5.2 SWMU 2: GRAVEL PIT (AREA 10)

5.2.1 Site Description and Waste Generation

SWMU 2 occupies approximately 5.8 acres in the southwest portion of the Chemical Munitions Storage Area (SWMU 11) (Figure 5.2-1). The pit, used for munitions burial, occupies an oval shaped area 150 ft long. This area, which is inside the double fence surrounding SWMU 11, is posted with warning signs that read "Buried Bombs - Keep Out," and "Danger-Pit Contaminated with Toxic Chemical Munitions."

The only documentation of the pit contents is an employee disposition referenced in the Installation Assessment (USATHAMA 1979). This disposition (dated 1 April 1959) documents interviews with installation employees that indicate that this covered gravel pit was used for burial of munitions without demilitarization. Munitions buried at the site include M-2 ignition cartridges, squibs, hand grenades, blasting caps, and M-21 incendiary bomb clusters. Other munitions potentially buried in the pit include mustard, smoke pots, TNT blocks, M-71 incendiary bombs, bottled FS smoke, and M-19 incendiary bombs. According to installation personnel, the munitions were covered with 7 ft of soil (NUS 1987). No dates of burial are provided in any of the referenced documentation.

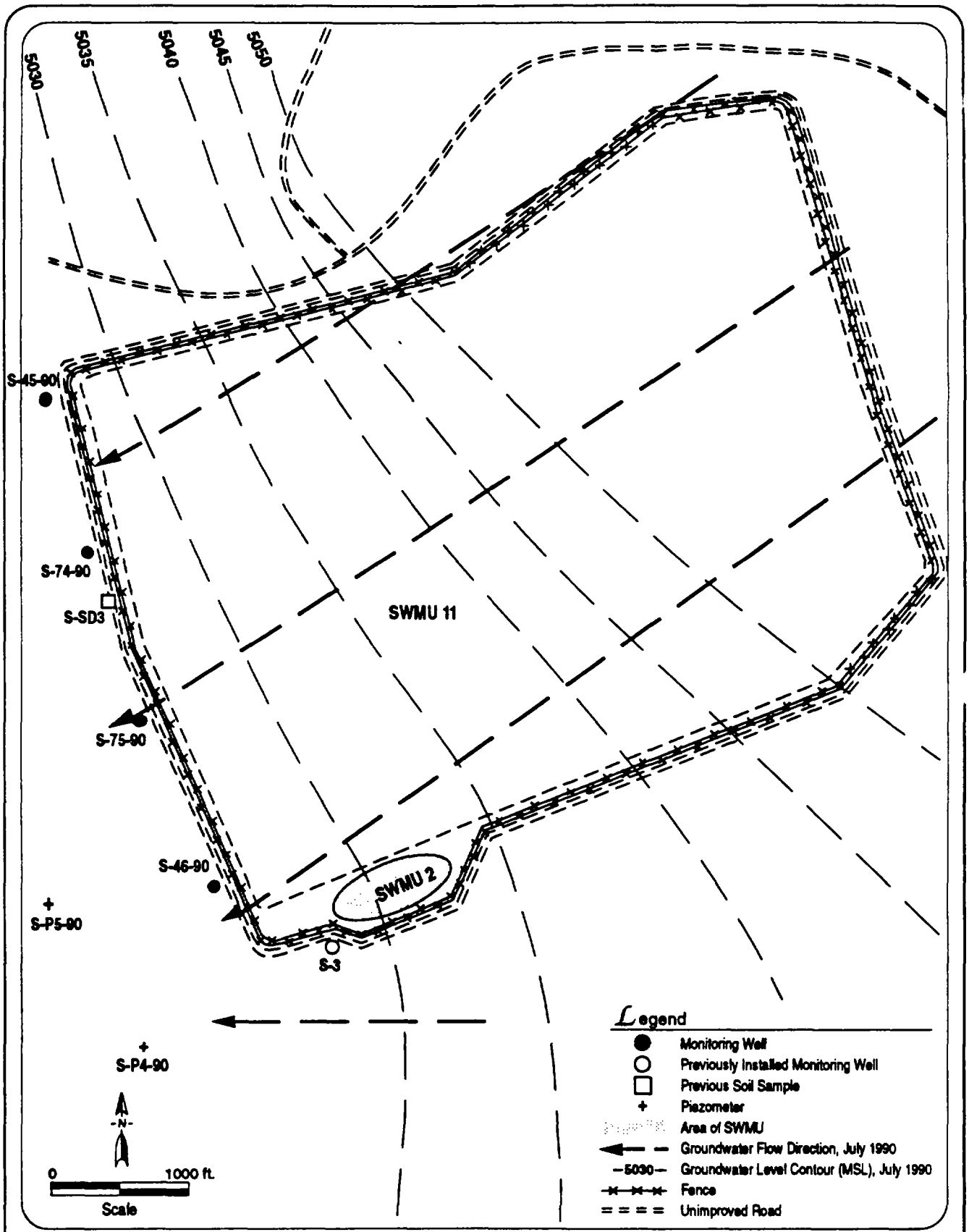
An interpretation of aerial photographs from 1974 and 1981 (EPIC 1982) indicated that this area was a clay pit later used as a dump site. The 1981 aerial photograph showed mounded and stacked material in the western portion of the site.

