**	**LL3sd-155-1125-SD**	**LL3sd-208-1050-SD**
Date		**08/09/2001**	**08/09/2001**	**08/06/2001**
Sample Type		**Grab**	**Field Duplicate**	**Grab**
Analyte	**Units**			
Inorganics				
Aluminum	mg/kg	6,420 =	10,400 =	14,900 J
Antimony	mg/kg	9.5 UJ	5.6 J	3.8 UJ
Arsenic	mg/kg	8.2 =	12.4 =	7.6 J
Barium	mg/kg	67.7 J	110 J	122 J
Beryllium	mg/kg	4.7 U	0.77 J	1.1 U
Cadmium	mg/kg	11.9 =	12.8 =	1.7 =
Calcium	mg/kg	7,480 J	17,400 J	8,540 J
Chromium	mg/kg	58 J	98.7 J	24 J
Cobalt	mg/kg	7.6 =	10.9 =	8.5 J
Copper	mg/kg	345 J	445 J	94.2 J
Iron	mg/kg	36,900 J	68,700 J	18,900 J
Lead	mg/kg	570 J	735 J	64.9 J
Magnesium	mg/kg	2,040 J	4,050 J	2,510 J
Manganese	mg/kg	329 J	686 J	445 J
Mercury	mg/kg	0.18 J	0.12 J	0.13 J
Nickel	mg/kg	23.5 =	36.2 =	23.9 J
Potassium	mg/kg	1,100 J	1,560 J	1,380 J
Selenium	mg/kg	19 U	5.5 J	1.6 J
Silver	mg/kg	4.7 U	5.6 U	0.87 J
Thallium	mg/kg	1.5 J	1.1 J	0.76 U
Vanadium	mg/kg	13 =	16.8 =	21.8 J
Zinc	mg/kg	776 =	992 =	390 J

ID = Identification.
= - Detected result.
J - Estimated result.
U - Not detected.

Table 4-68. Summary Sediment Results for Load Line 3 Sedimentation Basins - Organics

Functional Area		Pink Water and Washdown Sedimentation Sumps Aggregate	Pink Water and Washdown Sedimentation Sumps Aggregate	Pink Water and Washdown Sedimentation Sumps Aggregate
Station ID		**LL3-155**	**LL3-155**	**LL3-208**
Sample ID		**LL3sd-155-0957-SD**	**LL3sd-155-1125-SD**	**LL3sd-208-1050-SD**
Date		**08/09/2001**	**08/09/2001**	**08/06/2001**
Depth (ft)		**0 - 1**	**0 - 1**	**0 - 1**
Sample Type		**Grab**	**Field Duplicate**	**Grab**
Analyte	**Units**			
Explosives				
2,4,6-Trinitrotoluene	mg/kg	0.25 U	0.32 =	NA
Pesticides and PCBs				
PCB-1254	mg/kg	23 =	15 =	0.13 U
Volatile Organics				
2-Butanone	mg/kg	NA	NA	0.016 J
Acetone	mg/kg	NA	NA	0.041 J

ID = Identification.
NA = Not analyzed.
PCB = Polychlorinated biphenyl.
= - Detected result.
J - Estimated result.
U - Not detected.

Two water samples were collected from a covered process water supply basin located adjacent to Building EB-4A. This structure was observed to be intact, although the wood frame roof was partially collapsed. Analyses of these samples indicated a general absence of process-related inorganics; trace levels of cyanide were detected in one sample. Trace levels of three explosive compounds were also detected at concentration of 1 mg/L or less (Tables 4-69 and 4-70).

4.8.3 Floor Sweep Samples

Samples of fine debris material (dirt, dust, paint chips, etc.) were collected from the floor areas inside of Buildings EB-10 (station LL3-096), EB-4 (station LL3-110), and EB-3 (station LL3-141). Sample locations are illustrated on Figures 3-1 through 3-3. These samples were analyzed for explosives, inorganics (including cyanide, Cr^{+6}, and As^{+3}), VOCs, SVOCs, and pesticides/PCBs. Tables 4-71 and 4-72 present results for inorganic and organic constituents, respectively, that were detected in at least one sample.

Inorganics

Results of inorganic analyses of floor sweep samples show high concentrations of multiple metals. Samples ranged from 31 to 32% iron, indicating a large percentage of the samples were comprised of rust. Cadmium, chromium, lead, nickel, and zinc all were present at elevated concentrations in all three buildings. Cyanide and As^{+3} were detected in the samples collected from all three buildings, although concentrations were low and relatively consistent.

Table 4-69. Summary Water Results for Load Line 3 Water Supply Basin – Inorganics

Functional Area		Pink Water and Washdown Sedimentation Sumps Aggregate	Pink Water and Washdown Sedimentation Sumps Aggregate
Station ID		**LL3-213**	**LL3-214**
Sample ID		**LL3sw-213-1060-SW**	**LL3sw-214-1062-SW**
Date		**08/07/2001**	**08/09/2001**
Sample Type		**Grab**	**Grab**
Analyte	**Units**		
Inorganics			
Cyanide	mg/L	0.01 U	0.037 =
Aluminum	mg/L	0.16 J	0.17 J
Barium	mg/L	0.0076 J	0.0069 J
Calcium	mg/L	15.1 =	14.8 =
Copper	mg/L	0.018 =	0.018 =
Iron	mg/L	0.5 =	0.5 =
Lead	mg/L	0.003 =	0.01 U
Magnesium	mg/L	0.84 J	0.86 J
Manganese	mg/L	0.0077 J	0.0093 J
Potassium	mg/L	29.9 =	30 =
Sodium	mg/L	3.7 J	4.2 U
Zinc	mg/L	0.091 =	0.089 =

ID = Identification.
= - Detected result.
J - Estimated result.
U - Not detected.

Table 4-70. Summary Water Results for Load Line 3 Water Supply Basin – Organics

Functional Area		Pink Water and Washdown Sedimentation Sumps Aggregate	Pink Water and Washdown Sedimentation Sumps Aggregate
Station ID		**LL3-213**	**LL3-214**
Sample ID		**LL3sw-213-1060-SW**	**LL3sw-214-1062-SW**
Date		**08/07/2001**	**08/09/2001**
Sample Type		**Grab**	**Grab**
Analyte	**Units**		
Explosives			
1,3,5-Trinitrobenzene	mg/L	0.0023 J	0.0022 J
2,4,6-Trinitrotoluene	mg/L	0.98 =	1 =
2-Amino-4,6-dinitrotoluene	mg/L	0.07 =	0.077 =

ID = Identification.
* - Exceed Ravenna Army Ammunition Plant background criteria.
= - Detected result.
J - Estimated result.
U - Not detected.

