FINAL

PHASE II REMEDIAL INVESTIGATION SUPPLEMENTAL REPORT

FOR

LOAD LINE 12 (RVAAP-12)

AT THE

RAVENNA ARMY AMMUNITION PLANT, RAVENNA, OHIO

PREPARED FOR

US Army Corps of Engineers®

LOUISVILLE DISTRICT
CONTRACT No. GS-10F-0076J
DELIVERY ORDER W912QR-05-F-0033

November 2005

SAIC

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

contributed to the preparation of this document and should not be considered an eligible contractor for its review.

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U. S. Army Corps of Engineers
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CONTRACTOR STATEMENT OF INDEPENDENT TECHNICAL REVIEW

Science Applications International Corporation (SAIC) has completed the Final Phase II Remedial Investigation Supplemental Report for Load Line 12 (RVAAP-12) at the Ravenna Army Ammunition Plant, Ravenna, Ohio. Notice is hereby given that an independent technical review has been conducted that is appropriate to the level of risk and complexity inherent in the project. During the independent technical review, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of data quality objectives; technical assumptions; methods, procedures, and materials to be used; the appropriateness of data used and level of data obtained; and reasonableness of the results, including whether the product meets the customer's needs consistent with law and existing Corps policy.

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Study/Design Team Leader

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LIST OF ACRONYMS

AOC	area of concern
BGS	below ground surface
BHHRA	baseline human health risk assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	contaminant of concern
COPC	contaminant of potential concern
CSM	conceptual site model
DNT	dinitrotoluene
EPA	U. S. Environmental Protection Agency
EPC	exposure point concentration
FS	feasibility study
FWHHRAM	Facility-Wide Human Health Risk Assessment Manual
HHRA	human health risk assessment
HI	hazard index
HMX	octahydro-1,3,5-tetranitro-1,3,5,7-tetrozocine
ILCR	incremental lifetime cancer risk
IRP	Installation Restoration Program
MCL	maximum contaminant level
MKM	MKM Engineering, Inc.
Ohio EPA	Ohio Environmental Protection Agency
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PRG	preliminary remediation goal
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
RGO	remedial goal option
RI	remedial investigation
RVAAP	Ravenna Army Ammunition Plant
SAP	Sampling and Analysis Plan
SpecPro	SpecPro Inc.
SRC	site-related contaminant
SVOC	semivolatile organic compound
TAL	Target Analyte List
VOC	volatile organic compound

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EXECUTIVE SUMMARY

This Phase II Remedial Investigation (RI) Supplemental Report provides an updated assessment of the site geology, hydrogeology, nature and extent of groundwater contamination, and potential risks to groundwater receptors at Load Line 12 at the Ravenna Army Ammunition Plant (RVAAP). This report addresses data obtained through additional investigations and data acquisition since publication of the final Phase II RI Report in 2001 (USACE 2004a). Recently obtained data include sampling of existing Phase II RI wells in October 2004 and installation and sampling of five new unconsolidated zone monitoring wells in November 2004 as part of a characterization effort of 14 areas of concern (AOCs) at RVAAP. Also included in this report are monitoring data from four existing Load Line 12 wells collected in April 2005 as part of facility-wide groundwater characterization efforts.

Newly acquired data are compared to Phase II RI baseline human health risk assessment results to determine whether any new contaminants of potential concern (COPCs) emerge as potential risks to groundwater receptors. The risk evaluation also confirms whether any previously identified COPCs continue to be of concern in groundwater based on recent monitoring results. A qualitative assessment of risk incorporating the new data, relative to the baseline human health risk assessment in the Phase II RI, is provided.

The supplemental investigations addressed in this report were conducted as part of the U. S. Army's Installation Restoration Program (IRP) approach to implement the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process at RVAAP, which prioritizes environmental restoration at AOCs based on their relative potential threat to human health and the environment. Results of the additional investigations are used to determine whether data gaps identified in the Phase II RI have been adequately addressed, if further investigation is required, or if the AOC may proceed to the next step in the CERCLA process [e.g., Feasibility Study (FS)].

NATURE AND EXTENT OF GROUNDWATER CONTAMINATION

Geologic and groundwater chemical data collected in 2004 and 2005 from AOC monitoring wells indicate the following:

- Potentiometric data from existing and newly installed wells confirmed the presence of a potentiometric low that bisects the southern half of Load Line 12. Geologic data collected during drilling activities did not reveal a notable stratigraphic discontinuity or other feature that would produce the observed potentiometric surface.

- With the exception of nitrocellulose, the number and concentrations of explosives and propellants identified as site-related contaminants (SRCs) in the 2004/2005 data were generally lower than those observed in 2000. Nitrocellulose was detected in two wells where it had not been previously present and increased by a factor of three in one source area (Building 901) well.

- Recent monitoring data did not show substantial changes in the numbers and concentrations of Target Analyte List metals identified as SRCs, with the exception of aluminum and zinc, which showed increases of average concentrations. Only one zinc result exceeded background. Filtered samples show that arsenic continued to exceed its primary drinking water maximum contaminant level (MCL) and RVAAP facility-wide background value at several wells, although the background value also exceeds the MCL. Elevated arsenic is indigenous to the glacial soils at RVAAP; maximum soil concentrations at Load Line 12 ranged only from 1.4 to 3.3 times background. Thallium was identified above its MCL in well LL12mw-185 during the Phase II RI, but was not detected during 2004 sampling. Thallium was not previously detected in well LL12mw-113;

however, it exceeded its MCL at this well during the 2004 sampling. The low frequency of detection and sporadic occurrence suggest that thallium is likely not site related.

- Nitrate concentrations decreased at several locations showing previously elevated concentrations. However, adjacent to former Building 901, the maximum AOC-wide concentrations increased over the intervening time period between the 2000 and 2004 sampling events. Nitrate continued to be detected only in wells adjacent to primary ammonium nitrate production areas, suggesting that contaminants have not migrated far from source areas or off of the AOC.

- Recent monitoring data continue to show that semivolatile organic compounds, polychlorinated biphenyls/pesticides, and volatile organic compounds are minor contaminants in Load Line 12 groundwater.

- Monitoring data from wells along the southern boundary of the AOC continue to show that contaminants are not migrating off of the site toward the facility boundary.

SUPPLEMENTAL HUMAN HEALTH RISK EVALUATION

A human health risk evaluation was performed to compare recent (2004/2005) groundwater data to the results of the human health risk assessment presented in the Final Phase II RI Report (USACE 2004a) to qualitatively determine whether potential risks associated with recently measured concentrations are greater or less than those presented in the Final RI Report.

Ten chemicals formerly identified as COPCs in 2000 were not COPCs in the 2004/2005 data due to the fact that they were either not detected in the recent data [2,4-dinitrotoluene (DNT); 2-nitrotoluene; 4,4'-DDD; 4,4'-DDE; aldrin; alpha-chlordane; beta-BHC; and phenanthrene] or the U. S. Environmental Protection Agency Region 9 tap water preliminary remediation goals (PRGs) increased (barium and thallium). Four of these chemicals were identified as contaminants of concern (COCs) in the final RI (thallium; aldrin; 2,4-DNT; and 2-nitrotoluene). Six chemicals [4,4'-DDT and five polycyclic aromatic hydrocarbons (PAHs)] were not identified as COPCs in the 2000 data, but were identified as COPCs in the 2004/2005 data. Risks from these chemicals are likely to be minimal based on low frequency of detection and the fact that 4,4'-DDT only slightly exceeded conservative PRG screening values and the PAHs were detected in 2004 but not 2000 or 2005.

Ten COCs were identified in 2000. Three of these COCs (2,4-DNT; 2-nitrotoluene; and aldrin) were not detected in 2004/2005. The exposure point concentrations (EPCs), and therefore the risks, for four of these COCs [arsenic; hexahydro-1,3,5-trinitro-1,3,5-triazine; nitrate; and manganese] are slightly lower in 2004/2005 than in 2000. The EPCs, and therefore the risks, for two of these COCs [bis(2-ethylhexyl)phthalate and thallium] are slightly higher in 2004/2005 than in 2000.

These results indicate that the total risk associated with concentrations of chemicals measured in groundwater monitoring wells in 2004/2005 is likely to be less than the total risk reported in the final RI, but will still have an incremental lifetime cancer risk greater than 1.0E-06 and a hazard index greater than 1.0.

SUMMARY AND RECOMMENDATIONS

The evaluation of additional groundwater results for Load Line 12 does not indicate substantial changes in the overall contaminant profile or extent of migration, as defined in the Phase II RI. Other than nitrate and nitrocellulose in well LL12mw-187, no notable upward trends were observed. The new data did not show any new contaminant source areas or migration pathways and endpoints that would require updating

the conceptual site model. The qualitative human health risk evaluation did not indicate the likelihood of increased risk for hypothetical groundwater receptors. The additional investigations have achieved most of the identified data needs for groundwater remaining from Phase II RI, and it is noted that continued monitoring will occur under the facility-wide groundwater investigation.

Under the current IRP baseline plan, soil and dry sediments at Load Line 12 are being addressed under the scope of a performance-based contract in advance of groundwater and surface water, which are being further investigated on a facility-wide basis. The Phase II RI recommendation that soil and sediment media within the AOC move forward to the FS phase of the CERCLA process remains valid. Additional investigation of groundwater as part of an AOC-specific RI is not warranted based on data obtained to date. Load Line 12 is included in the ongoing facility-wide groundwater investigation and reporting activities. Required actions involving groundwater and surface water may be addressed in future decisions under those respective facility-wide initiatives. The Phase II RI noted that the lack of bedrock groundwater data may constitute a data gap for future decision planning. RI data obtained to date indicated that migration of groundwater contaminants is limited. The bedrock unit identified at Load Line 12 is competent shale and migration rates through this unit are assumed to be low.

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1.0 INTRODUCTION

This Phase II Remedial Investigation (RI) Supplemental Report addresses additional groundwater investigation activities for Load Line 12 at the U. S. Army Joint Munitions Command Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio (Figures 1-1 and 1-2). This Phase II RI Supplemental Report was conducted under the U. S. Department of Defense Installation Restoration Program (IRP) by Science Applications International Corporation, under contract number GS-10F-0076J, Delivery Order No. W912QR-05-F-003, with the U. S. Army Corps of Engineers, Louisville District. The Phase II RI, completed in 2004 (USACE 2004a), and supplemental investigations presented in this report, were conducted in compliance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 following work plans reviewed and commented on by the Ohio Environmental Protection Agency (Ohio EPA).

1.1 PURPOSE AND OBJECTIVES

The purpose of this Phase II RI Supplemental Report is to provide an updated assessment of the site geology, hydrogeology, nature and extent of groundwater contamination, and potential risks to groundwater receptors at Load Line 12 at RVAAP. This report incorporates additional data acquired since publication of the final Phase II RI Report in 2001. These additional data include results of field activities conducted as part of the RI for 14 areas of concern (AOCs) in 2004 by MKM Engineers, Inc. (MKM) under subcontract to RVAAP (MKM 2005). In addition, four existing Load Line 12 monitoring wells are included in an ongoing RVAAP facility-wide groundwater investigation conducted by SpecPro, Inc. (SpecPro) under subcontract to RVAAP (SpecPro 2005). Data were obtained from these wells in April 2005 and are included in the updated assessments.

The Final Phase II RI identified several data needs or uncertainties with respect to groundwater at Load Line 12 as summarized below.

- Additional groundwater characterization data within the AOC to identify the vertical and lateral extent of contamination, in particular nitrate near Buildings 900, FF-19, and 901 and metals and explosives contamination in the Team Track Area and Building 904 vicinity.

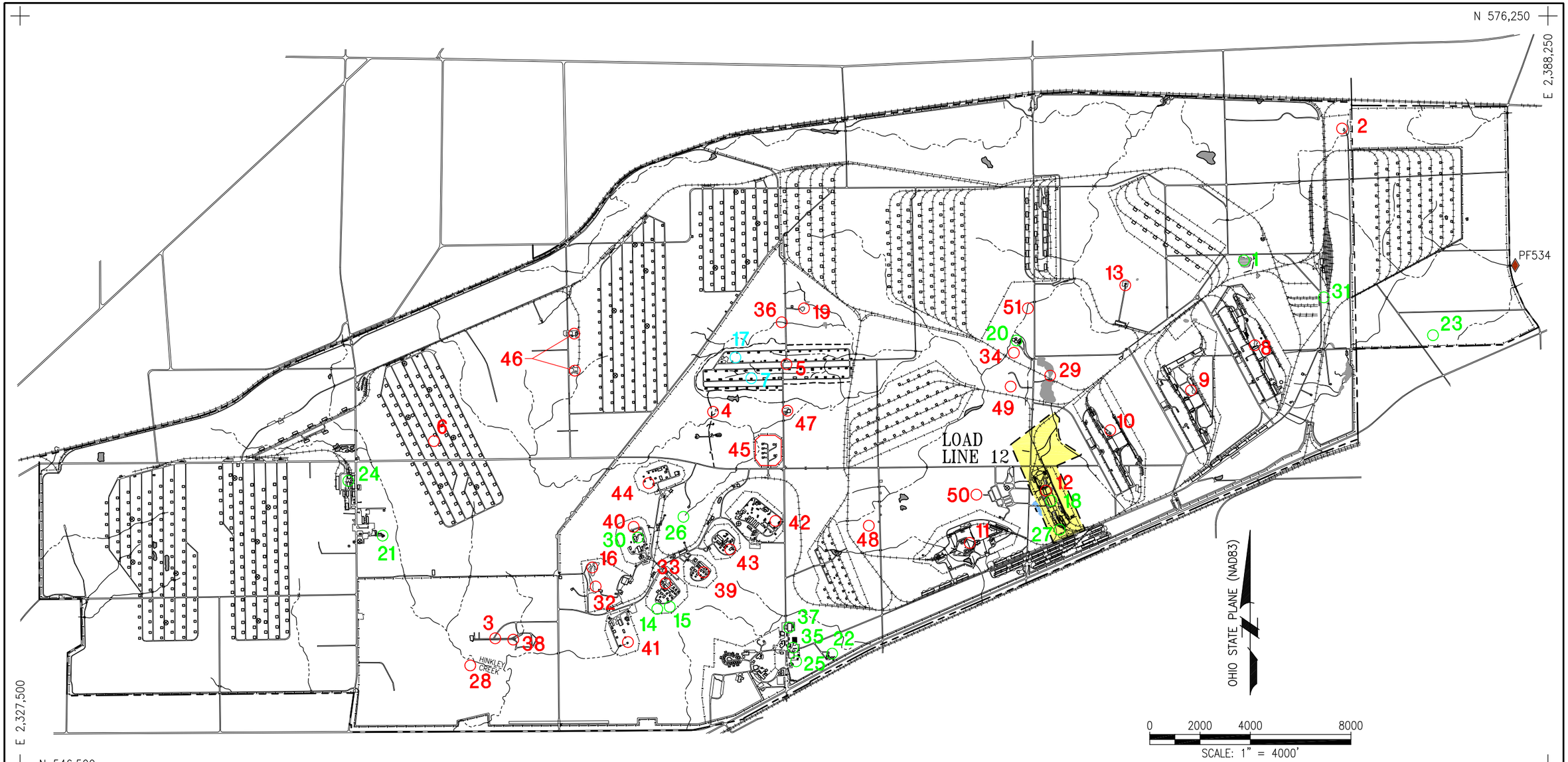
- Additional potentiometric data to more accurately define groundwater flow patterns within the AOC and help identify potential groundwater exit points, specifically wells or piezometers located east and west of the AOC boundaries to better establish regional flow patterns.

- Additional bedrock monitoring wells if future feasibility study (FS) planning requires such data to adequately evaluate remedial alternatives.

Additional investigation under the 14 AOCs RI and the facility-wide groundwater effort were designed to fill the data needs stated above, with the exception of bedrock groundwater data. The investigations further provided additional information on the potential for off-AOC transport of contaminants and allowed the qualitative assessment of contaminant concentration trends, particularly for those four wells from which multiple samples have been collected since 1999.

Using these newly acquired data, this Phase II RI supplemental report updates the geologic and hydrologic characteristics of Load Line 12 and the immediate surroundings area to refine potential contaminant transport pathways and receptor populations identified in the Phase II RI. The extent of

Figure 1-1. General Location and Orientation of RVAAP



LEGEND:

1 RAMSDELL QUARRY LANDFILL
2 ERIE BURNING GROUNDS
3 DEMOLITIONS AREA #1
4 DEMOLITIONS AREA #2
5 WINKLEPECK BURNING GROUNDS
6 C BLOCK QUARRY
7 BUILDING 1601 HAZARDOUS WASTE STORAGE
8 LOAD LINE 1 AND DILUTION/SETTLING POND
9 LOAD LINE 2 AND DILUTION/SETTLING POND
10 LOAD LINE 3 AND DILUTION/SETTLING POND
11 LOAD LINE 4 AND DILUTION/SETTLING POND
12 LOAD LINE 12 AND DILUTION/SETTLING POND
13 BUILDING 1200 AND DILUTION/SETTLING POND
14 LOAD LINE 6, EVAPORATION UNIT
15 LOAD LINE 6, TREATMENT PLANT
16 QUARRY LANDFILL/FORMER FUZE & BOOSTER BURNING PITS
17 DEACTIVATION FURNACE
18 LOAD LINE 12 PINK WASTEWATER TREATMENT
19 LANDFILL NORTH OF WINKLEPECK BURNING GROUND
20 SAND CREEK SEWAGE TREATMENT PLANT
21 DEPOT SEWAGE TREATMENT PLANT
22 GEORGE ROAD SEWAGE TREATMENT PLANT
23 UNIT TRAINING SITE WASTE OIL TANK
24 RESERVE UNIT MAINTENANCE AREA WASTE OIL TANK
25 BUILDING 1034 MOTOR POOL WASTE OIL TANK
26 FUZE BOOSTER AREA SETTLING TANKS
27 BUILDING 854–PCB STORAGE
28 MUSTARD AGENT BURIAL SITE
29 UPPER AND LOWER COBB'S POND COMPLEX
30 LOAD LINE 7 PINK WASTEWATER TREATMENT PLANT
31 ORE PILE RETENTION POND
32 40– AND 60–MM FIRING RANGE
33 FIRESTONE TEST FACILITY
34 SAND CREEK DISPOSAL ROAD LANDFILL
35 1037 BUILDING–LAUNDRY WASTEWATER SUMP
36 PISTOL RANGE
37 PESTICIDE STORAGE BUILDING T–4452
38 NACA TEST AREA
39 LOAD LINE 5/FUZE LINE 1
40 LOAD LINE 7/BOOSTER LINE 1
41 LOAD LINE 8/BOOSTER LINE 2
42 LOAD LINE 10/PERCUSSION ELEMENT
43 LOAD LINE 11/ARTILLERY PRIMER
44 WET STORAGE AREA
45 BUILDINGS F–15 AND F–16
46 BUILDING T–5301 DECONTAMINATION
47 ANCHOR TEST AREA
48 CENTRAL BURN PITS
49 ATLAS SCRAP YARD
50 DUMP ALONG PARIS–WINDHAM ROAD
51 CERCLA
RCRA
OTHER REGULATORY
RAILROAD TRACKS
FENCELINE
PROPERTY BOUNDARY
STREAM OR CREEK
STATION PF534

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:
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Figure 1-2. Ravenna Army Ammunition Plant Facility Map

contamination is reassessed and any emergent trends are qualitatively evaluated. Lastly, the new data are evaluated with respect to the Phase II RI baseline human health risk assessment (BHHRA) to identify any new contaminants of concern (COCs) or possible dismissal of previously identified COCs and to reevaluate the potential threats to human health to identify issues that may require consideration in a subsequent FS remediation and any future remedial action.

1.2 LOAD LINE 12 PHASE II REMEDIAL INVESTIGATION SUMMARY

General RVAAP site information, Load Line 12 operational history, and site characteristics, including geology and hydrogeology, are presented in Chapters 1 and 2 of the Final Phase II RI Report (USACE 2004a) and are not reiterated in this supplemental report. A total of ten piezometers were installed at Load Line 12 during the Phase II RI. These piezometers were used to map water table configurations and help guide the placement of permanent monitoring wells. Five of these piezometers were converted to monitoring wells and an additional nine monitoring wells installed. Monitoring wells were located to characterize groundwater in the vicinity of suspected source areas, as well as the perimeter of the AOC (Figure 1-3). The remaining piezometers not converted to monitoring wells were plugged and abandoned. Wells were developed and samples were collected and analyzed for explosives, propellants, metals, nitrate, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, and polychlorinated biphenyls (PCBs). Phase II RI field activities are fully detailed in Chapter 3 of the Phase II RI report. Results of the contaminant nature and extent, contaminant transport, and human health risk assessments (HHRAs) are presented in Chapters 4, 5, 6, and 8 of the Phase II RI report. Key results and conclusions are summarized below:

- Explosive compounds were detected at several Load Line 12 Phase II RI groundwater monitoring locations. Wells in the northern half of the AOC, particularly near Building 900, the northern boundary, and the Team Track Area, had the highest concentrations.

- Arsenic exceeded its primary federal drinking water maximum contaminant levels (MCLs) in groundwater samples collected near Building 904 and thallium exceeded it MCL in samples collected near Building FF-19. These two buildings had corresponding concentrations of arsenic and/or thallium elevated above background in surface and/or subsurface soil near the wells.

- Nitrate was detected at concentrations exceeding its primary federal drinking water MCL (10 mg/L) by factors of 1.6, 18.5, and 71.3 in wells near Buildings 900, FF-19, and 901, respectively. The fact that nitrate was detected only in wells adjacent to primary ammonium nitrate production areas indicated that contaminants had not migrated beyond the vicinity of the source areas.

- SVOCs and PCBs/pesticides were detected only sporadically and at low concentrations in Load Line 12 groundwater. The distribution of SVOCs in groundwater did not correspond to observed source areas for SVOCs in surface or subsurface soil.