5.2.2 Site Hydrogeology

SWMU 2 is located on a gentle southwest-sloping topographic surface in the west central part of TEAD-S, and is underlain by Quaternary alluvial deposits. No streams or ditches occur in the area of SWMU 2.

Subsurface lithology details were drawn from the field boring logs (Appendix A) of the two closest monitoring wells (S-3, S-46-90) downgradient of the site, and from sieve analyses of representative samples from these well borings. The near-surface sediment is composed of soft, yellowish-brown, clayey silt (ML). The unsaturated zone consists of interbedded sands and gravels in well S-46-90, west of SWMU 2, and alternating silts and clays in well S-3 to the south. The thickness of the unsaturated zone is approximately 10 to 20 ft. Silts and clays are soft to firm and dark yellowish-brown, with some sand and a trace of gravel (ML, CL). Sands are medium dense, very dark grayish-brown and fine grained, with some silt (SM). Gravels are loose, dark brown, with some medium- to coarse-grained sand (GP).

The saturated zone was sampled and logged from about 15 to 44 ft and is composed of dense, light gray to light yellowish-brown, fine- to medium-grained sand and sandy gravel (SM, SW, GP). The screened interval was 10 ft in well S-46-90 and 20 ft in well S-3. The hydraulic gradient in the area of SWMU 2 is relatively flat, so that groundwater flow directions may be uncertain or changeable. Well S-3, south of SWMU 2, appears to be downgradient from



Source:
EBASCO Field Measurement
Basic Information Maps 1985

Figure 5.2-1
Site Map
SWMU 2 - Gravel Pit (Area 10)

Tooele Army Depot - South Area
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EBASCO

SWMU 2 according to water levels collected during the RFI-Phase I, but well S-46-90 was installed west of the SWMU in case of a more westerly groundwater flow. Groundwater may also flow toward S-3 from areas other than SWMU 2 from the east.

The depth to groundwater in July 1990 was 19 ft in well S-46-90 and 23 ft in well S-3, where elevations are 5,027 and 5,028 ft msl, respectively. Water level measurements from July 1990 confirmed that groundwater flow converges in the vicinity of well S-3 from the northeast, east, and possibly the southeast.

5.2.3 Previous Sampling and RFI-Phase I Sampling Results

Previous investigations of SWMU 2 consisted of groundwater sampling at well S-3 in 1982, 1987, and 1988. Table 5.2-1 summarizes the results of the previous sampling and analyses of groundwater from this well.

During the RFI-Phase I, well S-46-90 was installed, and this well and well S-3 were sampled and analyzed for the full suite of groundwater analytes listed in Table 3.10-3, Section 3.10.10. Additional samples were also collected from these wells in the June 1992 additional sampling program and analyzed for volatile organics, explosives, and the agent breakdown products isopropylmethyl phosphonic acid and fluoroacetic acid. Analytes detected in groundwater samples from these two wells during the RFI-Phase I are presented in Table 5.2-2. The sample from well S-46-90 was analyzed for anions after the sample holding time had expired. Well locations, detected compounds, and their concentrations are presented for previous and RFI-Phase I groundwater investigations of SWMU 2 in Figures 5.2-2 through 5.2-6.

5.2.4 Contamination Assessment

During the RFI-Phase I, volatile organic compounds were detected at low concentrations in samples from monitoring wells S-3 and S-46-90, downgradient of SWMU 2. Organic compounds identified included methylene chloride, chloroform, and 1,1-dichloroethane. No volatile organic compounds were identified during historical investigations. The low concentration detection of methylene chloride at well S-46-90 was most likely caused by laboratory contamination. Methylene chloride was the only volatile organic detected in groundwater samples collected from wells S-3 and S-46-90 during the additional sampling program in June 1992. However, methylene chloride was also detected in the associated method blank for these samples at approximately the same low concentration and, therefore, can be attributed to laboratory contamination (EPA 1990). Alternatively, methylene chloride and chloroform can be released by incomplete combustion (i.e., during a fire or explosion) of HD (Department of Army 1988). Chloroform is also a possible decontamination byproduct of GB stabilizer DIPC, VX, VX stabilizer DIPC, and HD. The detection of 1,1-dichloroethane may be unrelated to the SWMU 2 burial pit since the history of this pit is not known to include any solvent use or disposal.