Table 4-71. Load Line 3 Phase II RI Floor Sweep Samples Results – Inorganics

Functional Area		Floorsweep Samples Aggregate	Floorsweep Samples Aggregate	Floorsweep Samples Aggregate
Station ID		**LL3-096**	**LL3-110**	**LL3-141**
Sample ID		**LL3fs-096-0798-FS**	**LL3fs-110-0832-FS**	**LL3fs-141-0917-FS**
Date		**08/20/2001**	**08/20/2001**	**08/20/2001**
Sample Type		**Grab**	**Grab**	**Grab**
Analyte	**Units**			
Inorganics				
Cyanide	mg/kg	0.69 =	0.94 =	0.54 =
Aluminum	mg/kg	1,450 =	1,770 =	916 =
Antimony	mg/kg	11.5 J	20.6 J	9.7 J
Arsenic	mg/kg	57 =	38.5 =	28.4 =
Arsenic +3	µg/g	0.0547 =	0.0714 =	0.048 =
Barium	mg/kg	2,000 =	1,640 =	1,240 =
Cadmium	mg/kg	61.1 =	114 =	10.8 =
Calcium	mg/kg	11,000 =	13,500 =	9,950 =
Chromium	mg/kg	201 =	252 =	124 =
Cobalt	mg/kg	32 =	39 =	21.3 =
Copper	mg/kg	345 =	748 =	1,500 =
Iron	mg/kg	329,000 =	322,000 =	310,000 =
Lead	mg/kg	6,890 J	4,530 J	2,180 J
Magnesium	mg/kg	1,050 =	1,150 =	869 =
Manganese	mg/kg	2,670 =	2,150 =	655 =
Mercury	mg/kg	0.17 =	0.034 J	0.09 J
Nickel	mg/kg	91.1 =	145 =	58.3 =
Potassium	mg/kg	9,260 =	9,090 =	6,060 =
Selenium	mg/kg	2.5 J	20.6 U	20.5 U
Silver	mg/kg	1.4 =	0.4 J	0.28 J
Sodium	mg/kg	3,050 =	1,770 =	1,550 =
Thallium	mg/kg	0.27 R	0.26 R	0.2 R
Vanadium	mg/kg	37.6 =	16.2 =	16.5 =
Zinc	mg/kg	1,470 =	1,180 =	838 =

ID = Identification.
RI = Remedial Investigation.
= - Detected result.
J - Estimated result.
U - Not detected.
R - Rejected result.

Table 4-72. Load Line 3 Phase II RI Floor Sweep Samples Results - Organics

Functional Area		Floorsweep Samples Aggregate	Floorsweep Samples Aggregate	Floorsweep Samples Aggregate
Station ID		**LL3-096**	**LL3-110**	**LL3-141**
Sample ID		**LL3fs-096-0798-FS**	**LL3fs-110-0832-FS**	**LL3fs-141-0917-FS**
Date		**08/20/2001**	**08/20/2001**	**08/20/2001**
Sample Type		**Grab**	**Grab**	**Grab**
Analyte	**Units**			
Explosives				
1,3,5-Trinitrobenzene	mg/kg	0.25 U	0.19 J	0.2 J
1,3-Dinitrobenzene	mg/kg	0.25 U	0.032 J	0.078 J
2,4,6-Trinitrotoluene	mg/kg	1.7 =	16 =	1.8 =
2-Amino-4,6-dinitrotoluene	mg/kg	0.25 =	0.89 =	0.33 =
4-Amino-2,6-dinitrotoluene	mg/kg	0.7 =	5.4 U	0.79 =
Pesticides and PCBs				
4,4'-DDE	mg/kg	7.7 J	2.6 =	0.78 J
Dieldrin	mg/kg	8.5 J	0.16 J	0.04 J
Endrin	mg/kg	0.94 J	0.087 UJ	0.035 UJ
Endrin Aldehyde	mg/kg	8.5 J	1.1 J	0.45 J
Methoxychlor	mg/kg	0.85 U	0.22 J	0.2 J
PCB-1254	mg/kg	830 =	120 =	49 =
alpha-Chlordane	mg/kg	0.62 J	0.087 U	0.038 J
gamma-Chlordane	mg/kg	5 J	0.58 J	0.26 J
Semivolatile Organics				
Benzo(*a*)anthracene	mg/kg	0.13 J	3.4 UJ	1.7 UJ
Benzo(*a*)pyrene	mg/kg	0.12 J	3.4 UJ	1.7 UJ
Benzo(*b*)fluoranthene	mg/kg	0.28 J	3.4 UJ	1.7 UJ
Benzo(*g,h,i*)perylene	mg/kg	0.063 J	3.4 UJ	1.7 UJ
Benzo(*k*)fluoranthene	mg/kg	0.083 J	3.4 UJ	1.7 UJ
Benzoic Acid	mg/kg	0.3 J	16 UJ	2.4 J
Bis(2-ethylhexyl)phthalate	mg/kg	0.89 J	8.3 J	2.6 J
Chrysene	mg/kg	0.28 J	3.4 UJ	1.7 UJ
Dimethyl phthalate	mg/kg	0.34 UJ	3.4 UJ	0.83 J
Fluoranthene	mg/kg	0.39 J	3.4 UJ	0.3 J
Phenanthrene	mg/kg	0.19 J	3.4 UJ	1.7 UJ
Pyrene	mg/kg	0.34 J	3.4 UJ	1.7 UJ
Volatile Organics				
Acetone	mg/kg	0.0029 J	0.021 UJ	0.02 U
Benzene	mg/kg	0.0052 U	0.0051 U	0.001 J
Toluene	mg/kg	0.0052 U	0.0051 U	0.0024 J

DDE = Dichlorodiphenyldichloroethylene.
ID = Identification.
RI = Remedial Investigation.
PCB = Polychlorinated biphenyl.
= - Detected result.
J - Estimated result.
U - Not detected.

Organics

Explosive compounds were detected in each of the floor sweep samples, although at low concentrations. The highest levels of explosives were observed in Building EB-4. Low, estimated concentrations of a number of SVOCs and pesticides were detected in all of the floor sweep samples. Trace levels of acetone, benzene, and toluene were also detected in the samples collected from Buildings EB-10 and EB-3. Notably, Arochlor-1254 was detected in all three floor sweep samples with the highest values observed in Building EB-10.

TCLP Analyses

In addition to direct analyses of floor sweepings, aliquots were collected for TCLP analyses (Table 4-73). Cadmium, chromium, and lead were the only analytes detected in TCLP extracts. Cadmium and lead concentrations in the sample collected at stations LL3-096 (Building EB-10) exceed maximum concentrations for the toxicity characteristic (1.0 and 5.0 mg/L, respectively) as specified in 40 *Code of Federal Regulations (CFR)* 261.24. Additionally, the lead result for the sample collected from Building EB-3 exceeded its TCLP criterion.

