E.O. Lawrence Berkeley National Laboratory
University of California
Environmental Restoration Program

United States Department of Energy

REQUEST FOR
NO FURTHER INVESTIGATION (NFI) STATUS
FOR
Building 75 Former Hazardous Waste Handling and Storage Facility
Solid Waste Management Unit 3-6

for the

Lawrence Berkeley National Laboratory

ENVIRONMENTAL RESTORATION PROGRAM

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A Joint Effort of
Environment, Health and Safety Division and
Earth Sciences Division
Lawrence Berkeley National Laboratory
University of California
Berkeley, CA 94720

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CONTENTS

LIST OF ABBREVIATIONS

AOC	Area of Concern
bgs	below ground surface
CAL-EPA	California Environmental Protection Agency
CAP	Corrective Action Program
CMS	Corrective Measures Study
COPC	Chemical of Potential Concern
DCE	dichloroethene
DHS	California Department of Health Services
DOE	U.S. Department of Energy
DTSC	Cal-EPA Department of Toxic Substances Control
ERP	Environmental Restoration Program
HWHF	Hazardous Waste Handling Facility
MCL	Maximum Contaminant Level
mg/kg	milligrams per kilogram
msl	mean sea level
µg/L	micrograms per liter (10^{-6} grams per liter)
NFA	No Further Action
NFI	No Further Investigation
PAHs	polynuclear aromatic hydrocarbons
PCB	polychlorinated biphenyl
PCE	tetrachloroethene (perchloroethene)
PRG	Preliminary Remediation Goal
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RWQCB	Regional Water Quality Control Board
SVOCs	Semi-volatile organic compounds
SWMU	Solid Waste Management Unit
TCA	trichloroethane
TCE	trichloroethene
TPH-D	Total Petroleum Hydrocarbons-diesel
TPH-G	Total Petroleum Hydrocarbons-gasoline
TSCA	Toxic Substances Control Act
USEPA	U.S. Environmental Protection Agency
UST	underground storage tank
VOCs	volatile organic compounds

SECTION 1

PURPOSE AND SCOPE

The purpose of this report is to request approval of No Further Investigation (NFI) status for the Building 75 Former Hazardous Waste Handling and Storage Facility (HWHF) under the Resource Conservation and Recovery Act (RCRA) Corrective Action Program (CAP) at Lawrence Berkeley National Laboratory (Berkeley Lab). The California Environmental Protection Agency (CAL-EPA) Department of Toxic Substances Control (DTSC) is the lead regulatory agency for the CAP and has the authority to approve NFI status for this unit. If NFI status is approved, no additional soil sampling would be required; however, the unit will be included in the site-wide risk assessment. In addition, groundwater monitoring would continue at the unit, in accordance with requirements of the Regional Water Quality Control Board (RWQCB).

The former HWHF was identified by the DTSC as Solid Waste Management Unit (SWMU)-27 in their RCRA Facility Assessment (RFA) completed in 1991 (DTSC, 1991) and as SWMU 3-6 by Berkeley Lab in the RFA completed in 1992 (Berkeley Lab, 1992). The location of SWMU 3-6 is shown on Figure 1. Section 2 of this report contains a description of the site. The nature and extent of contamination is discussed in Section 3. The rationale for requesting NFI status is contained in Section 4.

SECTION 2

DESCRIPTION OF UNIT

2.1 SITE DESCRIPTION AND HISTORY

The former HWHF operated at the Building 75 location from about 1962 until 1998 when the new HWHF was opened at Building 85. Hazardous and mixed wastes including polychlorinated biphenyls (PCBs) and waste oils, asbestos, acids, tritium and other radioactive wastes, chlorides, nitrites, organic and inorganic solvents, and other waste generated at Berkeley Lab were stored in containers pending disposal offsite. The description of chemical waste handling activities included in the Berkeley Lab RFA (Berkeley Lab, 1992) was as follows:

> There is a hazardous waste storage area outside of Room 131 that has drums containing waste acids on pallets with secondary containment. There are many lockers around the area used for storing hazardous materials. PCB-containing materials are also stored within a fenced area prior to disposal. The storage unit is a metal shed with a diked area.

Closure activities, which were completed on April 20, 1998, are summarized in the closure report (Berkeley Lab, 1998). Approval of closure certification for the facility was received from DTSC in July 1998 (DTSC, 1998). Soil samples collected within and around the former HWHF during closure investigations indicated that further investigation was required to adequately characterize the magnitude and extent of the contamination. DTSC specified that any additional soil investigations would be implemented as part of the RCRA CAP and not as part of closure activities.

Berkeley Lab initially requested NFI status for SWMU 3-6 in a report that was submitted to the DTSC in January 1999, requesting No Further Action (NFA) or NFI status for two SWMUs and four Areas of Concern (AOCs) (Berkeley Lab, 1999a). In April 1999, DTSC issued a Notice of Deficiency to Berkeley Lab's NFA/NFI request (DTSC, 1999a). On May 28, 1999, Berkeley Lab submitted responses to the comments in DTSC's Notice of Deficiency (Berkeley Lab, 1999b). Berkeley Lab's responses to specific DTSC's comments on SWMU 3-6 are included as Attachment 1 to this report. To address DTSC's concerns about the potential impact of soil contamination on groundwater and the adequacy of Berkeley Lab's assessment of the magnitude and extent of soil contamination, Berkeley Lab submitted workplans for the following activities:

June 1999	The installation of a new groundwater monitoring well downgradient from the area where the highest concentrations of PCBs had been detected in the soil (Berkeley Lab, 1999c).
August 1999	Additional soil sampling to more fully characterize the magnitude and extent of PCB contamination in soil at the former HWHF. (Berkeley Lab, 1999d).

On August 23, 1999, DTSC informed Berkeley Lab that the August 1999 workplan addressed the requirements and concerns of the DTSC with regard to soil contamination (DTSC, 1999b). However, the DTSC requested that the "work plan should also include provisions that will lead to full characterization of any existing ground water contamination…" DTSC's August letter also requested that Berkeley Lab formulate fate and transport theories on PCBs at the site. In response to DTSC's August 23 comments, Berkeley Lab submitted the results of transport and fate modeling of PCBs in soil and potential partitioning of PCBs between soil and groundwater (Berkeley Lab, 1999e). Results of the modeling, included as Attachment 2 to this report, indicated that the PCBs in the soil would not impact groundwater quality. Berkeley Lab also submitted a workplan addendum (Berkeley Lab, 1999f) to DTSC on November 3, 1999, proposing the installation of three additional groundwater monitoring wells at locations where the maximum concentrations of PCBs had been detected in the soil, to verify the modeling results.

Results of site investigations including the work specified in the above referenced workplans are discussed in Section 3 of this report.

2.2 PHYSICAL CHARACTERISTICS OF THE BUILDING 75 HWHF AREA

Figure 2 is a vicinity map of the former Building 75 Former HWHF area, that shows the surface topography and the location of groundwater monitoring wells. The surface in the Building 75 area is primarily covered with buildings and asphalt parking areas. The slopes to the north and west are undeveloped and covered with grass and trees. The grass-covered surface slopes steeply to the southeast toward Building 77.

2.2.1 Geology

Geologic cross sections (A-A', B-B', and C-C') are included on the soil contamination profiles (Figures 10b, 11b, and 12b) discussed in Section 3. The locations of the cross sections are shown on Figure 3. There are two types of artificial fill in the area of Building 75A: a clay and silty clay fill placed for building construction and a gravelly silt and sand backfill for underground utilities. The building construction fill increases in thickness from approximately 2 feet west of Building 75A to 20 feet east of Building 75A (Figure 11b). The backfill for the underground utilities extends to a maximum depth of approximately 12 feet below ground surface (bgs) (Figures 10b, 11b, and 12b). Orinda Formation siltstone and sandstone bedrock underlies the fill. The sandstone and siltstone is generally intensely fractured and friable. It is difficult to correlate the individual lithologic units between monitoring wells, except for between monitoring wells MW75-98-14 and MW75-98-15. The Orinda Formation extends to a depth of at least 200 feet at the site, as indicated in the boring for MW91-4, where the bottom of the Orinda Formation was not encountered.

2.2.2 Hydrogeology

Monitoring wells in the area of the former HWHF are screened in claystone, siltstone, and sandstone of the Orinda Formation. A groundwater elevation map of the former HWHF area based on water levels measured in January 2000 is included as Figure 4. The water table is also shown on the geologic cross sections. Water levels are not included for monitoring wells MW75-99-6 and MW75-99-8, since groundwater elevations/depths in these wells has not reached static levels. Measured depth to groundwater ranged from approximately 12 to 15 feet bgs in January 2000, with the water table within both the fill and the Orinda Formation, depending on the location (thickness of the fill). The minimum depth to groundwater measured in the area of the former HWHF has been approximately 10 feet. The groundwater elevation map (Figure 4) indicates that groundwater flows predominantly toward the south, which is consistent with the regional groundwater elevation map.

Based on results of slug tests conducted in monitoring wells, the Orinda Formation at Berkeley Lab has a hydraulic conductivity of 10^{-7} to 10^{-9}m/s. Results of slug tests conducted in monitoring wells near the former HWHF are listed in the following table:

Results of Slug Tests in Wells Near SWMU 3-6 Screened in the Orinda Formation

Well Number	Hydraulic Conductivity (m/sec)
MW75-98-15	4×10^{-7}
MW75-97-6	1×10^{-7}
MW75-97-7	1.3×10^{-9}
MW75-92-23	5.1×10^{-7}

SECTION 3

NATURE AND EXTENT OF CONTAMINATION

3.1 INTRODUCTION

The data discussed in this section are based on environmental investigations conducted during the RFI and as part of closure activities for the former HWHF. These activities and supporting analytical results were reported to the DTSC in the closure report for the former HWHF (Berkeley Lab, 1998) and in the NFI request report submitted to DTSC in January 1999 (Berkeley Lab, 1999a), for activities completed as of the date of that report. In addition, results have been reported to the regulatory agencies in the quarterly summaries of activities, in the Quarterly Progress Reports, and in various workplans.

Soil at the former HWHF has been sampled for a wide range of analytes, including radionuclides. Radionuclide results were discussed in the closure report (Berkeley Lab, 1998) but are not included in this report. Tritium has been detected in the soil at the former HWHF. The source of the tritium is the adjacent National Tritium Labeling Facility. The United States Environmental Protection Agency (USEPA) is reviewing the tritium data as part of its Superfund re-evaluation of the site and has requested that additional sampling be conducted.

3.2 SOIL SAMPLING

3.2.1 Screening Process for NFA or NFI Status

After sampling has been completed to evaluate whether a release has occurred at a SWMU or AOC and the magnitude and extent of any contamination have been adequately evaluated, Berkeley Lab screens the unit in accordance with the DTSC-approved procedure described in the following paragraphs. The purpose of the screening is to determine whether the unit should be recommended for either NFA or NFI status. No further site characterization is required by DTSC for SWMUs and AOCs approved for either NFA or NFI status. SWMUs and AOCs approved for NFI status will be included in the risk assessment to be conducted as part of the Corrective Measures Studies (CMS) phase of the CAP. SWMUs and AOCs that are approved for NFA status will not be included in the CMS.

The first step in the screening process is to compare the detected concentrations of analytes to Berkeley Lab background levels. The second step is to compare concentrations above background levels to United States Environmental Protection Agency (USEPA) Region IX and Cal-modified Preliminary Remediation Goals (PRGs) (USEPA, 1999) for residential soil.

Background Levels

Soil analytical data are compared to background levels to assess whether contamination is present. For compounds that are not naturally occurring, such as most organic compounds, any detection is assumed to be contamination, unless another source, such as laboratory contamination, can be verified. For naturally occurring analytes such as metals, detected concentrations are compared to statistically derived background levels to identify with a certain degree of confidence which constituents are present at concentrations that might represent contamination. Berkeley Lab has used the 95% upper tolerance limit method (USEPA, 1989) to estimate background concentrations of metals in soil (Berkeley Lab, 1995).

Preliminary Remediation Goals (PRGs)

Concentrations of analytes detected above background levels are then compared to USEPA Region IX PRGs and Cal-Modified PRGs for residential soil (USEPA, 1999). To implement a conservative approach, Berkeley Lab uses PRGs established for residential soils instead of less-stringent PRGs for soil at industrial sites. Where concentrations of contaminants in soil are within Berkeley Lab background levels or below PRGs for residential soil, the SWMU or AOC is recommended for NFA status. Where concentrations of contaminants in soil are above both Berkeley Lab background levels and PRGs for residential soil, the SWMU or AOC is recommended for NFI status.

3.2.2 Soil Sampling and Evaluation of Chemicals of Potential Concern

A map of the Building 75 Former HWHF area showing soils sampling locations is included as Figure 3. The analytes detected in soil samples collected at the Building 75 Former HWHF include PCBs, VOCs, semi-volatile organic compounds (SVOCs), Total Petroleum Hydrocarbons (TPH), Total Oil and Grease, and metals. Soil analytical results are included in Table 1 (PCBs), Table 2 (VOCs, SVOCs, TPH, and cyanide), and Table 3 (metals). The initial list of Chemicals of Potential Concern (COPCs) for SWMU 3-6 consisted of metals, cyanides, fuels, waste oils, and various organic chemicals including volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PAHs), and PCBs (Berkeley Lab, 1999a).

Based on the analytical results of 137 soil samples analyzed for VOCs, 80 for SVOCs, 98 for TPH /Total Oil and Grease, 84 for cyanide, and 120 for metals, the list of COPCs was reduced to PCBs. The rationale for designating PCBs as the only COPC for SWMU 3-6 was provided in Berkeley Lab's August 1999 Workplan for Investigation of Soil Contamination at Building 75 Former HWHF (Berkeley Lab, 1999d), which was approved by DTSC (DTSC, 1999b). The exclusion of contaminants other than PCBs as COPCs was based primarily on the magnitude and distribution of detections and comparison of maximum concentrations detected to PRGs for residential soil.

3.2.3 Chemical of Potential Concern - PCBs

There have been 290 soil samples collected at the former HWHF and analyzed for PCBs (Table 1). Both authoritative (judgement) sampling and probability (grid) sampling were utilized to assess the magnitude and extent of PCB contamination in the soil (Figure 3). Sampling locations during closure activities were selected to characterize the soil in areas where chemicals had been stored or transferred, and there was a potential for release of contaminants to the environment. After the areas of PCB contaminated soil had been identified, a 10-foot grid sampling pattern was established to more fully characterize the contamination. This sampling methodology has resulted in a detailed characterization of the magnitude and extent of PCB contamination in the soil.