- Conservative numerical fate and transport modeling predicted that leaching of metals and explosive compounds at Buildings 904, 905, and FF-19 will result in concentrations at the groundwater table in excess of preliminary remediation goals (PRGs) in the future. Modeling results also indicated that hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) from Buildings 904 and 905 could potentially migrate to the northwestern AOC boundary at concentrations above MCLs/PRGs. RDX was also identified as a potential migration concern from these source areas to the southern AOC boundary, although predicted maximum concentrations were low (0.15 mg/L) and the timeframe to attain maximum concentration was in excess of 120 years. The migration of metals and explosives at concentrations in excess of PRGs from these source areas to the stream exiting Load Line 12 to the north was also

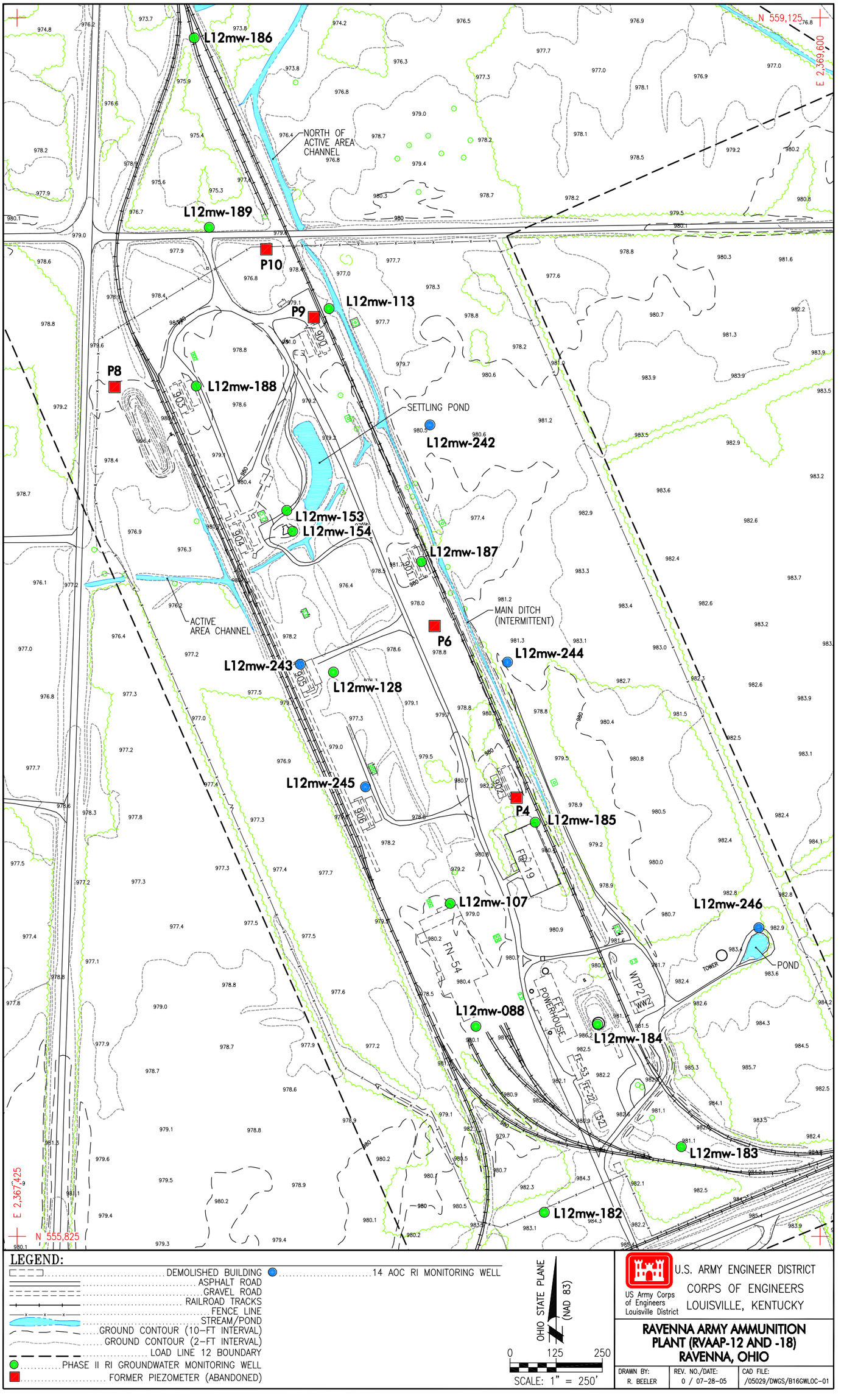

Figure 1-3. Load Line 12 Site Map and Locations of Groundwater Monitoring Wells

predicted to occur in the future. Migration of most of the constituents is attenuated because of moderate to high retardation factors, as well as degradation of organic compounds. These processes were not reflected in the conservative modeling results.

- Chemical hazards and risks associated with arsenic and nitrate in groundwater under hypothetical future National Guard and residential land use scenarios exceeded the upper bound of the CERCLA risk range. A total hazard index (HI) of 3 was estimated for monitoring wells at Load Line 12 for the National Guard receptor. This HI was associated primarily with arsenic. The total risk for this receptor (2E-04) fell above the range of 10^{-6} to 10^{-4} and was also associated primarily with arsenic. The estimated hazards (10 for adult and 33 for child) and total risk (1E-03 for adult and 7E-04 for child) exceeded the target ranges for the resident farmer scenario. The primary contributors to the total hazard were arsenic and nitrate. The primary contributor to risk for both the National Guard and resident farmer scenarios was arsenic.

- Aldrin; bis(2-ethylhexyl)phthalate; 2,4-dinitrotoluene (DNT); and RDX exceeded minimum remedial goal options (RGOs) for the National Guard and residential land use scenarios. However, a majority of the exceedances reflected method reporting limits in excess of the minimum RGOs.

1.3 ADDITIONAL INVESTIGATIONS

As part of the scope for the RI for 14 AOCs at RVAAP, MKM installed five new unconsolidated zone wells at Load Line 12 in November 2004 under a facility-wide work plan addendum reviewed and commented on by Ohio EPA (Figure 1-3). The 14 AOCs RI Report presents a full discussion of data quality objectives, field activities, and investigation methods employed during the effort (MKM 2005). A summary of monitoring well construction information is presented in Table 1-1. Boring logs and well construction records are contained in Appendix A. Boreholes were drilled using 6.25- or 4.25-in. inside diameter hollow-stem augers to the top of bedrock. Continuous split-spoon samples were collected for the purposes of geologic characterization. Monitoring wells were constructed using 2-in. diameter polyvinyl chloride screen and riser casing. All screens had 0.010-in.slots and were 10 ft in length. All five wells were above-grade completions. All newly installed wells were developed using whale pumps; development records are presented in Appendix B. Despite purging more than the required 5 wells volumes as specified by the facility-wide Sampling and Analysis Plan (SAP) (USACE 2001a), turbidity levels remained high in several wells due to the presence of fine silt throughout much of the AOC. Re-development of LL12mw-113 was performed prior to sampling of existing Phase II RI wells. Existing Phase II RI monitoring wells and the newly installed wells were sampled using low-flow sampling techniques and samples analyzed for explosives, propellants, filtered Target Analyte List (TAL) metals, nitrate, VOCs, SVOCs, pesticides, and PCBs. Analytical results and chain-of-custody records are included in Appendix C. Due to persistent elevated turbidity in many wells, filtered TAL metals were collected to minimize analytical interferences and ensure sample results represented dissolved phase concentrations. Filtration of samples was done using in-line 0.45-micron barrel filters.

Under the ongoing RVAAP facility-wide groundwater initiative, SpecPro conducted sampling of wells LL12mw-153, -182, -183, and -186 in April 2005 using low-flow sampling techniques per the facility-wide SAP. Turbidity levels ranged from 8 to 32 nephelometric turbidity units, which, for these wells, approximated conditions observed in November 2004. Samples were analyzed for explosives, propellants, filtered TAL metals, cyanide, nitrate, VOCs, SVOCs, pesticides, and PCBs. Sampling logs are presented in Appendix B. Analytical results and chain-of-custody records are included in Appendix C.

Table 1-1. Load Line 12 Monitoring Well Construction Information

Well ID	Ohio State Plane Easting	Ohio State Plane Northing	GL Elevation[a]	Total Depth[b]	TOC Elevation[a]	Depth to Water[c]	Well Head Type[d]	Monitoring Zone	Top of Screen (ft BGS)	Bottom of Screen (ft BGS)	Bottom of Inner Casing (ft BGS)	Stickup Height	Total Constructed Depth (ft BTOC)
L12mw-088	2368667.75	556393.79	978.94	29.0	981.06	7.46	A	Unconsolidated	14.8	24.8	25.0	2.12	27.12
L12mw-107	2368595.67	556759.02	978.03	33.0	980.15	10.69	A	Unconsolidated	20.7	30.7	31.0	2.12	33.12
L12mw-113	2368223.73	558345.37	977.67	23.0	980.18	7.66	A	Unconsolidated	12.3	22.3	22.5	2.51	25.01
L12mw-128	2368293.20	557371.54	976.21	34.0	978.24	10.73	A	Unconsolidated	21.1	31.1	31.3	2.03	33.33
L12mw-153	2368138.87	557823.23	975.34	26.0	977.85	7.57	A	Unconsolidated	12.3	22.3	22.5	2.51	25.01
L12mw-154	2368183.88	557754.56	977.00	29.0	979.06	9.98	A	Unconsolidated	16.4	26.4	26.6	2.06	28.66
L12mw-182	2368853.20	555890.35	982.20	36.1	984.42	12.52	A	Unconsolidated	25.2	35.2	35.5	2.22	37.72
L12mw-183	2369224.36	556068.15	980.59	36.0	982.98	13.91	A	Unconsolidated	23.3	33.3	33.6	2.39	35.99
L12mw-184	2368997.48	556399.46	980.96	29.5	983.16	13.69	A	Unconsolidated	18.8	28.8	29.0	2.20	31.20
L12mw-185	2368829.86	556946.75	979.09	24.0	981.31	10.33	A	Unconsolidated	10.8	20.8	21.0	2.22	23.22
L12mw-186	2367912.39	559065.95	976.34	23.0	978.31	7.39	A	Unconsolidated	8.8	18.8	19.0	1.97	20.97
L12mw-187	2368524.14	557633.10	977.90	29.0	979.94	11.32	A	Unconsolidated	17.2	27.2	27.4	2.04	29.44
L12mw-188	2367908.82	558132.59	978.46	20.5	980.63	6.70	A	Unconsolidated	9.8	19.8	20.0	2.17	22.17
L12mw-189	2367945.92	558569.27	976.17	18.5	978.04	6.07	A	Unconsolidated	7.5	17.5	17.7	1.87	19.57
LL12mw-242	2368545.29	558020.51	978.40	25.5	981.20	11.45	A	Unconsolidated	15.5	25.5	25.5	2.80	28.30
LL12mw-243	2368190.04	557376.32	978.10	23.0	980.79	10.37	A	Unconsolidated	13.0	23.0	23.0	2.69	25.69
LL12mw-244	2368751.42	557377.17	978.10	29.5	980.65	11.92	A	Unconsolidated	19.5	29.5	29.5	2.55	32.05
LL12mw-245	2368370.74	557044.55	977.50	28.0	980.04	8.84	A	Unconsolidated	18.0	28.0	28.0	2.54	30.54
LL12mw-246	2369432.17	556658.89	982.00	31.5	984.83	17.79	A	Unconsolidated	21.5	31.5	31.5	2.83	34.33

[a] Elevations are in feet above mean sea level (AMSL).
[b] Total drilled or installed depth relative to ground surface.
[c] Measurement relative to top of inner casing (TOC).
[d] A = above grade completion; F = flush-mount completion.
BGS = Below ground surface.
GL = Ground level.
TOC = Below top of casing.

1.4 REPORT ORGANIZATION

This Phase II RI Supplemental Report consists of an Executive Summary, Chapters 1.0 through 5.0, and supporting appendices. Chapter 1.0 describes the purpose, objectives, and organization of this report; provides a summary of Load Line 12 Phase II RI groundwater results; and outlines the additional field investigations addressed by this Supplemental Report. Chapter 2.0 updates the geology and hydrogeology of Load Line 12 and presents an updated contaminant nature and extent summary for groundwater. Chapter 3 presents the results of a qualitative risk evaluation for groundwater that encompasses additional investigation data collected since the Phase II RI. Chapter 4.0 provides conclusions, recommendations, and an updated conceptual site model (CSM) resulting from the evaluation of additional data of this study. Chapter 5.0 provides a list of referenced documents used to support this Phase II RI Supplemental Report.

Appendices (A through C) to this report contain supporting data collected during additional investigations conducted by MKM and SpecPro in 2004 and 2005, respectively. These appendices consist of monitoring well installation and boring logs (Appendix A), sampling logs (Appendix B), and laboratory analytical data and chain-of-custody forms (Appendix C).

2.0 ENVIRONMENTAL SETTING AND NATURE AND EXTENT OF GROUNDWATER CONTAMINATION

This chapter updates the physical characteristics of Load Line 12 and the surrounding environment that are factors in understanding potential contaminant transport pathways, receptors, and exposure scenarios for human health risks. The geology, hydrology, climate, and ecological characteristics of RVAAP were presented in Chapter 2 of the Phase II RI Report (USACE 2004a). The CSM for Load Line 12 is presented in Chapter 8.0 of the Phase II RI Report based on site-specific data from the Phase II RI and local and regional information.

2.1 UPDATED LOAD LINE 12 GEOLOGIC SETTING

All wells installed during the Phase II RI and all additional wells installed in November 2004 were screened within unconsolidated glacial sediments. A full description of site-specific geologic characteristics based on extensive Phase II RI soil sampling, test pit excavation, and monitoring well installation may be found in Chapter 2 of the Final Phase II RI report. Borings drilled for the five 2004 wells did not reveal any new geologic features that change the overall site-specific geologic description provided in the Phase II RI. The five new well borings encountered similar lithology as previously observed within the AOC (e.g., predominantly gray clayey silt to sandy clay).

Wells LL12mw-244 and -245 are of particular interest because these wells were located, in part, to identify a possible cause for a potentiometric low present during two previous rounds of water level measurements. The Phase II RI noted that the potentiometric low appeared to coincide with a thin, medium- to coarse-grained sand with some gravel encountered at depths in the central portion of the AOC. This sandy zone, with higher permeability, was postulated to be a cause for the potentiometric low. The borings for wells LL12mw-244 and -245 did not confirm the presence of any extensive sandy zones or stringers.

Borings drilled for wells LL12mw-242 through -246 encountered bedrock at depths ranging from 24 ft below ground surface (BGS) in the north and west portions of the AOC to 32 ft BGS in the southeastern portion of the AOC. The depths to bedrock are consistent with those observed in Phase II RI boring data and do not show the presence of notable bedrock lows within the AOC that might control groundwater movement.

2.2 UPDATED LOAD LINE 12 HYDROLOGIC/HYDROGEOLOGIC SETTING

A potentiometric surface map for Load Line 12 for January 2005 is provided in Figure 2-1. The updated map includes contemporaneous water level data collected from all Phase II RI and 14 AOC RI monitoring wells. The January 2005 potentiometric surface is similar to the overall water table configuration identified during the Phase II RI, which was collected during the historically dry season of the year (fall). The 2005 potentiometric data confirm the presence of a groundwater low in the central portion of the former process area. Groundwater flow divides exist in the northern quadrant of the main process area and in the southeast portion of the AOC, which bound the potentiometric low. Steeper gradients are observed near the northern divide and at the southern AOC boundary. In the northern two-thirds of the AOC, shallow groundwater flow appears to be directed to the northeast toward the Cobb's Pond complex consistent with regional drainage patterns. The 2005 data provide additional evidence that groundwater flow from the southern one-third of the AOC appears to be to the southeast.

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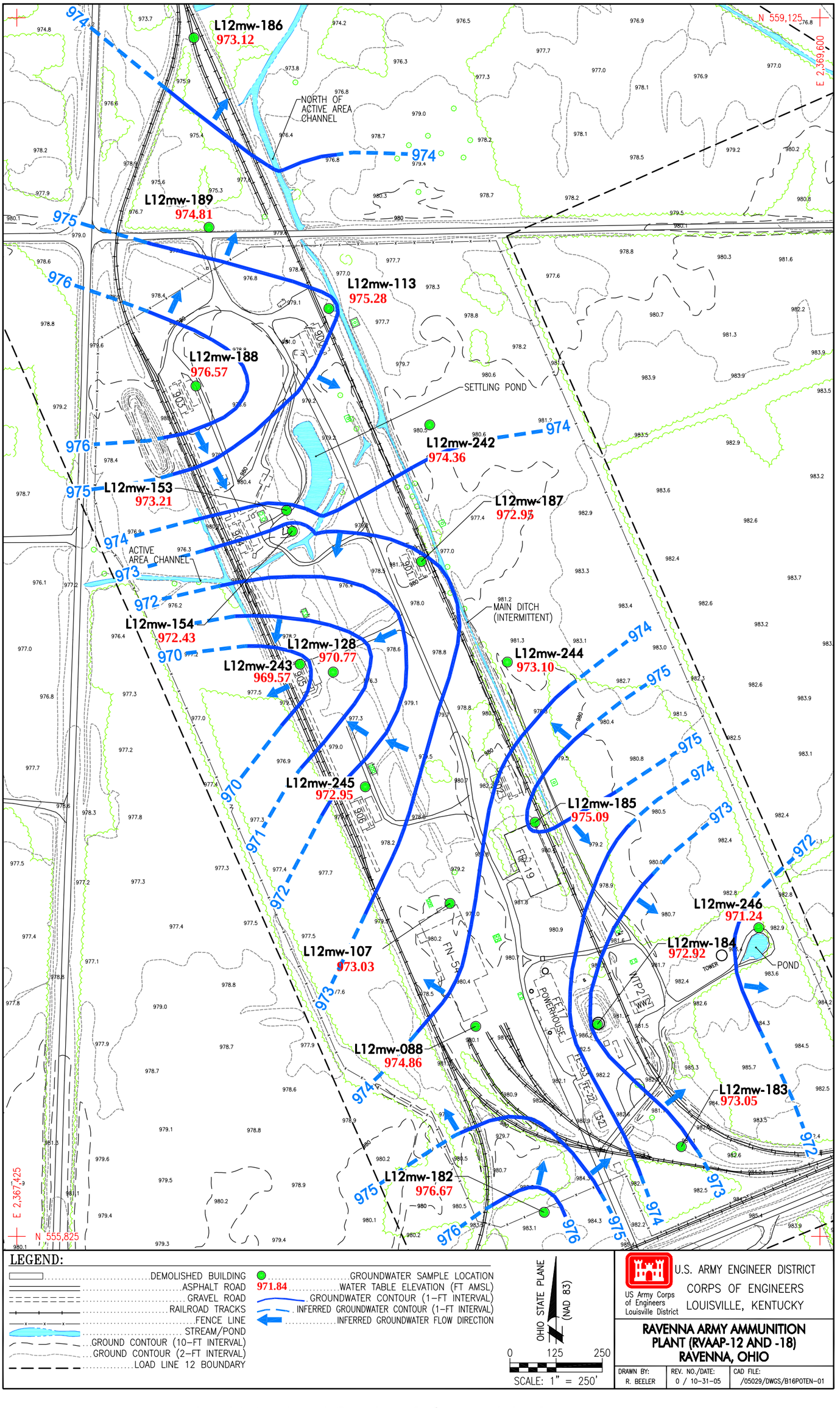

Figure 2-1. Potentiometric Groundwater Surface at Load Line 12

Results of slug tests performed at the 14 Phase II RI monitoring wells during November 2000 reveal hydraulic conductivity values ranging from 2.35×10^{-6} to 2.64×10^{-4} cm/sec. Hydraulic conductivity tests conducted on 0.6-m (2-ft) Shelby tube samples collected within the screened interval at each Phase II RI monitoring well ranged from 3.9×10^{-8} to 8.7×10^{-6} cm/sec, approximately two orders of magnitude less than the slug test results. Additional slug test data from Shelby tube samples were collected from the five new wells installed in 2004; these results will be published in the 14 AOC RI report (MKM 2005). Based on boring log information, the new wells are not expected to show any substantial hydraulic conductivity variations relative to the Phase II RI data.

2.3 DATA EVALUATION METHODS

For the purposes of this Phase II RI Supplemental Report, the evaluation and screening of data were performed using the established RVAAP processes employed in the Phase II RI Report (USACE 2004a) and other RIs for the facility, including: (1) defining data aggregates, (2) data reduction and screening, and (3) data presentation.

Data Aggregates

For the purposes of all data screening and evaluation, all unconsolidated zone groundwater data were compiled as one AOC-wide aggregate. Future groundwater resource use within the AOC is not currently planned. Additionally, site hydrogeologic conditions do not indicate the need for differentiation of unconsolidated zone groundwater into more than one aggregate. For groundwater nature and extent and risk evaluation, both Phase II RI and 2004/2005 data were evaluated as a combined data aggregate and 2004/2005 data were evaluated as a separate aggregate. The nature and extent summary presents data from all sampling efforts and focuses on identification of any notable differences in contaminant occurrence and distribution or potential trends between the Phase II RI and 2004/2005 sampling events. The human health risk evaluation likewise evaluates all combined data obtained since the Phase II RI and also examines the recent data for the occurrence of any new contaminants of potential concern (COPCs).

Data Reduction and Screening

Data reduction and screening steps to identify site-related contaminants (SRCs) included the following: frequency of detection screening, screening of inorganics against facility-wide background values, and screening of essential human nutrients. Detailed descriptions of these screening processes may be found in Section 4.1 of the Phase II RI Report (USACE 2004a) or other recent RI reports issued by the RVAAP IRP (e.g., Load Lines 1, 2, 3, 4, and 11, Winklepeck Burning Grounds, Demolition Area 2, etc.). The screening steps are summarized below.

- Inorganic constituents, VOCs, SVOCs, pesticides, and PCBs with a frequency of detection greater than or equal to 5% (e.g., 1 in 20 samples) were identified as SRCs. If the frequency of detection for one of these classes of analytes was less than 5%, a weight of evidence approach (e.g., clustering of detects and magnitude of detects) was used. For chemicals with less than 20 results, all detected constituents were carried forward to the facility-wide background and essential human nutrient screening steps. All detected explosives and propellants were considered to be SRCs regardless of the frequency of detection and, thus were subjected to the risk evaluation (Chapter 3.0). However, appropriate qualification is made in the assessment of nature and extent for explosives and propellants having a frequency of detection less than 5%.

- Facility-wide background values for inorganic constituents in soil, sediment, surface water, and groundwater (bedrock and unconsolidated zones) were developed as part of a previous Phase II RI at

the Winklepeck Burning Grounds at RVAAP (USACE 2001b). Any inorganic chemical exceeding its facility-wide background criterion for unconsolidated zone groundwater was considered to be an SRC. For inorganics not detected in the background data set, the background value is considered to be zero; thus, any detected value for these inorganics is considered to be above background.

- Chemicals considered to be essential nutrients (i.e., calcium, chloride, iodine, iron, magnesium, potassium, phosphorus, and sodium) are not generally addressed as SRCs in the contaminant nature and extent evaluation and the HHRA (EPA 1989 and 1996) unless they are grossly elevated relative to background values. For the Load Line 12 groundwater investigations, analyses were conducted for calcium, iron, magnesium, potassium, and sodium. These five constituents were eliminated as SRCs for the nature and extent evaluation and HHRA.

For the purposes of the nature and extent evaluation, groundwater results were also compared to state of Ohio drinking water MCLs to identify any exceedances. The HHRA further screens the data against U. S. Environmental Protection Agency (EPA) Region 9 PRGs to identify COPCs.

Data Presentation

Data summary statistics and screening results for groundwater data are presented in Chapter 3 in association with the HHRA (reference Tables 3-1 through 3-3). In the sections addressing the nature and extent of contamination for each medium, analytical results for selected SRCs are presented on maps to depict spatial distribution. Analytical results for classes of SRCs (e.g., explosive compounds, inorganics, or VOCs) are presented in data summary tables. Where only a few detected values were observed for a class of SRCs, the data are presented in the text of the chapter. Complete analytical results for all phases of groundwater investigation are contained in Appendix C.