Table 4-73. Load Line 3 Phase II RI TCLP Constituents Detected in Floor Sweep Samples

Functional Area		Floorsweep Samples Aggregate	Floorsweep Samples Aggregate	Floorsweep Samples Aggregate
Station ID		**LL3-096**	**LL3-110**	**LL3-141**
Sample ID		**LL3fs-096-0798-FS**	**LL3fs-110-0832-FS**	**LL3fs-141-0917-FS**
Date		**08/20/2001**	**08/20/2001**	**08/20/2001**
Sample Type		**Grab**	**Grab**	**Grab**
Analyte	**Units**			
Cadmium	mg/L	2.2 =	1.5 =	0.32 =
Chromium	mg/L	1.2 =	0.5 U	0.54 =
Lead	mg/L	27.7 =	3.5 =	8.5 =

ID = Identification.
RI = Remedial Investigation.
TCLP = Toxicity Characteristic Leaching Procedure.
= - Detected result.

4.9 ORDNANCE AND EXPLOSIVES AVOIDANCE SURVEY SUMMARY

UXO technicians provided OE avoidance training and support during all field operations. The OE avoidance crew cleared all soil, surface water/sediment, and drilling locations within the former operations areas. In addition, they provided clearance for all test pit locations and supported the video survey of sanitary and storm sewer lines. In accordance with technical direction from USACE, OE technicians performed physical water and sediment sampling activities for process effluent collection sumps within the melt-pour buildings in order to ensure worker safety. The OE technicians received training from SAIC staff on the proper sampling protocols prior to these sampling activities; SAIC personnel completed all chain-of-custody and packaging and shipping. No OE was discovered during field reconnaissance and magnetometer surveys of access routes and proposed sampling, drilling, or test pit points. Various debris and metal scrap was encountered throughout Load Line 3 during visual and magnetometer surveys including, metal, rail ties, vitrified clay pipe fragments, rail spikes, and iron pipe. In several instances, subsurface magnetic anomalies resulted in the decision to move pre-planned sample

locations short distances to points where no anomalies were observed. Appendix O contains the full OE avoidance report and supporting field logs for the Load Line 3 Phase II RI.

4.10 RADIOLOGICAL SURVEY RESULTS

Radiological surveys of Load Lines 2, 3, and 4 were conducted by USACE, Buffalo District staff to demonstrate that no residual radioactive contamination attributable to RVAAP activities remains within radiography buildings. The surveys were conducted using accepted survey methods for decommissioning. These surveys demonstrate that radiological activity from residual radioactive contamination for each area surveyed is below the release criteria set forth by the U.S. Nuclear Regulatory Commission Guideline 1.86. In addition, records were reviewed to determine if documentation existed to support the proper disposal of the radioactive sources (e.g., cobalt-60 sealed sources) used in the load lines at RVAAP. Radiological survey results indicate that there is no detectable cobalt-60 contamination in the load lines. In addition, records exist that indicate that two of the three, sealed cobalt-60 sources (a 500-curie and two 1,000-curie sources) used at Load Lines 2, 3, and 4 were shipped off-site in 1971 and 1972 and returned to their licensed owner. A later memorandum indicated all three sources were returned to their licensed owner. Efforts are being taken by the Army to locate any additional pertinent information regarding the fate of the third cobalt-60 source (1,000-curie). A complete report containing the methods and discussions of radiological survey results was prepared by the USACE, Buffalo District and is contained in Appendix S.

4.11 FIELD TNT AND RDX SCREENING ANALYSIS

This section presents a comparison of the TNT and RDX field screening analysis to values determined by the off-site analytical laboratory.

4.11.1 Field Sampling and Analysis Protocol

Samples were collected from surface, subsurface, and sediment locations in and around Load Line 3. All surface soil (0 to 1 ft depth) samples were composite samples from three individual sampling locations positioned in a 3-ft equilateral triangle pattern in the sampling area. Subsurface samples were collected at discrete locations, but were composited over the associated depth interval.

Field determinations of 2,4,6-TNT and RDX in soil and sediment samples were performed through implementation of colorimetric analyses developed by the USACE Cold Regions Research & Engineering Laboratory (CRREL).

The procedure for measuring TNT concentrations in soils involves a liquid extraction of the explosives from the soil matrix with acetone, and formation of a color complex with sodium sulfite and potassium hydroxide. Absorbance is measured at a wavelength of 540 nm. For RDX, all nitrate must be removed from the extract, then glacial acetic acid and zinc powder are added. A complexing agent (NitriVer3) is added to the sample, and absorbance is measured at 507 nm. In both methods, percent absorbance is correlated to concentration.

Off-site laboratory determinations for TNT and RDX were performed by solvent extraction and analysis by liquid chromatographic techniques (SW846-8330).

All surface soil and sediment samples were field analyzed with colorimetric methods for TNT and RDX. The purpose of the analysis was to define the extent of surface soil contamination with respect to these explosive compounds. Field colorimetry was also used as a screening method to reduce the number of

samples that required fixed-base laboratory analysis for explosives. The strategy can be summarized as follows:

- If the field method indicated TNT was present at >/= 1 parts per million (ppm), the sample was sent to the off-site laboratory for analysis of explosives and propellants.
- If the concentration of TNT was < 1 ppm, the analysis for RDX was performed.
- If RDX was present at a concentration >/= 1 ppm, the sample was sent to the off-site laboratory for analysis of explosives and propellants.
- In addition, 15% of the samples showing non-detects of TNT or RDX were sent to the off-site laboratory for analysis of explosives.
- All samples collected, regardless of field colorimetry results, were submitted for TAL metals analysis.

4.11.2 TNT Comparison

TNT field screening and laboratory results are presented in Table 4-74. Starting with the premise that the laboratory results are accurate relative to the presence or absence of TNT in the sample, the field screening values provide 2.6% false negative information and 14% false positive information. Consideration of values less than 2 ppm as equivalent reduces the false negative rate to 1.3% and the false positive occurrences to a 9% rate. Comparison of positive TNT data where both laboratory and field screening values were between 2 and 1,000 ppm provided a slope of 0.99 and a correlation coefficient of 0.706 (Figure 4-33). Due to the increased variability of values above 1,000 ppm and below 2 ppm, their data was eliminated from this comparison.

Review of laboratory results for associated explosive compounds (i.e., TNB, DNTs, nitrotoluenes, nitrocellulose, etc.) indicates there were not any impacts on the field screening determinations from these compounds. Elevated levels of nitrocellulose did not appear to influence the TNT screening value. The low levels of other nitro-compounds observed in these samples did not exhibit any impact on the TNT screening levels.