The magnitude and extent of PCBs detected in the soil are shown on Figures 5 through 9 for various depth ranges. PCBs were primarily detected west of Building 75A in an area that had been used to store transformers and beneath the southeast corner of Building 75A. The maximum concentration of PCBs detected in soil at SWMU 3-6 has been 48 mg/kg of aroclor-1248 in sample SB75YHW-97-2 collected at a depth of 0.8 feet west of Building 75A. As shown on the figures, the detected concentrations of PCBs generally extend to a maximum depth of approximately 7 feet. PCBs (0.64 mg/kg and 0.067 mg/kg) were only detected in 2 of the 114 samples collected below 7 feet.

Figures 10a, 11a, and 12a are cross sections (A-A', B-B', and C-C') showing sampling locations and the estimated vertical distribution of PCBs in the soil. The estimated vertical extent of soil contamination above 0.2 mg/kg (the PRG for residential soil) and 1 mg/kg (the USEPA's self-implementing cleanup level for soil in high occupancy areas under the Toxic Substances Control Act [TSCA]) are highlighted on the figures. Figures 10b, 11b, and 12b are similar cross sections, with the geology and water table superimposed. The cross sections (Figures 10b, 11b, and 12b) show that the soil contamination is restricted primarily to the fill. The locations of the cross sections are indicated on Figure 3.

3.2.4 Other Analytes Detected in Soil

Figures showing the locations and concentrations of organic analytes (excluding PCBs) detected in soil and metals detected above Berkeley Lab background levels are contained in Appendix A.

<u>Halogenated and Non-Aromatic Hydrocarbons</u>

Trace concentrations (0.42 mg/kg maximum) of acetone, tetrachloroethylene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (DCE), trans-1,2-DCE, 1,1-DCE, 1,1,1-trichloroethane (TCA), and/or methylene chloride were detected in 23 of the 137 soil samples collected at the unit. Detected concentrations ranged from one to four orders of magnitude below the PRGs.

Monoaromatic Hydrocarbons

Trace concentrations (0.14 mg/kg maximum) of chlorobenzene, toluene, ethylbenzene, total xylenes, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and p-isopropyltoluene were detected in the soil at the unit. Chlorobenzene and xylenes were each detected in 2 of 137 samples and the remaining five aromatic hydrocarbons were each detected only once. Detected concentrations ranged from two to five orders of magnitude below the PRGs.

Semi-Volatile Organic Compounds

Benzyl alcohol, di-n-butyl phthalate, butyl benzyl phthalate, bis(2-ethylhexyl)phthalate, and phenanthrene were detected in 14 of 80 soil samples collected at the unit. Detected concentrations ranged from two to five orders of magnitude below the PRGs.

Total Petroleum Hydrocarbons and Total Oil and Grease

Hydrocarbons within the boiling point ranges of crude/waste oil, diesel, kerosene, motor oil, and hydraulic/motor oil were detected at the unit. TPH-crude/waste oil was detected at a maximum concentration of 650 mg/kg. TPH-diesel, -kerosene, -motor oil, and -hydraulic/motor oil and total oil and grease were each detected in only a single sample.

Metals

Barium, chromium, cobalt, copper, lead, nickel, vanadium, and zinc were detected in soil samples at concentrations above Berkeley Lab background levels. Chromium and nickel were also detected at concentrations above their PRGs for residential soil. Detections of naturally-occurring metals at concentrations above a statistically-determined background level are expected. The assessment that the metals detected above the statistically defined site background levels probably represent background levels and not contamination from a release at the site was based on the magnitude and distribution of the detections and probability plots of the data (Berkeley Lab, 1999d).

3.3 GROUNDWATER CONTAMINATION

3.3.1 PCBs

Groundwater samples have been collected from monitoring wells MW75-96-20, MW75-98-14, MW75-98-15, MW75-99-4, MW75-99-6, MW75-99-7, and MW75-99-8 and analyzed for PCBs. MW75-99-6 was installed at the location where the maximum concentration of PCBs has been detected in the soil (Figure 5). MW75-99-7 and MW75-99-8 were installed in the areas where concentrations of PCBs above 1 mg/kg were detected in the soil at the greatest depths (Figures 6 and 7). MW75-98-14, MW75-98-15, and MW75-99-4 were installed downgradient from the areas of soil contamination. The locations of the wells and the extent of contaminated soil with concentrations of PCBs greater than 1 mg/kg are shown on Figure 13. **No PCBs have been detected in the groundwater in this area**. The detection limit reported for the PCB analyses was 0.2 μg/L. Copies of the laboratory reports are included as Attachment 3 to this report.

3.3.2 Other Analytes

The locations of groundwater monitoring wells in the area of SWMU 3-6 are shown on Figure 13. Four of these wells (MW75-98-15, MW75-99-4, MW75-99-6, and MW75-99-8) are located within the former HWHF (SWMU 3-6) boundary.

MW91-4, MW75-96-20, MW75-98-14, and MW75-99-7 are the closest wells to the east of the former HWHF (SWMU 3-6). Benzene has been detected in MW91-4 at concentrations ranging from 3.6 to 98 μg/L. The MCL for benzene is 1.0 μg/L. TPH quantified as crude/waste oil and diesel have also been detected in MW91-4 (maximum 490 μg/L). The source of the benzene and TPH is not known. Aromatic hydrocarbons have not been detected in the other monitoring wells in the area of SWMU 3-6.

Halogenated hydrocarbons have been detected in monitoring wells in the vicinity of SWMU 3-6 at maximum concentrations near the MCLs. The maximum concentrations detected from 1998 to 2000 are shown in the following table. Only TCE was detected at a concentration above the MCL during that period. The source of the contamination is not known. Only trace concentrations (less than the MCL) of chloroform and 1,1-DCE have been detected in wells within the former HWHF boundary. No halogenated hydrocarbons were detected in the most recent groundwater samples (February 2000) from the four wells within the former HWHF boundary.

Maximum Concentrations of Halogenated Hydrocarbons Detected from 1998 to 2000 (μg/L)

Contaminants *MCL*	**TCE** *5*	**cis-1,2-DCE** *6*	**chloroform** *100*	**1,1-DCA** *5*	**1,1-DCE** *6*	**1,1,1-TCA** *200*
Monitoring Wells Within the Former HWHF Boundary						
MW75-98-15	ND	ND	0.78	ND	ND	ND
MW75-99-4	ND	ND	ND	ND	1.2	ND
MW75-99-6	ND	ND	ND	ND	ND	ND
MW75-99-8	ND	ND	ND	ND	ND	ND
Nearest Monitoring Wells East of the Former HWHF						
MW91-4	ND	ND	ND	ND	ND	ND
MW75-96-20	9.3	3.0	1.3	ND	ND	ND
MW75-98-14	5.4	ND	ND	0.76	4.0	1.3
MW75-99-7	ND	4.8	ND	ND	ND	ND

ND = Halogenated hydrocarbons not detected.

Groundwater samples have been collected from monitoring wells MW91-4, MW75-96-20, MW75-98-14, MW75-98-15, MW75-99-4, MW75-99-7 and analyzed for metals. Except for an anomalous concentration of antimony reported in MW91-4 in 1993, all concentrations have been below MCLs. Concentrations of antimony in subsequent samples collected from MW91-4 have been well below the MCL.

Groundwater monitoring and investigations of potential sources of groundwater contamination in the area of Building 75 and Building 75A will continue, as required by the RWQCB.

3.4 POTENTIAL MIGRATION OF CONTAMINANTS TO SURFACE WATER

The storm drain system near SWMU 3-6 discharges to Chicken Creek (Figure 14). This system also carries effluent from the Building 69 and Building 77 areas. Surface water and sediment samples have been collected from Chicken Creek and analyzed for potential contaminants from upgradient sources. Analytical results for organic constituents are included in Table 4a and Table 5a, for surface water and sediment, respectively. Results of metal analyses are included in Table 4b (surface water) and Table 5b (sediment). Surface water samples have been analyzed for VOCs, SVOCs, and metals. No VOCs or SVOCs have been detected. Concentrations of metals detected in surface water samples have been below MCLs. Sediment samples have been analyzed for VOCs, SVOCs, PAHs, PCBs, total petroleum hydrocarbons as diesel (TPH-D) and gasoline (TPH-G), and metals. Results for sampling sediment from Chicken Creek for organic constituents are summarized below. Each analyte detected was only found in a single sample.

Sediment Sampling Results for Organic Constituents from Chicken Creek

Analysis	Concentration of Analyte Detected (mg/kg)	Was the Analyte Detected in Sediment also Detected in Soil Samples at SWMU 3-6
PCBs	PCB 1254 = 0.014	yes
VOCs	p-isopropyltoluene = 0.0058	yes
PAHs	benzo(a)pyrene = 0.075	no
	chrysene = 0.028	no
TPH-D	oil = 63	no
TPH-G	not detected	no

Arochlor 1254 was detected in only 2 of the 290 soil samples collected at SWMU 3-6 and in only 2 of the 47 samples in which PCBs were detected, but was the only arochlor detected in the sediment samples. A trace concentration of p-isopropyltoluene (0.013 mg/kg) was detected in only one of 137 soil samples collected at SWMU 3-6. Neither benzo(a)pyrene nor chrysene were detected in soil samples collected at SWMU 3-6. Lead (58 mg/kg maximum) and zinc (257 mg/kg maximum) were detected in sediment samples at concentrations above Berkeley Lab background levels for soil. Lead (20 mg/kg maximum) and zinc (118 mg/kg maximum) were detected at much lower maximum concentrations in soil samples collected at SWMU 3-6 and were detected slightly above the Berkeley Lab background level in only 2 out of 116 samples. Based on the comparison of type and concentrations of contaminants detected in the sediment to contaminants detected in soil at SWMU 3-6, it is unlikely that SWMU 3-6 is the source of the sediment contamination detected in Chicken Creek.

The concentration of PCBs detected in the sediment is below the USEPA sediment quality criteria (low-effect level =0.023 mg/kg) (USEPA, 1996). There are no sediment quality criteria for p-isopropyltoluene. The potential impact to the environment of contaminants detected in the sediment will be evaluated in the ecological risk assessment.

SECTION 4

RATIONALE FOR NFI RECOMMENDATION

4.1 INTRODUCTION

The Building 75 Former Hazardous Waste Handling and Storage Facility (HWHF) (SWMU 3-6) is recommended for No Further Investigation (NFI) status. The magnitude and extent of soil contamination, the potential impact of soil contamination on the groundwater, and the potential migration of contaminants to surface water have been evaluated. These criteria were discussed in Section 3 of this report and are summarized below as justification for this NFI recommendation. SWMU 3-6 will be included in the site wide risk assessment, as required for units approved for NFI status, since PCBs were detected at concentrations above PRGs for residential soil.

4.2 RESPONSE TO DTSC COMMENTS

In accordance with Berkeley Lab's Response (Berkeley Lab, 199b) to DTSC's April 30, 1999 Notice of Deficiency (DTSC, 1999a), Berkeley Lab submitted a workplan to DTSC for review and approval in August 1999 (Berkeley Lab, 1999d). The workplan specified additional sampling to further characterize the vertical and lateral extent of soil contamination. On August 23, 1999, DTSC informed Berkeley Lab that the August workplan addressed the requirements and concerns of the DTSC with regard to soil contamination (DTSC, 1999b). However, the DTSC requested that

"the work plan should also include provisions that will lead to full characterization of any existing ground water contamination …

1. *Formulate fate and transport theories on PCBs at the site based on the actual conditions identified so far. ie: PCB contamination in specific type of soil units in contact with a fluctuating water table,*

2. *Identify most possible locations of contaminants in groundwater based on the theories formulated,*

3. *Maximize the opportunity of massive coring of the unit to probe the water in the saturated zone directly contiguous to the contaminated soil matrix,*

4. *Indicate how groundwater contamination would be delineated if it was detected in the ground water."*

To address comment #1, Berkeley Lab submitted the results of transport and fate modeling of PCBs in soil and potential partitioning of PCBs between soil and groundwater (Berkeley Lab, 1999e). Results of the modeling, which are included as Attachment 2 to this report, indicated that the PCBs in the soil would not impact groundwater quality.

Berkeley Lab submitted a workplan addendum (Berkeley Lab, 1999f) to DTSC on November 3, 1999 to address DTSC's concern about the full characterization of any existing ground water contamination (comments #2, #3, and #4). The workplan specified the installation of three groundwater monitoring wells, one at the location where the maximum concentration of PCBs had been detected in the soil and two at locations where high concentrations of PCBs were detected at the maximum depths. These were the most likely locations where groundwater might be impacted. All three wells were installed and sampled for PCBs. **No PCBs were detected.**

4.3 RECOMMENDATION FOR NFI STATUS

Based on the analytical results of 137 soil samples analyzed for VOCs, 80 for SVOCs, 98 for TPH/Total Oil and Grease, 84 for cyanide, and 120 for metals, PCBs were the only contaminant retained as a Chemical of Potential Concern (COPC). The rationale for including PCBs as the only COPC was provided in Berkeley Lab's August 1999 workplan (Berkeley Lab, 1999d), which was approved by DTSC (DTSC, 1999b) and summarized in this report.

Soil Contamination

There have been 290 soil samples collected at the former HWHF and analyzed for PCBs. The magnitude and horizontal and vertical extent of PCB contamination in the soil have been evaluated. Both authoritative (judgement) sampling and probability (grid) sampling were utilized to assess the magnitude and extent of PCB contamination in the soil. The sampling was conducted in accordance with work plans that were prepared in consultation with DTSC

(Berkeley Lab, 1997, 1999c, 1999d, and 1999f). The detected concentrations of PCBs at concentrations greater than 1 mg/kg extend to a maximum depth of approximately 7 feet. The soil contamination is restricted primarily to the fill in the area west of Building 75A and near the southeast corner of the building.

Potential Migration of Contaminants to Groundwater

PCB contamination has not been detected in groundwater samples collected from three monitoring wells in the areas where the highest concentrations of PCBs were detected in the soil or in three monitoring wells located downgradient from the area of soil contamination. Results of modeling have indicated that the PCBs in the soil should not impact groundwater quality.

Potential Migration of Contaminants to Surface Water

The storm drain system near SWMU 3-6 discharges to Chicken Creek. Surface water and sediment samples have been collected from Chicken Creek and analyzed for potential contaminants from upgradient sources. No chemical contaminants were detected in the surface water samples. The source of the very low concentrations of contaminants detected in sediment samples is unknown. Based on comparison of contaminants detected in the sediment to contaminants detected in soil at SWMU 3-6, it is unlikely that SWMU 3-6 is the source. The potential impact to the environment from contaminants detected in the sediment will be evaluated in the ecological risk assessment.