Semivolatile organic compounds were also detected in the groundwater samples, but may not indicate contaminant releases from the burial pit butylbenzyl phthalate (BBZP) was previously detected in well S-3. Low concentrations of BBZP and other phthalates in environmental

TABLE 5.2-1 **Summary of Previous Analytical Investigations for SWMU 2: Gravel Pit (Area 10)**

GROUNDWATER (µg/l)

Analytical Groups and Analytes Detected	S-3 1982	S-3 1987	S-3 1988
Volatile Organics:			
Unknowns[c]			21
Semivolatile Organics:			
Butylbenzyl phthalate (BBZP)	NA	2.0[a] (3.0)	LT (10)
Agent Breakdown Products:	NA	NA	
Isopropylmethyl phosphonic acid (IMPA)			13,000 (470)
Explosives:			
2,4,6-Trinitrotoluene (246TNT)	LT (1.0)	LT (6.3)	3.3 (0.78)
Metals (total or total/dissolved):			
Antimony (Sb)	NA	LT (7.0)	6.5/LT (3.0)
Arsenic (As)	12 (4.0)	31 (2.5)	21/20 (5.0)
Barium (Ba)	NA	21 (3.4)	NA
Copper (Cu)	LT (6.0)	25 (21)	11/3.3 (1.8)
Cyanides - Total (TCYN)	12 (5.0)	LT (u)	NA
Lead (Pb)	LT (30)	LT (1.5)	2.7/LT (2.50)
Nickel (Ni)	7.0 (4.0)	66 (65)	LT (9.6)
Silver (Ag)	LT (8.0)	0.18 (0.14)	0.70/0.70 (0.19)

a Probably due to laboratory contamination
c The identity or concentrations of these compounds cannot be conclusively determined and reporting limits have not been established
u Detection limit unavailable
NA Not analyzed

GT Greater than
LT Less than
µg/l Microgram per liter

References: 1982 data - Ertec 1982
1987 data - EA Engineering 1988
1988 Data - Weston 1991

TABLE 5.2-1 **Summary of Previous Analytical Investigations for SWMU 2: Gravel Pit (Area 10)**

GROUNDWATER (µg/l)

Analytical Groups and Analytes Detected	S-3 1982	S-3 1987	S-3 1988
Metals (total or total/ dissolved) (continued):			
Sodium (Na)	1,400,000 (1000)	740,000 (450)	2,100,000/3,300,000
Thallium (Tl)	NA	2.7 (1.7)	LT (4.7)
Zinc (Zn)	63 (3.0)	20 (14)	70/19 (17)
Anions:			
Bromide (Br)	NA	2000 (240)	LT (50)
Chloride (Cl)	GT 17,000 (100)	3,200,000 (5000)	3,000,000 (75)
Fluoride (F)	1800 (1000)	1200 (360)	LT (100)
Orthophosphate (PO_4ORT)	NA	70 (57)	NA
Sulfate (SO_4)	GT 19,000 (1000)	900,000 (4700)	840,000 (130000)
Nitrite (NO_2)	LT (900)		
Nitrate (NO_3)	LT (1000)		
Nitrate-nonspecific (NIT)		350 (+24)	LT (5000)
Radionuclides (pCi/l):			
Gross alpha (ALPHAG)	LT (3.0)	LT 47 (u)	LT 67 (v)
Gross beta (BETAG)	9.0±6.0 (6.0)	LT 52 (u)	LT 47 (v)
Uranium - Total	NA	NA	12 (v)
Petroleum Hydrocarbons	NA	NA	560 (200)

NA Not analyzed
GT Greater than
LT Less than

µg/l micrograms per liter
u Detection limit unavailable
v Detection limit for radionuclides varies
( ) Detection limit

References: 1982 data - Ertec, 1982
1987 data - EA Engineering, 1988
1988 data - Weston, 1989

TABLE 5.2-2 **Summary of RFI -Phase I Investigations for SWMU 2: Gravel Pit (Area 10)**

GROUNDWATER (µg/l)