Figure 4-32 plots field screening data versus laboratory data. The limited data available for comparison provides a correlation slope of 0.99 and a correlation coefficient of 0.706. It is believed the field screening has provided a valid representation of the presence or absence of TNT above 1 to 2 ppm and a reasonable correlation for those positive values greater than 2 ppm.

4.11.3 RDX Comparison

RDX field screening and laboratory results are presented in Table 4-75. Starting with the premise that the laboratory results are accurate relative to the presence or absence of RDX in the sample, all field screening values were confirmed to be below 1 ppm. Since no RDX comparison data were above the reporting levels, no correlation coefficient information was feasible. It is believed the field screening has provided a valid representation of the presence or absence of RDX above 1 ppm; however, because of the lack of positive detects, statistical correlation of field and laboratory quantified results could not be done.

Review of laboratory results for associated explosive compounds (i.e., HMX, nitrocellulose, nitroquanidine, etc.) does not indicate any obvious impacts on the field screening determinations from these compounds. Elevated levels of nitrocellulose did not appear to influence the RDX screening value. Low levels of HMX and nitroquanidine observed in these samples did not exhibit an impact on the RDX screening levels.

Table 4-74. Load Line 3 Laboratory/Field TNT Comparison

Station	Sample No.	Lab Result		Lab Dup Result		Field Result		Units
LL3-047	LL31069	0.65				1.7		mg/kg
LL3-050	LL31084	0.25	U			1	U	mg/kg
LL3-053	LL31073	0.65				1	U	mg/kg
LL3-055	LL30687	2.4				8.4		mg/kg
LL3-055	LL30688	6.2	J			6.6		mg/kg
LL3-056	LL30690	0.83				3.6		mg/kg
LL3-056	LL30691	500				201		mg/kg
LL3-057	LL30693	52		40		29		mg/kg
LL3-058	LL30696	120				138		mg/kg
LL3-058	LL30697	51				30		mg/kg
LL3-059	LL30699	0.15	J			1	U	mg/kg
LL3-060	LL30702	7.5				5.5		mg/kg
LL3-063	LL30707	650				4211		mg/kg
LL3-063	LL30708	240				96		mg/kg
LL3-065	LL30713	0.76				2.3		mg/kg
LL3-066	LL30716	0.69				2.3		mg/kg
LL3-067	LL30719	4.5				1.35		mg/kg
LL3-067	LL30720	0.54				1.5		mg/kg
LL3-074	LL30736	0.25	U	0.25	U	1	U	mg/kg
LL3-076	LL30742	0.068	J			1	U	mg/kg
LL3-077	LL30745	820				848		mg/kg
LL3-080	LL30754	0.25	U			1.1		mg/kg
LL3-082	LL30760	0.25	U	0.25	U	1	U	mg/kg
LL3-085	LL30769	2.9				1	U	mg/kg
LL3-090	LL30784	0.07	J			1.86		mg/kg
LL3-090	LL30785	0.25	U			2.5		mg/kg
LL3-092	LL30790	0.25	U			2.4		mg/kg
LL3-097	LL30799	0.25	U	0.25	U	1	U	mg/kg
LL3-099	LL30805	220				159		mg/kg
LL3-101	LL30811	13				14.6		mg/kg
LL3-101	LL30812	33				14.2		mg/kg
LL3-102	LL30814	0.25	U			1.3		mg/kg
LL3-102	LL30815	0.28				1.46		mg/kg
LL3-103	LL30817	0.56				4.7		mg/kg
LL3-104	LL30820	0.25	U			3.4		mg/kg
LL3-105	LL30823	8.4				6.3		mg/kg
LL3-106	LL30826	0.24	J			3.9		mg/kg
LL3-106	LL30827	0.31				1.7		mg/kg
LL3-111	LL30833	2.1				2.4		mg/kg
LL3-111	LL30834	1.5				3		mg/kg
LL3-117	LL30851	6.5				10.6		mg/kg
LL3-118	LL30854	0.3				2.2		mg/kg
LL3-119	LL30857	13				11.7		mg/kg
LL3-126	LL30872	0.25	U			1	U	mg/kg
LL3-127	LL30875	0.25	U	0.25	U	1	U	mg/kg
LL3-132	LL30890	0.25	U			1.8		mg/kg

Table 4-74. Load Line 3 Laboratory/Field TNT Comparison (continued)

Station	Sample No.	Lab Result		Lab Dup Result		Field Result		Units
LL3-135	LL30899	0.91				1.2		mg/kg
LL3-136	LL30902	0.18	J			3.6		mg/kg
LL3-137	LL30905	0.25	U			5.5		mg/kg
LL3-138	LL30908	0.25	U			1	U	mg/kg
LL3-142	LL30918	1.2		0.72		1.34		mg/kg
LL3-144	LL30924	0.25	U			1	U	mg/kg
LL3-153	LL30951	21				49		mg/kg
LL3-153	LL30952	210				182		mg/kg
LL3-155	LL30957	0.25	U	0.32		1	U	mg/kg
LL3-157	LL30963	4200				1563		mg/kg
LL3-157	LL30964	270				195		mg/kg
LL3-158	LL30966	0.25	U			1	U	mg/kg
LL3-171	LL30997	0.25	U			1	U	mg/kg
LL3-210	LL31053	380		380		863		mg/kg
LL3-212	LL31057	0.25	U			1	U	mg/kg
LL3-215	LL31063	0.16	J			1	U	mg/kg
LL3-216	LL31064	0.32				1.5		mg/kg
LL3-217	LL31066	0.61				9.8		mg/kg
LL3-218	LL31067	68				18.5		mg/kg
LL3-219	LL31068	1.6				7.3		mg/kg
LL3-220	LL31075	2.7				4.2		mg/kg
LL3-223	LL31088	0.25	U			2.1		mg/kg
LL3-224	LL31089	0.25	U			1	U	mg/kg
LL3-226	LL31092	0.14	J			1.1		mg/kg
LL3-226	LL31097	1.3				5.8		mg/kg
LL3-227	LL31093	37				59		mg/kg
LL3-230	LL31098	2400				146		mg/kg
LL3-230	LL31085	0.69				1.3		mg/kg
LL3-231	LL31099	3600				1748		mg/kg
LL3-231	LL31100	120				241		mg/kg
LL3sd/sw	LL31077	110				79		mg/kg

TNT = Trinitrotoluene.