2.4 NATURE AND EXTENT OF GROUNDWATER CONTAMINATION

Figure 1-3 illustrates the locations of groundwater monitoring wells sampled during the Phase II RI and 2004/2005 groundwater sampling events. Tables 2-1 through 2-3 provide analytical results for chemicals identified as SRCs by the data screening process.

2.4.1 Explosives and Propellants

Thirteen explosives and propellants compounds were detected in groundwater samples among all stations during the Phase II RI. Figure 2-2 shows the distribution of detected explosives and propellants compounds in each groundwater well over time. Table 2-1 contains results for all explosives and propellants detected at least once in groundwater at Load Line 12.

Results for the 2004/2005 monitoring events show a decrease in the total numbers of explosives and propellants detected in groundwater at Load Line 12 since the time of the RI. Five of the 13 explosives compounds identified as SRCs during the Phase II RI (2,4-DNT; 2-nitrotoluene; 3- nitrotoluene; nitrobenzene; and tetryl) were not subsequently detected. For those eight SRCs detected in both events, a notable decrease in frequency of detection across the board was evident, with the exception of nitrocellulose. Nitrocellulose exhibited an increase in frequency of detection in the 2004/2005 sampling of the existing Phase II RI monitoring wells; this compound was not detected in any of the new wells installed in 2004. Octahydro-1,3,5-tetranitro-1,3,5-7-tetrazocine (HMX) was identified as a new SRC in groundwater based on a single detection in well LL12mw-243 installed in 2004.

Table 2-1. Results for Site-Related Explosives and Propellants Compounds in Groundwater at Load Line 12

Station			L12mw-088	L12mw-088	L12mw-107	L12mw-107	L12mw-113
Sample Date			11/01/2000	10/26/2004	10/30/2000	10/27/2004	10/31/2000
Sample Type			Grab	Grab	Grab	Grab	Grab
Analyte (mg/L)[a]	PRG	Units					
1,3,5-Trinitrobenzene	1.1	mg/L	0.00054 UJ	0.0002 U	0.00011 J	0.0002 U	0.00082 UJ
1,3-Dinitrobenzene	0.0036	mg/L	0.0002 UJ	0.0002 U	0.0002 UJ	0.0002 U	0.000095 J
2,4,6-Trinitrotoluene	0.0022	mg/L	0.0002 UJ	0.00025 U	0.0002 UJ	0.00025 U	0.0017 J
2,4-Dinitrotoluene	NA	mg/L	0.00064 UJ	0.00036 U	0.00022 UJ	0.00036 U	0.00013 UJ
2-Amino-4,6-dinitrotoluene	NA	mg/L	0.0012 UJ	0.00036 U	0.00017 J	0.00036 U	0.00041 J
2-Nitrotoluene	0.00066	mg/L	0.0063 J	0.00031 U	0.00051 UJ	0.00031 U	0.0017 J
3-Nitrotoluene	0.12	mg/L	0.0006 UJ	0.00031 U	0.00017 J	0.00031 U	0.00016 J
4-Amino-2,6-dinitrotoluene	NA	mg/L	0.00048 UJ	0.00033 U	0.0002 UJ	0.00033 U	0.00043 J
4-Nitrotoluene	0.00066	mg/L	0.0002 UJ	0.00031 U	0.0003 UJ	0.00031 U	0.00097 J
HMX	1.8	mg/L	0.0005 UJ	0.00031 U	0.0005 UJ	0.00031 U	0.0005 UJ
Nitrobenzene	0.0034	mg/L	0.0002 UJ	0.00016 U	0.0002 UJ	0.00016 U	0.000091 J
Nitrocellulose	NA	mg/L	0.5 UJ	0.5 U	0.5 U	0.5 U	0.5 U
RDX	0.00061	mg/L	0.001 UJ	0.0002 U	0.00012 J	0.0002 U	0.00093 J
Tetryl	0.36	mg/L	0.0009 J	0.00078 U	0.0002 UJ	0.00078 U	0.002 J

Station			L12mw-113	L12mw-113	L12mw-128	L12mw-128	L12mw-153
Sample Date			10/31/2000	11/05/2004	10/31/2000	10/27/2004	11/06/2000
Sample Type			Field Duplicate	Grab	Grab	Grab	Grab
Analyte (mg/L)[a]	PRG	Units					
1,3,5-Trinitrobenzene	1.1	mg/L	0.00061 UJ	0.00037 U	0.00058 UJ	0.0002 U	0.00045 U
1,3-Dinitrobenzene	0.0036	mg/L	0.0002 UJ	0.00037 U	0.0002 UJ	0.0002 U	0.0002 U
2,4,6-Trinitrotoluene	0.0022	mg/L	0.0005 J	0.00046 U	0.00017 J	0.00025 U	0.0002 U
2,4-Dinitrotoluene	NA	mg/L	0.00037 UJ	0.00066 U	0.00013 UJ	0.00036 U	0.00065 =
2-Amino-4,6-dinitrotoluene	NA	mg/L	0.0004 J	0.00066 U	0.00026 J	0.00036 U	0.00089 U
2-Nitrotoluene	0.00066	mg/L	0.0016 J	0.00057 U	0.0014 UJ	0.00031 U	0.0049 =
3-Nitrotoluene	0.12	mg/L	0.00015 J	0.00057 U	0.00017 J	0.00031 U	0.00078 =
4-Amino-2,6-dinitrotoluene	NA	mg/L	0.0002 J	0.00061 U	0.00013 J	0.00033 U	0.00011 J
4-Nitrotoluene	0.00066	mg/L	0.00084 UJ	0.00057 U	0.00071 UJ	0.00031 U	0.0018 =
HMX	1.8	mg/L	0.0005 UJ	0.00057 U	0.0005 UJ	0.00031 U	0.0005 U
Nitrobenzene	0.0034	mg/L	0.00011 J	0.00029 U	0.000076 J	0.00016 U	0.00021 =
Nitrocellulose	NA	mg/L	0.55 =	0.5 U	0.5 U	0.5 U	0.5 U
RDX	0.00061	mg/L	0.00091 J	0.00037 U	0.00072 J	0.0002 U	0.001 U
Tetryl	0.36	mg/L	0.0011 J	0.0014 U	0.00045 J	0.00078 U	0.00044 U

Table 2-1. Results for Site-Related Explosive and Propellant Compounds in Groundwater at Load Line 12 (continued)

Station			L12mw-153	L12mw-153	L12mw-154	L12mw-154	L12mw-182
Sample Date			10/28/2004	04/12/2005	11/06/2000	10/28/2004	10/30/2000
Sample Type			Grab	Grab	Grab	Grab	Grab
Analyte (mg/L)[a]	PRG	Units					
1,3,5-Trinitrobenzene	1.1	mg/L	0.0002 U	0.0001 U	0.00023 U	0.0002 UJ	0.00052 J
1,3-Dinitrobenzene	0.0036	mg/L	0.0002 U	0.000032 J	0.0002 U	0.0002 UJ	0.0002 UJ
2,4,6-Trinitrotoluene	0.0022	mg/L	0.00025 U	0.0001 U	0.0002 U	0.00025 UJ	0.00041 J
2,4-Dinitrotoluene	NA	mg/L	0.00036 U	0.0001 U	0.00068 U	0.00036 UJ	0.00013 UJ
2-Amino-4,6-dinitrotoluene	NA	mg/L	0.00036 U	0.0001 U	0.00065 =	0.00036 UJ	0.0002 UJ
2-Nitrotoluene	0.00066	mg/L	0.00031 U	NA	0.0039 =	0.00031 UJ	0.00023 J
3-Nitrotoluene	0.12	mg/L	0.00031 U	NA	0.00052 U	0.00031 UJ	0.0002 UJ
4-Amino-2,6-dinitrotoluene	NA	mg/L	0.00033 U	0.0001 U	0.0001 J	0.00033 UJ	0.0002 UJ
4-Nitrotoluene	0.00066	mg/L	0.00031 U	0.0005 U	0.0026 =	0.00031 UJ	0.0002 UJ
HMX	1.8	mg/L	0.00031 U	0.0001 U	0.0005 U	0.00031 UJ	0.0005 UJ
Nitrobenzene	0.0034	mg/L	0.00016 U	0.0001 U	0.00019 J	0.00016 UJ	0.0002 UJ
Nitrocellulose	NA	mg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
RDX	0.00061	mg/L	0.0002 U	0.0001 U	0.0005 U	0.0002 UJ	0.0005 UJ
Tetryl	0.36	mg/L	0.00078 U	0.0001 U	0.0002 U	0.00078 UJ	0.00036 J

Station			L12mw-182	L12mw-182	L12mw-182	L12mw-182	L12mw-183
Sample Date			10/29/2004	10/29/2004	04/12/2005	04/12/2005	10/30/2000
Sample Type			Grab	Field Duplicate	Grab	Field Duplicate	Grab
Analyte (mg/L)[a]	PRG	Units					
1,3,5-Trinitrobenzene	1.1	mg/L	0.0002 U	0.0002 U	0.000061 J	0.000045 J	0.00029 J
1,3-Dinitrobenzene	0.0036	mg/L	0.0002 U	0.0002 U	0.0001 U	0.0001 U	0.0002 UJ
2,4,6-Trinitrotoluene	0.0022	mg/L	0.00025 U	0.00025 U	0.0001 U	0.0001 U	0.00024 J
2,4-Dinitrotoluene	NA	mg/L	0.00036 U	0.00036 U	0.0001 U	0.0001 U	0.000069 J
2-Amino-4,6-dinitrotoluene	NA	mg/L	0.00036 U	0.00036 U	0.0001 U	0.0001 U	0.0002 UJ
2-Nitrotoluene	0.00066	mg/L	0.00031 U	0.00031 U	NA	NA	0.00022 J
3-Nitrotoluene	0.12	mg/L	0.00031 U	0.00031 U	NA	NA	0.0002 UJ
4-Amino-2,6-dinitrotoluene	NA	mg/L	0.00033 U	0.00033 U	0.0001 U	0.0001 U	0.0002 UJ
4-Nitrotoluene	0.00066	mg/L	0.00031 U	0.00031 U	0.0005 U	0.0005 U	0.00016 J
HMX	1.8	mg/L	0.00031 U	0.00031 U	0.0001 U	0.0001 U	0.0005 UJ
Nitrobenzene	0.0034	mg/L	0.00016 U	0.00016 U	0.0001 U	0.0001 U	0.0002 UJ
Nitrocellulose	NA	mg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
RDX	0.00061	mg/L	0.0002 U	0.0002 U	0.0001 U	0.0001 U	0.00013 J
Tetryl	0.36	mg/L	0.00078 U	0.00078 U	0.0001 U	0.0001 U	0.00057 J

Table 2-1. Results for Site-Related Explosive and Propellant Compounds in Groundwater at Load Line 12 (continued)

Station			L12mw-183	L12mw-183	L12mw-184	L12mw-184	L12mw-185
Sample Date			11/01/2004	04/12/2005	10/31/2000	10/29/2004	11/07/2000
Sample Type			Grab	Grab	Grab	Grab	Grab
Analyte (mg/L)[a]	PRG	Units					
1,3,5-Trinitrobenzene	1.1	mg/L	0.0002 U	0.000017 J	0.00061 UJ	0.0002 U	0.00058 U
1,3-Dinitrobenzene	0.0036	mg/L	0.0002 U	0.0001 U	0.0002 UJ	0.0002 U	0.0002 U
2,4,6-Trinitrotoluene	0.0022	mg/L	0.00025 U	0.0001 U	0.0002 UJ	0.00025 U	0.0002 U
2,4-Dinitrotoluene	NA	mg/L	0.00036 U	0.0001 U	0.00058 J	0.00036 U	0.00042 =
2-Amino-4,6-dinitrotoluene	NA	mg/L	0.00036 U	0.0001 U	0.00094 UJ	0.00036 U	0.0019 U
2-Nitrotoluene	0.00066	mg/L	0.00031 U	NA	0.004 J	0.00031 U	0.003 =
3-Nitrotoluene	0.12	mg/L	0.00031 U	NA	0.00048 UJ	0.00031 U	0.00072 U
4-Amino-2,6-dinitrotoluene	NA	mg/L	0.00033 U	0.0001 U	0.00018 J	0.00033 U	0.0002 U
4-Nitrotoluene	0.00066	mg/L	0.00031 U	0.0005 U	0.002 J	0.00031 U	0.00055 U
HMX	1.8	mg/L	0.00031 U	0.0001 U	0.0005 UJ	0.00031 U	0.0005 U
Nitrobenzene	0.0034	mg/L	0.00016 U	0.0001 U	0.00016 J	0.00016 U	0.0002 U
Nitrocellulose	NA	mg/L	0.5 U	0.5 U	0.5 U	0.18 =	0.5 U
RDX	0.00061	mg/L	0.0002 U	0.0001 U	0.0017 UJ	0.0002 U	0.00034 J
Tetryl	0.36	mg/L	0.00078 U	0.0001 U	0.00076 UJ	0.00078 U	0.0002 U

Station			L12mw-185	L12mw-186	L12mw-186	L12mw-186	L12mw-187
Sample Date			11/01/2004	11/01/2000	11/01/2004	04/13/2005	10/31/2000
Sample Type			Grab	Grab	Grab	Grab	Grab
Analyte (mg/L)[a]	PRG	Units					
1,3,5-Trinitrobenzene	1.1	mg/L	0.0002 U	0.001 J	0.0002 U	0.0001 U	0.00062 UJ
1,3-Dinitrobenzene	0.0036	mg/L	0.0002 U	0.0002 UJ	0.0002 U	0.0001 U	0.0002 UJ
2,4,6-Trinitrotoluene	0.0022	mg/L	0.00025 U	0.0002 UJ	0.00025 U	0.0001 U	0.00084 J
2,4-Dinitrotoluene	NA	mg/L	0.00036 U	0.001 UJ	0.00036 U	0.0001 U	0.00025 J
2-Amino-4,6-dinitrotoluene	NA	mg/L	0.00036 U	0.0015 J	0.00036 U	0.0001 U	0.00027 J
2-Nitrotoluene	0.00066	mg/L	0.00031 U	0.0026 J	0.00031 U	NA	0.0023 J
3-Nitrotoluene	0.12	mg/L	0.00031 U	0.00053 UJ	0.00031 U	NA	0.00023 UJ
4-Amino-2,6-dinitrotoluene	NA	mg/L	0.00033 U	0.00043 UJ	0.00033 U	0.0001 U	0.0002 J
4-Nitrotoluene	0.00066	mg/L	0.00031 U	0.0037 J	0.00031 U	0.000057 J	0.0014 J
HMX	1.8	mg/L	0.00031 U	0.0005 UJ	0.00031 U	0.0001 U	0.0005 UJ
Nitrobenzene	0.0034	mg/L	0.00016 U	0.00022 UJ	0.00016 U	0.0001 U	0.0002 UJ
Nitrocellulose	NA	mg/L	0.3 =	0.5 UJ	0.5 U	0.5 U	3 =
RDX	0.00061	mg/L	0.0002 U	0.002 J	0.0002 U	0.0001 U	0.0006 UJ
Tetryl	0.36	mg/L	0.00078 U	0.0002 UJ	0.00078 U	0.0001 U	0.00089 J

Table 2-1. Results for Site-Related Explosive and Propellant Compounds in Groundwater at Load Line 12 (continued)

Station			L12mw-187	L12mw-187	L12mw-188	L12mw-188	L12mw-189
Sample Date			10/31/2000	10/29/2004	11/06/2000	10/28/2004	11/01/2000
Sample Type			Field Duplicate	Grab	Grab	Grab	Grab
Analyte (mg/L)[a]	PRG	Units					
1,3,5-Trinitrobenzene	1.1	mg/L	0.00019 J	0.0002 U	0.00059 U	0.0002 U	0.00079 J
1,3-Dinitrobenzene	0.0036	mg/L	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ
2,4,6-Trinitrotoluene	0.0022	mg/L	0.00012 J	0.00025 U	0.0002 U	0.00025 U	0.00089 J
2,4-Dinitrotoluene	NA	mg/L	0.00028 J	0.00036 U	0.00013 U	0.00036 U	0.0012 J
2-Amino-4,6-dinitrotoluene	NA	mg/L	0.00029 J	0.00036 U	0.00067 =	0.00036 U	0.002 UJ
2-Nitrotoluene	0.00066	mg/L	0.0022 J	0.00031 U	0.0032 =	0.00031 U	0.0065 J
3-Nitrotoluene	0.12	mg/L	0.0002 J	0.00031 U	0.00046 U	0.00031 U	0.00076 UJ
4-Amino-2,6-dinitrotoluene	NA	mg/L	0.000092 J	0.00033 U	0.0002 U	0.00033 U	0.00032 UJ
4-Nitrotoluene	0.00066	mg/L	0.0012 UJ	0.00031 U	0.0022 =	0.00031 U	0.00057 UJ
HMX	1.8	mg/L	0.0005 UJ	0.00031 U	0.0005 U	0.00031 U	0.0005 UJ
Nitrobenzene	0.0034	mg/L	0.000075 J	0.00016 U	0.00019 J	0.00016 U	0.00015 J
Nitrocellulose	NA	mg/L	1.3 =	9.4 =	0.5 U	0.5 U	0.5 UJ
RDX	0.00061	mg/L	0.00051 UJ	0.0002 U	0.0011 U	0.0002 U	0.00026 J
Tetryl	0.36	mg/L	0.0002 UJ	0.00078 U	0.0002 U	0.00078 U	0.00016 J

Station			L12mw-189	L12mw-242	L12mw-242	L12mw-243	L12mw-244
Sample Date			10/28/2004	11/30/2004	11/30/2004	11/29/2004	11/29/2004
Sample Type			Grab	Field Duplicate	Grab	Grab	Grab
Analyte (mg/L)[a]	PRG	Units					
1,3,5-Trinitrobenzene	1.1	mg/L	0.0002 U	0.0002 U	0.00022 U	0.00022 U	0.00029 U
1,3-Dinitrobenzene	0.0036	mg/L	0.0002 U	0.0002 U	0.00022 U	0.00022 U	0.00029 U
2,4,6-Trinitrotoluene	0.0022	mg/L	0.00025 U	0.00025 U	0.00028 U	0.003 =	0.00036 U
2,4-Dinitrotoluene	NA	mg/L	0.00036 U	0.00036 U	0.0004 U	0.00039 U	0.00052 U
2-Amino-4,6-dinitrotoluene	NA	mg/L	0.00036 U	0.00036 U	0.0004 U	0.0025 =	0.00052 U
2-Nitrotoluene	0.00066	mg/L	0.00031 U	0.00031 U	0.00034 U	0.00034 U	0.00044 U
3-Nitrotoluene	0.12	mg/L	0.00031 U	0.00031 U	0.00034 U	0.00034 U	0.00044 U
4-Amino-2,6-dinitrotoluene	NA	mg/L	0.00033 U	0.00033 U	0.00036 U	0.0032 =	0.00047 U
4-Nitrotoluene	0.00066	mg/L	0.00031 U	0.00031 U	0.00034 U	0.00034 U	0.00044 U
HMX	1.8	mg/L	0.00031 U	0.00031 U	0.00034 U	0.00078 =	0.00044 U
Nitrobenzene	0.0034	mg/L	0.00016 U	0.00016 U	0.00018 U	0.00017 U	0.00023 U
Nitrocellulose	NA	mg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
RDX	0.00061	mg/L	0.0002 U	0.0002 U	0.00022 U	0.0015 =	0.00029 U
Tetryl	0.36	mg/L	0.00078 U	0.00078 U	0.00086 U	0.00085 U	0.0011 U

Table 2-1. Results for Site-Related Explosive and Propellant Compounds in Groundwater at Load Line 12 (continued)

Station			L12mw-245	L12mw-246
Sample Date			11/29/2004	11/29/2004
Sample Type			Grab	Grab
Analyte (mg/L)[a]	PRG	Units		
1,3,5-Trinitrobenzene	1.1	mg/L	0.0002 U	0.00028 U
1,3-Dinitrobenzene	0.0036	mg/L	0.0002 U	0.00028 U
2,4,6-Trinitrotoluene	0.0022	mg/L	0.00025 U	0.00035 U
2,4-Dinitrotoluene	NA	mg/L	0.00036 U	0.0005 U
2-Amino-4,6-dinitrotoluene	NA	mg/L	0.00036 U	0.0005 U
2-Nitrotoluene	0.00066	mg/L	0.00031 U	0.00043 U
3-Nitrotoluene	0.12	mg/L	0.00031 U	0.00043 U
4-Amino-2,6-dinitrotoluene	NA	mg/L	0.00033 U	0.00046 U
4-Nitrotoluene	0.00066	mg/L	0.00031 U	0.00043 U
HMX	1.8	mg/L	0.00031 U	0.00043 U
Nitrobenzene	0.0034	mg/L	0.00016 U	0.00022 U
Nitrocellulose	NA	mg/L	0.5 U	0.5 U
RDX	0.00061	mg/L	0.0002 U	0.00028 U
Tetryl	0.36	mg/L	0.00078 U	0.0011 U

[a]Ravenna facility-wide background for all explosives and propellants is zero. There are no promulgated maximum contaminant levels for site-related explosives and propellants.
"=" = Analyte present and concentration accurate.
HMX = Octahydro-1,3,57-tetranitro-1,3,5,7-tetrazocine.
NA = Not analyzed.
PRG = U. S. Environmental Protection Agency Region 9 tap water preliminary remediation goal.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
Qualifiers:

J = Estimated value less than reporting limits.
U = Nondetect.