Analytical Groups and Analytes Detected	S-46-90		S-3	
	Phase I	June 1992	Phase I	June 1992
Volatile Organics:				
1,1 - Dichloroethane (11DCLE)	LT 1.1	LT 1.1	1.7	LT 1.1
Chloroform (CHCL3)	LT 0.83	LT 0.83	1.2	LT 0.83
Methylene chloride(CH2CL2)	6.2	7.4*	LT 5.4	7.1*
Unknowns	3.0			
Semivolatile Organics:		NA		NA
Unknowns	25		7.0	
Agent Breakdown Products: None detected				
Explosives: None detected				
Metals:		NA		NA
Arsenic (As)	17		28	
Lead (Pb)	LT 1.3		4.7	
Mercury (Hg)	LT 0.24		0.27	
Sodium (Na)	2,000,000		1,600,000	
Zinc (Zn)	LT 21		40	
Anions:		NA		NA
Bromide (Br)	2200		1100	
Chloride (Cl)	9,500,000		4,200,000	
Radionuclides (pCi/l):		NA		NA
Gross alpha (ALPHAG)	69		71	
Gross beta (BETAG)	LT 0.30		130	
Uranium (U)	7.7		12	

* Detected in associated method blank
NA Not analyzed
LT Less than
pCi/l Picocurie per liter
µg/l Microgram per liter

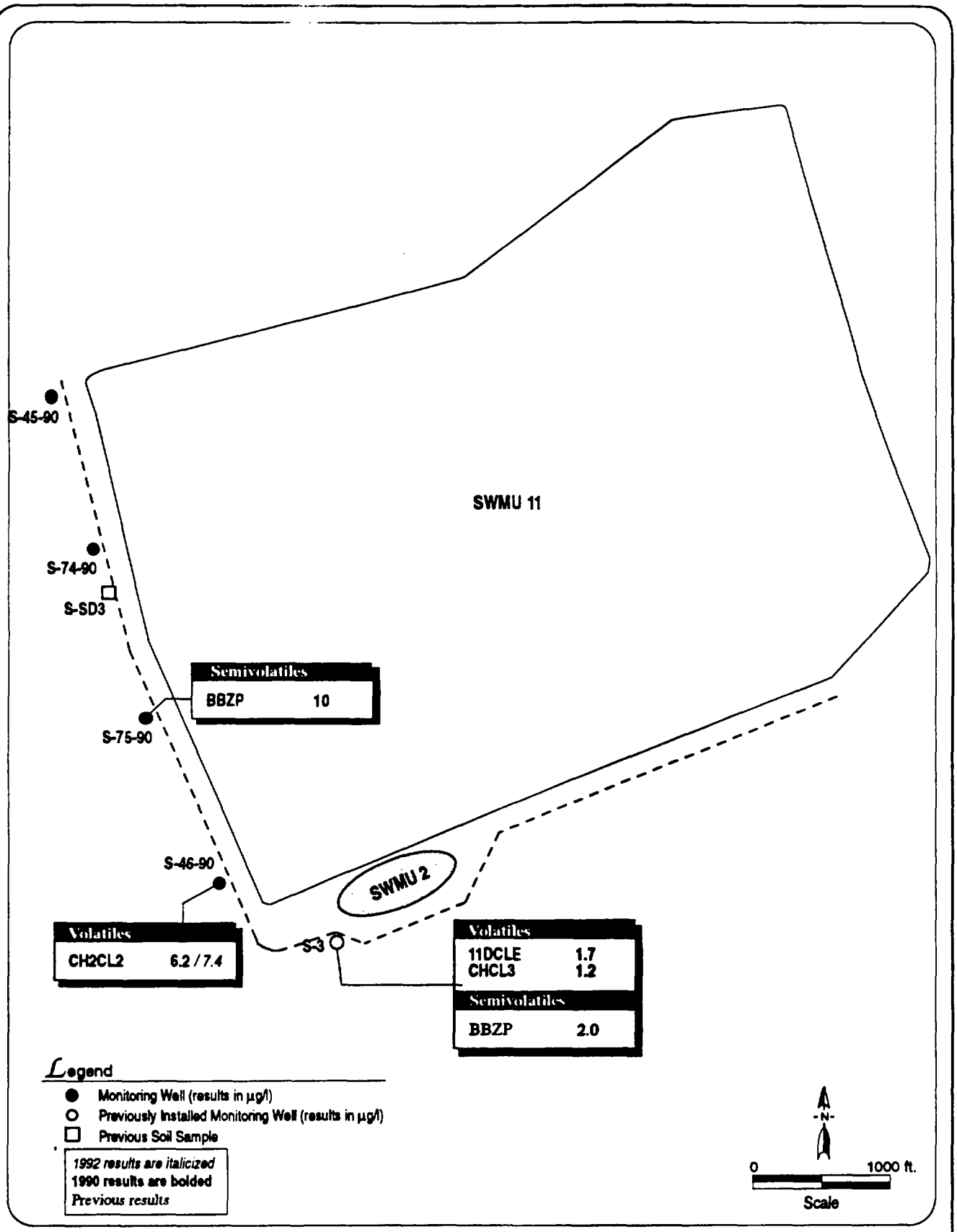

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Figure 5.2-2
SWMU 2 - Gravel Pit (Area 10)
Organics