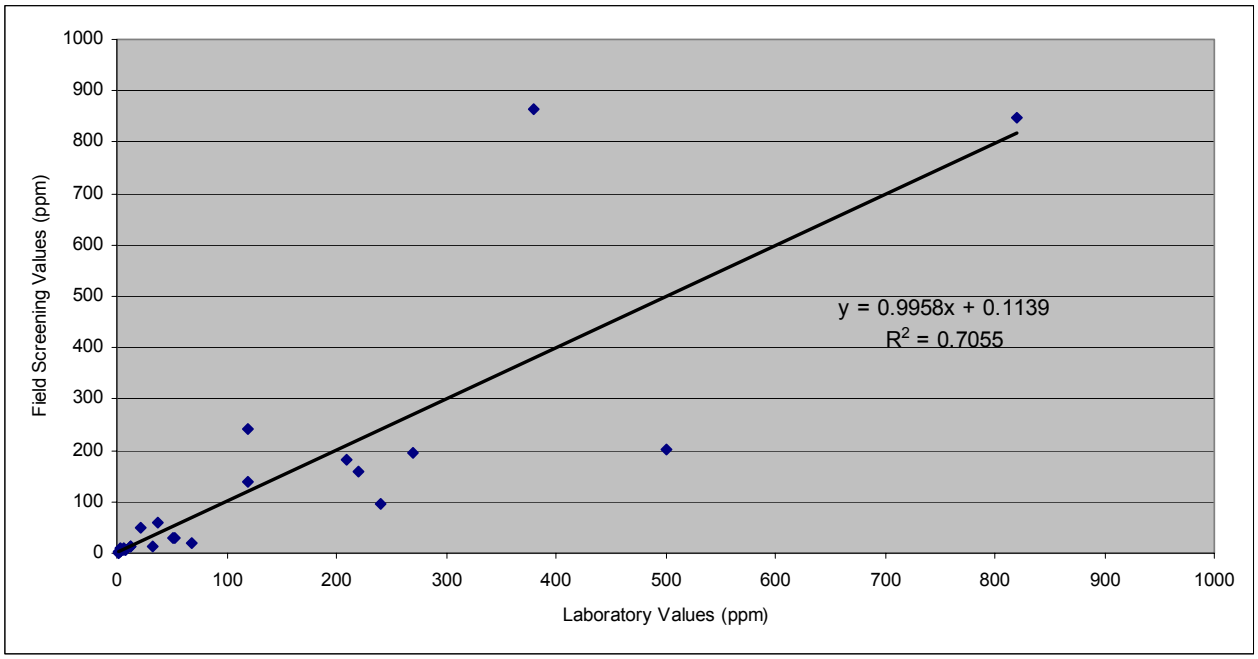


Figure 4-32. Load Line 3 Field Screening/Laboratory Data Comparison

Table 4-75. Load Line 3 Laboratory/Field RDX Comparison

Station	Sample No.	Lab Result		Lab Dup Result		Field Result		Units
LL3-050	LL31084	0.5	U			1	U	mg/kg
LL3-053	LL31073	0.5	U			1	U	mg/kg
LL3-059	LL30699	0.5	U			1	U	mg/kg
LL3-060	LL30702	0.5	U			1	U	mg/kg
LL3-067	LL30719	0.5	U			1	U	mg/kg
LL3-074	LL30736	0.5	U	0.5	U	1	U	mg/kg
LL3-076	LL30742	0.5	U			1	U	mg/kg
LL3-082	LL30760	0.5	U	0.5	U	1	U	mg/kg
LL3-085	LL30769	0.5	U			1	U	mg/kg
LL3-097	LL30799	0.5	U	0.5	U	1	U	mg/kg
LL3-126	LL30872	0.5	U			1	U	mg/kg
LL3-127	LL30875	0.5	U	0.5	U	1	U	mg/kg
LL3-132	LL30890	0.5	U			1	U	mg/kg
LL3-135	LL30899	0.5	U			1	U	mg/kg
LL3-138	LL30908	0.5	U			1	U	mg/kg
LL3-144	LL30924	0.5	U			1	U	mg/kg
LL3-155	LL30957	0.5	U	0.5	U	1	U	mg/kg
LL3-158	LL30966	0.5	U			1	U	mg/kg
LL3-171	LL30997	0.5	U			1	U	mg/kg
LL3-212	LL31057	0.5	U			1	U	mg/kg
LL3-215	LL31063	0.5	U			1	U	mg/kg
LL3-224	LL31089	0.5	U			1	U	mg/kg
LL3sd/sw	LL31077	1	U			1	U	mg/kg

RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.

4.12 SUMMARY OF CONTAMINANT NATURE AND EXTENT

Evaluation of data collected during the Phase I and Phase II RIs show that historical operations have resulted in contamination of surface and subsurface soil, primarily in the vicinity of the former operations buildings, and in some drainage ditches near source areas. Contaminant occurrences in surface water and groundwater were generally limited in terms of extent and magnitude; however, low levels of SRCs (explosives and metals) were observed in the Cobb's Pond Tributary and in the groundwater. Sediments of the Cobb' Pond Tributary were influenced primarily by inorganic constituents and, to a lesser extent, explosive compounds. The storm/sanitary sewer system at Load Line 3 contained primarily SRCs of explosive compounds, inorganic constituents, and PCBs. Notably elevated concentrations of inorganic constituents were observed in the sediments of the storm inlets in the vicinity of Building EB-803. A brief summary of nature and extent of contamination within each of the environmental media characterized, including building and structures, is outlined below.

4.12.1 Surface Soil

Aggregates containing the former process buildings (Explosive Handling Areas, Preparation and Receiving Areas, and Packaging and Shipping Areas) exhibited greater numbers and concentrations of SRCs than the outlying aggregates (Change Houses, West Ditches, and Perimeter Area). The observed distributions of contaminants indicate relatively low mobility with the bulk of contamination adjacent to former process buildings. Explosives were detected in all aggregates with the exception of Change Houses and the DLA Storage Tanks Aggregates, with 2,4,6-TNT being the most pervasive constituent across Load Line 3. Inorganic constituents were consistently identified in all surface soil aggregates. Those constitutes directly related to process operations such as cadmium, chromium, lead, nickel, and zinc were found to exceed the established background criteria with the highest frequency. SVOC compounds (primarily PAHs), VOCs, and pesticides, were detected throughout the surface soils; however, concentrations were generally low and appeared as localized detects, typically located near the process buildings or railroad tracks. PCBs (specifically PCB-1254) were widely reported with localized elevated concentrations in the vicinity of Buildings EB-4, EB-11, EB-803, EB-6A, and EB-8A.

Based on the evaluation of the occurrence and distribution of contaminants in surface soil at Load Line 3, the following observations can be made.

Preparation and Receiving Areas Aggregate

- Explosive compounds were identified in the surface soils in the aggregate, primarily near Building EB-20 and the near the east footprint of Building EB-803, with relatively low concentrations. In the limited number of surface soil samples analyzed for propellant compounds, nitrocellulose was most pervasive along the west footprint of Building EB 803.