Table 2-2. Results for Site-Related Inorganics in Groundwater at Load Line 12

Station					L12mw-088	L12mw-088	L12mw-107	L12mw-107	L12mw-113	L12mw-113
Sample Date					11/01/2000	10/26/2004	10/30/2000	10/27/2004	10/31/2000	10/31/2000
Sample Type					Grab	Grab	Grab	Grab	Grab	Field Duplicate
Analyte (mg/L)	Units	PRG	MCL	Background Criteria[a]						
Common Anions										
Nitrate as N	mg/L	1.0	10	0	0.1 U	0.2 U	0.1 U	0.57 =	**16.3 =**	**16.3 =**
Metals										
Aluminum	mg/L	36.0	0.05-0. 2[b]	0	0.2 U	**0.13 = ***	0.2 U	**0.061 = ***	0.2 U	0.2 U
Arsenic	mg/L	0.000045	0.01	0.0117	**0.011 =**	**0.019 = ***	0.0042 J	**0.019 = ***	0.005 U	0.005 U
Barium	mg/L	2.6	2	0.0821	0.29 = *	0.49 = *	0.072 J	0.032 =	0.072 J	0.072 J
Cadmium	mg/L	0.018	0.005	0	0.005 U	0.002 U	0.005 U	0.002 U	0.005 U	0.005 U
Chromium	mg/L	0.11	0.1	0.0073	0.0014 J	0.002 =	0.01 U	0.0024 =	0.0015 J	0.0021 J
Cobalt	mg/L	0.73		0	0.05 U	0.005 U	0.0028 J *	0.005 U	0.0016 J *	0.0015 J *
Copper	mg/L	1.5	1.3	0	0.025 U	0.0028 = *	0.025 U	0.0021 = *	0.025 U	0.025 U
Lead	mg/L	NA	0.015	0	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U
Magnesium	mg/L	NA		43.3	47.4 = *	25 =	63.9 = *	63 = *	83.2 = *	84.3 = *
Manganese	mg/L	0.88	0. 05[b]	1.02	**0.34 =**	**0.15 =**	**0.36 =**	**0.18 =**	**1.4 = ***	**1.4 = ***
Mercury	mg/L	0.011	0.002	0	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel	mg/L	0.73	0.1	0	0.04 U	0.016 = *	0.0062 J *	0.01 U	0.0034 J *	0.0035 J *
Selenium	mg/L	0.18	0.05	0	0.005 U	0.015 U	0.005 U	0.015 U	0.005 U	0.005 U
Thallium	mg/L	0.0024	0.002	0	0.002 UJ	0.004 U	0.002 UJ	0.004 U	0.002 UJ	0.002 UJ
Zinc	mg/L	11.0	5[b]	0.0609	0.02 U	0.03 U	0.02 U	0.03 U	0.02 U	0.02 U

Table 2-2. Results for Site-Related Inorganics in Groundwater at Load Line 12 (continued)

Station					**L12mw-113**	**L12mw-128**	**L12mw-128**	**L12mw-153**	**L12mw-153**	**L12mw-153**
Sample Date					**11/05/2004**	**10/31/2000**	**10/27/2004**	**11/06/2000**	**10/28/2004**	**04/12/2005**
Sample Type					**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**
Analyte (mg/L)	**Units**	**PRG**	**MCL**	**Background Criteria[a]**						
Common Anions										
Nitrate as N	mg/L	1.0	10	0	0.51 =	0.1 U	0.2 U	0.1 U	0.2 U	0.1 U
Metals										
Aluminum	mg/L	36.0	0.05-0. 2[b]	0	**1.4 = ***	0.2 U	0.045 = *	0.081 U	0.026 = *	0.2 U
Arsenic	mg/L	0.000045	0.01	0.0117	**0.012 = ***	**0.07 = ***	**0.061 = ***	**0.012 = ***	**0.032 = ***	**0.024 = ***
Barium	mg/L	2.6	2	0.0821	0.044 =	0.094 J *	0.064 =	0.1 J *	0.087 = *	0.0815 =
Cadmium	mg/L	0.018	0.005	0	0.002 U	0.005 U	0.002 U	0.005 U	0.002 U	0.01 U
Chromium	mg/L	0.11	0.1	0.0073	0.0024 =	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U
Cobalt	mg/L	0.73		0	0.0035 = *	0.0015 J *	0.005 U	0.05 U	0.005 U	0.001 UJ
Copper	mg/L	1.5	1.3	0	0.0034 = *	0.025 U	0.0018 = *	0.025 U	0.0018 = *	0.02 U
Lead	mg/L	NA	0.015	0	0.0039 = *	0.003 U	0.00094 = *	0.003 U	0.003 U	0.01 U
Magnesium	mg/L	NA		43.3	80 = *	79.8 = *	130 = *	71.7 = *	77 = *	74.8 = *
Manganese	mg/L	0.88	0. 05[b]	1.02	**1.4 = ***	**0.35 =**	**0.2 =**	**0.23 =**	**0.2 =**	**0.188 =**
Mercury	mg/L	0.011	0.002	0	0.0002 U	0.0002 U	0.00019 = *	0.0002 U	0.0002 U	0.0002 U
Nickel	mg/L	0.73	0.1	0	0.008 = *	0.0026 J *	0.01 U	0.0041 U	0.01 U	0.02 U
Selenium	mg/L	0.18	0.05	0	0.015 U	0.005 U	0.015 U	0.005 U	0.0064 = *	0.01 U
Thallium	mg/L	0.0024	0.002	0	**0.0029 = ***	0.002 UJ	0.004 U	0.002 U	0.004 U	0.001 U
Zinc	mg/L	11.0	5[b]	0.0609	0.02 =	0.02 U	0.03 U	0.021 =	0.03 =	0.1 U

Table 2-2. Results for Site-Related Inorganics in Groundwater at Load Line 12 (continued)

Station					L12mw-154	L12mw-154	L12mw-182	L12mw-182	L12mw-182	L12mw-182
Sample Date					11/06/2000	10/28/2004	10/30/2000	10/29/2004	10/29/2004	04/12/2005
Sample Type					Grab	Grab	Grab	Field Duplicate	Grab	Grab
Analyte (mg/L)	Units	PRG	MCL	Background Criteria[a]						
Common Anions										
Nitrate as N	mg/L	1.0	10	0	0.1 U	0.2 U	0.1 U	0.2 U	0.2 U	0.1 U
Metals										
Aluminum	mg/L	36.0	0.05-0. 2[b]	0	0.081 U	0.031 = *	0.086 U	0.15 U	0.15 U	0.2 U
Arsenic	mg/L	0.000045	0.01	0.0117	**0.055 = ***	**0.037 = ***	**0.021 = ***	**0.042 = ***	**0.044 = ***	**0.0256 = ***
Barium	mg/L	2.6	2	0.0821	0.07 J	0.064 =	0.089 J *	0.1 = *	0.1 = *	0.115 = *
Cadmium	mg/L	0.018	0.005	0	0.005 U	0.002 U	0.005 U	0.002 U	0.002 U	0.01 U
Chromium	mg/L	0.11	0.1	0.0073	0.01 U	0.002 =	0.01 U	0.01 U	0.01 U	0.02 U
Cobalt	mg/L	0.73		0	0.05 U	0.005 U	0.0016 J *	0.005 U	0.005 U	0.02 U
Copper	mg/L	1.5	1.3	0	0.025 U	0.01 U	0.025 U	0.01 U	0.01 U	0.02 U
Lead	mg/L	NA	0.015	0	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.01 U
Magnesium	mg/L	NA		43.3	52.7 = *	62 = *	65.9 = *	51 = *	51 = *	58.9 = *
Manganese	mg/L	0.88	0. 05[b]	1.02	**0.15 =**	**0.074 =**	**0.08 =**	0.043 =	0.043 =	0.0234 UJ
Mercury	mg/L	0.011	0.002	0	0.0002 U	0.0002 U	0.0002 U	0.000059 = *	0.000078 = *	0.000065 UJ
Nickel	mg/L	0.73	0.1	0	0.003 U	0.01 U	0.0027 J *	0.002 = *	0.01 U	0.003 UJ
Selenium	mg/L	0.18	0.05	0	0.005 U	0.015 U	0.005 U	0.015 U	**0.0053 = ***	0.01 U
Thallium	mg/L	0.0024	0.002	0	0.002 U	0.004 U	0.002 U	0.004 U	0.004 U	0.001 U
Zinc	mg/L	11.0	5[b]	0.0609	0.017 J	0.03 U	0.02 U	0.03 U	0.03 U	0.1 U

Table 2-2. Results for Site-Related Inorganics in Groundwater at Load Line 12 (continued)

Station					L12mw-182	L12mw-183	L12mw-183	L12mw-183	L12mw-184	L12mw-184
Sample Date					04/12/2005	10/30/2000	11/01/2004	04/12/2005	10/31/2000	10/29/2004
Sample Type					Field Duplicate	Grab	Grab	Grab	Grab	Grab
Analyte (mg/L)	**Units**	**PRG**	**MCL**	**Background Criteria[a]**						
Common Anions										
Nitrate as N	mg/L	1.0	10	0		0.1 U	0.27 =	0.06 UJ	0.1 U	0.2 =
Metals										
Aluminum	mg/L	36.0	0.05-0. 2[b]	0	0.2 U	0.2 U	0.15 U	0.2 U	0.2 U	0.025 U
Arsenic	mg/L	0.000045	0.01	0.0117	**0.0279 = ***	**0.017 = ***	**0.043 = ***	**0.0288 = ***	**0.029 = ***	**0.019 = ***
Barium	mg/L	2.6	2	0.0821	0.125 = *	0.08 J	0.064 =	0.0608 =	0.083 J *	0.018 =
Cadmium	mg/L	0.018	0.005	0	0.01 U	0.005 U	0.002 U	0.01 U	0.005 U	0.002 U
Chromium	mg/L	0.11	0.1	0.0073	0.02 U	0.01 U	0.01 U	0.02 U	0.01 U	0.01 U
Cobalt	mg/L	0.73		0	0.0012 UJ	0.0033 J *	0.005 U	0.02 U	0.0015 J *	0.005 U
Copper	mg/L	1.5	1.3	0	0.02 U	0.025 U	0.01 U	0.02 U	0.025 U	0.01 U
Lead	mg/L	NA	0.015	0	0.01 U	0.003 U	0.003 U	0.01 U	0.003 U	0.003 U
Magnesium	mg/L	NA		43.3	64.2 = *	41.4 =	39 =	41 =	99.6 = *	150 = *
Manganese	mg/L	0.88	0. 05[b]	1.02	0.0467 UJ	**0.078 =**	**0.056 =**	0.0592 UJ	**0.28 =**	**0.55 =**
Mercury	mg/L	0.011	0.002	0	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel	mg/L	0.73	0.1	0	0.0037 UJ	0.0086 J *	0.01 U	0.02 U	0.0025 J *	0.01 U
Selenium	mg/L	0.18	0.05	0	0.01 U	0.005 U	0.015 U	0.01 U	0.005 U	**0.0059 = ***
Thallium	mg/L	0.0024	0.002	0	0.001 U	0.002 UJ	0.004 U	0.001 U	0.002 UJ	0.004 U
Zinc	mg/L	11.0	5[b]	0.0609	0.1 U	0.02 U	0.03 U	0.1 U	0.02 U	0.017 =

Table 2-2. Results for Site-Related Inorganics in Groundwater at Load Line 12 (continued)

Station					L12mw-185	L12mw-185	L12mw-186	L12mw-186	L12mw-186	L12mw-187
Sample Date					11/07/2000	11/01/2004	11/01/2000	11/01/2004	04/13/2005	10/31/2000
Sample Type					Grab	Grab	Grab	Grab	Grab	Grab
Analyte (mg/L)	Units	PRG	MCL	Background Criteria[a]						
Common Anions										
Nitrate as N	mg/L	1.0	10	0	**185 =**	**160 =**	0.1 U	0.2 U	0.6 =	**713 =**
Metals										
Aluminum	mg/L	36.0	0.05-0. 2[b]	0	0.065 U	0.15 U	0.2 U	**0.078 = ***	0.2 U	0.2 U
Arsenic	mg/L	0.000045	0.01	0.0117	0.005 U	0.002 U	0.005 U	0.0055 =	0.0039 UJ	0.0054 =
Barium	mg/L	2.6	2	0.0821	0.076 J	0.06 =	0.08 J	0.042 =	0.046 =	1.1 = *
Cadmium	mg/L	0.018	0.005	0	0.005 U	0.002 U	0.0014 J *	0.002 U	0.01 U	0.005 U
Chromium	mg/L	0.11	0.1	0.0073	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Cobalt	mg/L	0.73		0	0.0036 U	0.003 = *	0.0043 J *	0.0022 = *	0.0014 UJ	0.0029 J *
Copper	mg/L	1.5	1.3	0	0.025 U	0.01 U	0.025 U	0.01 U	0.02 U	0.025 U
Lead	mg/L	NA	0.015	0	0.003 U	0.003 U	0.003 U	0.003 U	0.01 U	0.003 U
Magnesium	mg/L	NA		43.3	296 = *	260 = *	58 = *	54 = *	66.9 = *	177 = *
Manganese	mg/L	0.88	0. 05[b]	1.02	**1.3 = ***	**1.7 = ***	**0.71 =**	**0.32 =**	**0.35 =**	**0.96 =**
Mercury	mg/L	0.011	0.002	0	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel	mg/L	0.73	0.1	0	0.0046 U	0.0073 = *	0.0044 J *	0.0019 = *	0.02 U	0.0061 J *
Selenium	mg/L	0.18	0.05	0	0.005 U	0.0087 = *	0.005 U	0.015 U	0.01 U	0.005 U
Thallium	mg/L	0.0024	0.002	0	**0.0024 J ***	0.004 U	0.002 UJ	0.004 U	0.001 U	0.004 UJ
Zinc	mg/L	11.0	5[b]	0.0609	0.02 U	0.021 =	0.02 U	0.015 =	0.1 U	0.02 U

Table 2-2. Results for Site-Related Inorganics in Groundwater at Load Line 12 (continued)

Station					**L12mw-187**	**L12mw-187**	**L12mw-188**	**L12mw-188**	**L12mw-189**	**L12mw-189**
Sample Date					**10/31/2000**	**10/29/2004**	**11/06/2000**	**10/28/2004**	**11/01/2000**	**10/28/2004**
Sample Type					**Field Duplicate**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**
Analyte (mg/L)	**Units**	**PRG**	**MCL**	**Background Criteria[a]**						
Common Anions										
Nitrate as N	mg/L	1.0	10	0	**731 =**	**1200 =**	0.1 U	0.2 U	0.1 U	0.2 U
Metals										
Aluminum	mg/L	36.0	0.05-0.2[b]	0	0.2 U	0.054 U	**0.53 = ***	0.15 U	0.2 U	**0.066 = ***
Arsenic	mg/L	0.000045	0.01	0.0117	0.0063 =	0.002 U	0.01 =	0.0041 =	0.005 U	0.0022 =
Barium	mg/L	2.6	2	0.0821	1.2 = *	0.42 = *	0.047 J	0.046 =	0.023 J	0.02 =
Cadmium	mg/L	0.018	0.005	0	0.005 U	0.002 U	0.005 U	0.002 U	0.005 U	0.002 U
Chromium	mg/L	0.11	0.1	0.0073	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Cobalt	mg/L	0.73		0	0.0031 J *	0.008 = *	0.0035 U	0.0012 = *	0.0037 J *	0.005 U
Copper	mg/L	1.5	1.3	0	0.025 U	0.01 U	0.0096 J *	0.0026 = *	0.025 U	0.0022 = *
Lead	mg/L	NA	0.015	0	0.003 U	0.0009 = *	0.01 = *	0.003 U	0.003 U	0.003 U
Magnesium	mg/L	NA		43.3	191 = *	270 = *	132 = *	120 = *	85 = *	77 = *
Manganese	mg/L	0.88	0. 05[b]	1.02	**1 =**	**1.8 = ***	**1.8 = ***	**0.77 =**	**0.32 =**	**0.39 =**
Mercury	mg/L	0.011	0.002	0	0.0002 U	0.000065 = *	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel	mg/L	0.73	0.1	0	0.0066 J *	0.014 = *	0.0062 U	0.003 = *	0.005 J *	0.01 U
Selenium	mg/L	0.18	0.05	0	0.005 U	0.01 = *	0.005 U	0.015 U	0.005 U	0.015 U
Thallium	mg/L	0.0024	0.002	0	0.004 UJ	0.004 U	0.002 UJ	0.004 U	0.002 UJ	0.004 U
Zinc	mg/L	11.0	5[b]	0.0609	0.02 U	0.019 =	0.018 J	0.03 U	0.02 U	0.069 = *

Table 2-2. Results for Site-Related Inorganics in Groundwater at Load Line 12 (continued)

Station					L12mw-242	L12mw-242	L12mw-243	L12mw-244	L12mw-245	L12mw-246
Sample Date					11/30/2004	11/30/2004	11/29/2004	11/29/2004	11/29/2004	11/29/2004
Sample Type					Field Duplicate	Grab	Grab	Grab	Grab	Grab
Analyte (mg/L)	Units	PRG	MCL	Background Criteria[a]						
Common Anions										
Nitrate as N	mg/L	1.0	10	0	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Metals										
Aluminum	mg/L	36.0	0.05-0.2[b]	0	0.15 U	0.15 U	0.042 = *	0.15 U	**0.14 = ***	0.15 U
Arsenic	mg/L	0.000045	0.01	0.0117	**0.025 = ***	**0.023 = ***	0.005 =	**0.011 =**	0.0049 =	**0.03 = ***
Barium	mg/L	2.6	2	0.0821	0.023 =	0.02 =	0.062 =	0.13 = *	0.054 =	0.047 =
Cadmium	mg/L	0.018	0.005	0	0.002 U	0.002 U	0.00031 = *	0.002 U	0.002 U	0.002 U
Chromium	mg/L	0.11	0.1	0.0073	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Cobalt	mg/L	0.73		0	0.005 U	0.005 U	0.0014 = *	0.005 U	0.0014 = *	0.005 U
Copper	mg/L	1.5	1.3	0	0.003 = *	0.0028 = *	0.01 U	0.01 U	0.01 U	0.01 U
Lead	mg/L	NA	0.015	0	0.003 U	0.003 U	0.0086 = *	0.001 = *	0.0013 = *	0.0017 = *
Magnesium	mg/L	NA		43.3	44 = *	44 = *	77 = *	25 J	60 = *	52 = *
Manganese	mg/L	0.88	0.05[b]	1.02	**0.084 =**	**0.086 =**	**0.25 =**	**0.16 =**	**0.099 =**	**0.078 =**
Mercury	mg/L	0.011	0.002	0	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel	mg/L	0.73	0.1	0	0.01 U	0.01 U	0.0032 = *	0.0015 = *	0.0043 = *	0.0023 = *
Selenium	mg/L	0.18	0.05	0	0.015 U	0.015 U	0.015 U	0.015 U	0.0034 = *	0.015 U
Thallium	mg/L	0.0024	0.002	0	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U
Zinc	mg/L	11.0	5[b]	0.0609	0.0075 =	0.011 =	0.04 =	0.03 U	0.031 =	0.015 =

[a]Facility-wide background criteria are for unconsolidated/filtered samples.
[b]State of Ohio Secondary MCL.
MCL = Ohio maximum contaminant level.
NB = No background value established.
PRG = U. S. Environmental Protection Agency Region 9 tap water preliminary remediation goal.
Qualifiers:

* = Value exceeds the facility-wide background criterion.
"=" = Analyte present and concentration accurate.
J = Estimated value less than reporting limits.
U = Nondetect.

Values shown in **BOLD** exceed the MCL or PRG.

Table 2-3. Results for SVOCs, VOCs, and Pesticides Detected in Groundwater at Load Line 12

Station				L12mw-088	L12mw-088	L12mw-107	L12mw-107	L12mw-113	L12mw-113	L12mw-113
Sample Date				11/01/2000	10/26/2004	10/30/2000	10/27/2004	10/31/2000	10/31/2000	11/05/2004
Sample Type				Grab	Grab	Grab	Grab	Grab	Field Duplicate	Grab
Analyte (mg/L)[a]	Units	PRG	MCL							
Pesticides										
4,4'-DDD	mg/L	0.00028	NA	0.00005 U	0.00011 U	0.00005 U	0.00011 U	0.00005 U	0.00005 U	0.00011 U
4,4'-DDE	mg/L	0.0002	NA	0.00005 U	0.000099 U	0.00005 U	0.000099 U	0.00005 U	0.00005 U	0.000096 U
4,4'-DDT	mg/L	0.0002	NA	0.00005 U	0.00015 U	0.00005 U	0.00015 U	0.00005 U	0.00005 U	0.00014 U
Aldrin	mg/L	0.000004	NA	0.00005 U	0.000099 U	0.00005 U	0.000099 U	0.00005 U	0.00005 U	0.000096 U
Heptachlor	mg/L	0.000015	0.0004	0.00005 U	0.00015 U	0.00005 U	0.00015 U	0.00005 U	0.00005 U	0.00014 U
alpha-Chlordane	mg/L	0.00019	NA	0.00005 U	0.00005 U	0.00005 U	0.00005 U	0.00005 U	0.00005 U	0.000048 U
beta-BHC	mg/L	0.000037	NA	0.00005 U	0.000099 U	0.00005 U	0.000099 U	0.00005 U	0.00005 U	0.000096 U
Semivolatile Organics										
4-Methylphenol	mg/L	0.18	NA	0.01 U	0.0029 =	0.01 U	0.002 U	0.01 U	0.01 U	0.002 U
Benz(*a*)anthracene	mg/L	0.000092	NA	0.01 U	0.0002 U	0.01 U	0.0002 U	0.01 U	0.01 U	0.0002 U
Benzo(a)pyrene	mg/L	0.000009	0.0002	0.01 U	0.0004 U	0.01 U	0.0004 U	0.01 U	0.01 U	0.0004 U
Benzo(*b*)fluoranthene	mg/L	0.000092	NA	0.01 U	0.0004 U	0.01 U	0.0004 U	0.01 U	0.01 U	0.0004 U
Benzo(*g,h,i*)perylene	mg/L	NA	NA	0.01 U	0.001 U	0.01 U	0.001 U	0.01 U	0.01 U	0.001 U
Benzo(*k*)fluoranthene	mg/L	0.00092	NA	0.01 U	0.0004 U	0.01 U	0.0004 U	0.01 U	0.01 U	0.0004 U
Benzoic Acid	mg/L	150.0	NA		0.015 J		0.02 U			0.02 U
Bis(2-ethylhexyl)phthalate	mg/L	0.0048	0.006	0.01 U	0.015 U	0.01 U	0.015 U	0.01 U	0.01 U	0.015 U
Chrysene	mg/L	0.0092	NA	0.01 U	0.0005 U	0.01 U	0.00051 U	0.01 U	0.01 U	0.0005 U
Dibenz(*a,h*)anthracene	mg/L	0.000009	NA	0.01 U	0.0004 U	0.01 U	0.0004 U	0.01 U	0.01 U	0.0004 U
Diethyl phthalate	mg/L	29.0	NA	0.01 U	0.002 U	0.01 U	0.002 U	0.01 U	0.01 U	0.002 U
Indeno(*1,2,3-cd*)pyrene	mg/L	0.000092	NA	0.01 U	0.0004 U	0.01 U	0.0004 U	0.01 U	0.01 U	0.0004 U
Phenanthrene	mg/L	NA	NA	0.01 U	0.001 U	0.01 U	0.001 U	0.01 U	0.01 U	0.001 U
Phenol	mg/L	11.0	NA	0.01 U	0.025 =	0.01 U	0.0051 U	0.01 U	0.01 U	0.005 U
Pyrene	mg/L	0.18	NA	0.01 U	0.001 U	0.01 U	0.001 U	0.01 U	0.01 U	0.001 U
Volatile Organics										
2-Butanone	mg/L	7.0	NA	0.01 U	0.0083 J	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
4-Methyl-2-pentanone	mg/L	2.0	NA	0.01 U	0.0083 J	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Acetone	mg/L	5.5	NA	0.01 U	0.074 =	0.01 UJ	0.01 U	0.01 U	0.01 U	0.01 U
Methylene Chloride	mg/L	0.0043	0.005	0.005 U	0.0015 U	0.005 U	0.0015 U	0.005 U	0.005 U	0.0015 U
Toluene	mg/L	0.72	1.0	0.005 U	0.001 U	0.005 U	0.001 U	0.005 U	0.005 U	0.001 U

Table 2-3. Results for SVOCs, VOCs, and Pesticides Detected in Groundwater at Load Line 12 (continued)