SECTION 5

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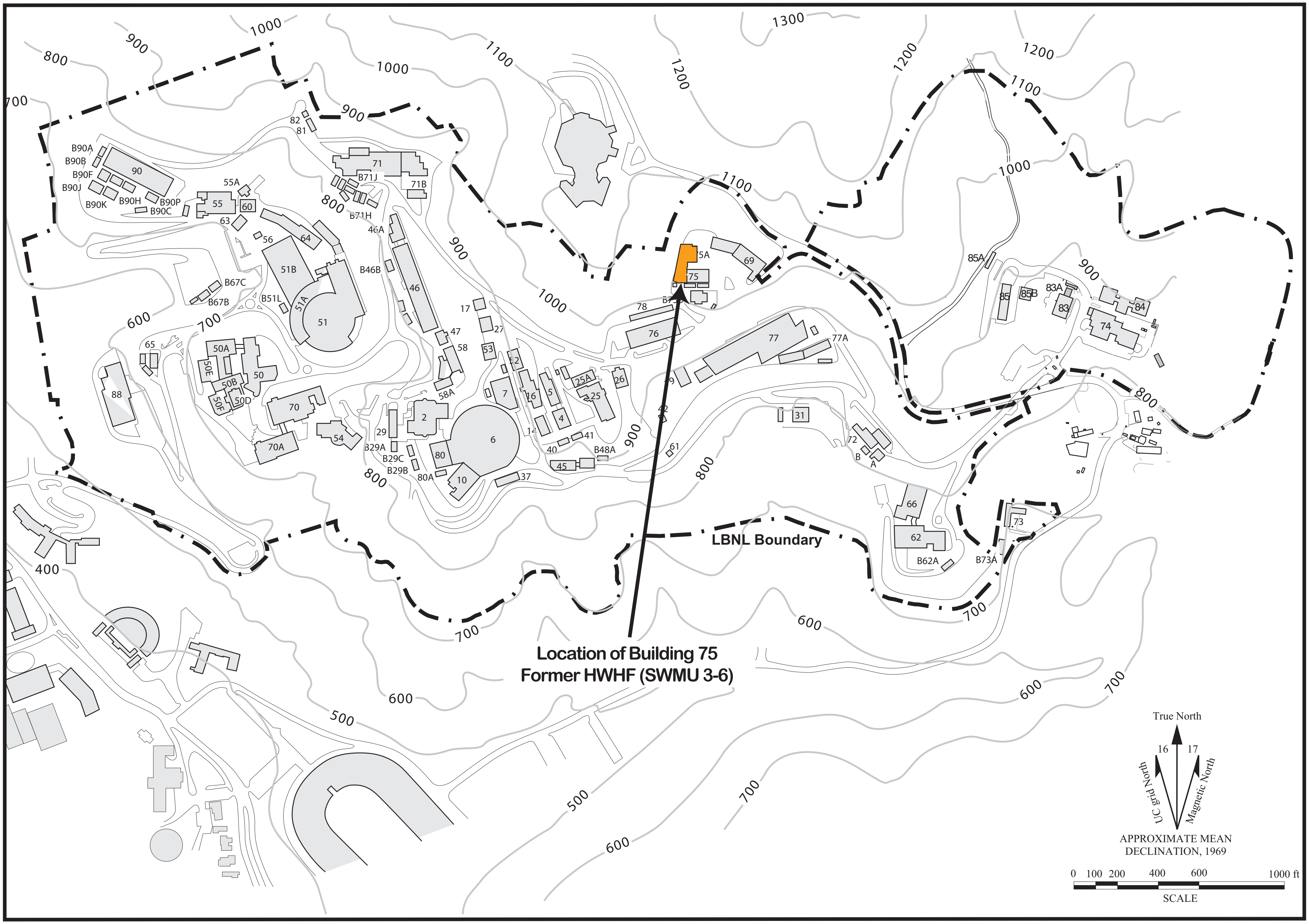

1-LocMap.ai
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Figure 1. Location of Former Building 75 Former Hazardous Waste Handling and Storage Facility (HWHF) (SWMU 3-6), Lawrence Berkeley National Laboratory (LBNL).

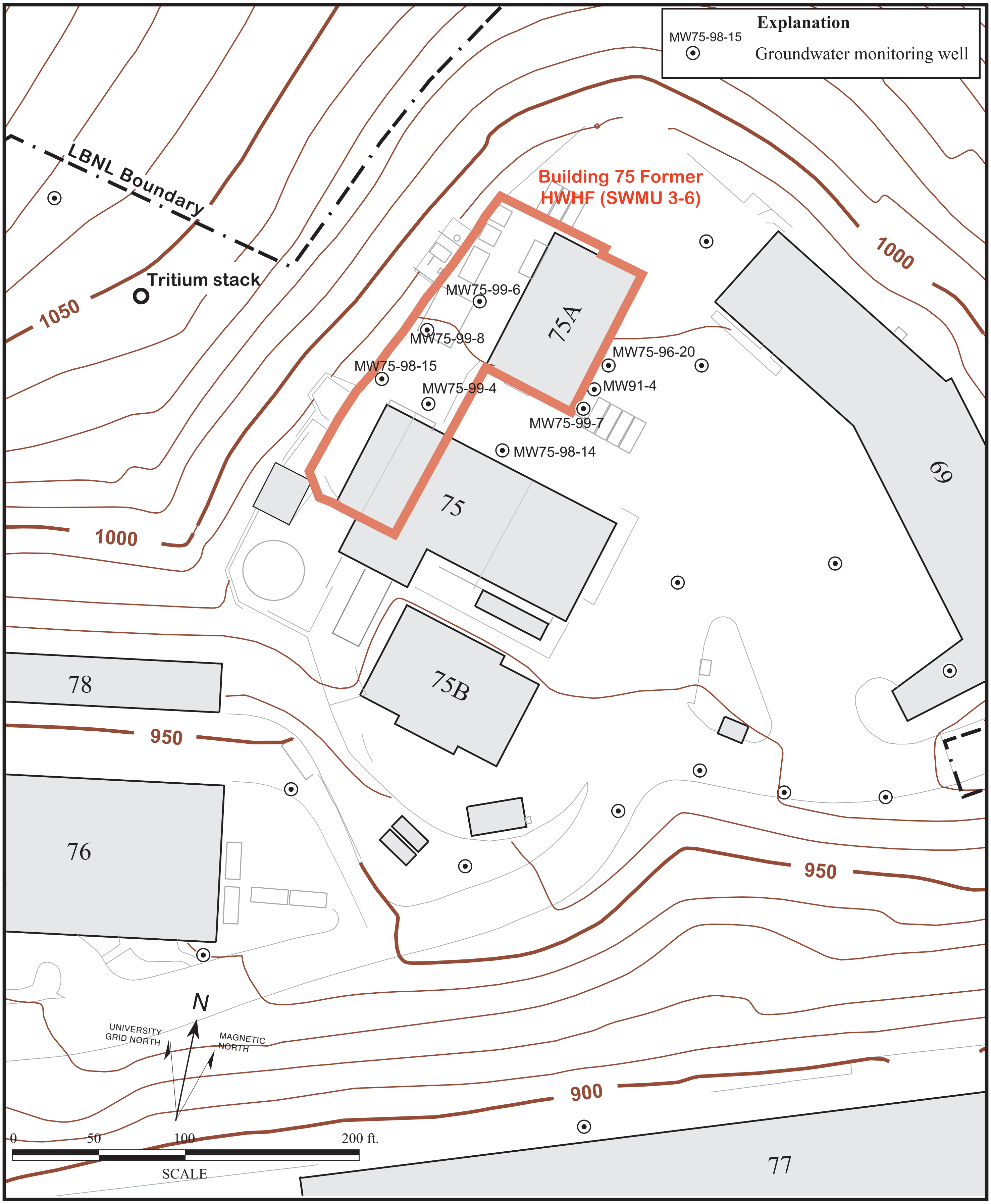

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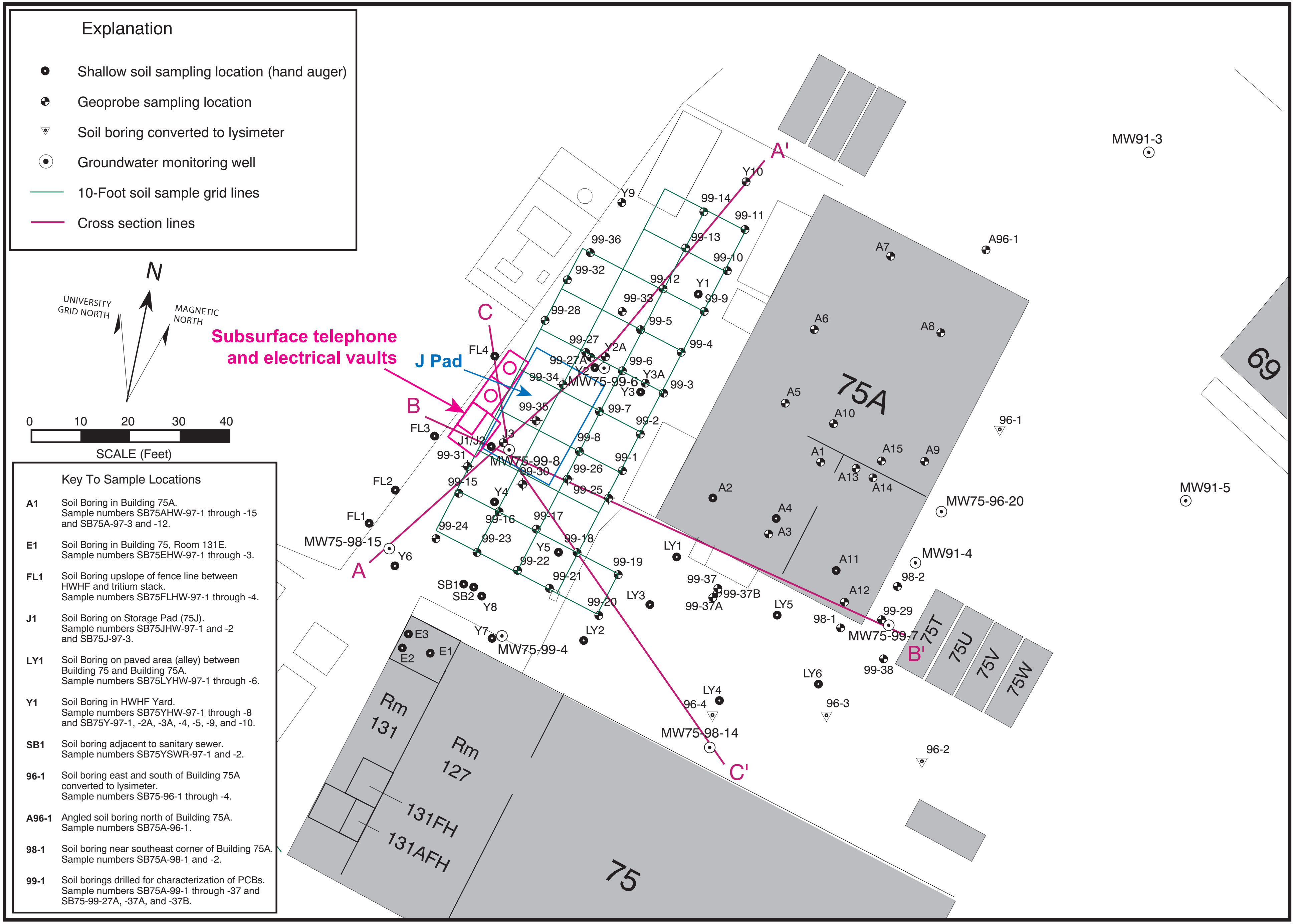
Figure 2. Location of Building 75 Former HWHF (SWMU 3-6) Showing Surface Topography and Locations of Groundwater Monitoring Wells.



3-B75Base.ai
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Figure 3. Base Map, Building 75 Former HWHF (SWMU 3-6) Showing Soil Sampling Locations and Locations of Cross Sections.