- Inorganic SRC compounds were widely detected throughout the surface soils of the Preparation and Receiving Areas Aggregate, specifically, in the vicinity of Building EB-803.

- SVOCs detected were limited to areas immediate to Building EB-3 and EB-803. The most pervasive compounds were benzo(*a*)anthracene, benzo(*a*)pyrene, and benzo(*b*)fluoranthene, with all detected concentrations being less than 1 mg/kg. VOC detections were also limited in areas immediate to Building EB-3. Three VOC compounds were identified in this area, all with concentrations less than 1 mg/kg. Four pesticide compounds were reported with all detected concentrations being less than 1 mg/kg. Two PCB compounds, PCB-1254 and PCB-1260, were identified in the surface soils. PCB-1254 was the most pervasive with the peak concentration being identified along the

southwestern corner of Building EB-803. In general, concentrations of SVOCs, VOCs, pesticides, and PCBs were low and distribution limited to areas immediate to Buildings EB-3 and EB-803.

Change Houses Aggregate

- Explosive compounds were not identified in the surface soil samples within the Change Houses Aggregate through field analysis, indicating the absence of explosive compounds within the surface soils of the aggregate. Therefore, additional explosives analysis was not performed on surface soils within the aggregate.

- Inorganic SRC constituents were widely detected in each surface soil sample collected from this aggregate. With the exception of silver, all inorganic SRCs were detected in each surface soil sample collected. Peak concentrations of nine inorganic constituents were identified along the southern footprint of Building EB-8A, with the general distribution of remaining constituents being divided among all remaining samples.

- Analysis of SVOCs, VOCs, and pesticides were not performed in the Change Houses Aggregate. PCB-1254 was identified in four of six surface soil samples collected. Concentrations reported were confined to Buildings EB-8 and EB-8A, with the highest detected value being reported on the south side of Building EB-8A.

Explosive Handling Areas Aggregate

- Explosive compounds were widely reported in the surface soils of the aggregate, with the highest detected concentration of 2,4,6-TNT (390,000 mg/kg) found within the Load Line 3 surface soils. The sample was collected from a vacuum pump housing east of Building EB-10. In general, however, peak concentrations of explosive and propellant compounds occur in the vicinity of process Buildings EA-6 and EB-4.

- Elevated concentrations of inorganic constituents were widely distributed throughout the Explosive Handling Areas Aggregate. The most pervasive inorganics detected were cadmium, copper, lead, thallium, and zinc and to a lesser degree, antimony, arsenic, and barium. Peak concentrations were typically grouped near former process Buildings EB-4 and EA-6 and, to a lesser degree, other former process areas of the aggregate.

- Several SVOCs were identified and widely distributed throughout the surface soils of the aggregate. In particular, PAHs, were consistently identified throughout the areas immediate to Buildings EA-6, EB-4, and EB-10 and, to a lesser extent, Building EB-4A. VOCs were limited to toluene and acetone, with all detected concentrations being less than 1 mg/kg.

- Pesticides and PCBs were also identified in the surface soils throughout the Explosives Handling Areas Aggregate. Several pesticides compounds were at relatively low concentrations in areas immediate to the process buildings within the aggregate. PCBs appeared more pervasive, specifically PCB-1254, which was widely detected within the aggregate. Notable concentrations were identified in the vicinity of Building EB-4.

Packaging and Shipping Areas Aggregate

- Explosive compound identification was limited within in Packaging and Shipping Area Aggregate. Three compounds were identified in the surface soil with the peak, isolated concentration of 2,4,6-TNT

(820 mg/kg) being reporting west of Building EB-11, along the railroad track. All detected concentrations of nitroguanide were less than 1 mg/kg.

- Inorganic SRCs were identified throughout the surface soils within the Packaging and Shipping Areas Aggregate. Pervasive compounds included cadmium, lead, mercury, thallium, and zinc. The highest concentrations of 12 SRC constituents were identified along the railroad track, west of Building EB-11. In general, inorganic SRCs were widely detected and distributed throughout the aggregate.

- Several SVOCs were identified in the surface soil sample collected from the Packaging and Receiving Aggregate. In particular, the PAH compounds were identified, with all concentrations being less than 1 mg/kg. There were no VOC or pesticide compounds detected in the surface soil sample collected.

- PCB-1254 was consistently detected, with the highest concentration (91 mg/kg) being reported in the vicinity of Building EB-11. Otherwise, detected concentrations were typically less than 1 mg/kg.

DLA Storage Tanks Area Aggregate

- Explosive and propellant compounds were not identified in the surface soils of the DLA Storage Tanks Area Aggregate.

- Inorganic SRCs were found to be widely distributed throughout the surface soils of the DLA Storage Tanks Area Aggregate. The most pervasive compounds were antimony and cadmium. Typically, elevated concentrations of inorganic SRCs were reported in the southernmost DLA storage tank farm, specifically just south of the southernmost storage tank along the railroad track. This area contained the highest concentration of eight inorganic SRCs. Although the highest concentrations were detected in the southernmost portion of the DLA storage tank farm, numerous SRC constituents were identified in every sample collected.

- SVOC compounds were detected in limited distribution (one location) and concentration in the surface soils of the DLA Storage Tanks Area Aggregate. The PAH compounds identified were all less than 1 mg/kg. Neither VOCs, pesticides, nor PCBs were identified at detectable concentrations in the surface soils of the aggregate.

West Ditches Aggregate

- 2,4,6-TNT was identified as the most pervasive explosive compound within the dry ditch sediments of the aggregate. The peak concentration was identified in the western tip of the central ditch, just south of Building EB-8. This ditch drains the northern areas of the Explosives Handling Areas Aggregate. In general, the associated explosive and propellant compounds identified were reported at much lower concentrations, typically less than 1 mg/kg.

- Cadmium, lead, mercury, and zinc were identified as the most pervasive inorganic constituents within the dry ditch sediments of the West Ditches Aggregate. With the exception of lead, the highest concentrations of the most pervasive constituents were found near the Load Line 3 west fence line. The peak concentrations of lead and copper were identified at the head of the central West Ditch, just west of Building EB-4. Inorganic SRCs were identified in all samples collected; however, surface soil samples appeared to be somewhat less impacted than the dry ditch sediments.

- SVOCs were detected in all surface soil and dry ditch sediment samples collected. Specifically, PAH compounds were most pervasive, with the peak concentrations of 15 SRCs being reported in the

southernmost West Ditch just north of Building EB-22. VOCs were not characterized in the surface soils or dry ditch sediments of the West Ditches Aggregate.

- Pesticide compounds were identified with limited distribution and in limited concentrations with all reported values being less than 1 mg/kg. PCB-1254 and PCB-1260 were each identified, with PCB-1254 being most pervasive. The peak concentrations of PCB-1254 were identified in the central West Ditch north of Building EB-8.