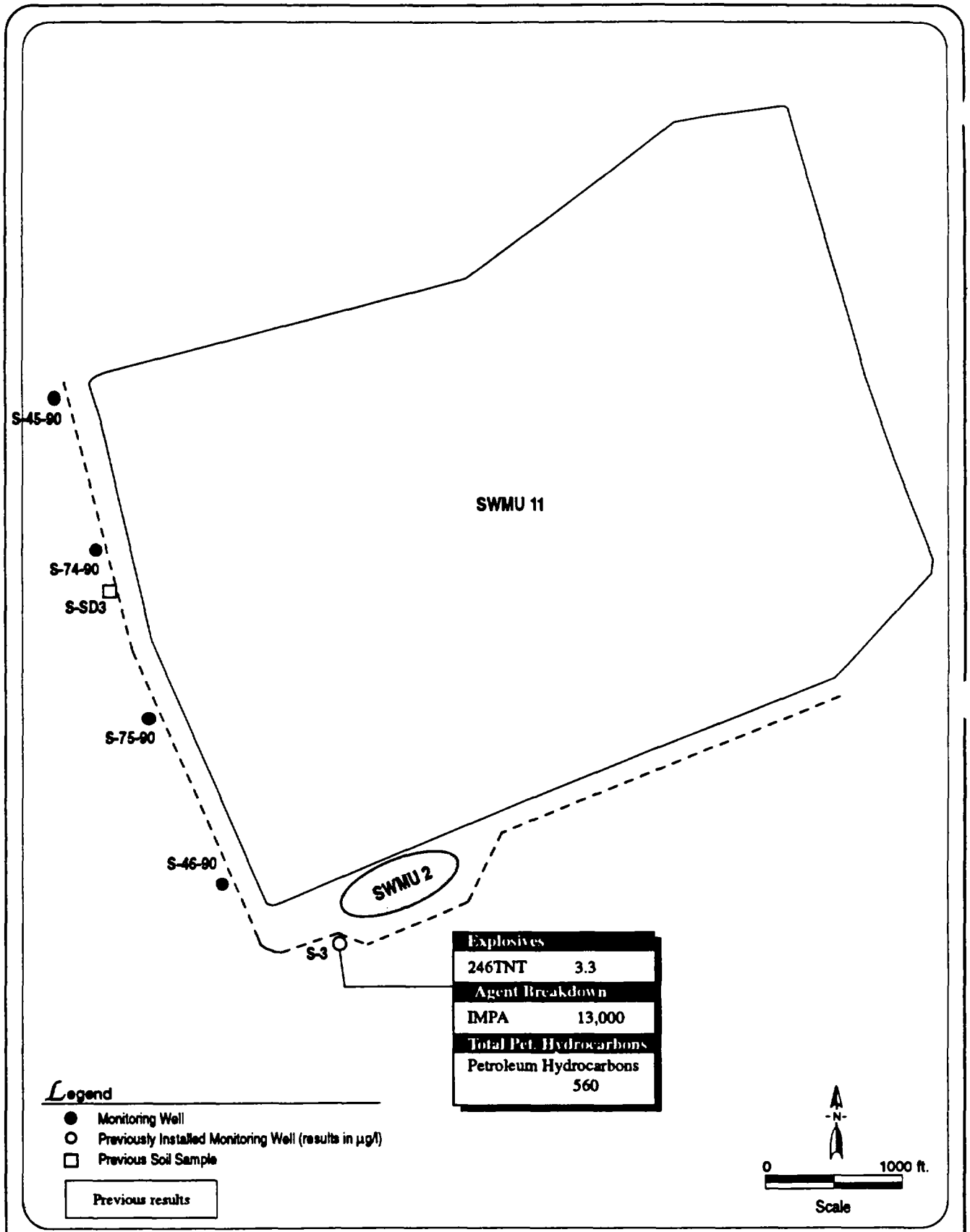

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Figure 5.2-3
SWMU 2 - Gravel Pit (Area 10)
Explosives, Agent Breakdown Products, Total Petroleum Hydrocarbons