Station				L12mw-128	L12mw-128	L12mw-153	L12mw-153	L12mw-153	L12mw-154	L12mw-154
Sample Date				10/31/2000	10/27/2004	11/06/2000	10/28/2004	04/12/2005	11/06/2000	10/28/2004
Sample Type				Grab	Grab	Grab	Grab	Grab	Grab	Grab
Analyte (mg/L)[a]	Units	PRG	MCL							
Pesticides										
4,4'-DDD	mg/L	0.00028	NA	0.00005 U	0.00011 U	0.000099 =	0.00011 U	0.00003 U	0.00005 U	0.00011 U
4,4'-DDE	mg/L	0.0002	NA	0.00005 U	0.000099 U	0.00005 U	0.000098 U	0.00003 U	0.000056 =	0.0001 U
4,4'-DDT	mg/L	0.0002	NA	0.00005 U	0.00015 U	0.00005 U	0.00015 U	0.000051 =	0.00005 U	0.00015 U
Aldrin	mg/L	0.000004	NA	0.00005 U	0.000099 U	0.000054 =	0.000098 U	0.00003 U	0.00005 U	0.0001 U
Heptachlor	mg/L	0.000015	0.0004	0.00005 U	0.00015 U	0.00005 U	0.00015 U	0.00017 =	0.00005 U	0.00015 U
alpha-Chlordane	mg/L	0.00019	NA	0.00005 U	0.00005 U	0.00005 J	0.000049 U	0.00003 U	0.00005 U	0.00005 U
beta-BHC	mg/L	0.000037	NA	0.00005 U	0.000099 U	0.000055 =	0.000098 U	0.00003 U	0.00005 U	0.0001 U
Semivolatile Organics										
4-Methylphenol	mg/L	0.18	NA	0.01 U	0.002 U	0.01 U	0.002 U		0.01 U	0.002 U
Benz(*a*)anthracene	mg/L	0.000092	NA	0.01 U	0.0002 U	0.01 U	0.0002 U	0.0002 U	0.01 U	0.0002 U
Benzo(a)pyrene	mg/L	0.000009	0.0002	0.01 U	0.0004 U	0.01 U	0.0004 U	0.0002 U	0.01 U	0.00041 U
Benzo(*b*)fluoranthene	mg/L	0.000092	NA	0.01 U	0.0004 U	0.01 U	0.0004 U	0.0002 U	0.01 U	0.00041 U
Benzo(*g,h,i*)perylene	mg/L	NA	NA	0.01 U	0.001 U	0.01 U	0.001 U	0.0002 U	0.01 U	0.001 U
Benzo(*k*)fluoranthene	mg/L	0.00092	NA	0.01 U	0.0004 U	0.01 U	0.0004 U	0.0002 U	0.01 U	0.00041 U
Benzoic Acid	mg/L	150.0	NA		0.02 U		0.02 U			0.02 U
Bis(2-ethylhexyl)phthalate	mg/L	0.0048	0.006	0.01 U	0.015 U	0.012 =	0.015 U	0.0011 UJ	0.0061 J	0.015 U
Chrysene	mg/L	0.0092	NA	0.01 U	0.0005 U	0.01 U	0.0005 U	0.0002 U	0.01 U	0.00051 U
Dibenz(*a,h*)anthracene	mg/L	0.000009	NA	0.01 U	0.0004 U	0.01 U	0.0004 U	0.0002 U	0.01 U	0.00041 U
Diethyl phthalate	mg/L	29.0	NA	0.01 U	0.002 U	0.01 U	0.002 U	0.001 U	0.01 U	0.002 U
Indeno(*1,2,3-cd*)pyrene	mg/L	0.000092	NA	0.01 U	0.0004 U	0.01 U	0.0004 U	0.0002 U	0.01 U	0.00041 U
Phenanthrene	mg/L	NA	NA	0.01 U	0.001 U	0.0028 J	0.001 U	0.0002 U	0.01 U	0.001 U
Phenol	mg/L	11.0	NA	0.01 U	0.005 U	0.01 U	0.005 U	0.001 U	0.01 U	0.0051 U
Pyrene	mg/L	0.18	NA	0.01 U	0.001 U	0.01 U	0.001 U	0.0002 U	0.01 U	0.001 U
Volatile Organics										
2-Butanone	mg/L	7.0	NA	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
4-Methyl-2-pentanone	mg/L	2.0	NA	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Acetone	mg/L	5.5	NA	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U	0.009 U	0.01 U
Methylene Chloride	mg/L	0.0043	0.005	0.005 U	0.0015 U	0.005 U	0.0015 U	0.002 U	0.005 U	0.0011 J
Toluene	mg/L	0.72	1.0	0.005 U	0.001 U	0.005 U	0.001 U	0.00051 J	0.005 U	0.001 U

Table 2-3. Results for SVOCs, VOCs, and Pesticides Detected in Groundwater at Load Line 12 (continued)

Station				L12mw-182	L12mw-182	L12mw-182	L12mw-182	L12mw-182	L12mw-183	L12mw-183
Sample Date				10/30/2000	10/29/2004	10/29/2004	04/12/2005	04/12/2005	10/30/2000	11/01/2004
Sample Type				Grab	Field Duplicate	Grab	Grab	Field Duplicate	Grab	Grab
Analyte (mg/L)[a]	Units	PRG	MCL							
Pesticides										
4,4'-DDD	mg/L	0.00028	NA	0.00005 U	0.00011 U	0.00011 U	0.00003 U	0.00003 U	0.00005 U	0.00011 U
4,4'-DDE	mg/L	0.0002	NA	0.00005 U	0.000096 U	0.000096 U	0.00003 U	0.00003 U	0.00005 U	0.000099 U
4,4'-DDT	mg/L	0.0002	NA	0.00005 U	0.00014 U	0.00014 U	0.000062 =	0.000097 =	0.00005 U	0.00015 U
Aldrin	mg/L	0.000004	NA	0.00005 U	0.000096 U	0.000096 U	0.00003 U	0.00003 U	0.00005 U	0.000099 U
Heptachlor	mg/L	0.000015	0.0004	0.00005 U	0.00014 U	0.00014 U	0.00003 U	0.000021 J	0.00005 U	0.00015 U
alpha-Chlordane	mg/L	0.00019	NA	0.00005 U	0.000048 U	0.000048 U	0.00003 U	0.00003 U	0.00005 U	0.00005 U
beta-BHC	mg/L	0.000037	NA	0.00005 U	0.000096 U	0.000096 U	0.00003 U	0.00003 U	0.00005 U	0.000099 U
Semivolatile Organics										
4-Methylphenol	mg/L	0.18	NA	0.01 U	0.0019 U	0.0019 U			0.01 U	0.002 U
Benz(*a*)anthracene	mg/L	0.000092	NA	0.01 U	0.00019 U	0.00019 U	0.0002 U	0.0002 U	0.01 U	0.00014 J
Benzo(a)pyrene	mg/L	0.000009	0.0002	0.01 U	0.00039 U	0.00038 U	0.0002 U	0.0002 U	0.01 U	0.00016 J
Benzo(*b*)fluoranthene	mg/L	0.000092	NA	0.01 U	0.00039 U	0.00038 U	0.0002 U	0.0002 U	0.01 U	0.00041 U
Benzo(*g,h,i*)perylene	mg/L	NA	NA	0.01 U	0.00097 U	0.00095 U	0.0002 U	0.0002 U	0.01 U	0.00034 J
Benzo(*k*)fluoranthene	mg/L	0.00092	NA	0.01 U	0.00039 U	0.00038 U	0.0002 U	0.0002 U	0.01 U	0.00012 J
Benzoic Acid	mg/L	150.0	NA		0.019 U	0.019 U				0.02 U
Bis(2-ethylhexyl)phthalate	mg/L	0.0048	0.006	0.01 U	0.015 U	0.0063 J	0.0016 UJ	0.011 UJ	0.01 U	0.015 U
Chrysene	mg/L	0.0092	NA	0.01 U	0.00049 U	0.00048 U	0.0002 U	0.0002 U	0.01 U	0.00015 J
Dibenz(*a,h*)anthracene	mg/L	0.000009	NA	0.01 U	0.00039 U	0.00038 U	0.0002 U	0.0002 U	0.01 U	0.0005 J
Diethyl phthalate	mg/L	29.0	NA	0.01 U	0.0019 U	0.0019 U	0.00039 J	0.00046 J	0.01 U	0.002 U
Indeno(*1,2,3-cd*)pyrene	mg/L	0.000092	NA	0.01 U	0.00039 U	0.00038 U	0.0002 U	0.0002 U	0.01 U	0.00037 J
Phenanthrene	mg/L	NA	NA	0.01 U	0.00097 U	0.00095 U	0.0002 U	0.0002 U	0.01 U	0.001 U
Phenol	mg/L	11.0	NA	0.01 U	0.011 =	0.0094 =	0.0068 =	0.0052 =	0.01 U	0.0051 U
Pyrene	mg/L	0.18	NA	0.01 U	0.00097 U	0.00095 U	0.0002 U	0.0002 U	0.01 U	0.001 U
Volatile Organics										
2-Butanone	mg/L	7.0	NA	0.01 U	0.01 U	0.01 U	0.00056 J	0.01 U	0.01 U	0.01 U
4-Methyl-2-pentanone	mg/L	2.0	NA	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Acetone	mg/L	5.5	NA	0.01 U	0.01 U	0.01 U	0.0045 J	0.01 U	0.01 UJ	0.01 U
Methylene Chloride	mg/L	0.0043	0.005	0.005 U	0.0015 U	0.0015 U	0.002 U	0.002 U	0.005 U	0.0015 U
Toluene	mg/L	0.72	1.0	0.005 U	0.001 U	0.001 U	0.00027 J	0.00023 J	0.005 U	0.001 U

Table 2-3. Results for SVOCs, VOCs, and Pesticides Detected in Groundwater at Load Line 12 (continued)

Station				L12mw-183	L12mw-184	L12mw-184	L12mw-185	L12mw-185	L12mw-186	L12mw-186
Sample Date				04/12/2005	10/31/2000	10/29/2004	11/07/2000	11/01/2004	11/01/2000	11/01/2004
Sample Type				Grab	Grab	Grab	Grab	Grab	Grab	Grab
Analyte (mg/L)[a]	Units	PRG	MCL							
Pesticides										
4,4'-DDD	mg/L	0.00028	NA	0.00003 U	0.00005 U	0.0001 U	0.00005 U	0.00011 U	0.00005 U	0.00011 U
4,4'-DDE	mg/L	0.0002	NA	0.00003 U	0.00005 U	0.000095 U	0.00005 U	0.0001 U	0.00005 U	0.0001 U
4,4'-DDT	mg/L	0.0002	NA	0.00022 J	0.00005 U	0.00014 U	0.00005 U	0.00015 U	0.00005 U	0.00015 U
Aldrin	mg/L	0.000004	NA	0.00003 U	0.00005 U	0.000095 U	0.00005 U	0.0001 U	0.00005 U	0.0001 U
Heptachlor	mg/L	0.000015	0.0004	0.00003 U	0.00005 U	0.00014 U	0.00005 U	0.00015 U	0.00005 U	0.00015 U
alpha-Chlordane	mg/L	0.00019	NA	0.00003 U	0.00005 U	0.000048 U	0.00005 U	0.000051 U	0.00005 U	0.00005 U
beta-BHC	mg/L	0.000037	NA	0.00003 U	0.00005 U	0.000095 U	0.00005 U	0.0001 U	0.00005 U	0.0001 U
Semivolatile Organics										
4-Methylphenol	mg/L	0.18	NA		0.01 U	0.002 U	0.01 U	0.002 U	0.01 U	0.002 U
Benz(*a*)anthracene	mg/L	0.000092	NA	0.0002 U	0.01 U	0.0002 U	0.01 U	0.0002 U	0.01 U	0.00027 =
Benzo(a)pyrene	mg/L	0.000009	0.0002	0.0002 U	0.01 U	0.00041 U	0.01 U	0.0004 U	0.01 U	0.00029 J
Benzo(*b*)fluoranthene	mg/L	0.000092	NA	0.0002 U	0.01 U	0.00041 U	0.01 U	0.0004 U	0.01 U	0.0002 J
Benzo(*g,h,i*)perylene	mg/L	NA	NA	0.0002 U	0.01 U	0.001 U	0.01 U	0.001 U	0.01 U	0.00081 J
Benzo(*k*)fluoranthene	mg/L	0.00092	NA	0.0002 U	0.01 U	0.00041 U	0.01 U	0.0004 U	0.01 U	0.00024 J
Benzoic Acid	mg/L	150.0	NA			0.02 U		0.02 U		0.02 U
Bis(2-ethylhexyl)phthalate	mg/L	0.0048	0.006	0.0012 UJ	0.01 U	0.005 J	0.01 U	0.015 U	0.01 U	0.015 U
Chrysene	mg/L	0.0092	NA	0.0002 U	0.01 U	0.00051 U	0.01 U	0.0005 U	0.01 U	0.00025 J
Dibenz(*a,h*)anthracene	mg/L	0.000009	NA	0.0002 U	0.01 U	0.00041 U	0.01 U	0.0004 UJ	0.01 U	0.00095 J
Diethyl phthalate	mg/L	29.0	NA	0.001 U	0.01 U	0.002 U	0.01 U	0.002 U	0.01 U	0.002 U
Indeno(*1,2,3-cd*)pyrene	mg/L	0.000092	NA	0.0002 U	0.01 U	0.00041 U	0.01 U	0.0004 U	0.01 U	0.00081 =
Phenanthrene	mg/L	NA	NA	0.0002 U	0.01 U	0.001 U	0.01 U	0.001 U	0.01 U	0.001 U
Phenol	mg/L	11.0	NA	0.001 U	0.01 U	0.0029 J	0.01 U	0.005 U	0.01 U	0.005 U
Pyrene	mg/L	0.18	NA	0.0002 U	0.01 U	0.001 U	0.01 U	0.001 U	0.01 U	0.00013 J
Volatile Organics										
2-Butanone	mg/L	7.0	NA	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
4-Methyl-2-pentanone	mg/L	2.0	NA	0.00035 J	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Acetone	mg/L	5.5	NA	0.01 U	0.015 U	0.01 U	0.0074 U	0.01 U	0.01 U	0.01 U
Methylene Chloride	mg/L	0.0043	0.005	0.002 U	0.005 U	0.0015 U	0.005 U	0.0015 U	0.005 U	0.0015 U
Toluene	mg/L	0.72	1.0	0.00026 J	0.005 U	0.001 U	0.005 U	0.001 U	0.005 U	0.001 U

Table 2-3. Results for SVOCs, VOCs, and Pesticides Detected in Groundwater at Load Line 12 (continued)

Station				L12mw-186	L12mw-187	L12mw-187	L12mw-187	L12mw-188	L12mw-188	L12mw-189
Sample Date				04/13/2005	10/31/2000	10/31/2000	10/29/2004	11/06/2000	10/28/2004	11/01/2000
Sample Type				Grab	Grab	Field Duplicate	Grab	Grab	Grab	Grab
Analyte (mg/L)[a]	Units	PRG	MCL							
Pesticides										
4,4'-DDD	mg/L	0.00028	NA	0.00003 U	0.00005 U	0.00005 U	0.00011 U	0.00005 U	0.00011 U	0.000077 U
4,4'-DDE	mg/L	0.0002	NA	0.00003 U	0.00005 U	0.00005 U	0.0001 U	0.00005 U	0.000098 U	0.00005 U
4,4'-DDT	mg/L	0.0002	NA	0.00003 U	0.00005 U	0.00005 U	0.00015 U	0.00005 U	0.00015 U	0.00005 U
Aldrin	mg/L	0.000004	NA	0.00003 U	0.00005 U	0.00005 U	0.0001 U	0.00005 U	0.000098 U	0.00005 U
Heptachlor	mg/L	0.000015	0.0004	0.00003 U	0.00005 U	0.00005 U	0.00015 U	0.00005 U	0.00015 U	0.00005 U
alpha-Chlordane	mg/L	0.00019	NA	0.00003 U	0.00005 U	0.00005 U	0.00005 U	0.00005 U	0.000049 U	0.00005 U
beta-BHC	mg/L	0.000037	NA	0.00003 U	0.00005 U	0.00005 U	0.0001 U	0.00005 U	0.000098 U	0.00005 U
Semivolatile Organics										
4-Methylphenol	mg/L	0.18	NA		0.01 U	0.01 U	0.002 U	0.01 U	0.002 U	0.01 U
Benz(*a*)anthracene	mg/L	0.000092	NA	0.0002 U	0.01 U	0.01 U	0.0002 U	0.01 U	0.0002 U	0.01 U
Benzo(a)pyrene	mg/L	0.000009	0.0002	0.0002 U	0.01 U	0.01 U	0.00039 U	0.01 U	0.0004 U	0.01 U
Benzo(*b*)fluoranthene	mg/L	0.000092	NA	0.0002 U	0.01 U	0.01 U	0.00039 U	0.01 U	0.0004 U	0.01 U
Benzo(*g,h,i*)perylene	mg/L	NA	NA	0.0002 U	0.01 U	0.01 U	0.00098 U	0.01 U	0.001 U	0.01 U
Benzo(*k*)fluoranthene	mg/L	0.00092	NA	0.0002 U	0.01 U	0.01 U	0.00039 U	0.01 U	0.0004 U	0.01 U
Benzoic Acid	mg/L	150.0	NA				0.02 U		0.02 U	
Bis(2-ethylhexyl)phthalate	mg/L	0.0048	0.006	0.0011 UJ	0.01 U	0.01 U	0.059 =	0.01 U	0.015 U	0.01 U
Chrysene	mg/L	0.0092	NA	0.0002 U	0.01 U	0.01 U	0.00049 U	0.01 U	0.0005 U	0.01 U
Dibenz(*a,h*)anthracene	mg/L	0.000009	NA	0.0002 U	0.01 U	0.01 U	0.00039 U	0.01 U	0.0004 U	0.01 U
Diethyl phthalate	mg/L	29.0	NA	0.001 U	0.01 U	0.01 U	0.002 U	0.01 U	0.002 U	0.01 U
Indeno(*1,2,3-cd*)pyrene	mg/L	0.000092	NA	0.0002 U	0.01 U	0.01 U	0.00039 U	0.01 U	0.0004 U	0.01 U
Phenanthrene	mg/L	NA	NA	0.0002 U	0.01 U	0.01 U	0.00098 U	0.01 U	0.001 U	0.01 U
Phenol	mg/L	11.0	NA	0.001 U	0.01 U	0.01 U	0.0024 J	0.01 U	0.005 U	0.01 U
Pyrene	mg/L	0.18	NA	0.0002 U	0.01 U	0.01 U	0.00098 U	0.01 U	0.001 U	0.01 U
Volatile Organics										
2-Butanone	mg/L	7.0	NA	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
4-Methyl-2-pentanone	mg/L	2.0	NA	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Acetone	mg/L	5.5	NA	0.01 U	0.01 U	0.046 U	0.01 U	0.0063 U	0.01 U	0.01 U
Methylene Chloride	mg/L	0.0043	0.005	0.002 U	0.005 U	0.005 U	0.0015 U	0.005 U	0.0015 U	0.005 U
Toluene	mg/L	0.72	1.0	0.001 U	0.005 U	0.005 U	0.001 U	0.005 U	0.001 U	0.005 U

Table 2-3. Results for SVOCs, VOCs, and Pesticides Detected in Groundwater at Load Line 12 (continued)

Station				L12mw-189	L12mw-242	L12mw-242	L12mw-243	L12mw-244	L12mw-245	L12mw-246
Sample Date				10/28/2004	11/30/2004	11/30/2004	11/29/2004	11/29/2004	11/29/2004	11/29/2004
Sample Type				Grab	Field Duplicate	Grab	Grab	Grab	Grab	Grab
Analyte (mg/L)[a]	Units	PRG	MCL							
Pesticides										
4,4'-DDD	mg/L	0.00028	NA	0.00011 UJ	0.00011 U	0.00011 UJ	0.00011 U	0.00011 U	0.00011 U	0.00011 U
4,4'-DDE	mg/L	0.0002	NA	0.000098 UJ	0.0001 U	0.0001 UJ	0.0001 U	0.0001 U	0.000098 U	0.000099 U
4,4'-DDT	mg/L	0.0002	NA	0.00015 UJ	0.00015 U	0.00015 UJ	0.00015 U	0.00015 U	0.00015 U	0.00015 U
Aldrin	mg/L	0.000004	NA	0.000098 UJ	0.0001 U	0.0001 UJ	0.0001 U	0.0001 U	0.000098 U	0.000099 U
Heptachlor	mg/L	0.000015	0.0004	0.00015 UJ	0.00015 U	0.00015 UJ	0.00015 U	0.00015 U	0.00015 U	0.00015 U
alpha-Chlordane	mg/L	0.00019	NA	0.000049 UJ	0.00005 U	0.00005 UJ	0.000052 U	0.00005 U	0.000049 U	0.00005 U
beta-BHC	mg/L	0.000037	NA	0.000098 UJ	0.0001 U	0.0001 UJ	0.0001 U	0.0001 U	0.000098 U	0.000099 U
Semivolatile Organics										
4-Methylphenol	mg/L	0.18	NA	0.0019 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Benz(*a*)anthracene	mg/L	0.000092	NA	0.00019 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Benzo(a)pyrene	mg/L	0.000009	0.0002	0.00039 U	0.0004 U	0.0004 U	0.0004 U	0.00039 U	0.0004 U	0.00039 U
Benzo(*b*)fluoranthene	mg/L	0.000092	NA	0.00039 U	0.0004 U	0.0004 U	0.0004 U	0.00039 U	0.0004 U	0.00039 U
Benzo(*g,h,i*)perylene	mg/L	NA	NA	0.00097 U	0.001 U	0.001 U	0.00099 U	0.00098 U	0.00099 U	0.00098 U
Benzo(*k*)fluoranthene	mg/L	0.00092	NA	0.00039 U	0.0004 U	0.0004 U	0.0004 U	0.00039 U	0.0004 U	0.00039 U
Benzoic Acid	mg/L	150.0	NA	0.019 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Bis(2-ethylhexyl)phthalate	mg/L	0.0048	0.006	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U
Chrysene	mg/L	0.0092	NA	0.00049 U	0.00051 U	0.00051 U	0.0005 U	0.00049 U	0.0005 U	0.00049 U
Dibenz(*a,h*)anthracene	mg/L	0.000009	NA	0.00039 U	0.0004 U	0.0004 U	0.0004 U	0.00039 U	0.0004 U	0.00039 U
Diethyl phthalate	mg/L	29.0	NA	0.0019 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Indeno(*1,2,3-cd*)pyrene	mg/L	0.000092	NA	0.00039 U	0.0004 U	0.0004 U	0.0004 U	0.00039 U	0.0004 U	0.00039 U
Phenanthrene	mg/L	NA	NA	0.00097 U	0.001 U	0.001 U	0.00099 U	0.00098 U	0.00099 U	0.00098 U
Phenol	mg/L	11.0	NA	0.0049 U	0.0051 U	0.0051 U	0.005 U	0.0049 U	0.005 U	0.0049 U
Pyrene	mg/L	0.18	NA	0.00097 U	0.001 U	0.001 U	0.00099 U	0.00098 U	0.00099 U	0.00098 U
Volatile Organics										
2-Butanone	mg/L	7.0	NA	0.01 U	0.038 =	0.047 =	0.01 U	0.01 U	0.01 U	0.01 U
4-Methyl-2-pentanone	mg/L	2.0	NA	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Acetone	mg/L	5.5	NA	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Methylene Chloride	mg/L	0.0043	0.005	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U
Toluene	mg/L	0.72	1.0	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U

[a]Ravenna facility-wide background for organic compounds is zero.