Perimeter Area Aggregate

- Explosive compounds identified within the Perimeter Area Aggregate were found to be associated with Buildings EA-21 and EA-5. In general, concentrations of explosive compounds were typically low, with the propellant compound nitrocellulose being detected at the peak concentration of 60.7 mg/kg near Building EA-21.

- Cadmium, mercury, and zinc were identified as most pervasive in the surface soils of the Perimeter Area Aggregate. Generally, inorganic SRCs were widely distributed throughout the aggregate with peak concentrations of several metals being detected in the area of Building EA-21, near the railroad track. Samples collected from areas not associated with process building or other former active areas typically contained lower concentrations of inorganic SRCs.

- SVOCs were detected in limited distribution and limited concentration within the surface soils of the Perimeter Areas Aggregate. Specifically, PAH compounds were identified in samples associated with Building EA-21 and near the railroad track south of Building E-6A. VOCs were also of limited distribution and concentration, as all constituents were identified at concentrations less than 1 mg/kg. Six pesticides compounds and PCB-1254 were detected in the surface soils near Building EA-21. To a lesser degree, PCB-1254 was also identified near Building EA-7 and EA-5.

4.12.2 Subsurface Soils

Subsurface soils within the Change Houses Aggregate, Packaging and Shipping Areas Aggregate, West Ditches Aggregate, and the DLA Storage Tanks Aggregate were not characterized during the Phase II RI. Based on field explosive analysis, further evaluation of the subsurface soils as they pertain to explosives in the Preparation and Receiving Aggregate was not performed. Evaluation of subsurface soils for SVOCs, VOCs, and pesticides were also not performed. PCBs were exclusively evaluated within the subsurface soils of the Explosives Handling Areas Aggregate.

Explosive compounds were identified in the subsurface soils within the Explosives Handling Areas Aggregate and the Perimeter Area Aggregate. As in the surface soils, 2,4,6-TNT was the most pervasive explosive constituent detected. In samples analyzed near Buildings EA-6, EA-21, and EA-5, 2,4,6-TNT concentrations in the subsurface exceeded the detected concentrations in the corresponding surface samples. Due to the adsorptive properties of the explosive compounds, the inconsistencies may be attributed to reworking of the surface soils with the Explosives Handling Areas and Perimeter Area Aggregates.

Several organic constituents were identified in the subsurface soils within Load Line 3. Primary accumulation areas for inorganic SRCs were in the immediate vicinity of former process buildings within each aggregate characterized. Within the limited number of subsurface soil samples collected, the distribution of inorganic constituents appears widespread throughout the load line; however, concentrations generally appear lower than identified in the surface interval.

The organic subsurface soils investigation at the Load Line 3 consisted only of PCB analysis within the Explosives Handling Areas Aggregate. The peak concentration of PCB-1254 was identified in the subsurface soils on the west side of Building EB-4. In this area, the subsurface soil concentration was 35 times higher than the corresponding surface soil sample.

Preparation and Receiving Areas Aggregate

- Based on field explosives analysis (i.e., field explosive analysis did not identify TNT or RDX at concentrations exceeding 1 mg/kg), confirmatory laboratory analysis for explosives analysis was not performed in the subsurface soils of the Preparation and Receiving Area Aggregate.

- Arsenic, cadmium, lead, and zinc were identified as SRCs in the subsurface soils within the Preparation and Receiving Areas Aggregate. With the exception of cadmium, all SRCs were identified in the limited number of subsurface soil samples collected. Peak concentrations of all inorganic SRCs were present in the subsurface soils immediate to Building EB-3. Arsenic was the single constituent identified as slightly exceeding the concentration reported in the corresponding surface soil sample.

Explosives Handling Areas Aggregate

- Of the subsurface soils analyzed for explosive compounds, 2,4,6-TNT and 2-amino-4,6-DNT were most pervasive in the subsurface soils of the Explosives Handling Area Aggregate. Peak concentrations of nine explosive compounds were reported in the subsurface soils (1 to 3 ft below land surface) in the immediate vicinity of Building EA-6. The primary accumulation areas for explosive compounds in the subsurface soils appear to be in the vicinity of Buildings EA-6 and EB-4.

- Nine inorganic constituents were identified as SRCs in the subsurface soils of the Explosives Handling Areas Aggregate. The most pervasive SRCs were cadmium and lead (i.e., detected most frequently above background), however, copious SRCs were found to be widely dispersed among all subsurface soil samples collected. The peak concentration accumulation areas for detected subsurface soil inorganics appear to be in the immediate vicinity of Buildings EB-4 and EA-6.

- PCBs were exclusively assessed in the subsurface soils within the Explosives Handling Areas Aggregate. PCB-1254 was reported in two of three samples collected, with peak concentrations identified in the subsurface soils immediate to Building EB-4. In this area, PCB-1254 concentrations exceeded the corresponding surface soil sample.

Perimeter Area Aggregate

- Of the limited number of subsurface soil samples collected from the Perimeter Area Aggregate for explosives analysis, eight explosive compounds were identified. 1,3,5-trinitrobenze and 2,4,6-TNT were most persistent, being detected in each sample. Peak concentrations of each were identified in the subsurface soils near Building EA-5, along the railroad track. The remaining constituents were reported as single occurrences in the subsurface soils near Building EA-6.

- Eight inorganic constituents were identified and retained as SRCs in the subsurface soils within the Perimeter Area Aggregate. With the exception of cadmium, all SRCs were reported in each sample. Peak concentrations of each SRC were reported in the subsurface soils immediate to Building EA-21. Of the constituents identified, arsenic and beryllium were reported at concentrations exceeding those reported in the corresponding surface samples.

4.12.3 Sediment

Within the sediments of the Cobb's Pond Tributary Aggregate, explosive and inorganic compounds were identified. Explosive concentrations were generally low with limited distribution, while inorganic constituents experienced a wider distribution throughout the tributary. PCB-1254 was identified as a single occurrence within the sediments of the Cobb's Pond Tributary.

Cobb's Pond Tributary Aggregate

- Two explosive compounds (2,4,6-TNT and 4-amino-2,6-DNT) were identified in sediments of the Cobb's Pond Tributary. The explosive compounds exhibited low concentrations and were identified in only one sample, the most down-gradient location. As explosives were not identified in the upgradient sediment locations; the detections may be attributed to sediments mobilized during rain events over time, with no continuing source to feed the upgradient locations.

- Inorganic analytes are most abundant and most concentrated in sediments collected from the most upgradient location. To a lesser extent, inorganics are distributed throughout the sediments of the Cobb's Pond Tributary.