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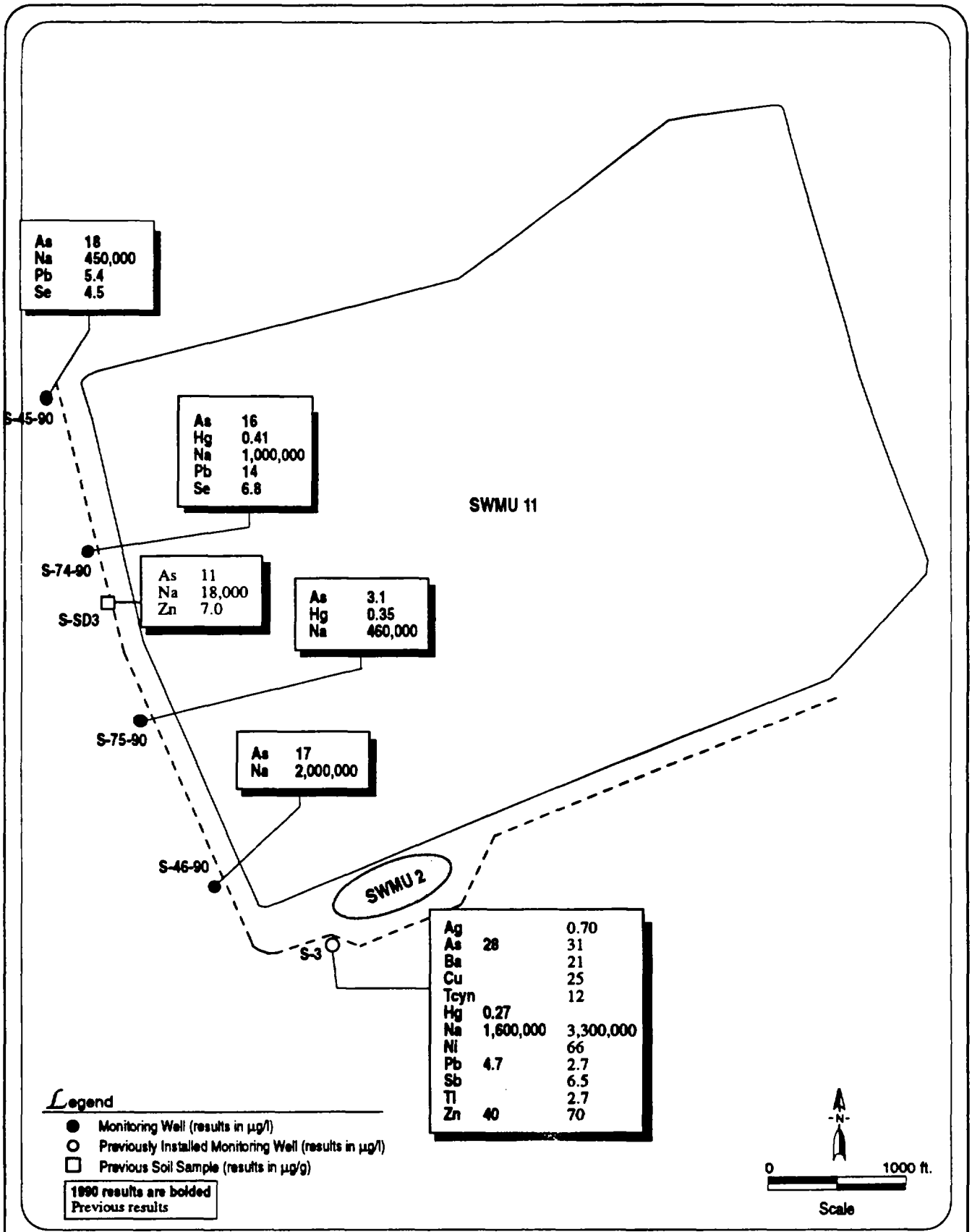

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Figure 5.2-4
SWMU 2 - Gravel Pit (Area 10)
Metals and Cyanide