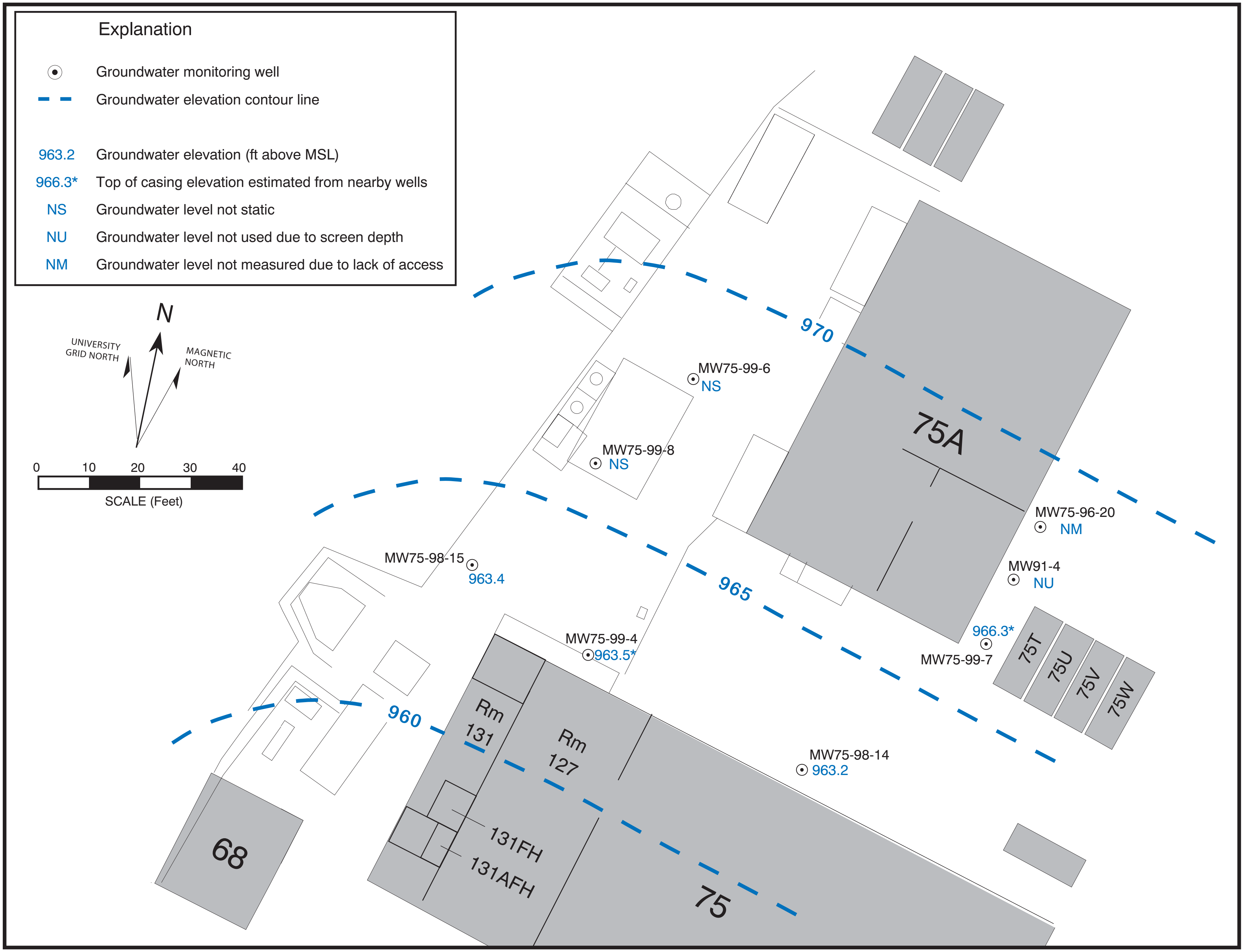
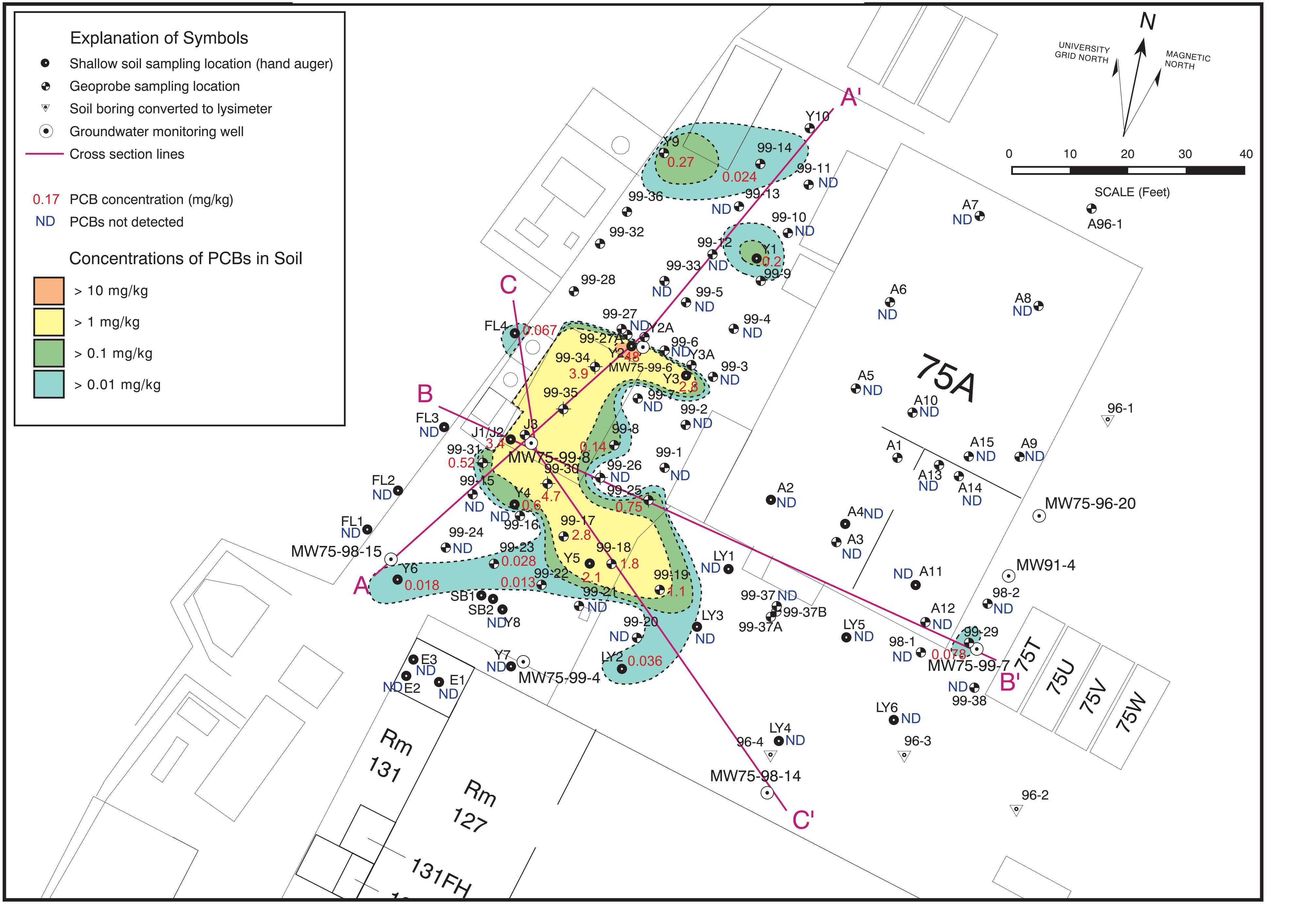


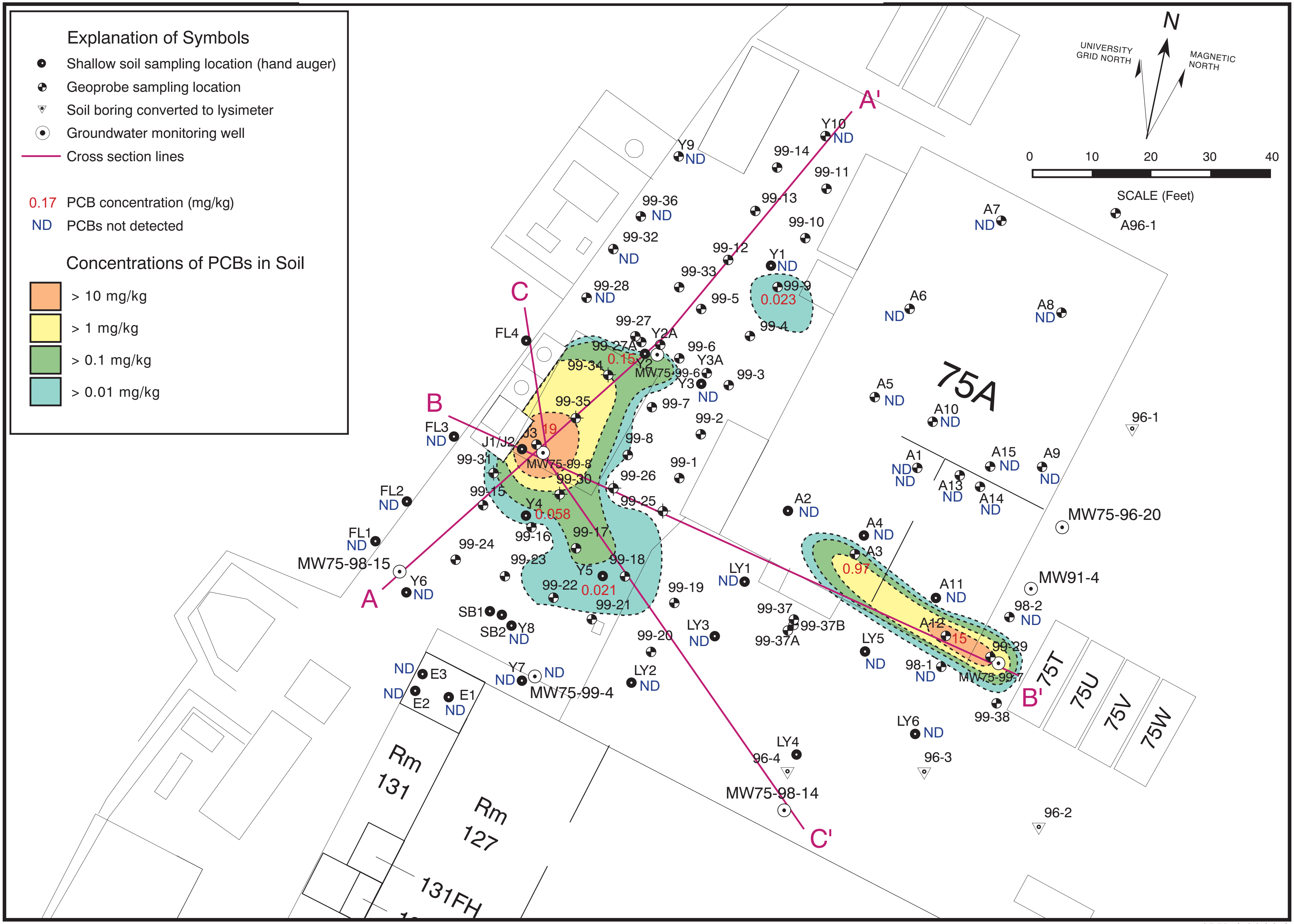
Figure 4. **Groundwater Level Elevation Map (January 2000), Building 75 Former HWHF (SWMU 3-6).**

4-B75PCBs-GW.ai
02/00



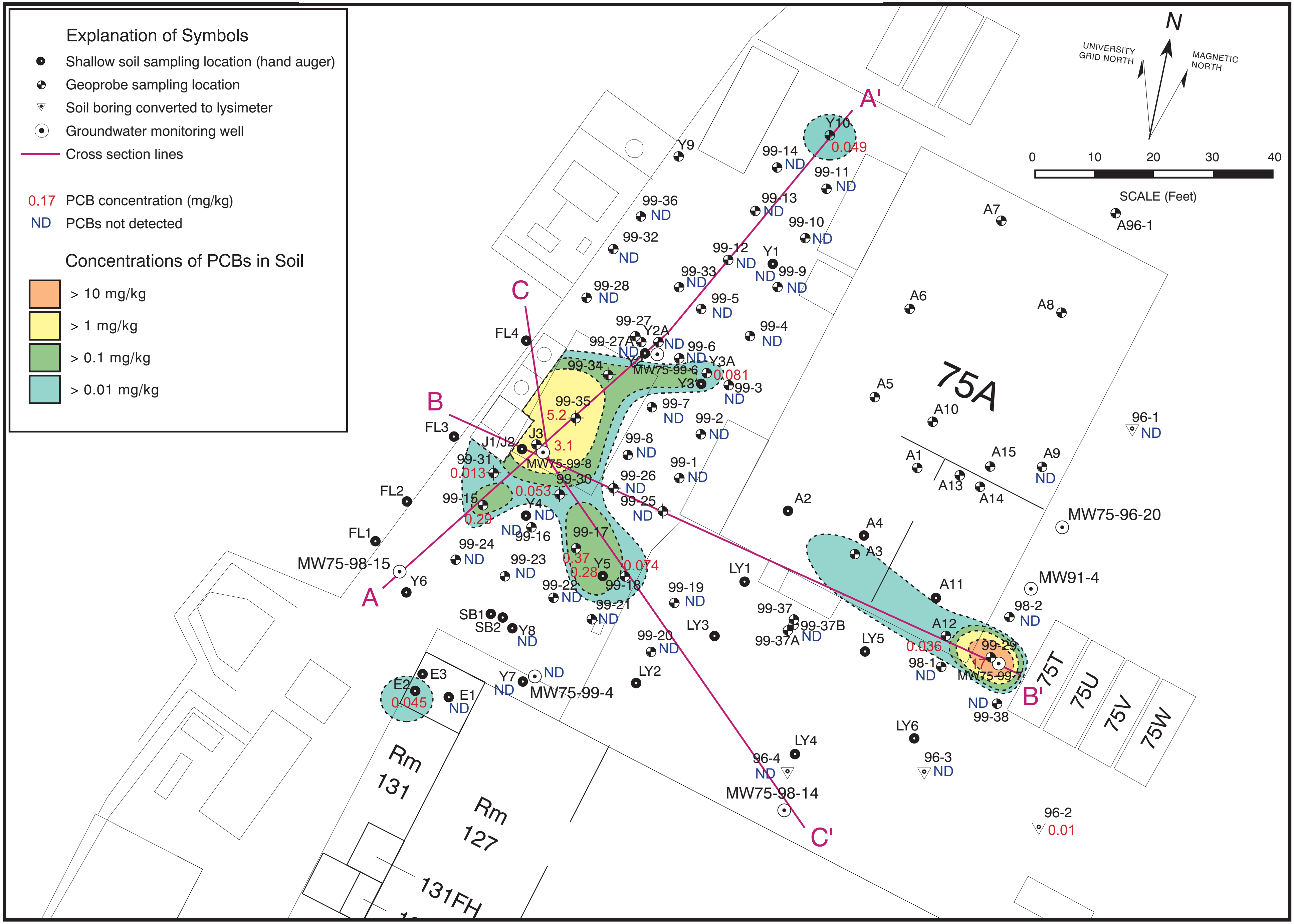
5-B75pcbs0-2.0.ai
02/00

Figure 5. Concentrations of PCBs Detected in Soil Samples (mg/kg) from 0 to 2.0 feet bgs, Building 75 Former HWHF (SWMU 3-6).



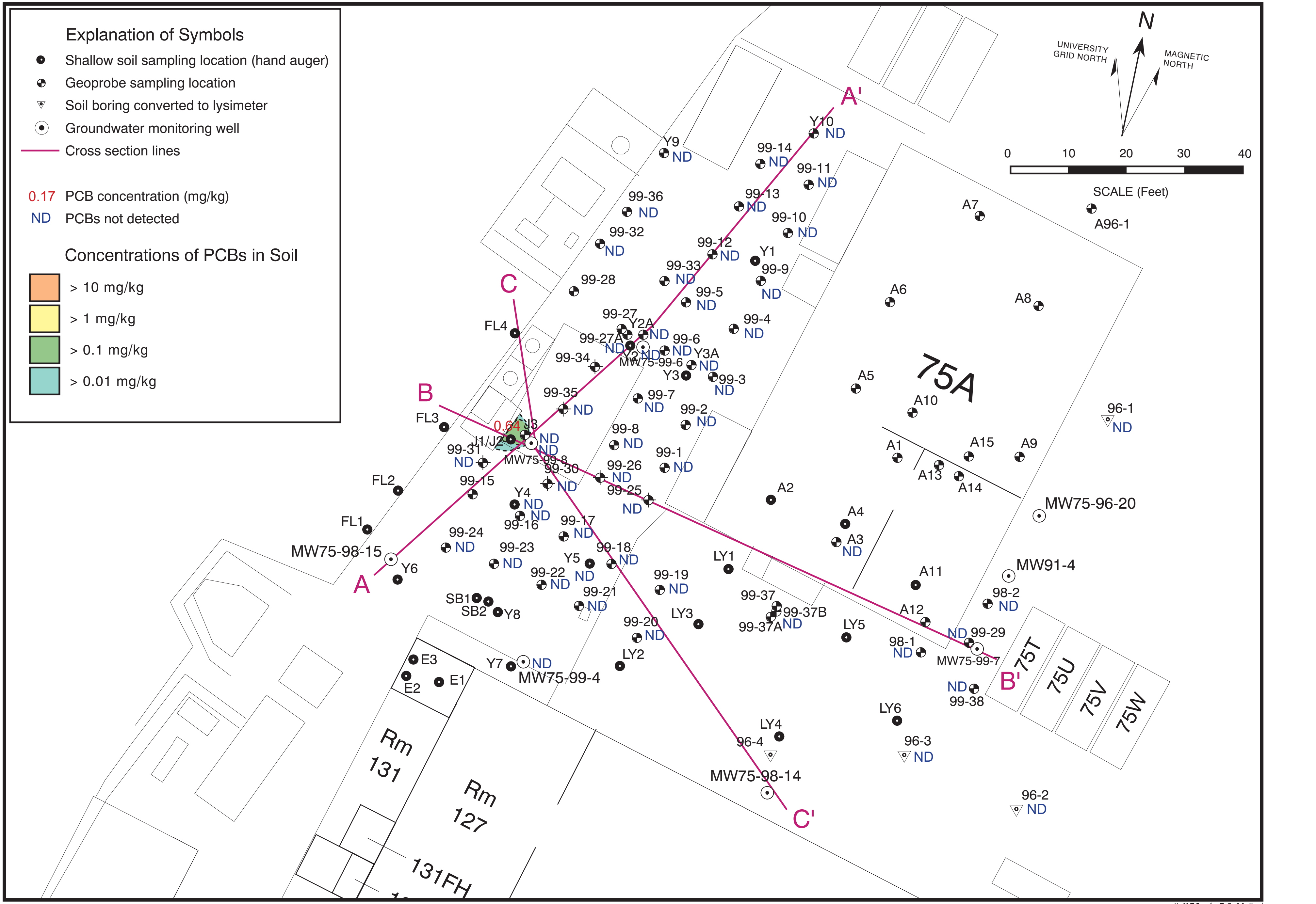
6-B75pcbs2.2-3.8.ai
02/00

Figure 6. Concentrations of PCBs Detected in Soil Samples (mg/kg) from 2.2 to 3.8 feet bgs, Building 75 Former HWHF (SWMU 3-6).