BHC = Benzene hexachloride.
DDD = Dichlorodiphenyldichloroethane.
DDE = Dichlorodiphenyldichloroethylene.
DDT = Dichlorodiphenyltrichloroethane.
MCL = Ohio maximum contaminant level.
PRG = U. S. Environmental Protection Agency Region 9 Tap Water Preliminary Remediation Goal.

Qualifiers:
"=" = Analyte present and concentration accurate.
J = Estimated value less than reporting limits.
U = Nondetect.

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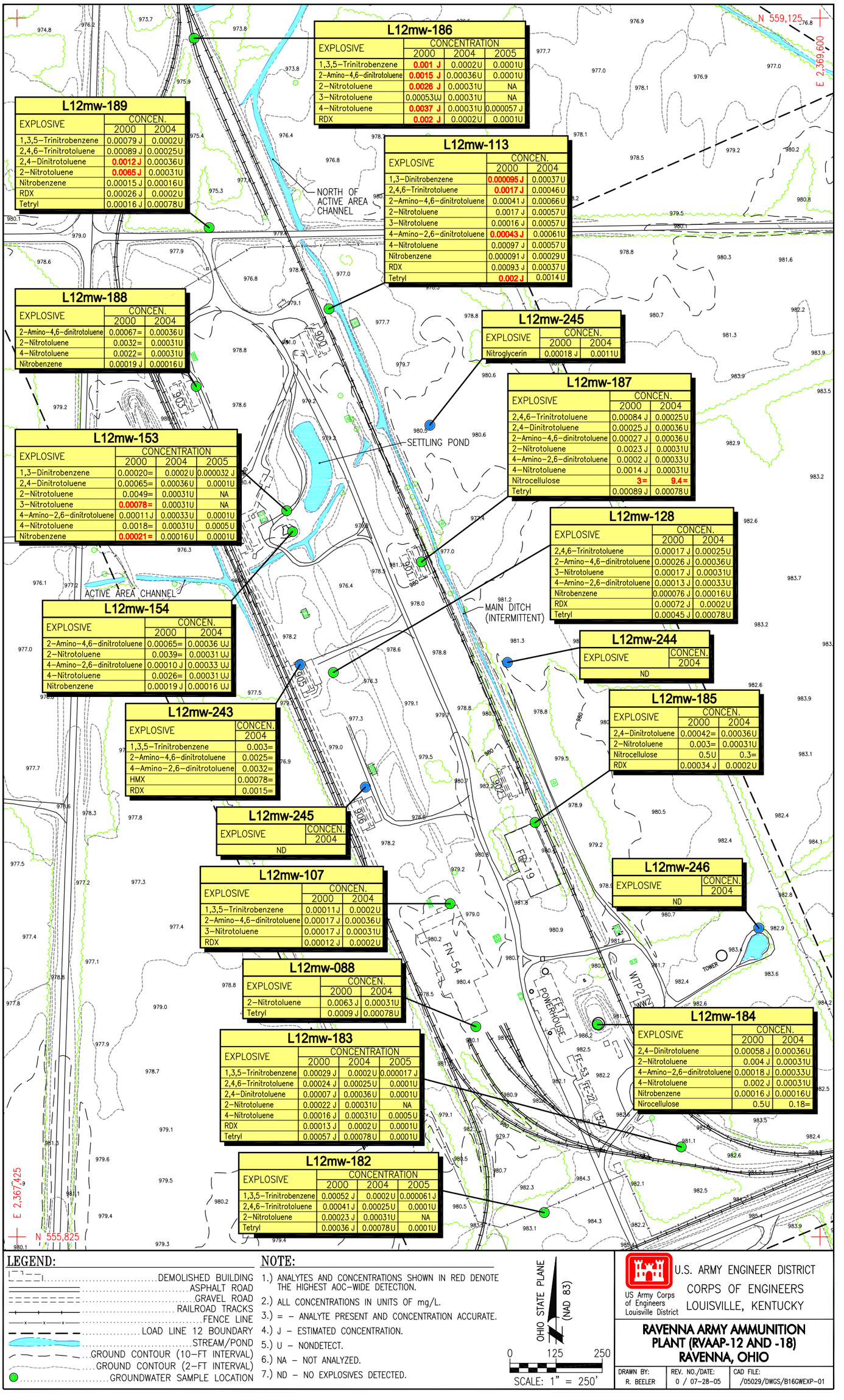

Figure 2-2. Explosives and Propellants Compounds in Groundwater at Load Line 12

The 2004/2005 sampling results and the addition of five new wells did not reveal any notable changes in the overall distribution of explosives. Nitrocellulose was the only constituent that exhibited a notable increase in concentration between sampling events. Nitrocellulose was detected in about 30% of Phase II RI surface soil samples. The wells showing nitrocellulose increases were all located adjacent to former production buildings. In well LL12mw-187 in particular, concentrations increased from 3 to 9.9 mg/L. The increase of nitrocellulose was accompanied by a large corresponding increase of nitrate in this well (713 to 1,200 mg/L). Nitrocellulose was detected for the first time in 2004/2005 sampling events in wells LL12mw-184 and -185, which are also located adjacent to former production or support facilities. Potentiometric data do not support the possibility of southward migration from Ll12mw-187 to LL12mw-184 and -185 in the water table interval. Monitoring wells located at the southern boundary (LL12mw-182 and -183) and northern boundary (LL12mw-186 and -189) of the AOC showed overall decreases of frequency and magnitude of detectable explosives.

2.4.2 Inorganics

All groundwater samples collected during the Phase II RI and 2004/2005 investigations were analyzed for TAL metals (filtered) and nitrate. Additionally, the Phase II RI and the April 2005 facility-wide groundwater monitoring event included cyanide analyses. Facility-wide background criteria for metals were established prior to the Phase II efforts and only detections above background are discussed below. Exceptions to this are aluminum, antimony, beryllium, cadmium, cobalt, copper, lead, mercury, nickel, selenium, silver, thallium, and vanadium, for which background criteria were set to zero and are, therefore, automatically considered SRCs if detected at a frequency greater than 5%.

Twelve inorganics were identified as SRCs in groundwater during the Phase II RI. Two new SRCs (mercury and selenium) were identified from results for the 2004/2005 sampling events. Vanadium was identified as an SRC in the Phase II RI data set due to the fact that its background value is zero; it was eliminated as an SRC as it was not detected in recent samples (see Chapter 3, Table 3-1). Cadmium and thallium were identified as SRCs in the combined data sets; however, it is noted that both metals were detected only once during the Phase II RI and once during the 2004/2005 sampling events in different wells at low concentrations (two detects each in different wells at different times). These disparate results indicate that cadmium and thallium are most likely not site related. Of the metals identified as SRCs, only arsenic and thallium exceeded EPA Region 9 tap water PRGs and MCLs (see Chapter 3, Table 3-3). It is noted that the RVAAP background for arsenic also exceeds the MCL. Manganese exceeded its tap water PRG and its secondary MCL. Table 2-2 provides analytical results for all inorganics identified as SRCs in the combined Phase II RI and 2004/2005 sampling data.

The SRCs most frequently detected include aluminum, arsenic, barium, cobalt, manganese, nickel, and zinc, which were detected in about 50% or more of the total samples. Chromium, copper, lead, and selenium were detected in 16 to 24% of the total samples. Figure 2-3 illustrates the distribution of these 11 most frequently detected inorganic SRCs. Wells LL12mw-185, -187, and -243 exhibited the greatest numbers of metals above background (eight or more in the 2004/2005 data set). These three wells are immediately adjacent to former facility buildings and may indicate very localized contamination related to operating processes. Maximum concentrations of the metals were scattered among multiple wells and no particular clustering of elevated results was noted. With the exception of aluminum and zinc, average and maximum metals concentrations did not exhibit any particular trends between the 2000 and 2004/2005 sampling events. Aluminum concentrations increased in a number of wells, in particular LL12mw-113 (nondetect to 1.4 mg/L); the background concentration for aluminum in filtered unconsolidated zone groundwater samples is zero. Zinc average and maximum concentrations were overall higher in the 2004/2005 samples; however, samples from only well LL12mw-189 exceeded background. Mercury and selenium, two new SRCs identified from 2004/2005 data, were detected exclusively in the existing

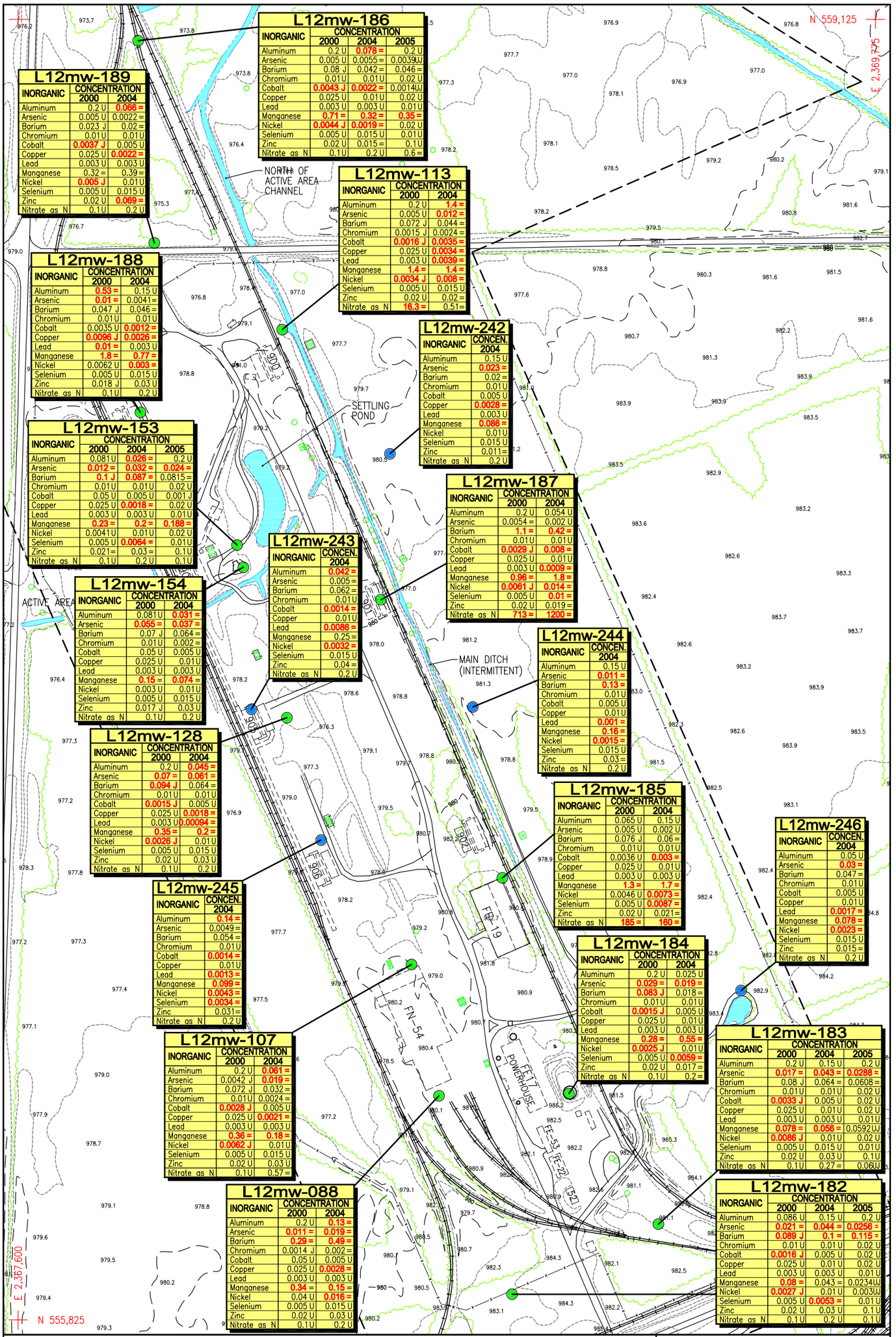

Figure 2-3. Selected Inorganics in Groundwater at Load Line 12

Phase II RI monitoring wells, whereas they were not detected previously. Mercury was detected in only three samples and none of these exceeded tap water PRGs or MCLs. The recent selenium detects, however, were extremely low (less than PRGs and MCLs) and scattered among six different wells.

Nitrate was detected during the Phase II RI in wells LL12mw-113, -185, and -187 at concentrations ranging from 16.3 to 713 mg/L (MCL = 10 mg/L). These wells are adjacent to former ammonium nitrate production Buildings 900, 901, and 902. During the 2004/2005 sampling events, nitrate concentrations in well LL12mw-113 decreased from 16.3 to 0.51 mg/L and concentrations decreased from 185 to 160 mg/L in well LL12mw-185. Nitrate levels increased in well LL12mw-187 from 731 to 1,200 mg/L. Samples from wells LL12mw-107, -183, -184, and -186 did not contain detectable nitrate in 2000; however, 2004/2005 samples contained very low detectable nitrate ranging from 0.2 to 0.27 mg/L. Samples from new monitoring wells installed in 2004 did not contain nitrate. Nitrate is highly mobile in groundwater and its continued localized distribution and limited evidence of migration over a 5-year timeframe suggest that low unconsolidated zone permeabilities and retardation/attenuation have limited migration of contaminants within Load Line 12.

2.4.3 Semivolatile Organic Compounds, Volatile Organic Compounds, and Polychlorinated Biphenyls

Two SVOCs were detected at 2 of 14 monitoring wells during the Phase II RI. Bis(2-ethylhexyl)phthalate was detected at 12 and 6.1 µg/L at wells L12mw-153 and -154, respectively (Table 2-3). This SVOC was detected in three additional samples during the 2004/2005 investigations. Phenanthrene, detected at well L12mw-153 during the Phase II RI was not detected in subsequent samples. Low concentrations of 13 additional SVOCs, primarily polycyclic aromatic hydrocarbons (PAHs), were detected in 1 to 2 samples during the 2004/2005 investigations. Of these SVOCs, benzo(*a*)pyrene and bis(2-ethylhexyl)phthalate exceeded their respective MCLs. The large majority of detected SVOCs were present in November 2004 samples collected from wells LL12mw-183 and -186. These constituents were not detected in previous Phase II RI samples or in facility-wide groundwater samples collected in April 2005.

VOCs were not detected in Phase II RI samples collected in 2000. Five VOCs were detected in one to three samples collected during the later sampling events (Table 2-3). A majority of the detected values were estimated concentrations less than laboratory reporting limits and primarily associated with the April 2005 sampling event wherein they had not been detected in the wells during the previous two events.

Five pesticides (aldrin; 4,4'-DDD; 4,4'-DDE; alpha-chlordane; and beta-BHC) were detected during Phase II RI sampling in 2000. None of these constituents were detected in the 2004/2005 sampling event. Two previously undetected pesticides (4,4'-DDT and heptachlor) were present at low concentrations in two wells during the 2004/2005 sampling events. PCBs were not detected in any of the Load Line 12 groundwater samples collected to date.

2.4.4 Summary

Results of additional groundwater investigations conducted since 2000 do not substantially alter the results of the contaminant nature and extent evaluation presented in the Phase II RI. New wells installed in 2004 did not reveal previously unknown geologic conditions or features that would serve as preferential contaminant migration pathways. Potentiometric data collected in January 2005, including the five new wells, show a generally consistent water table configuration as that observed during previous investigations at the AOC.

With the exception of nitrocellulose, the number and concentrations of explosives and propellants in recent groundwater samples were generally lower than that observed in 2000. Results for inorganic analyses do not show substantial changes in the types and concentrations of metals in groundwater. Nitrate concentrations in one source area well (LL12mw-187) near former Building 901 increased over the intervening time period between investigations. However, nitrate concentrations decreased in most other wells where it was previously detected.

The more recent groundwater results continue to suggest that contaminant mobility is limited within the low permeability silt to silty clays comprising the unconsolidated zone. Wells along the southern boundary of the AOC (LL12mw-182 and -183) continue to show undetectable or extremely low trace levels of the principal contaminants observed within the AOC (e.g., explosives or nitrate), thus indicating that migration off of the AOC to the south has not occurred. Likewise, 2004/2005 monitoring data do not indicate preferential migration of contaminants to the north along the surface drainage route. The 2004/2005 monitoring results have not shown migration to the northwestern and southern AOC boundaries to date, as suggested by conservative numerical modeling predictions.

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3.0 QUALITATIVE RISK CHARACTERIZATION

The purpose of this chapter is to compare 2004/2005 groundwater data to the results of the HHRA presented in the final Phase II RI (USACE 2004a) to qualitatively determine whether potential risks associated with recent groundwater concentrations are greater or less than those presented in the Final RI. Groundwater data evaluated in the HHRA in the final RI were collected in October and November 2000. Additional groundwater data were collected in support of the 14 AOC RI (MKM 2005) in October and November 2004 and the site-wide groundwater investigation (SpecPro) in April 2005.

This evaluation compares COPCs and exposure point concentrations (EPCs) for the groundwater data collected in 2000 to that collected in 2004/2005 to determine if the newer data result in a change to the overall conclusions of the Load Line 12 HHRA with respect to groundwater.

3.1 CONTAMINANTS OF POTENTIAL CONCERN

Twenty groundwater COPCs were identified in the Final RI report for groundwater data collected in 2000. Sixteen groundwater COPCs are identified in groundwater data collected in 2004/2005 (Table 3-1) using the same screening criteria described in the Final RI report with one exception. In the Final RI report, groundwater data were compared against one-tenth of the EPA Region 9 tap water PRGs. Subsequent to completion of the Load Line 12 RI report, the *RVAAP's Facility Wide Human Health Risk Assessor Manual* (FWHHRAM, USACE 2004b) was finalized. Per the FWHHRAM, current groundwater COPCs are identified by comparing detected groundwater concentrations against the EPA Region 9 tap water PRGs. This most recent guidance is used to determine COPCs for the 2004/2005 groundwater data. Looking at Table 3-1, use of the Region 9 tap water PRG rather than 1/10th the Region 9 tap water PRG for noncarcinogens has no impact on the COPC screen because the maximum detected concentrations of all 21 noncarcinogenic chemicals eliminated as COPCs are at least an order of magnitude lower than the Region 9 tap water PRG.

The groundwater COPCs identified in the 2000 and 2004/2005 data are presented in Table 3-2 and summarized below.

- Ten chemicals are COPCs in both the 2000 data and 2004/2005 data: nitrate; arsenic; lead; manganese; 2,4,6-trinitrotoluene; 2-amino-4,6-DNT; 4-amino-2,6-DNT; nitrocellulose; RDX; and bis(2-ethylhexyl)phthalate.

- Eight chemicals were COPCs in the 2000 data but were not detected and, therefore, are not COPCs in the 2004/2005 data: 2,4-DNT; 2-nitrotoluene; 4,4'-DDD; 4,4'-DDE; aldrin; alpha-chlordane; beta-BHC; and phenanthrene. Note that 2-nitrotoluene was analyzed for in samples collected in 2004 but not in samples collected in 2005.

- Two additional chemicals were COPCs in the 2000 data but are not COPCs in the 2004/2005 data: barium and thallium. The change in COPC status for barium is due to the change in screening criteria (i.e., maximum detected concentration of these metals is greater than 1/10 the Region 9 tap water criteria used in 2000 but below the Region 9 tap water criteria currently recommended in the FWHHRAM). Thallium is eliminated from the 2004/2005 COPC list based on a low frequency of detection (1 detect in 23 samples). Barium was not identified as a COC (i.e., it was not a risk driver) in the risk assessment conducted using the 2000 data and the concentration of barium is lower in the 2004/2005 data. Therefore, elimination of barium as a COPC based on the Region 9 tap water PRG does not impact the results of this qualitative risk characterization.