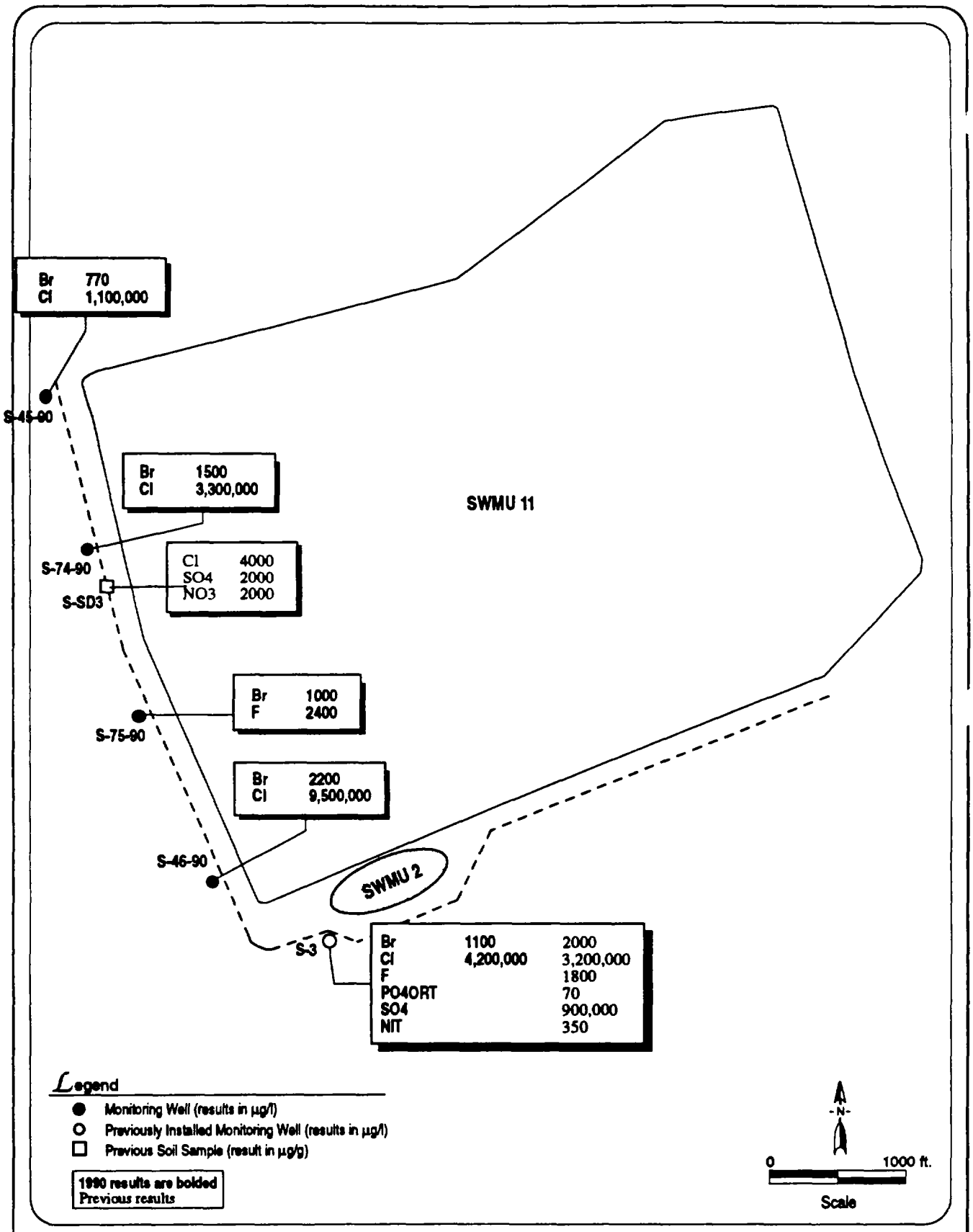

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Figure 5.2-5
SWMU 2 - Gravel Pit (Area 10)
Anions