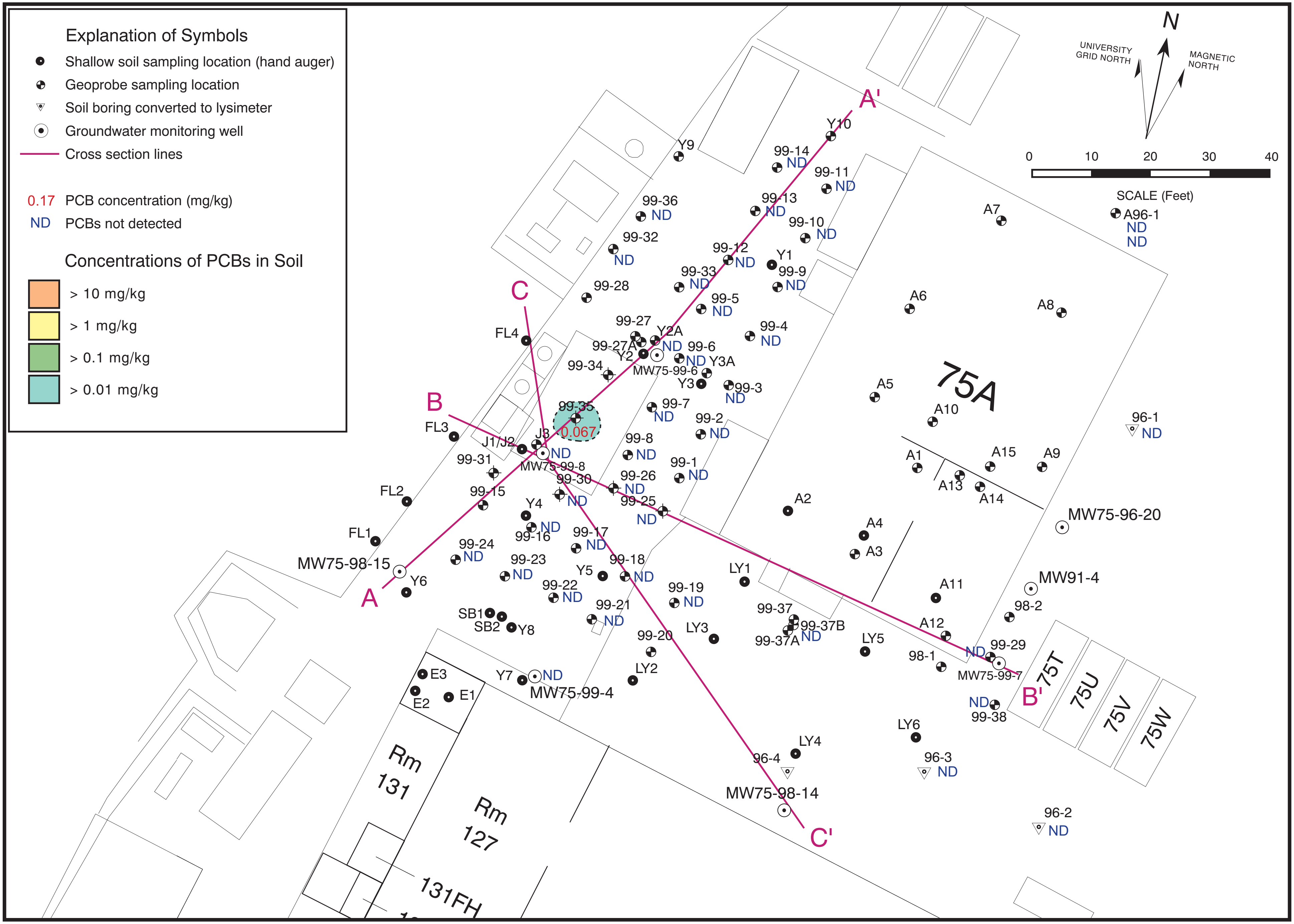
7-B75pcbs4.0-6.8.ai
02/00

Figure 7. Concentrations of PCBs Detected in Soil Samples (mg/kg) from 4.0 to 6.8 feet bgs, Building 75 Former HWHF (SWMU 3-6).



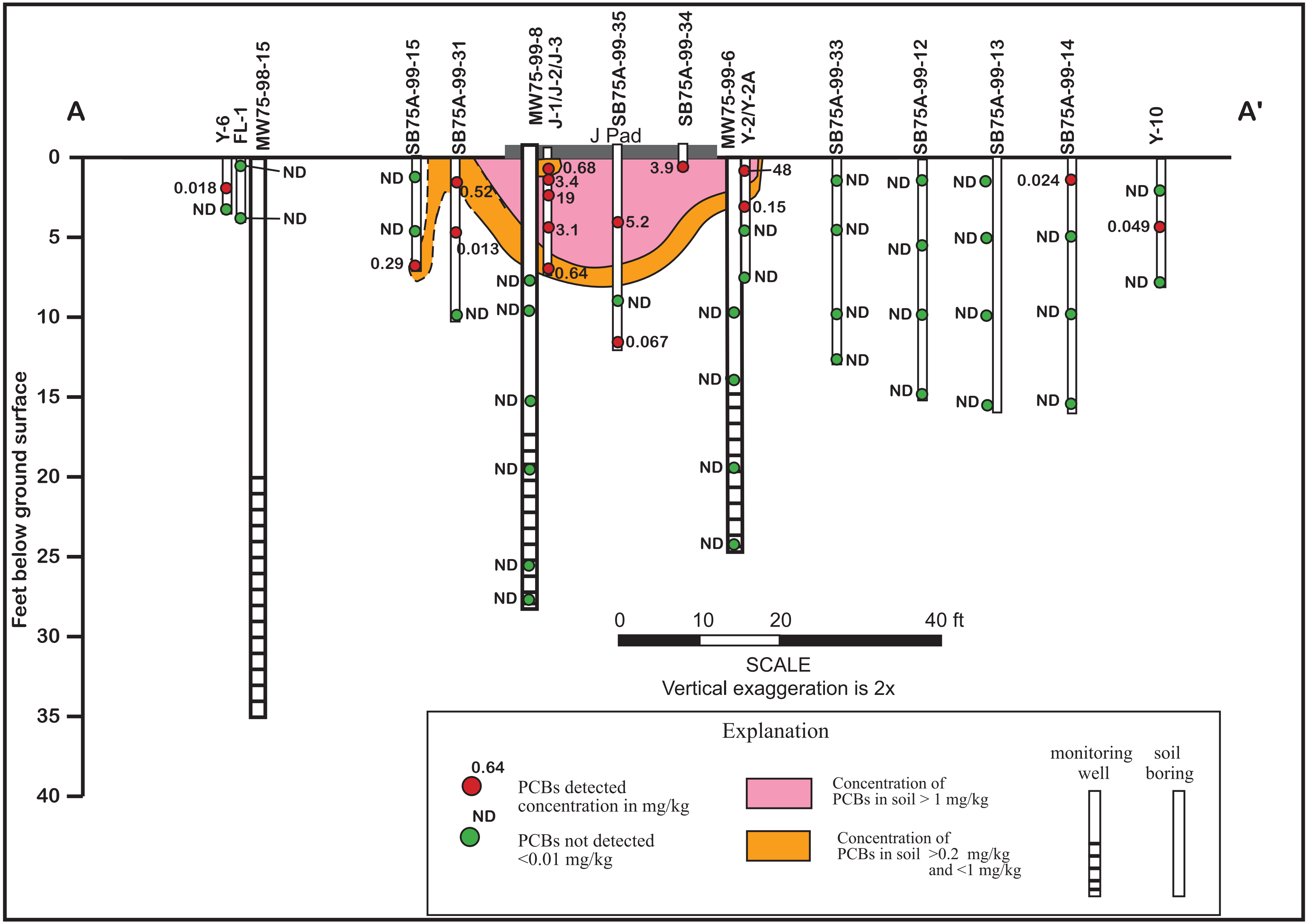
8-B75pcbs7.3-11.0.ai
02/00

Figure 8. Concentrations of PCBs Detected in Soil Samples (mg/kg) from 7.3 to 11.0 feet bgs, Building 75 Former HWHF (SWMU 3-6).



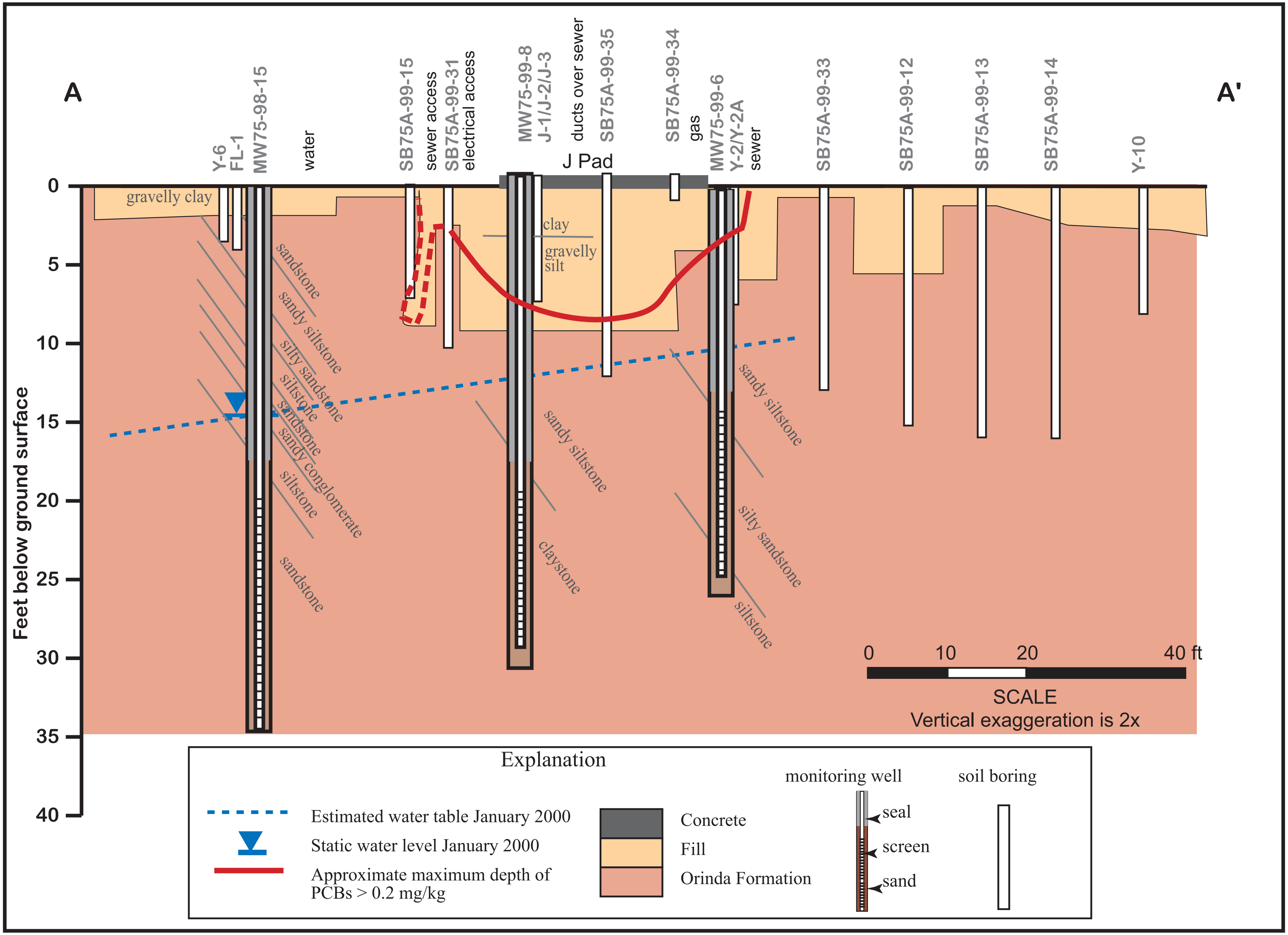
9-B75pcbs12.1-17.8.ai
02/00

Figure 9. **Concentrations of PCBs Detected in Soil Samples (mg/kg) from 12.1 to 17.8 feet bgs, Building 75 Former HWHF (SWMU 3-6).**