Table 3-1. Summary of Site-Related Chemicals and COPC Screening for Load Line 12 Groundwater Data Collected in 2004 and 2005

Analyte[a]	CAS Number	Units	Results >Detection Limit	Average Result[b]	Minimum Detect	Maximum Detect	95% UCL of Mean	Exposure Concentration	Site Background Criteria[c]	SRC?	Region 9 Tap Water Criteria	COPC?	MCL
Anions													
Nitrate as N	**14797558**	**mg/L**	**7/ 23**	**5.93E+01**	**2.00E-01**	**1.20E+03**	**1.49E+02**	**1.49E+02**	**NA**	**Yes**	**1.00E+00**	**Yes**	**1.00E+01**
Metals													
Aluminum	7429905	mg/L	10/ 23	1.30E-01	2.60E-02	1.40E+00	2.30E-01	2.30E-01	NA	Yes	3.60E+01	No	NA
Arsenic	**7440382**	**mg/L**	**20/ 23**	**1.97E-02**	**2.20E-03**	**6.10E-02**	**2.56E-02**	**2.56E-02**	**1.17E-02**	**Yes**	**4.50E-05**	**Yes**	**1.00E-02**
Barium	7440393	mg/L	23/ 23	9.42E-02	1.80E-02	4.90E-01	1.36E-01	1.36E-01	8.21E-02	Yes	2.60E+00	No	2.00E+00
Cadmium	7440439	mg/L	1/ 23	1.67E-03	3.10E-04	3.10E-04	2.23E-03	3.10E-04	NA	No	1.80E-02	No	5.00E-03
Calcium	7440702	mg/L	23/ 23	1.90E+02	6.80E+01	9.40E+02	2.60E+02	2.60E+02	1.15E+02	No	NA	No	NA
Chromium	7440473	mg/L	4/ 23	5.38E-03	2.00E-03	2.40E-03	6.25E-03	2.40E-03	7.30E-03	No	1.10E-01	No	1.00E-01
Cobalt	7440484	mg/L	7/ 23	3.13E-03	1.20E-03	8.00E-03	4.05E-03	4.05E-03	NA	Yes	7.30E-01	No	NA
Copper	7440508	mg/L	8/ 23	4.98E-03	1.80E-03	3.40E-03	5.93E-03	3.40E-03	NA	Yes	1.50E+00	No	1.30E+00
Iron	7439896	mg/L	19/ 23	1.62E+00	4.20E-02	5.90E+00	5.87E+00	5.87E+00	2.79E-01	No	1.10E+01	No	NA
Lead	**7439921**	**mg/L**	**7/ 23**	**2.45E-03**	**9.00E-04**	**8.60E-03**	**3.16E-03**	**3.16E-03**	**NA**	**Yes**	**NA**	**Yes**	**1.50E-02**
Magnesium	7439954	mg/L	23/ 23	8.51E+01	2.50E+01	2.70E+02	1.11E+02	1.11E+02	4.33E+01	No	NA	No	NA
Manganese	**7439965**	**mg/L**	**21/ 23**	**3.95E-01**	**4.30E-02**	**1.80E+00**	**1.04E+00**	**1.04E+00**	**1.02E+00**	**Yes**	**8.80E-01**	**Yes**	**NA**
Mercury	7439976	mg/L	3/ 23	9.85E-05	6.50E-05	1.90E-04	1.08E-04	1.08E-04	NA	Yes	1.10E-02	No	2.00E-03
Nickel	7440020	mg/L	10/ 23	6.00E-03	1.50E-03	1.60E-02	7.36E-03	7.36E-03	NA	Yes	7.30E-01	No	1.00E-01
Potassium	7440097	mg/L	21/ 23	8.61E+00	2.00E+00	6.00E+01	1.26E+01	1.26E+01	2.89E+00	No	NA	No	NA
Selenium	7782492	mg/L	6/ 23	6.83E-03	3.40E-03	1.00E-02	7.36E-03	7.36E-03	NA	Yes	1.80E-01	No	5.00E-02
Sodium	7440235	mg/L	23/ 23	2.73E+01	1.10E+01	5.40E+01	3.19E+01	3.19E+01	4.57E+01	No	NA	No	NA
Thallium	7440280	mg/L	1/ 23	1.78E-03	2.90E-03	2.90E-03	2.00E-03	2.00E-03	NA	No	2.40E-03	No	2.00E-03
Zinc	7440666	mg/L	11/ 23	2.64E-02	1.10E-02	6.90E-02	3.24E-02	3.24E-02	6.09E-02	Yes	1.10E+01	No	NA
Organics-Explosives													
1,3,5-Trinitrobenzene	99354	mg/L	2/ 23	9.86E-05	1.70E-05	6.10E-05	1.11E-04	6.10E-05	NA	Yes	1.10E+00	No	NA
1,3-Dinitrobenzene	99650	mg/L	1/ 23	9.88E-05	3.20E-05	3.20E-05	1.10E-04	3.20E-05	NA	Yes	3.60E-03	No	NA
2,4,6-Trinitrotoluene	**118967**	**mg/L**	**1/ 23**	**2.47E-04**	**3.00E-03**	**3.00E-03**	**4.62E-04**	**4.62E-04**	**NA**	**Yes**	**2.20E-03**	**Yes**	**NA**
2-Amino-4,6-dinitrotoluene	**35572782**	**mg/L**	**1/ 19**	**3.19E-04**	**2.50E-03**	**2.50E-03**	**5.30E-04**	**5.30E-04**	**NA**	**Yes**	**NA**	**Yes**	**NA**
4-Amino-2,6-dinitrotoluene	**19406510**	**mg/L**	**1/ 19**	**3.40E-04**	**3.20E-03**	**3.20E-03**	**6.16E-04**	**6.16E-04**	**NA**	**Yes**	**NA**	**Yes**	**NA**
4-Nitrotoluene	99990	mg/L	1/ 23	1.76E-04	5.70E-05	5.70E-05	1.93E-04	5.70E-05	NA	Yes	6.60E-04	No	NA
HMX	2691410	mg/L	1/ 23	1.76E-04	7.80E-04	7.80E-04	2.27E-04	2.27E-04	NA	Yes	1.80E+00	No	NA
Nitrocellulose	**9004700**	**mg/L**	**3/ 23**	**6.47E-01**	**1.80E-01**	**9.40E+00**	**1.33E+00**	**1.33E+00**	**NA**	**Yes**	**NA**	**Yes**	**NA**
RDX	**121824**	**mg/L**	**1/ 23**	**1.60E-04**	**1.50E-03**	**1.50E-03**	**2.65E-04**	**2.65E-04**	**NA**	**Yes**	**6.10E-04**	**Yes**	**NA**
Organics-Pesticide/PCB													
4,4'-DDT	**50293**	**mg/L**	**3/ 23**	**7.64E-05**	**5.10E-05**	**2.20E-04**	**8.86E-05**	**8.86E-05**	**NA**	**Yes**	**2.00E-04**	**Yes**	**NA**
Heptachlor	76448	mg/L	1/ 23	7.07E-05	1.70E-04	1.70E-04	8.13E-05	8.13E-05	NA	No	1.50E-05	No	4.00E-04

Table 3-1. Summary of Site-Related Chemicals and COPC Screening for Load Line 12 Groundwater Data Collected in 2004 and 2005 (continued)

Analyte[a]	CAS Number	Units	Results >Detection Limit	Average Result[b]	Minimum Detect	Maximum Detect	95% UCL of Mean	Exposure Concentration	Site Background Criteria[c]	SRC?	Region 9 Tap Water Criteria	COPC?	MCL
Organics-Semivolatile													
4-Methylphenol	106445	mg/L	1/ 19	1.09E-03	2.90E-03	2.90E-03	1.27E-03	1.27E-03	NA	Yes	1.80E-01	No	NA
Benz(*a*)anthracene	**56553**	**mg/L**	**2/ 23**	**1.09E-04**	**1.40E-04**	**2.70E-04**	**1.22E-04**	**1.22E-04**	**NA**	**Yes**	**9.20E-05**	**Yes**	**NA**
Benzo(*a*)pyrene	**50328**	**mg/L**	**2/ 23**	**1.84E-04**	**1.60E-04**	**2.90E-04**	**2.00E-04**	**2.00E-04**	**NA**	**Yes**	**9.20E-06**	**Yes**	**2.00E-04**
Benzo(*b*)fluoranthene	205992	mg/L	1/ 23	1.82E-04	2.00E-04	2.00E-04	1.96E-04	1.96E-04	NA	No	9.20E-05	No	NA
Benzo(*g,h,i*)perylene	**191242**	**mg/L**	**2/ 23**	**4.33E-04**	**3.40E-04**	**8.10E-04**	**4.96E-04**	**4.96E-04**	**NA**	**Yes**	**NA**	**Yes**	**NA**
Benzo(*k*)fluoranthene	207089	mg/L	2/ 23	1.80E-04	1.20E-04	2.40E-04	1.95E-04	1.95E-04	NA	Yes	9.20E-04	No	NA
Benzoic Acid	65850	mg/L	1/ 19	1.02E-02	1.50E-02	1.50E-02	1.07E-02	1.07E-02	NA	Yes	1.50E+02	No	NA
Bis(2-ethylhexyl)phthalate	**117817**	**mg/L**	**3/ 23**	**8.38E-03**	**5.00E-03**	**5.90E-02**	**1.24E-02**	**1.24E-02**	**NA**	**Yes**	**4.80E-03**	**Yes**	**6.00E-03**
Chrysene	218019	mg/L	2/ 23	2.19E-04	1.50E-04	2.50E-04	2.41E-04	2.41E-04	NA	Yes	9.20E-03	No	NA
Dibenz(*a,h*)anthracene	**53703**	**mg/L**	**2/ 23**	**2.27E-04**	**5.00E-04**	**9.50E-04**	**2.90E-04**	**2.90E-04**	**NA**	**Yes**	**9.20E-06**	**Yes**	**NA**
Diethyl phthalate	84662	mg/L	1/ 23	9.04E-04	3.90E-04	3.90E-04	9.77E-04	3.90E-04	NA	No	2.90E+01	No	NA
Indeno(1,2,3-*cd*)pyrene	**193395**	**mg/L**	**2/ 23**	**2.16E-04**	**3.70E-04**	**8.10E-04**	**2.66E-04**	**2.66E-04**	**NA**	**Yes**	**9.20E-05**	**Yes**	**NA**
Phenol	108952	mg/L	5/ 23	3.72E-03	2.40E-03	2.50E-02	5.51E-03	5.51E-03	NA	Yes	1.10E+01	No	NA
Pyrene	129000	mg/L	1/ 23	4.11E-04	1.30E-04	1.30E-04	4.70E-04	1.30E-04	NA	No	1.80E-01	No	NA
Organics-Volatile													
2-Butanone	78933	mg/L	3/ 23	6.78E-03	5.60E-04	4.70E-02	9.94E-03	9.94E-03	NA	Yes	7.00E+00	No	NA
4-Methyl-2-pentanone	108101	mg/L	2/ 23	4.94E-03	3.50E-04	8.30E-03	5.38E-03	5.38E-03	NA	Yes	2.00E+00	No	NA
Acetone	67641	mg/L	2/ 23	7.98E-03	4.50E-03	7.40E-02	1.31E-02	1.31E-02	NA	Yes	5.50E+00	No	NA
Methylene Chloride	75092	mg/L	1/ 23	8.09E-04	1.10E-03	1.10E-03	8.50E-04	8.50E-04	NA	No	4.30E-03	No	5.00E-03
Toluene	108883	mg/L	3/ 23	4.80E-04	2.60E-04	5.10E-04	5.04E-04	5.04E-04	NA	Yes	7.20E-01	No	1.00E+00

[a] Only analytes with detected concentrations are shown in this summary.
[b] In some cases, the average result may exceed the maximum detect because one-half of the laboratory reporting limit was used as a surrogate value in calculation of summary statistics.
[c] Facility-wide background criteria are for unconsolidated/filtered samples.
CAS = Chemical Abstracts Service.
COPC = Chemical of potential concern.
DDT = Dichlorodiphenyltrichloroethane.
HMX = Octachloro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
MCL = Maximum contaminant level from http://www.epa.gov/safewater/mcl.html#mcls.
NA = Not available.
PCB = Polychlorinated biphenyl.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related contaminant.
UCL = Upper confidence limit.
Chemicals in **BOLD** denote maximum detected concentration exceeds the preliminary remediation goal and/or MCL.

Table 3-2. COPCs Identified for Load Line 12 Groundwater Data Collected in 2000 Compared to Data Collected in 2004/2005

		2000 Groundwater Data from Final RI Report (all units mg/L)						2004/2005 Groundwater Data (all units mg/L)						
Analyte[a]	CAS Number	Frequency of Detect	Minimum Detect	Maximum Detect	EPC	1/10th Region 9 Tap Water Criteria	COPC?	Frequency of Detect	Minimum Detect	Maximum Detect	EPC	Region 9 Tap Water Criteria	COPC?	MCL
Anions														
Nitrate as N	**14797558**	**3 / 14**	**1.63E+01**	**7.13E+02**	**1.57E+02**	**1.00E+00**	**Yes**	**7/ 23**	**2.00E-01**	**1.20E+03**	**1.49E+02**	**1.00E+00**	**Yes**	**1.00E+01**
Metals														
Arsenic	**7440382**	**10 / 14**	**4.20E-03**	**7.00E-02**	**5.52E-02**	**4.48E-06**	**Yes**	**20/ 23**	**2.20E-03**	**6.10E-02**	**2.56E-02**	**4.50E-05**	**Yes**	**1.00E-02**
Barium	7440393	14 / 14	2.30E-02	1.10E+00	2.94E-01	2.55E-01	Yes	23/ 23	1.80E-02	4.90E-01	1.36E-01	2.60E+00	No	2.00E+00
Lead	**7439921**	**1 / 14**	**1.00E-02**	**1.00E-02**	**3.18E-03**	**NA**	**Yes**	**7/ 23**	**9.00E-04**	**8.60E-03**	**3.16E-03**	**NA**	**Yes**	**1.50E-02**
Manganese	**7439965**	**14 / 14**	**7.80E-02**	**1.80E+00**	**1.65E+00**	**8.76E-02**	**Yes**	**21/ 23**	**4.30E-02**	**1.80E+00**	**1.04E+00**	**8.80E-01**	**Yes**	**NA**
Thallium	7440280	1 / 14	2.40E-03	2.40E-03	1.38E-03	2.41E-04	Yes	1/ 23	2.90E-03	2.90E-03	2.00E-03	2.40E-03	No	2.00E-03
Organics-Explosives														
2,4,6-Trinitrotoluene	**118967**	**6 / 14**	**1.70E-04**	**1.70E-03**	**5.84E-04**	**2.24E-04**	**Yes**	**1/ 23**	**3.00E-03**	**3.00E-03**	**4.62E-04**	**2.20E-03**	**Yes**	**NA**
2,4-Dinitrotoluene	**121142**	6 / 14	6.90E-05	1.20E-03	4.89E-04	9.89E-06	Yes	0 / 23	--	--	--	--	--	NA
2-Amino-4,6-dinitrotoluene	**35572782**	**7 / 14**	**1.70E-04**	**1.50E-03**	**1.09E-03**	**NA**	**Yes**	**1/ 19**	**2.50E-03**	**2.50E-03**	**5.30E-04**	**NA**	**Yes**	**NA**
2-Nitrotoluene	**88722**	12 / 14	2.20E-04	6.50E-03	3.85E-03	6.08E-03	Yes	0 / 23	--	--	--	--	--	NA
4-Amino-2,6-dinitrotoluene	**19406510**	**6 / 14**	**1.00E-04**	**4.30E-04**	**2.05E-04**	**NA**	**Yes**	**1/ 19**	**3.20E-03**	**3.20E-03**	**6.16E-04**	**NA**	**Yes**	**NA**
Nitrocellulose	**9004700**	**1 / 14**	**3.00E+00**	**3.00E+00**	**7.94E-01**	**NA**	**Yes**	**3/ 23**	**1.80E-01**	**9.40E+00**	**1.33E+00**	**NA**	**Yes**	**NA**
RDX	**121824**	**7 / 14**	**1.20E-04**	**2.00E-03**	**9.70E-04**	**6.11E-05**	**Yes**	**1/ 23**	**1.50E-03**	**1.50E-03**	**2.65E-04**	**6.10E-04**	**Yes**	**NA**
Organics-Pesticide/PCB														
4,4'-DDD	72548	1 / 14	9.90E-05	9.90E-05	4.06E-05	2.80E-05	Yes	0 / 23	--	--	--	--	--	NA
4,4'-DDE	72559	1 / 14	5.60E-05	5.60E-05	3.11E-05	1.98E-05	Yes	0 / 23	--	--	--	--	--	NA
4,4'-DDT	**50293**	0 / 14	--	--	--	--	--	**3/ 23**	**5.10E-05**	**2.20E-04**	**8.86E-05**	**2.00E-04**	**Yes**	**NA**
Aldrin	309002	1 / 14	5.40E-05	5.40E-05	3.07E-05	3.95E-07	Yes	0 / 23	--	--	--	--	--	NA
alpha-Chlordane	5103719	1 / 14	5.00E-05	5.00E-05	3.00E-05	NA	Yes	0 / 23	--	--	--	--	--	2.00E-03[b]
beta-BHC	319857	1 / 14	5.50E-05	5.50E-05	3.09E-05	3.74E-06	Yes	0 / 23	--	--	--	--	--	NA
Organics-Semivolatile														
Benz(*a*)anthracene	**56553**	0 / 14	--	--	--	--	--	**2/ 23**	**1.40E-04**	**2.70E-04**	**1.22E-04**	**9.20E-05**	**Yes**	**NA**
Benzo(*a*)pyrene	**50328**	0 / 14	--	--	--	--	--	**2/ 23**	**1.60E-04**	**2.90E-04**	**2.00E-04**	**9.20E-06**	**Yes**	**2.00E-04**
Benzo(*g,h,i*)perylene	**191242**	0 / 14	--	--	--	--	--	**2/ 23**	**3.40E-04**	**8.10E-04**	**4.96E-04**	**NA**	**Yes**	**NA**
Bis(2-ethylhexyl)phthalate	117817	2/14	6.10E-03	1.20E-02	6.46E-03	4.80E-04	Yes	**3/ 23**	**5.00E-03**	**5.90E-02**	**1.24E-02**	**4.80E-03**	**Yes**	**6.00E-03**
Dibenz(*a,h*)anthracene	**53703**	0 / 14	--	--	--	--	--	**2/ 23**	**5.00E-04**	**9.50E-04**	**2.90E-04**	**9.20E-06**	**Yes**	**NA**
Indeno(1,2,3-*cd*)pyrene	**193395**	0 / 14	--	--	--	--	--	**2/ 23**	**3.70E-04**	**8.10E-04**	**2.66E-04**	**9.20E-05**	**Yes**	**NA**
Phenanthrene	85018	1 / 14	2.80E-03	2.80E-03	2.80E-03	NA	Yes	0 / 23	--	--	--	--	--	NA

[a] Only analytes that are COPCs are shown in this summary.
[b] Value reported is MCL for chlordane.
BHC = Benzene hexachloride.
CAS = Chemical Abstracts Service.
COPC = Chemical of potential concern.
DDD = Dichlorodiphenyldichloroethane.
DDE = Dichlorodiphenyldichloroethylene.
DDT = Dichlorodiphenyltrichloroethane.
EPC = Exposure point concentration = the lesser of the 95% upper confidence limit or maximum detected concentration.
MCL = Maximum contaminant level from http://www.epa.gov/safewater/mcl.html#mcls.
NA = Not available
PCB = Polychlorinated biphenyl.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
RI = Remedial investigation.
Chemicals in **BOLD** denote maximum detected concentration exceeds the preliminary remediation goal and/or MCL.

- Six chemicals were not detected and, therefore, were not identified as COPCs in the 2000 data, but were detected and are identified as COPCs in the 2004/2005 data: 4,4'-DDT; benz(*a*)anthracene; benzo(*a*)pyrene; benzo(*g,h,i*)perylene; dibenz(*a,h*)anthracene; and indeno(1,2,3-*cd*)pyrene.

Note that PRGs and MCLs listed in Table 3-1 are the most recently available values and may differ from the those presented in the Final RI report. A COPC screening using all data from 2000 and 2004/2005 and showing the combined 20 COPCs is provided in Table 3-3.

3.2 QUALITATIVE RISK CHARACTERIZATION

Risk characterization results for the 2004/2005 groundwater data are qualitatively evaluated by comparing the corresponding EPCs to the EPCs from the 2000 data. This comparison is shown in Table 3-4 and summarized below.

The total incremental lifetime cancer risks (ILCRs) estimated for the National Guard Trainee, Resident Farmer Adult, and Resident Farmer Child using the 2000 data are 2.2E-04, 1.0E-03, and 7.0E-04, respectively. Six COCs contribute to this risk with individual ILCRs >1.0E-06 for one or more of these receptors: arsenic; aldrin; bis(2-ethylhexyl)phthalate; 2,4-DNT; 2-nitrotoluene; and RDX.

- The EPC for five of these COCs is lower in the 2004/2005 data than in the 2000 data by a factor of approximately 2.2 to 3.7 (arsenic and RDX), or the chemical is not detected in the 2004/2005 data (aldrin; 2,4-DNT; and 2-nitrotoluene).

- The EPC for one of these COCs [bis(2-ethylhexyl)phthalate] is larger in the 2004/2005 data than in the 2000 data by a factor of approximately 2.

The total HIs estimated for the National Guard Trainee, Resident Farmer Adult, and Resident Farmer Child using the 2000 data are 2.5, 9.6, and 33, respectively. Four COCs contribute to these HIs with individual hazard quotients >1.0 for one or more of these receptors: arsenic, nitrate, manganese, and thallium.

- The EPC for three of these COCs is lower in the 2004/2005 data than in the 2000 data (arsenic, nitrate, and manganese) by a factor of approximately 1.1 to 2.2.

- The EPC for one of these COCs (thallium) is larger in the 2004/2005 data than in the 2000 data by a factor of approximately 1.4.

Six chemicals were not identified as COPCs in the 2000 data but are identified as COPCs in the 2004/2005 data: 4,4'-DDT; benz(*a*)anthracene; benzo(*a*)pyrene; benzo(*g,h,i*)perylene; dibenz(*a,h*)anthracene; and indeno(1,2,3-*cd*)pyrene. Risks from these chemicals are likely to be minimal because

- 4,4'-DDT was detected in only 3 of 23 samples collected in 2004/2005 and the maximum detected concentration of 0.00022 mg/L is only slightly greater than the Region 9 tap water PRG (0.00020 mg/L), while the EPC (0.000089 mg/L) is below the PRG.