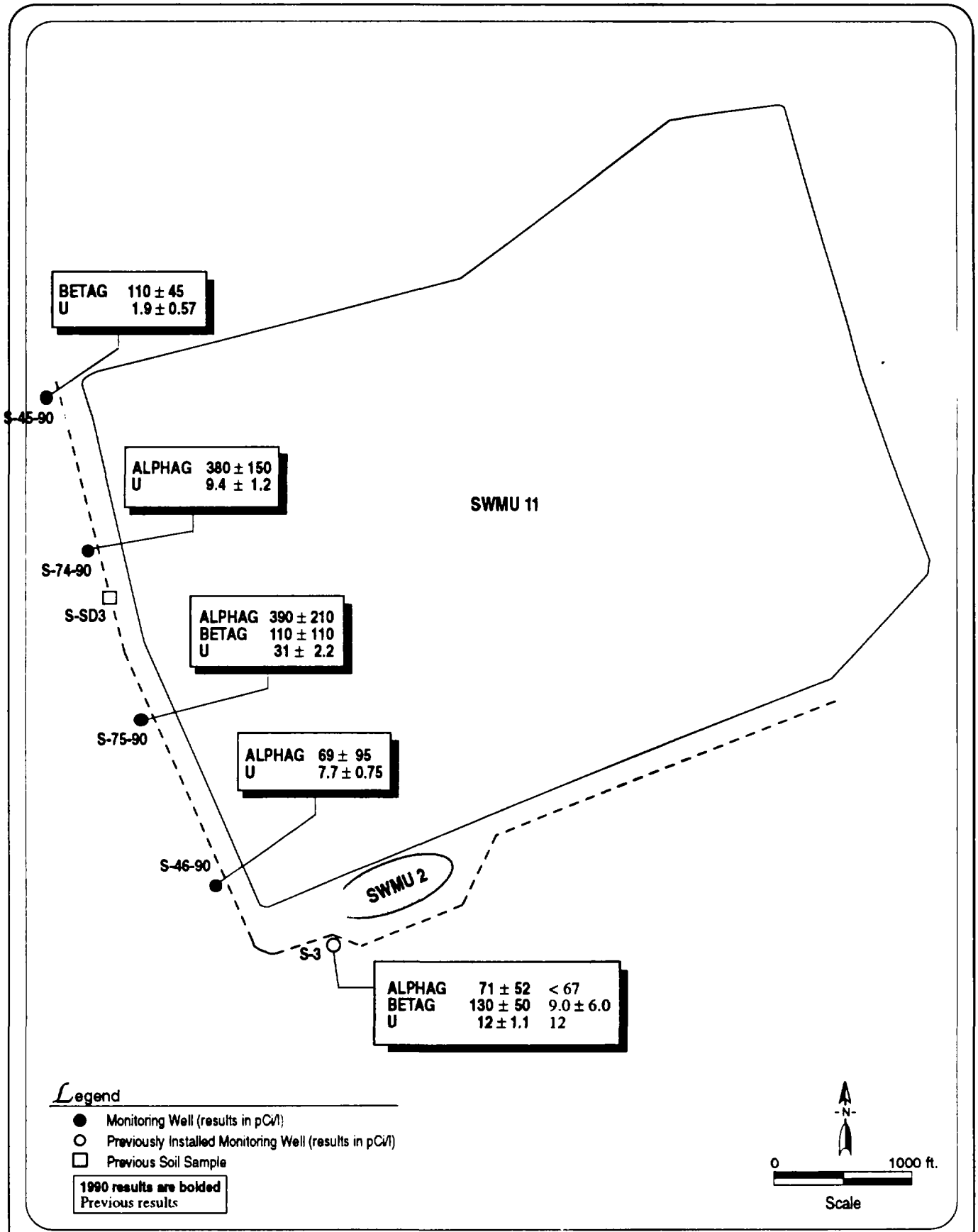

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Figure 5.2-6
SWMU 2 - Gravel Pit (Area 10)
Radionuclides

samples are commonly attributable to sampling and analytical procedures because of their occurrence in PVC, other plastics, and rubber gloves.

Petroleum hydrocarbons, 2,4,6-trinitrotoluene, and isopropylmethyl phosphonic acid (IMPA) were detected during previous investigations at monitoring well S-3. RFI-Phase I analyses for volatile and semivolatile organics, explosives, and agent breakdown products are capable of detecting these compounds but did not indicate their presence. Likewise, these compounds were not detected in samples collected for volatile organics, explosives, and agent breakdown products in June 1992. The occurrence of petroleum hydrocarbons in this groundwater may be explained by the use of fuels for burning wastes prior to the disposal of munitions in this pit. The source of these compounds may also be upgradient to the east of well S-3, perhaps in the area of former storage buildings and railroad tracks. The compound 2,4,6-trinitrotoluene, however, is an explosive that could be related to a release to groundwater from SWMU 2. The previous IMPA detection was qualified as not USATHAMA-certified, and the detection limit of the RFI-Phase I method for IMPA was lower than that of previous investigations. Therefore, the previous detection of IMPA at well S-3 is suspect. Should this detection be confirmed by later sampling, the source of IMPA may be in SWMU 11, where nerve agents are stored, rather than SWMU 2, where no nerve agent disposal is known.

Inorganic groundwater quality data for both SWMU 2 wells were compared to concentrations typical of other wells in water quality zone II. Chloride was the only inorganic detected at an elevated concentration. Since a wide concentration range of inorganic analyte concentrations is typical of zone II groundwater, this elevated chloride concentration is not expected to indicate contamination. Chloride and other anion concentrations may be inaccurately reported since the RFI-Phase I sample was analyzed after the holding time had elapsed.

5.2.5 Recommendations

No soil sampling is recommended at this SWMU because of the presence in the pit of live rounds that should not be disturbed considering their burial with agent and their location inside the Area 10 chemical storage area (SWMU 11) where other agent munitions are stored. Furthermore, the location and contents of the pit are adequately known to satisfy the RFI objectives. A Corrective Measure Study is recommended, but implementation of the study should be delayed until closure of SWMU 11. While this SWMU remains undisturbed, wells S-3 and S-46-90 should be resampled annually to detect any future releases from the buried wastes. As discussed in Section 6.0, the analytical method used for IMPA should be selected to be accurate in saline water.