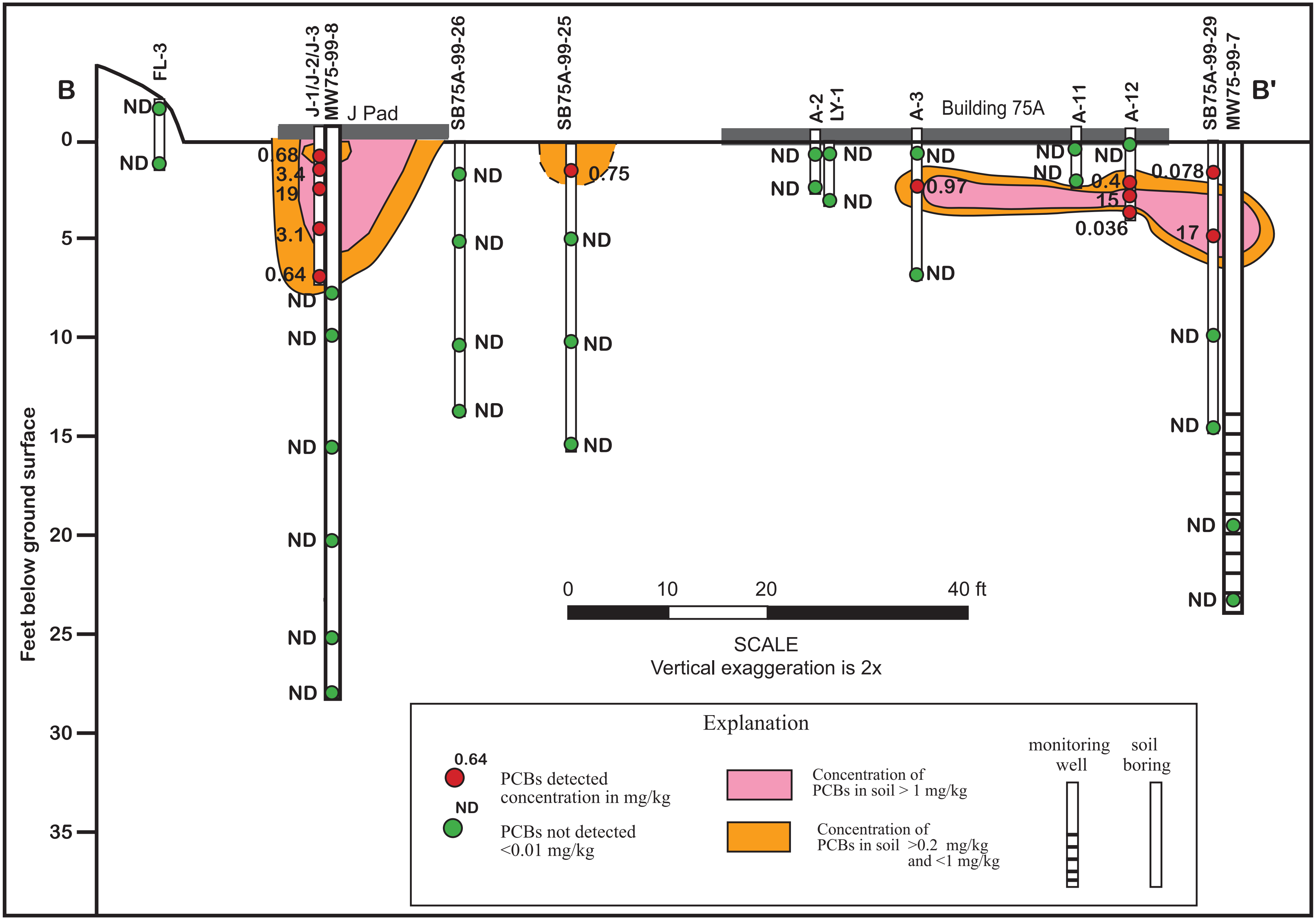
10a-75x-secAA'.ai
02/00

Figure 10a. Cross Section A-A' Showing Concentrations of PCBs Detected (mg/kg), Building 75 Former HWHF (SWMU 3-6).



10b-75x-secAA'geo.ai
02/00

Figure 10b. **Cross Section A-A' Showing Geology, Building 75 Former HWHF (SWMU 3-6).**



11a-75x-secBB'.ai
02/00

Figure 11a. Cross Section B-B' Showing Concentrations of PCBs Detected (mg/kg), Building 75 Former HWHF (SWMU 3-6).

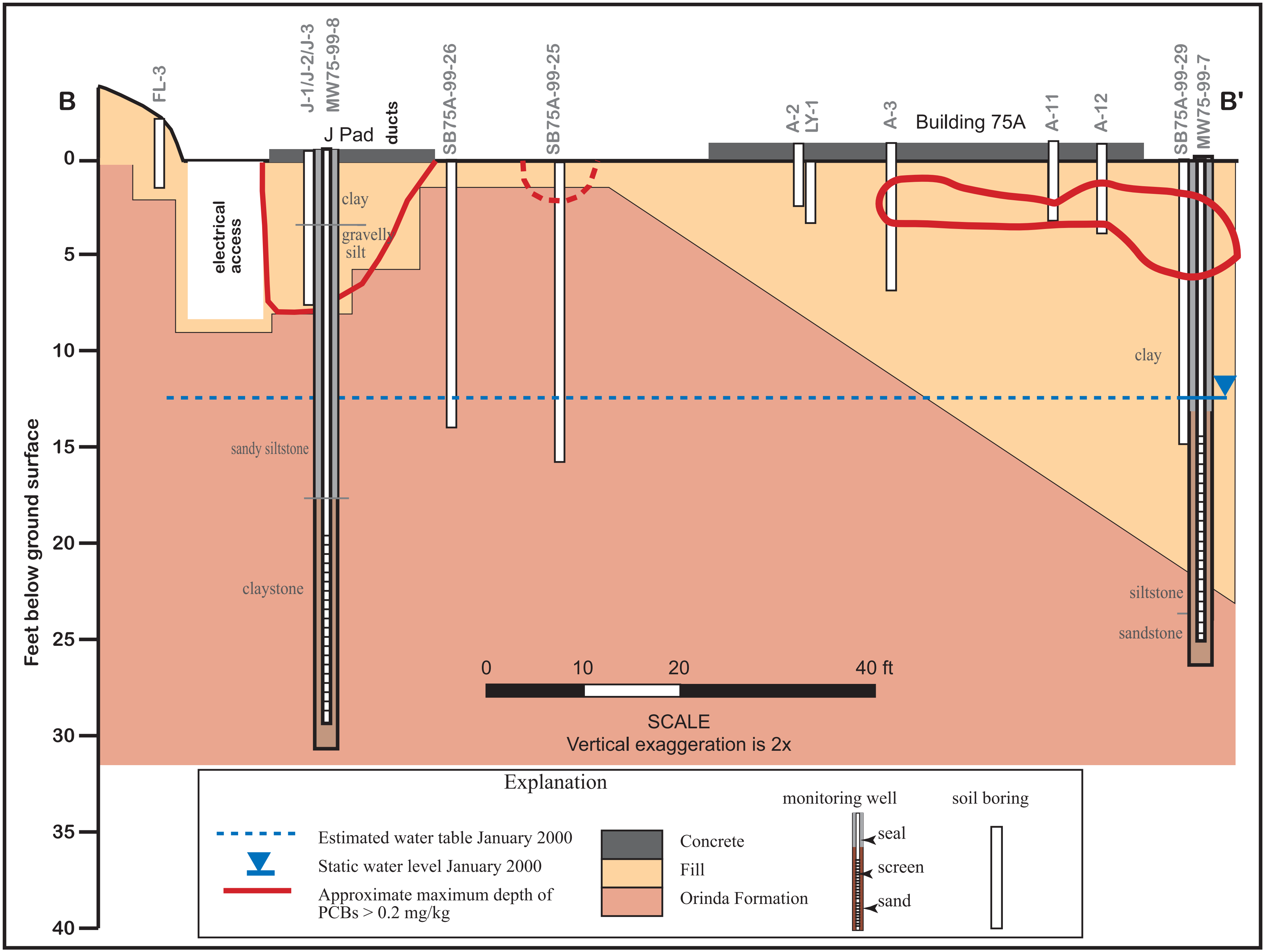


Figure 11b. Cross Section B-B' Showing Geology, Building 75 Former HWHF (SWMU 3-6).

11b-75x-secBB'geo.ai
02/00

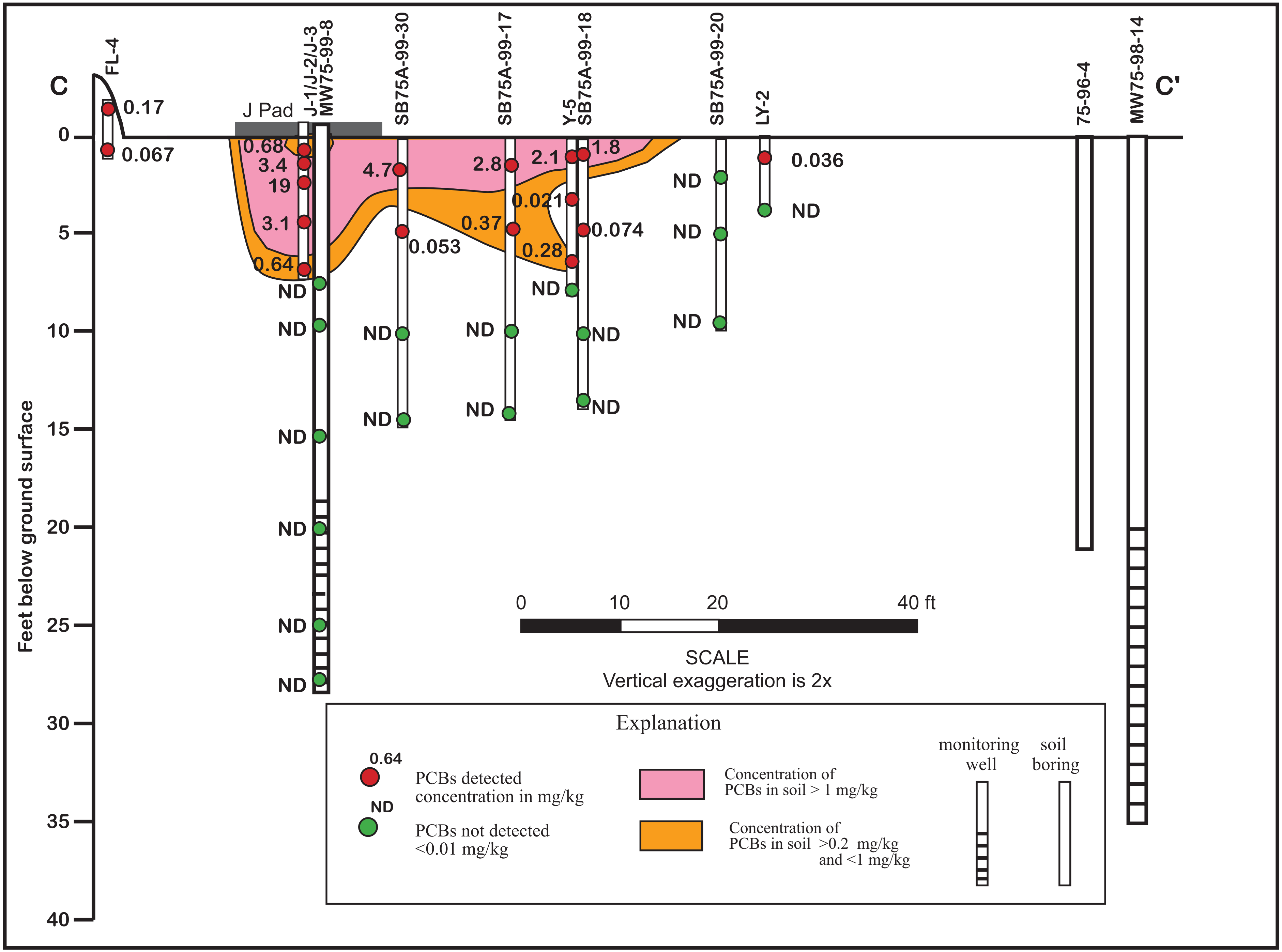
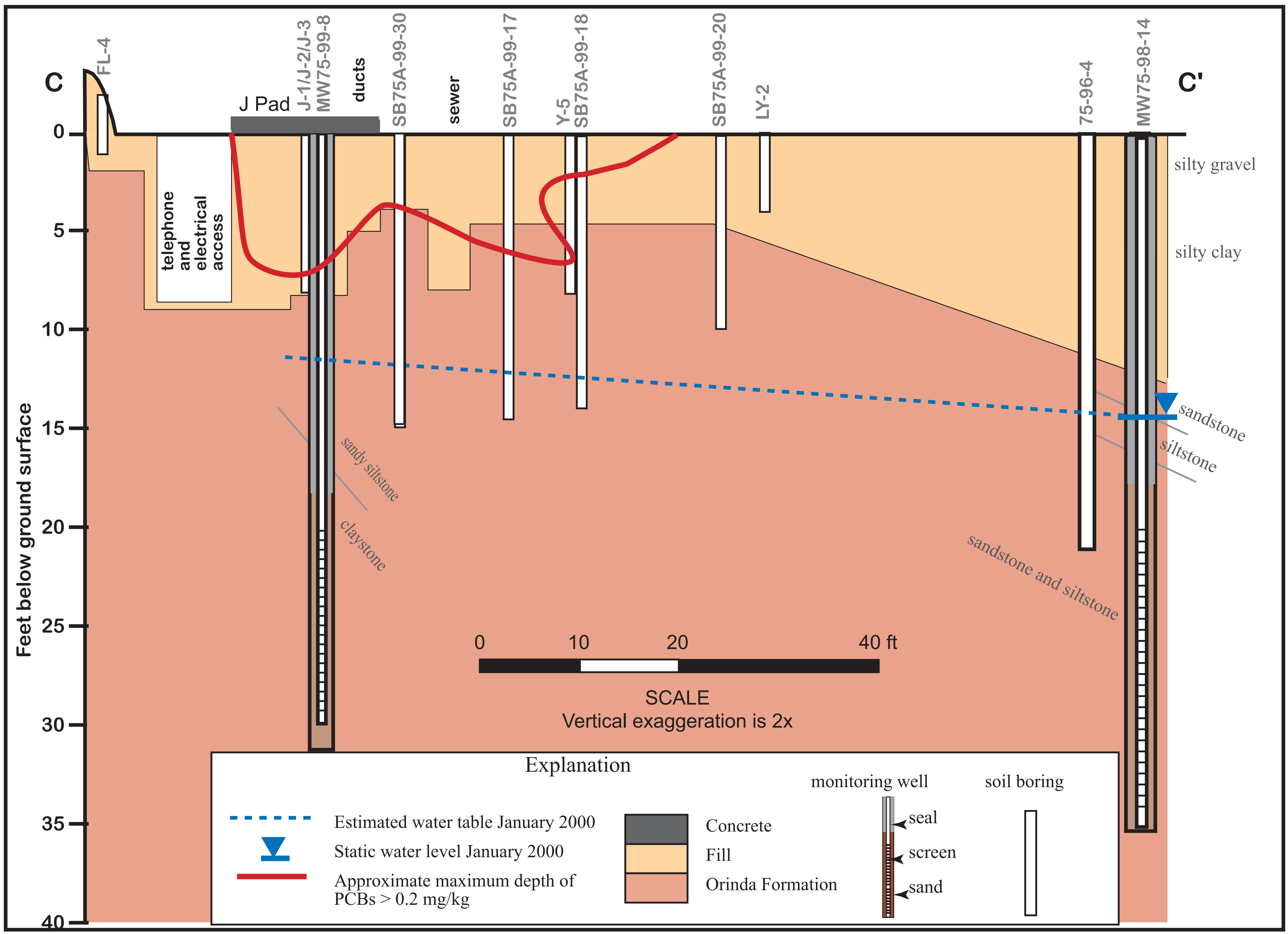


Figure 12a. **Cross Section C-C' Showing Concentrations of PCBs Detected (mg/kg), Building 75 Former HWHF (SWMU 3-6).**