Table 3-3. Summary of Site-Related Chemicals and COPC Screening for Load Line 12 Groundwater Data Collected in 2000, 2004, and 2005 combined

Analyte[a]	CAS Number	Units	Results >Detection Limit	Average Result[b]	Minimum Detect	Maximum Detect	95% UCL of Mean	Exposure Concentration	Site Background Criteria[c]	SRC?	Region 9 Tap Water Criteria	COPC?	MCL
Anions													
Nitrate as N	**14797558**	**mg/L**	**10 / 37**	**6.16E+01**	**2.00E-01**	**1.20E+03**	**1.25E+02**	**1.25E+02**	**NA**	**Yes**	**1.00E+00**	**Yes**	**1.00E+01**
Metals													
Aluminum	7429905	mg/L	11 / 37	1.24E-01	2.60E-02	1.40E+00	1.87E-01	1.87E-01	NA	Yes	3.60E+01	No	NA
Arsenic	**7440382**	**mg/L**	**30 / 37**	**1.89E-02**	**2.20E-03**	**7.00E-02**	**3.77E-02**	**3.77E-02**	**1.17E-02**	**Yes**	**4.50E-05**	**Yes**	**1.00E-02**
Barium	7440393	mg/L	37 / 37	1.20E-01	1.80E-02	1.10E+00	1.74E-01	1.74E-01	8.21E-02	Yes	2.60E+00	No	2.00E+00
Cadmium	7440439	mg/L	2 / 37	1.95E-03	3.10E-04	1.40E-03	2.31E-03	1.40E-03	NA	Yes	1.80E-02	No	5.00E-03
Calcium	7440702	mg/L	37 / 37	2.07E+02	6.80E+01	9.40E+02	2.60E+02	2.60E+02	1.15E+02	No	NA	No	NA
Chromium	7440473	mg/L	6 / 37	5.05E-03	1.40E-03	2.40E-03	5.62E-03	2.40E-03	7.30E-03	No	1.10E-01	No	1.00E-01
Cobalt	7440484	mg/L	16 / 37	4.69E-03	1.20E-03	8.00E-03	6.49E-03	6.49E-03	NA	Yes	7.30E-01	No	NA
Copper	7440508	mg/L	9 / 37	7.75E-03	1.80E-03	9.60E-03	8.91E-03	8.91E-03	NA	Yes	1.50E+00	No	1.30E+00
Iron	7439896	mg/L	28 / 37	1.56E+00	4.20E-02	6.90E+00	2.07E+00	2.07E+00	2.79E-01	No	1.10E+01	No	NA
Lead	**7439921**	**mg/L**	**8 / 37**	**2.32E-03**	**9.00E-04**	**1.00E-02**	**2.89E-03**	**2.89E-03**	**NA**	**Yes**	**NA**	**Yes**	**1.50E-02**
Magnesium	7439954	mg/L	37 / 37	8.95E+01	2.50E+01	2.96E+02	1.07E+02	1.07E+02	4.33E+01	No	NA	No	NA
Manganese	**7439965**	**mg/L**	**35 / 37**	**4.71E-01**	**4.30E-02**	**1.80E+00**	**9.04E-01**	**9.04E-01**	**1.02E+00**	**Yes**	**8.80E-01**	**Yes**	**NA**
Mercury	7439976	mg/L	3 / 37	9.91E-05	6.50E-05	1.90E-04	1.05E-04	1.05E-04	NA	Yes	1.10E-02	No	2.00E-03
Nickel	7440020	mg/L	19 / 37	5.63E-03	1.50E-03	1.60E-02	7.07E-03	7.07E-03	NA	Yes	7.30E-01	No	1.00E-01
Potassium	7440097	mg/L	35 / 37	8.15E+00	2.00E+00	6.00E+01	1.01E+01	1.01E+01	2.89E+00	No	NA	No	NA
Selenium	7782492	mg/L	6 / 37	5.19E-03	3.40E-03	1.00E-02	5.87E-03	5.87E-03	NA	Yes	1.80E-01	No	5.00E-02
Sodium	7440235	mg/L	37 / 37	2.77E+01	1.10E+01	5.77E+01	3.15E+01	3.15E+01	4.57E+01	No	NA	No	NA
Thallium	**7440280**	**mg/L**	**2 / 37**	**1.55E-03**	**2.40E-03**	**2.90E-03**	**1.72E-03**	**1.72E-03**	**NA**	**Yes**	**2.40E-03**	**Yes**	**2.00E-03**
Vanadium	7440622	mg/L	1 / 37	1.25E-02	1.30E-03	1.30E-03	1.51E-02	1.30E-03	NA	No	3.60E-02	No	NA
Zinc	7440666	mg/L	14 / 37	2.09E-02	1.10E-02	6.90E-02	2.51E-02	2.51E-02	6.09E-02	Yes	1.10E+01	No	NA
Organics-Explosives													
1,3,5-Trinitrobenzene	99354	mg/L	7 / 37	2.02E-04	1.70E-05	1.00E-03	2.59E-04	2.59E-04	NA	Yes	1.10E+00	No	NA
1,3-Dinitrobenzene	99650	mg/L	2 / 37	9.91E-05	3.20E-05	9.50E-05	1.06E-04	9.50E-05	NA	Yes	3.60E-03	No	NA
2,4,6-Trinitrotoluene	**118967**	**mg/L**	**7 / 37**	**2.90E-04**	**1.70E-04**	**3.00E-03**	**4.43E-04**	**4.43E-04**	**NA**	**Yes**	**2.20E-03**	**Yes**	**NA**
2,4-Dinitrotoluene	**121142**	**mg/L**	**6 / 37**	**2.34E-04**	**6.90E-05**	**1.20E-03**	**2.94E-04**	**2.94E-04**	**NA**	**Yes**	**9.90E-05**	**Yes**	**NA**
2-Amino-4,6-dinitrotoluene	**35572782**	**mg/L**	**8 / 33**	**4.14E-04**	**1.70E-04**	**2.50E-03**	**5.56E-04**	**5.56E-04**	**NA**	**Yes**	**NA**	**Yes**	**NA**
2-Nitrotoluene	**88722**	**mg/L**	**12 / 33**	**1.30E-03**	**2.20E-04**	**6.50E-03**	**1.87E-03**	**1.87E-03**	**NA**	**Yes**	**4.90E-05**	**Yes**	**NA**
3-Nitrotoluene	99081	mg/L	4 / 33	2.08E-04	1.60E-04	7.80E-04	2.44E-04	2.44E-04	NA	Yes	1.20E-01	No	NA
4-Amino-2,6-dinitrotoluene	**19406510**	**mg/L**	**7 / 33**	**2.64E-04**	**1.00E-04**	**3.20E-03**	**4.21E-04**	**4.21E-04**	**NA**	**Yes**	**NA**	**Yes**	**NA**
4-Nitrotoluene	**99990**	**mg/L**	**9 / 37**	**5.44E-04**	**5.70E-05**	**3.70E-03**	**7.78E-04**	**7.78E-04**	**NA**	**Yes**	**6.60E-04**	**Yes**	**NA**
HMX	2691410	mg/L	1 / 37	2.04E-04	7.80E-04	7.80E-04	2.36E-04	2.36E-04	NA	Yes	1.80E+00	No	NA
Nitrobenzene	98953	mg/L	7 / 37	9.84E-05	7.60E-05	2.10E-04	1.09E-04	1.09E-04	NA	Yes	3.40E-03	No	NA
Nitrocellulose	**9004700**	**mg/L**	**4 / 37**	**5.71E-01**	**1.80E-01**	**9.40E+00**	**1.00E+00**	**1.00E+00**	**NA**	**Yes**	**NA**	**Yes**	**NA**
RDX	**121824**	**mg/L**	**8 / 37**	**3.08E-04**	**1.20E-04**	**2.00E-03**	**4.24E-04**	**4.24E-04**	**NA**	**Yes**	**6.10E-04**	**Yes**	**NA**
Tetryl	479458	mg/L	7 / 37	3.99E-04	1.60E-04	2.00E-03	4.94E-04	4.94E-04	NA	Yes	3.60E-01	No	NA
Organics-Pesticide/PCB													
4,4'-DDD	72548	mg/L	1 / 37	4.16E-05	9.90E-05	9.90E-05	4.68E-05	4.68E-05	NA	No	2.80E-04	No	NA
4,4'-DDE	72559	mg/L	1 / 37	3.72E-05	5.60E-05	5.60E-05	4.11E-05	4.11E-05	NA	No	2.00E-04	No	NA
4,4'-DDT	**50293**	**mg/L**	**3 / 37**	**5.70E-05**	**5.10E-05**	**2.20E-04**	**6.72E-05**	**6.72E-05**	**NA**	**Yes**	**2.00E-04**	**Yes**	**NA**

Table 3-3. Summary of Site-Related Chemicals and COPC Screening for Load Line 12 Groundwater Data Collected in 2000, 2004, and 2005 combined (continued)

Analyte[a]	CAS Number	Units	Results >Detection Limit	Average Result[b]	Minimum Detect	Maximum Detect	95% UCL of Mean	Exposure Concentration	Site Background Criteria[c]	SRC?	Region 9 Tap Water Criteria	COPC?	MCL
Aldrin	309002	mg/L	1 / 37	3.72E-05	5.40E-05	5.40E-05	4.11E-05	4.11E-05	NA	No	4.00E-06	No	NA
Heptachlor	76448	mg/L	1 / 37	5.34E-05	1.70E-04	1.70E-04	6.23E-05	6.23E-05	NA	No	1.50E-05	No	4.00E-04
alpha-Chlordane	5103719	mg/L	1 / 37	2.45E-05	5.00E-05	5.00E-05	2.60E-05	2.60E-05	NA	No	1.90E-04	No	NA
beta-BHC	319857	mg/L	1 / 37	3.72E-05	5.50E-05	5.50E-05	4.11E-05	4.11E-05	NA	No	3.70E-05	No	NA
Organics-Semivolatile													
4-Methylphenol	106445	mg/L	1 / 33	2.75E-03	2.90E-03	2.90E-03	3.34E-03	2.90E-03	NA	No	1.80E-01	No	NA
Benz(*a*)anthracene	**56553**	**mg/L**	**2 / 37**	**1.96E-03**	**1.40E-04**	**2.70E-04**	**2.63E-03**	**2.70E-04**	**NA**	**Yes**	**9.20E-05**	**Yes**	**NA**
Benzo(*a*)pyrene	**50328**	**mg/L**	**2 / 37**	**2.01E-03**	**1.60E-04**	**2.90E-04**	**2.66E-03**	**2.90E-04**	**NA**	**Yes**	**9.20E-06**	**Yes**	**2.00E-04**
Benzo(*b*)fluoranthene	205992	mg/L	1 / 37	2.01E-03	2.00E-04	2.00E-04	2.66E-03	2.00E-04	NA	No	9.20E-05	No	NA
Benzo(*g,h,i*)perylene	**191242**	**mg/L**	**2 / 37**	**2.16E-03**	**3.40E-04**	**8.10E-04**	**2.79E-03**	**8.10E-04**	**NA**	**Yes**	**NA**	**Yes**	**NA**
Benzo(*k*)fluoranthene	207089	mg/L	2 / 37	2.00E-03	1.20E-04	2.40E-04	2.66E-03	2.40E-04	NA	Yes	9.20E-04	No	NA
Benzoic Acid	65850	mg/L	1 / 19	1.02E-02	1.50E-02	1.50E-02	1.07E-02	1.07E-02	NA	Yes	1.50E+02	No	NA
Bis(2-ethylhexyl)phthalate	**117817**	**mg/L**	**5 / 37**	**7.32E-03**	**5.00E-03**	**5.90E-02**	**9.83E-03**	**9.83E-03**	**NA**	**Yes**	**4.80E-03**	**Yes**	**6.00E-03**
Chrysene	218019	mg/L	2 / 37	2.03E-03	1.50E-04	2.50E-04	2.68E-03	2.50E-04	NA	Yes	9.20E-03	No	NA
Dibenz(*a,h*)anthracene	**53703**	**mg/L**	**2 / 37**	**2.03E-03**	**5.00E-04**	**9.50E-04**	**2.69E-03**	**9.50E-04**	**NA**	**Yes**	**9.20E-06**	**Yes**	**NA**
Diethyl phthalate	84662	mg/L	1 / 37	2.45E-03	3.90E-04	3.90E-04	3.01E-03	3.90E-04	NA	No	2.90E+01	No	NA
Indeno(1,2,3-*cd*)pyrene	**193395**	**mg/L**	**2 / 37**	**2.03E-03**	**3.70E-04**	**8.10E-04**	**2.68E-03**	**8.10E-04**	**NA**	**Yes**	**9.20E-05**	**Yes**	**NA**
Phenanthrene	85018	mg/L	1 / 37	2.10E-03	2.80E-03	2.80E-03	2.71E-03	2.71E-03	NA	No	NA	No	NA
Phenol	108952	mg/L	5 / 37	4.20E-03	2.40E-03	2.50E-02	5.30E-03	5.30E-03	NA	Yes	1.10E+01	No	NA
Pyrene	129000	mg/L	1 / 37	2.15E-03	1.30E-04	1.30E-04	2.77E-03	1.30E-04	NA	No	1.80E-01	No	NA
Organics-Volatile													
2-Butanone	78933	mg/L	3 / 37	6.10E-03	5.60E-04	4.70E-02	8.04E-03	8.04E-03	NA	Yes	7.00E+00	No	NA
4-Methyl-2-pentanone	108101	mg/L	2 / 37	4.96E-03	3.50E-04	8.30E-03	5.23E-03	5.23E-03	NA	Yes	2.00E+00	No	NA
Acetone	67641	mg/L	2 / 37	6.83E-03	4.50E-03	7.40E-02	9.99E-03	9.99E-03	NA	Yes	5.50E+00	No	NA
Methylene Chloride	75092	mg/L	1 / 37	1.45E-03	1.10E-03	1.10E-03	1.68E-03	1.10E-03	NA	No	4.30E-03	No	5.00E-03
Toluene	108883	mg/L	3 / 37	1.24E-03	2.60E-04	5.10E-04	1.52E-03	5.10E-04	NA	Yes	7.20E-01	No	1.00E+00

[a] Only analytes with detected concentrations are shown in this summary.
[b] In some cases, the average result may exceed the maximum detect because one-half of the laboratory reporting limit was used as a surrogate value in calculation of summary statistics.
[c] Facility-wide background criteria are for unconsolidated/filtered samples.
BHC = Benzene hexachloride.
CAS = Chemical Abstracts Service.
COPC = Chemical of potential concern.
DDD = Dichlorodiphenyldichloroethane.
DDE = Dichlorodiphenyldichloroethylene.
DDT = Dichlorodiphenyltrichloroethane.
HMX = Octachloro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
MCL = Maximum contaminant level from http://www.epa.gov/safewater/mcl.html#mcls.
NA = Not available.
PCB = Polychlorinated biphenyl.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related chemical.
UCL = Upper confidence limit.
Chemicals in **BOLD** denote maximum detected concentration exceeds the preliminary remediation goal and/or MCL.

Table 3-4. COCs Identified for Load Line 12 Groundwater Data Collected in 2000 and 2004/2005

COC	2000 Groundwater Data from Final RI Report				2004/2005 Groundwater Data	2004/2005 EPC Higher/ Lower than 2000 EPC?	2000 EPC 2004/2005 EPC
	EPC (mg/L)	National Guard Trainee	Resident Farmer				
			Adult	Child	EPC (mg/L)		
ILCRs for Carcinogenic COCs							
Metals							
Arsenic	5.52E-02	2.1E-04	9.8E-04	6.8E-04	2.56E-02	Lower	2.2
Organics-Explosives							
2,4-Dinitrotoluene	4.89E-04	8.5E-07	3.9E-06	2.7E-06	--	--	--
2-Nitrotoluene	3.85E-03	2.4E-06	1.1E-05	7.4E-06	--	--	--
RDX	9.70E-04	2.7E-07	1.3E-06	8.8E-07	2.65E-04	Lower	3.7
Organics-Pesticide/PCB							
Aldrin	3.07E-05	4.3E-06	1.3E-05	7.2E-06	--	--	--
Organics-Semivolatile							
Bis(2-ethylhexyl)phthalate	6.46E-03	2.4E-06	6.1E-06	2.9E-06	1.24E-02	Higher	0.5
HIs for Non-carcinogenic COCs							
Anions							
Nitrate as N	1.57E+02	0.71	2.7	9.5	1.49E+02	Lower	1.1
Metals							
Arsenic	5.52E-02	1.3	5.1	18	2.56E-02	Lower	2.2
Manganese	1.65E+00	0.29	1.1	3.6	1.04E+00	Lower	1.6
Thallium	1.38E-03	0.12	0.47	1.7	2.00E-03	Higher	0.7

-- = Not detected in 2004/2005 data.
COC = Contaminant of concern.
EPC = Exposure point concentration.
HI = Hazard index.
ILCR = Incremental lifetime cancer risk.
PCB = Polychlorinated biphenyl.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
RI = Remedial investigation.

- Benz(*a*)anthracene, benzo(*a*)pyrene, benzo(*g,h,i*)perylene, dibenz(*a,h*)anthracene, and indeno(1,2,3-*cd*)pyrene were each detected in 2 of 23 samples. All five of these PAHs were detected ("J" qualified or estimated below the reporting limit) in monitoring wells LL12mw-183 and -186 during the November 2004 sampling event but were non-detect in November 2000 and April 2005.

Ten chemicals formerly identified as COPCs in 2000 were not COPCs in the 2004/2005 data due to the fact that they were either not detected in the recent data or the EPA Region 9 tap water PRGs changed (increased). Six chemicals (4,4'-DDT and five PAHs) were not identified as COPCs in the 2000 data, but were identified as COPCs in the 2004/2005 data. Ten COCs were identified in 2000. Three of these COCs (2,4-DNT; 2-nitrotoluene; and aldrin) were not detected in 2004/2005. The EPCs, and therefore the risks for four of these COCs (arsenic, RDX, nitrate, and manganese), is slightly lower in 2004/2005 than in 2000. The EPCs, and therefore the risks, for two of these COCs [bis(2-ethylhexyl)phthalate and thallium] are slightly higher in 2004/2005 than in 2000. These results indicate

- The total risk associated with concentrations of chemicals measured in groundwater monitoring wells in 2004/2005 is likely to be less than the total risk reported in the final RI, but will still have an ILCR greater than 1.0E-06 and an HI greater than 1.0.

- The explosives (i.e., 2,4-DNT; 2-nitrotoluene; and RDX) identified as COCs from the 2000 data would probably not be COCs for the 2004/2005 data. 2,4-DNT and 2-nitrotoluene were not detected in 2004/2005 and the EPC for RDX is lower in 2004/2005 by a factor of 3.7, which would likely decrease the ILCR for this chemical to below 1.0E-06.

- Metals (i.e., arsenic, nitrate, manganese, and thallium) and bis(2-ethylhexyl)phalate identified as COCs in 2000 data would remain COCs based on the 2004/2005 data.

- 4,4'-DDT identified as a new COPC in the 2004/2005 data would probably not be a COC because its EPC is below the conservative Region 9 tap water PRG.

- The PAHs [benz(*a*)anthracene, benzo(*a*)pyrene, benzo(*g,h,i*)perylene, dibenz(*a,h*)anthracene, and indeno(1,2,3-*cd*)pyrene] identified as new COPCs in the 2004/2005 data may be COCs because the EPCs of some of these PAHs are more than an order of magnitude greater than the conservative Region 9 tap water PRG; however, these PAHs were detected in only two wells in 2004 and were not detected in these or any other wells in 2000 or 2005. These higher molecular weight PAHs are generally not highly mobile in soil. This, combined with the fact that they were detected in 2004 but not 2005, introduces uncertainty in whether they are actually present in groundwater. Given the low frequency of detection and high uncertainty regarding their presence, no groundwater RGOs are recommended for these PAHs.

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4.0 SUMMARY AND CONCLUSIONS

This Phase II RI Supplemental Report updated site geology, hydrogeology, nature and extent of groundwater contamination based on additional investigations conducted in 2004/2005. Newly acquired data were compared to Phase II RI BHHRA results to determine whether any new contaminants COPCs emerged as potential risks to groundwater receptors. The risk evaluation provided a qualitative assessment of the current risks relative to the findings of the Phase II RI.

4.1 SUMMARY OF GROUNDWATER CONTAMINANT NATURE AND EXTENT

Geologic and groundwater chemical data collected in 2004/2005 from AOC monitoring wells indicate the following:

- Potentiometric data from existing and newly installed wells confirmed the presence of a potentiometric low that bisects the southern half of Load Line 12. Geologic data collected during drilling activities did not reveal a notable stratigraphic discontinuity or other feature that would produce the observed potentiometric surface.

- With the exception of nitrocellulose, the number and concentrations of explosives and propellants identified as SRCs in the 2004/2005 data were generally lower than those observed in 2000. Nitrocellulose was detected in two wells where it had not been previously present and increased by a factor of three in one source area (Building 901) well.

- Recent monitoring data did not show substantial changes in the numbers and concentrations of TAL metals identified as SRCs, with the exception of aluminum and zinc, which showed increases of average concentrations. Only one zinc result exceeded background. Filtered samples show that arsenic continued to exceed its primary drinking water MCLs and RVAAP facility-wide background value at several wells, although the background value also exceeds the MCL. Elevated arsenic is indigenous to the glacial soils at RVAAP; maximum soil concentrations at Load Line 12 ranged only from 1.4 to 3.3 times background. Thallium was identified above its MCL in well LL12mw-185 during the Phase II RI, but was not detected during 2004 sampling. Thallium was not previously detected in well LL12mw-113; however, it exceeded its MCL at this well during the 2004 sampling. The low frequency of detection and sporadic occurrence suggest that thallium is likely not site related.

- Nitrate concentrations decreased at several locations showing previously elevated concentrations. However, adjacent to former Building 901, the maximum AOC-wide concentrations increased over the intervening time period between the 2000 and 2004 sampling events. Nitrate continued to be detected only in wells adjacent to primary ammonium nitrate production areas, suggesting that contaminants have not migrated far from source areas or off of the AOC.

- Recent monitoring data continue to show that SVOCs, PCBs/pesticides, and VOCs are minor contaminants in Load Line 12 groundwater.

- Monitoring data from well along the southern boundary of the AOC continue to show that contaminants are not migrating off of the site toward the facility boundary.

4.2 SUMMARY OF THE SUPPLEMENTAL HUMAN HEALTH RISK ASSESSMENT

Ten chemicals formerly identified as COPCs in 2000, were not COPCs in the 2004/2005 data due to the fact that they were either not detected in the recent data (2,4-DNT; 2-nitrotoluene; 4,4'-DDD; 4,4'-DDE; aldrin; alpha-chlordane; beta-BHC; and phenanthrene) or the EPA Region 9 tap water PRGs increased (barium and thallium). Four of these chemicals were identified as COCs in the final RI (thallium; aldrin; 2,4-DNT; and 2-nitrotoluene). Six chemicals (4,4'-DDT and five PAHs) were not identified as COPCs in the 2000 data, but were identified as COPCs in the 2004/2005 data. Risks from these chemicals are likely to be minimal based on low frequency of detection and the fact that 4,4'-DDT only slight exceeded conservative PRG screening values and the PAHs were detected in 2004 but not 2000 or 2005.

Ten COCs were identified in 2000. Three of these COCs (2,4-DNT; 2-nitrotoluene; and aldrin) were not detected in 2004/2005. The EPCs, and therefore the risks, for four of these COCs (arsenic, RDX, nitrate, and manganese) are slightly lower in 2004/2005 than in 2000. The EPCs, and therefore the risks, for two of these COCs [bis(2-ethylhexyl)phthalate and thallium] are slightly higher in 2004/2005 than in 2000.

These results indicate that the total risk associated with concentrations of chemicals measured in groundwater monitoring wells in 2004/2005 is likely to be less than the total risk reported in the final RI, but will still have an ILCR greater than 1.0E-06 and an HI greater than 1.0.

4.3 UPDATED CONCEPTUAL SITE MODEL

The evaluation of additional groundwater results for Load Line 12 does not indicate substantial changes in the overall contaminant profile or extent of migration, as defined in the Phase II RI. Other than nitrate and nitrocellulose in well LL12mw-187, no notable upward trends were observed. The new data did not show any new contaminant source areas or migration pathways and endpoints with respect to the CSM presented in the Phase II RI. The additional investigations achieved most of the identified data needs for groundwater remaining from Phase II RI and it is noted that continued monitoring will occur under the facility-wide groundwater investigation.

Conservative numerical modeling of leaching potential in the Phase II RI suggested that predicted concentrations of some metals and explosives in the vicinities of Buildings 904, 905, FF-19, and the Team Track area could leach to groundwater at concentrations greater than PRGs/MCLs. The CSM suggested that peak concentrations may have already occurred based on Phase II RI results. The 2004/2005 data show that concentrations of explosives in groundwater adjacent to these sources have decreased overall since the Phase II RI. The concentrations of metals over time have not shown notable upward or downward trends. These recent data further suggest that leaching of some constituents has already occurred and that concentrations are declining. Modeling also predicted the possibility of future contaminant transport and discharge to surface water exiting the northern end of the AOC and to the southern AOC boundary, although timeframes were on the order of 100 years or more following release. Recent data do not show evidence of migration to these exit points over the course of the past 5 years.

4.4 RECOMMENDATIONS

Under the current IRP baseline plan, soil and dry sediments at Load Line 12 are being addressed under the scope of a performance-based contract in advance of groundwater and surface water, which are being further investigated under facility-wide initiatives. The Phase II RI recommendation that soil and sediment media within the AOC move forward to the FS phase of the CERCLA process remains valid.

Additional investigation of unconsolidated zone groundwater as part of an AOC-specific RI is not warranted based on data obtained to date. The Phase II RI noted that the lack of bedrock groundwater data may constitute a data gap for future decision planning. RI data obtained to date indicated that migration of groundwater contaminants is limited. The bedrock unit identified at Load Line 12 is competent shale and migration rates through this unit are assumed to be low; therefore, additional investigation of the bedrock shale unit at Load Line 12 does not appear to be warranted at this time. Load Line 12 is included in the ongoing facility-wide groundwater investigation and reporting activities. Required actions involving groundwater and surface water may be addressed in future decisions under those respective facility-wide initiatives.

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