- Neither SVOCs, VOCs, nor pesticides were analyzed during the Phase II RI field effort. Reported SVOC compounds were identified during the Phase I RI. SVOC compounds, specifically PAHs, were identified at a single location with all reported values being less than 1 mg/kg. Reported pesticide compounds were also identified during the Phase I RI where four pesticides were detected at concentrations less than 1 mg/kg.

- PCB-1254 was reported in a single occurrence in the sediments of the Cobb's Pond Tributary, identified approximately 275 ft north of tributary headwaters.

4.12.4 Surface Water

Within the Load Line 3 surface water aggregates, explosive compounds were limited to low concentrations within the surface water pool near Building EA-6A. Inorganic SRCs were identified in each aggregate, with relatively low concentrations being reported. Organic constituents identified were confined as an isolated occurrence of 2-butanone within the Cobb's Pond Tributary.

Cobb's Pond Tributary Aggregate

- No explosive or propellant compounds were reported at detectable levels in the waters of the Cobb's Pond Tributary.

- Seven metals, antimony, arsenic, barium, cobalt, manganese, nickel, and vanadium were identified in the surface water associated with the Cobb's Pond Tributary. Detected concentrations were relatively low with concentrations remaining constant or decreasing at the downgradient location.

- An isolated occurrence of 2-butanone was identified in the downgradient location of the Cobb's Pond Tributary. As the detected concentration was relatively low, and a single occurrence, this detect appears to be an isolated outlier. Other organic constituents were not identified in the waters of the Cobb's Pond Tributary.

Miscellaneous Surface Water Aggregate

- Explosive constituents were identified in the surface water sample collected in the vicinity of Building EA-6A, with all reported values being less than 1 mg/L.

- Antimony and barium were identified in the surface water sample collected, although at relatively low concentrations. As the miscellaneous sample station LL3-222 was a standing pool of surface water in the proximity Building EA-6A, the detected metals may indicate leaching of the surrounding surface soils.

- Neither SVOCs, VOCs, pesticides, nor PCBs were identified at detectable levels in the Miscellaneous Surface Water Aggregate.

4.12.5 Groundwater

Impact to the groundwater of Load Line 3 appear limited to isolated zones of explosive compounds west and downgradient of Building EB-4. Minor concentrations of inorganic constituents were identified throughout the load line. Several organic constituents were also present in limited concentration and distribution.

- Seven explosive compounds were identified in the Load Line 3 groundwater. The peak concentrations of each individual compound were identified in the areas west and downgradient of the Load Line 3 Explosives Handling Areas Aggregate.

- Two metals, cobalt and manganese, were identified as SRCs in the Load Line 3 groundwater. Detected concentrations of cobalt were all less than 1 mg/L and all concentrations of manganese were less than 2.2 mg/L, lower than the established MCL for manganese.

- One semivolatile compound [bis(2-ethylhexyl)phthalate], seven VOCs, and two pesticides were identified in limited distribution and limited concentrations in the groundwater samples collected from Load Line 3. All reported values were less than 0.01 mg/kg. PCBs were not detected in the Load Line 3 groundwater.

4.12.6 Storm/Sanitary Sewer System

Explosives

- Five explosive compounds were identified in the sediments and waters of the Load Line 3 storm/sanitary sewer system. Concentrations identified in water were all less than 0.01 mg/L. With the exception of 2,4,6-TNT, concentrations of explosive compounds detected in the storm/sanitary sewer system were relatively low. The highest concentrations of detected explosive compounds were typically detected at station LL3-218, which is located west of Building EB-4. Based on the limited number of samples collected and the analytical data evaluated, explosive compound impact to sediments associated with the storm/sanitary sewer system appears limited.

Inorganics

- Several metal constituents were identified in the water samples collected from the storm/sanitary sewer system. However, only three compounds, lead, nickel, and silver, were retained as SRCs within the aggregate. Station LL3-225, which is a sanitary sewer manhole (MH413) located north of Building EB-10, contained the only detected concentrations of the SRC metals, with all detected

concentrations being less than 0.01 mg/L. Based on the limited number of samples collected, inorganic impact to the storm/sewer system waters appears minor.

- All sediment samples collected contained detectable concentrations of at least one inorganic SRC. Notably elevated concentrations of process-related metals, including chromium, lead, copper, and nickel, were identified in samples collected from stations LL3-223 (Inlet EH-21) and LL3-224 (Inlet EB-20). Both stations are storm sewer inlets located in the vicinity of Building EB-803. In addition, station LL3-215 (Inlet EB-4) contained the highest detected concentration of zinc. This station is a storm sewer inlet located northwest of Building EB-10, on the west side of the railroad track. Inorganic constituents detected in the sediments of the storm/sanitary sewer system of Load Line 3 were found to be widespread with localized areas of increased impact being the storm inlets in the vicinity of Building EB-803.

SVOCs, VOCs, and Pesticides/PCBs

- Neither SVOCs, VOCs, pesticides, nor PCBs were identified in the waters of the storm/sanitary sewer system at Load Line 3.

- The only PCB compound identified in the sediments of the storm/sanitary sewer system was PCB-1254, which was identified in all sediment samples collected. Generally, PCB-1254 was found to be widespread in the sediments of the storm/sanitary sewer system, with increased impact associated with the storm inlets draining the areas in the vicinity of buildings EB-10 and EB-4.

4.12.7 Buildings and Structures

- Soil beneath building sub-floors exhibited generally low concentrations of explosives, several inorganic constituents, and PCB-1254. Out of 12 samples collected, 8 samples did not contain detectable TNT or RDX in the field laboratory and were not submitted for fixed-base analyses. Of the four remaining samples submitted to the fixed-base laboratory, three contained low concentrations of explosives ranging from 0.063 to 0.98 mg/kg.

- Sediments collected from process buildings exhibited detectable levels of inorganic constituents, particularly cadmium, chromium, copper, lead, and zinc. Primary accumulation areas exhibiting the highest concentrations were the washout annex of Building EB-4 and the sedimentation basin of Building EA-6.

- Explosive compounds were detected in the sediments collected with elevated concentrations being associated primarily with the washout basin of Building EB-4 and, to a lesser extent, the sedimentation basin of Building EA-6.

- Relatively low concentrations of several SVOCs (primarily PAHs) and VOCs were identified in the sediments of the washout annexes of Building EB-4 and EB-4A.

- Water samples collected from the washout basins reflected detectable concentrations of metals and explosives corresponding to those observed at high concentrations in sediment.

- Floor sweep samples contained detectable levels of explosive, inorganic, and organic compounds. Low levels of explosives were reported, as well as low levels of several SVOCs and VOCs. PCB-1254 was present in all samples with peak concentrations being identified from Building EB-10.

- TCLP analysis of floor sweep samples indicated levels of cadmium and lead that exceed their respective TCLP criteria.