12a-75x-secCC'.ai
02/00



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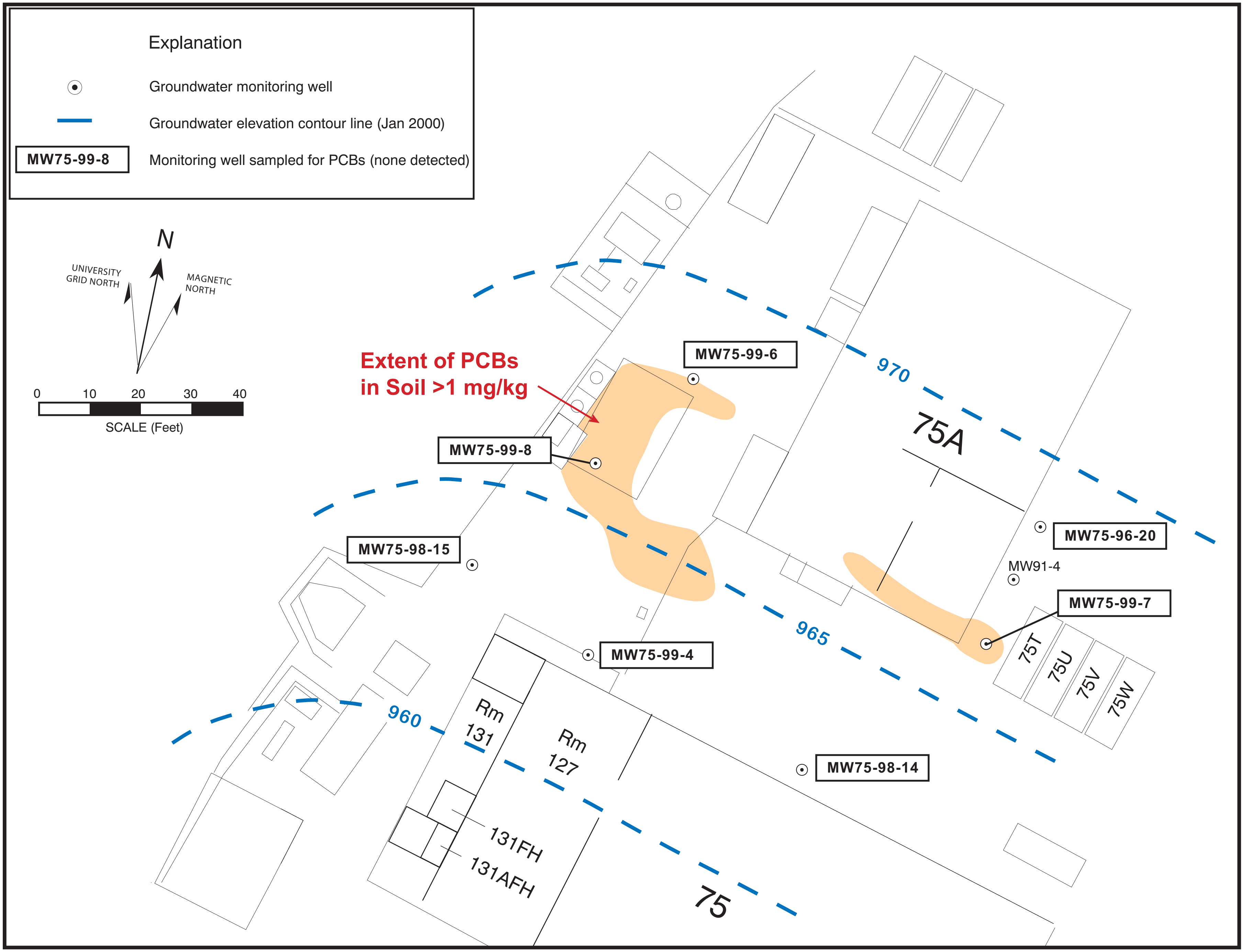

13-B75PCBs-soil2&GW.ai
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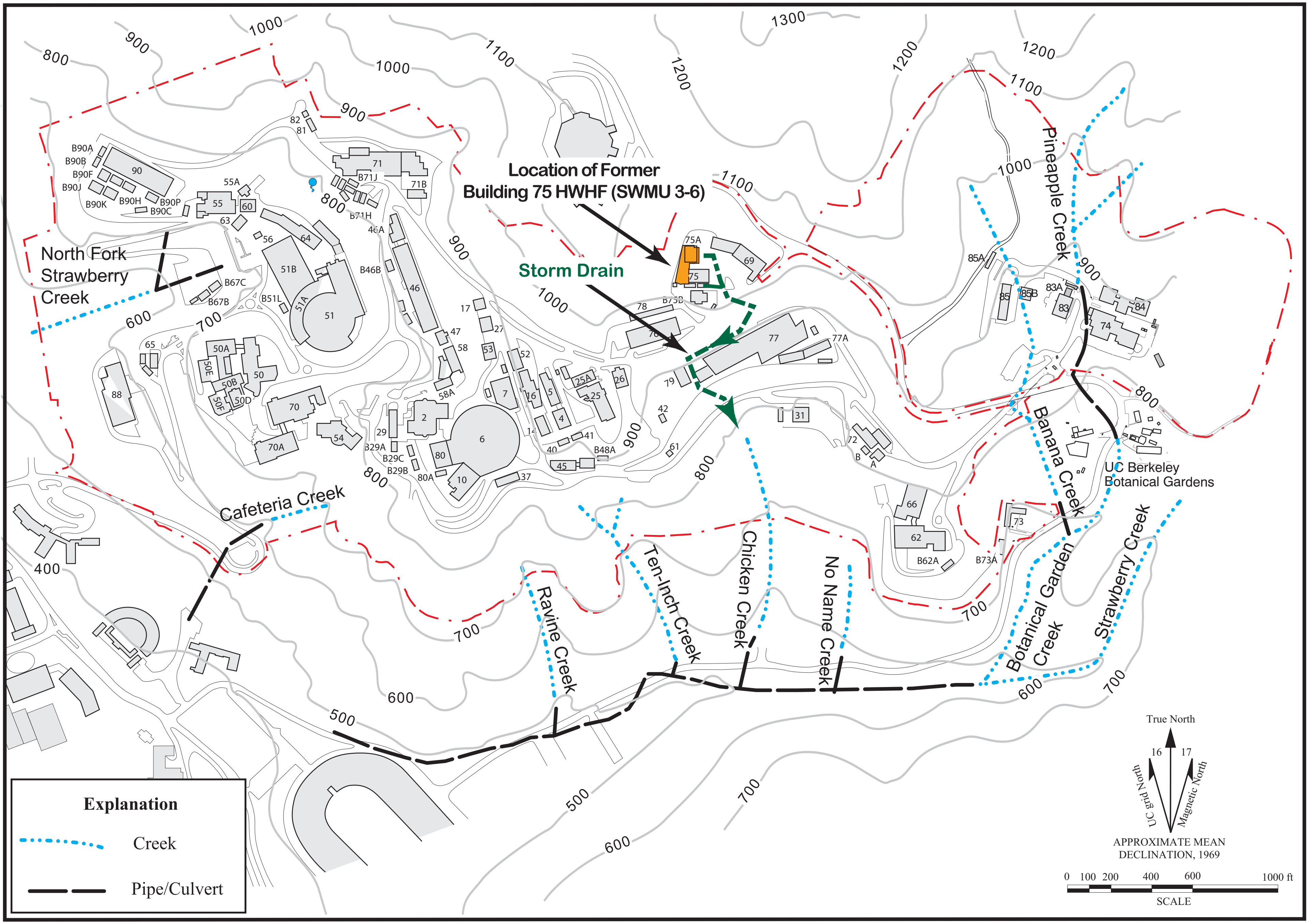
Figure 13. Location of Groundwater Monitoring Wells Sampled for PCBs, Building 75 Former HWHF (SWMU 3-6).



14-surf.ai
02/00

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Soil Sampling Results for PCBs

SWMU 3-6: Building 75 Former Hazardous Waste Handling and Storage Facility

Boring/Well Number	Depth (ft bgs)	Date	Lab	Aroclor-1232 mg/kg	Aroclor-1242 mg/kg	Aroclor-1248 mg/kg	Aroclor-1254 mg/kg
SB75AHW-97-1	1.0	Jul-97	BC	ND	ND	ND	ND
SB75AHW-97-1	3.0	Jul-97	BC	ND	ND	ND	ND
SB75AHW-97-2	1.1	Jul-97	BC	ND	ND	ND	ND
SB75AHW-97-2	2.6	Jul-97	BC	ND	ND	ND	ND
SB75AHW-97-3	1.0	Jul-97	BC	ND	ND	ND	ND
SB75AHW-97-3	2.6	Jul-97	BC	ND	0.97	ND	ND
SB75AHW-97-4	1.0	Jul-97	BC	ND	ND	ND	ND
SB75AHW-97-4	2.5	Jul-97	BC	ND	ND	ND	ND
SB75AHW-97-5	1.0	Jul-97	BC	ND	ND	ND	ND
SB75AHW-97-5	2.8	Jul-97	BC	ND	ND	ND	ND
SB75AHW-97-6	1.0	Jul-97	BC	ND	ND	ND	ND
SB75AHW-97-6	2.9	Jul-97	BC	ND	ND	ND	ND
SB75AHW-97-7	1.0	Jul-97	BC	ND	ND	ND	ND
SB75AHW-97-7	3.0	Jul-97	BC	ND	ND	ND	ND
SB75AHW-97-8	1.0	Jul-97	BC	ND	ND	ND	ND
SB75AHW-97-8	3.2	Jul-97	BC	ND	ND	ND	ND
SB75AHW-97-9	1.3	Jul-97	BC	ND	ND	ND	ND
SB75AHW-97-9	3.0	Jul-97	BC	ND	ND	ND	ND
SB75AHW-97-9	4.7	Sep-97	BC	ND	ND	ND	ND
SB75AHW-97-10	1.0	Jul-97	BC	ND	ND	ND	ND
SB75AHW-97-10	3.0	Jul-97	BC	ND	ND	ND	ND
SB75AHW-97-11	1.0	Jul-97	BC	ND	ND	ND	ND
SB75AHW-97-11	2.5	Jul-97	BC	ND	ND	ND	ND
SB75AHW-97-12	1.0	Jul-97	BC	ND	ND	ND	ND
SB75AHW-97-12	2.8	Jul-97	BC	ND	0.40	ND	ND
SB75AHW-97-12	3.2	Sep-97	BC	ND	**15**	ND	ND
SB75AHW-97-13	1.0	Mar-98	BC	ND	ND	ND	ND
SB75AHW-97-13	2.8	Mar-98	BC	ND	ND	ND	ND
SB75AHW-97-14	1.1	Mar-98	BC	ND	ND	ND	ND
SB75AHW-97-14	3.0	Mar-98	BC	ND	ND	ND	ND
SB75AHW-97-15	1.2	Mar-98	BC	ND	ND	ND	ND
SB75AHW-97-15	3.2	Mar-98	BC	ND	ND	ND	ND
SB75EHW-97-1	1.0	Aug-97	BC	ND	ND	ND	ND
SB75EHW-97-1	3.5	Aug-97	BC	ND	ND	ND	ND
SB75EHW-97-1	4.3	Sep-97	BC	ND	ND	ND	ND
SB75EHW-97-2	1.1	Aug-97	BC	ND	ND	ND	ND
SB75EHW-97-2	3.5	Aug-97	BC	ND	ND	ND	ND
SB75EHW-97-2	5.0	Sep-97	BC	ND	0.045	ND	ND
SB75EHW-97-3	1.1	Aug-97	BC	ND	ND	ND	ND
SB75EHW-97-3	2.8	Aug-97	BC	ND	ND	ND	ND
SB75FLHW-97-1	0.5	Aug-97	BC	ND	ND	ND	ND
SB75FLHW-97-1	3.8	Aug-97	BC	ND	ND	ND	ND
SB75FLHW-97-2	0.5	Aug-97	BC	ND	ND	ND	ND
SB75FLHW-97-2	3.0	Aug-97	BC	ND	ND	ND	ND
SB75FLHW-97-3	0.5	Aug-97	BC	ND	ND	ND	ND
SB75FLHW-97-3	3.2	Aug-97	BC	ND	ND	ND	ND
SB75FLHW-97-4	0.5	Aug-97	BC	ND	ND	0.17	ND
SB75FLHW-97-4	2.6	Aug-97	BC	ND	ND	0.067	ND
SB75J-97-3	3.0	Oct-97	BC	ND	ND	**19**	ND
SB75J-97-3	5.0	Oct-97	BC	ND	ND	**3.10**	ND
SB75J-97-3	7.3	Oct-97	BC	ND	ND	0.64	ND
SB75JHW-97-1	1.8	Aug-97	BC	ND	ND	**3.40**	ND
SB75JHW-97-2	1.3	Sep-97	BC	ND	ND	ND	0.68

Table 1.

Soil Sampling Results for PCBs

SWMU 3-6: Building 75 Former Hazardous Waste Handling and Storage Facility

Boring/Well Number	Depth (ft bgs)	Date	Lab	Aroclor-1232 mg/kg	Aroclor-1242 mg/kg	Aroclor-1248 mg/kg	Aroclor-1254 mg/kg
SB75LYHW-97-1	0.8	Aug-97	BC	ND	ND	ND	ND
SB75LYHW-97-1	2.8	Aug-97	BC	ND	ND	ND	ND
SB75LYHW-97-2	1.2	Aug-97	BC	ND	ND	0.036	ND
SB75LYHW-97-2	3.7	Aug-97	BC	ND	ND	ND	ND
SB75LYHW-97-3	1.0	Aug-97	BC	ND	ND	ND	ND
SB75LYHW-97-3	2.5	Aug-97	BC	ND	ND	ND	ND
SB75LYHW-97-4	1.2	Aug-97	BC	ND	ND	ND	ND
SB75LYHW-97-4	2.0	Aug-97	BC	ND	ND	ND	ND
SB75LYHW-97-5	1.0	Aug-97	BC	ND	ND	ND	ND
SB75LYHW-97-5	2.7	Aug-97	BC	ND	ND	ND	ND
SB75LYHW-97-6	0.7	Aug-97	BC	ND	ND	ND	ND
SB75LYHW-97-6	2.8	Aug-97	BC	ND	ND	ND	ND
SB75Y-97-1	3.2	Oct-97	BC	ND	ND	ND	ND
SB75Y-97-1	6.7	Oct-97	BC	ND	ND	ND	ND
SB75Y-97-2A	4.5	Oct-97	BC	ND	ND	ND	ND
SB75Y-97-2A	7.5	Oct-97	BC	ND	ND	ND	ND
SB75Y-97-3A	4.5	Oct-97	BC	ND	ND	0.081	ND
SB75Y-97-3A	7.5	Oct-97	BC	ND	ND	ND	ND
SB75Y-97-4	4.9	Oct-97	BC	ND	ND	ND	ND
SB75Y-97-4	7.5	Oct-97	BC	ND	ND	ND	ND
SB75Y-97-5	6.3	Oct-97	BC	ND	ND	0.28	ND
SB75Y-97-5	7.5	Oct-97	BC	ND	ND	ND	ND
SB75Y-97-9	1.0	Oct-97	BC	ND	ND	0.27	ND
SB75Y-97-9	3.0	Oct-97	BC	ND	ND	ND	ND
SB75Y-97-9	7.5	Oct-97	BC	ND	ND	ND	ND
SB75Y-97-10	2.2	Oct-97	BC	ND	ND	ND	ND
SB75Y-97-10	4.5	Oct-97	BC	ND	ND	0.049	ND
SB75Y-97-10	8.0	Oct-97	BC	ND	ND	ND	ND
SB75YHW-97-1	0.5	Aug-97	BC	ND	ND	0.20	ND
SB75YHW-97-1	3.2	Aug-97	BC	ND	ND	ND	ND
SB75YHW-97-2	0.8	Aug-97	BC	ND	ND	**48**	ND
SB75YHW-97-2	3.0	Aug-97	BC	ND	ND	0.15	ND
SB75YHW-97-3	0.8	Aug-97	BC	ND	ND	**2.8**	ND
SB75YHW-97-3	3.0	Aug-97	BC	ND	ND	ND	ND
SB75YHW-97-4	0.7	Aug-97	BC	ND	ND	0.60	ND
SB75YHW-97-4	2.8	Aug-97	BC	ND	ND	0.058	ND
SB75YHW-97-5	0.8	Aug-97	BC	ND	ND	**2.1**	ND
SB75YHW-97-5	3.0	Aug-97	BC	ND	ND	0.021	ND
SB75YHW-97-6	2.0	Aug-97	BC	ND	ND	0.018	ND
SB75YHW-97-6	3.2	Aug-97	BC	ND	ND	ND	ND
SB75YHW-97-7	1.2	Aug-97	BC	ND	ND	ND	ND
SB75YHW-97-7	3.0	Aug-97	BC	ND	ND	ND	ND
SB75YHW-97-8	1.3	Sep-97	BC	ND	ND	ND	ND
SB75YHW-97-8	3.5	Sep-97	BC	ND	ND	ND	ND
SB75YHW-97-8	4.3	Sep-97	BC	ND	ND	ND	ND
SB75YHW-97-8	5.4	Sep-97	BC	ND	ND	ND	ND
SB75-96-1	4.0	Jul-96	BC	ND	ND	ND	ND
SB75-96-1	9.0	Jul-96	BC	ND	ND	ND	ND
SB75-96-1	14.2	Jul-96	BC	ND	ND	ND	ND
SB75-96-1	19.3	Jul-96	BC	ND	ND	ND	ND
SB75-96-1	24.1	Jul-96	BC	ND	ND	ND	ND
SB75-96-1	29.0	Jul-96	BC	ND	ND	ND	ND

Table 1.

Soil Sampling Results for PCBs

SWMU 3-6: Building 75 Former Hazardous Waste Handling and Storage Facility

Boring/Well Number	Depth (ft bgs)	Date	Lab	Aroclor-1232 mg/kg	Aroclor-1242 mg/kg	Aroclor-1248 mg/kg	Aroclor-1254 mg/kg
SB75A-96-1	3.8	Sep-96	BC	ND	ND	ND	ND
SB75A-96-1	12.5	Sep-96	BC	ND	ND	ND	ND
SB75A-96-1	17.8	Sep-96	BC	ND	ND	ND	ND
SB75A-96-1	22.5	Sep-96	BC	ND	ND	ND	ND
SB75-96-2	4.7	Jul-96	BC	ND	ND	ND	0.01
SB75-96-2	9.5	Jul-96	BC	ND	ND	ND	ND
SB75-96-2	15.1	Jul-96	BC	ND	ND	ND	ND
SB75-96-2	20.0	Jul-96	BC	ND	ND	ND	ND
SB75-96-3	5.1	Jul-96	BC	ND	ND	ND	ND
SB75-96-3	10.1	Jul-96	BC	ND	ND	ND	ND
SB75-96-3	15.0	Jul-96	BC	ND	ND	ND	ND
SB75-96-3	19.5	Jul-96	BC	ND	ND	ND	ND
SB75A-97-3	7.5	Oct-97	BC	ND	ND	ND	ND
SB75A-97-12	4.2	Oct-97	BC	ND	ND	0.036	ND
SB75A-98-1	1.5	Apr-98	BC	ND	ND	ND	ND
SB75A-98-1	3.2	Apr-98	BC	ND	ND	ND	ND
SB75A-98-1	5.8	Apr-98	BC	ND	ND	ND	ND
SB75A-98-1	11.0	Apr-98	BC	ND	ND	ND	ND
SB75A-98-2	1.8	Apr-98	BC	ND	ND	ND	ND
SB75A-98-2	3.2	Apr-98	BC	ND	ND	ND	ND
SB75A-98-2	6.0	Apr-98	BC	ND	ND	ND	ND
SB75A-98-2	10.8	Apr-98	BC	ND	ND	ND	ND
SB75A-99-1	1.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-1	5.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-1	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-1	15.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-2	0.8	Aug-99	BC	ND	ND	ND	ND
SB75A-99-2	4.5	Aug-99	BC	ND	ND	ND	ND
SB75A-99-2	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-2	13.3	Aug-99	BC	ND	ND	ND	ND
SB75A-99-3	0.8	Aug-99	BC	ND	ND	ND	ND
SB75A-99-3	5.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-3	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-3	15.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-4	0.8	Aug-99	BC	ND	ND	ND	ND
SB75A-99-4	5.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-4	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-4	14.9	Aug-99	BC	ND	ND	ND	ND
SB75A-99-5	0.8	Aug-99	BC	ND	ND	ND	ND
SB75A-99-5	5.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-5	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-5	15.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-6	0.7	Aug-99	BC	ND	ND	ND	ND
SB75A-99-6	5.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-6	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-6	15.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-7	0.7	Aug-99	BC	ND	ND	ND	ND
SB75A-99-7	5.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-7	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-7	15.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-8	1.0	Aug-99	BC	ND	0.14	ND	ND
SB75A-99-8	5.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-8	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-8	15.0	Aug-99	BC	ND	ND	ND	ND

Table 1.

Soil Sampling Results for PCBs

SWMU 3-6: Building 75 Former Hazardous Waste Handling and Storage Facility

Boring/Well Number	Depth (ft bgs)	Date	Lab	Aroclor-1232 mg/kg	Aroclor-1242 mg/kg	Aroclor-1248 mg/kg	Aroclor-1254 mg/kg
SB75A-99-9	2.2	Aug-99	BC	ND	0.023	ND	ND
SB75A-99-9	5.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-9	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-9	15.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-10	1.5	Aug-99	BC	ND	ND	ND	ND
SB75A-99-10	5.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-10	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-10	15.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-11	1.5	Aug-99	BC	ND	ND	ND	ND
SB75A-99-11	5.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-11	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-11	15.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-12	1.5	Aug-99	BC	ND	ND	ND	ND
SB75A-99-12	5.5	Aug-99	BC	ND	ND	ND	ND
SB75A-99-12	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-12	14.5	Aug-99	BC	ND	ND	ND	ND
SB75A-99-13	1.5	Aug-99	BC	ND	ND	ND	ND
SB75A-99-13	5.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-13	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-13	15.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-14	1.5	Aug-99	BC	ND	0.024	ND	ND
SB75A-99-14	5.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-14	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-14	15.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-15	1.5	Aug-99	BC	ND	ND	ND	ND
SB75A-99-15	5.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-15	6.8	Aug-99	BC	ND	0.29	ND	ND
SB75A-99-16	1.5	Aug-99	BC	ND	ND	ND	ND
SB75A-99-16	5.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-16	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-16	15.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-17	1.5	Aug-99	BC	ND	**2.8**	ND	ND
SB75A-99-17	5.0	Aug-99	BC	ND	0.37	ND	ND
SB75A-99-17	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-17	14.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-18	1.5	Aug-99	BC	ND	**1.8**	ND	ND
SB75A-99-18	5.0	Aug-99	BC	ND	0.074	ND	ND
SB75A-99-18	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-18	13.5	Aug-99	BC	ND	ND	ND	ND
SB75A-99-19	1.5	Aug-99	BC	**1.1**	ND	ND	ND
SB75A-99-19	5.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-19	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-19	15.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-20	2.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-20	5.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-20	9.5	Aug-99	BC	ND	ND	ND	ND
SB75A-99-21	1.5	Aug-99	BC	ND	ND	ND	ND
SB75A-99-21	5.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-21	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-21	14.5	Aug-99	BC	ND	ND	ND	ND
SB75A-99-22	1.5	Aug-99	BC	ND	0.013	ND	ND
SB75A-99-22	5.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-22	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-22	15.0	Aug-99	BC	ND	ND	ND	ND

Table 1.

Soil Sampling Results for PCBs

SWMU 3-6: Building 75 Former Hazardous Waste Handling and Storage Facility

Boring/Well Number	Depth (ft bgs)	Date	Lab	Aroclor-1232	Aroclor-1242	Aroclor-1248	Aroclor-1254
				mg/kg	mg/kg	mg/kg	mg/kg
SB75A-99-23	2.0	Aug-99	BC	ND	0.028	ND	ND
SB75A-99-23	5.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-23	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-23	15.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-24	1.5	Aug-99	BC	ND	ND	ND	ND
SB75A-99-24	5.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-24	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-24	15.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-25	1.5	Aug-99	BC	ND	0.75	ND	ND
SB75A-99-25	5.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-25	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-25	15.1	Aug-99	BC	ND	ND	ND	ND
SB75A-99-26	1.5	Aug-99	BC	ND	ND	ND	ND
SB75A-99-26	5.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-26	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-26	13.5	Aug-99	BC	ND	ND	ND	ND
SB75A-99-27A	1.5	Aug-99	BC	ND	ND	ND	ND
SB75A-99-27A	5.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-27A	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-28	3.5	Aug-99	BC	ND	ND	ND	ND
SB75A-99-28	6.3	Aug-99	BC	ND	ND	ND	ND
SB75A-99-29	1.5	Aug-99	BC	ND	0.078	ND	ND
SB75A-99-29	5.0	Aug-99	BC	ND	**17.0**	ND	ND
SB75A-99-29	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-29	14.8	Aug-99	BC	ND	ND	ND	ND
SB75A-99-30	1.5	Aug-99	BC	ND	**4.7**	ND	ND
SB75A-99-30	5.0	Aug-99	BC	ND	0.053	ND	ND
SB75A-99-30	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-30	14.6	Aug-99	BC	ND	ND	ND	ND
SB75A-99-31	2.0	Aug-99	BC	ND	0.52	ND	ND
SB75A-99-31	5.0	Aug-99	BC	ND	0.013	ND	ND
SB75A-99-31	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-32	3.5	Aug-99	BC	ND	ND	ND	ND
SB75A-99-32	5.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-32	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-32	14.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-33	1.5	Aug-99	BC	ND	ND	ND	ND
SB75A-99-33	4.7	Aug-99	BC	ND	ND	ND	ND
SB75A-99-33	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-33	12.5	Aug-99	BC	ND	ND	ND	ND
SB75A-99-34	1.5	Aug-99	BC	ND	**3.9**	ND	ND
SB75A-99-35	5.0	Aug-99	BC	ND	**5.2**	ND	ND
SB75A-99-35	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-35	12.1	Aug-99	BC	ND	0.067	ND	ND
SB75A-99-36	2.5	Aug-99	BC	ND	ND	ND	ND
SB75A-99-36	4.8	Aug-99	BC	ND	ND	ND	ND
SB75A-99-36	9.3	Aug-99	BC	ND	ND	ND	ND
SB75A-99-36	12.5	Aug-99	BC	ND	ND	ND	ND
SB75A-99-37	1.5	Aug-99	BC	ND	ND	ND	ND
SB75A-99-37B	6.3	Aug-99	BC	ND	ND	ND	ND
SB75A-99-37B	10.0	Aug-99	BC	ND	ND	ND	ND
SB75A-99-37B	15.0	Aug-99	BC	ND	ND	ND	ND

Table 1.

Soil Sampling Results for PCBs

SWMU 3-6: Building 75 Former Hazardous Waste Handling and Storage Facility

				Aroclor-1232	Aroclor-1242	Aroclor-1248	Aroclor-1254
Boring/Well Number	Depth (ft bgs)	Date	Lab	mg/kg	mg/kg	mg/kg	mg/kg
SB75A-99-38	1.5	Nov-99	BC	ND	ND	ND	ND
SB75A-99-38	5.0	Nov-99	BC	ND	ND	ND	ND
SB75A-99-38	9.4	Nov-99	BC	ND	ND	ND	ND
SB75A-99-38	13.8	Nov-99	BC	ND	ND	ND	ND
MW75-99-4	3.0	Jul-99	BC	ND	ND	ND	ND
MW75-99-4	4.5	Jul-99	BC	ND	ND	ND	ND
MW75-99-4	6.5	Jul-99	BC	ND	ND	ND	ND
MW75-99-4	9.2	Jul-99	BC	ND	ND	ND	ND
MW75-99-4	13.5	Jul-99	BC	ND	ND	ND	ND
MW75-99-4	18.8	Jul-99	BC	ND	ND	ND	ND
MW75-99-4	28.5	Jul-99	BC	ND	ND	ND	ND
MW75-99-4	33.7	Jul-99	BC	ND	ND	ND	ND
MW75-99-6	10.1	Nov-99	BC	ND	ND	ND	ND
MW75-99-6	13.7	Nov-99	BC	ND	ND	ND	ND
MW75-99-6	18.9	Nov-99	BC	ND	ND	ND	ND
MW75-99-6	23.9	Nov-99	BC	ND	ND	ND	ND
MW75-99-7	19.3	Nov-99	BC	ND	ND	ND	ND
MW75-99-7	23.9	Nov-99	BC	ND	ND	ND	ND
MW75-99-8	8.3	Dec-99	BC	ND	ND	ND	ND
MW75-99-8	10.5	Dec-99	BC	ND	ND	ND	ND
MW75-99-8	15.6	Dec-99	BC	ND	ND	ND	ND
MW75-99-8	20.6	Dec-99	BC	ND	ND	ND	ND
MW75-99-8	25.7	Dec-99	BC	ND	ND	ND	ND
MW75-99-8	28.1	Dec-99	BC	ND	ND	ND	ND

ND = Not detected (< 0.01 mg/kg)

Detections of PCBs greater than 1 mg/kg are in **boldface type.**

BC = Analysis by BC Laboratories

LBNL = Analysis by LBNL laboratory

Table 2.

Soil Sampling Results for VOCs, SVOCs, TPH, and Cyanide

SWMU 3-6: Building 75 Former Hazardous Waste Handling and Storage Facility

Sample ID	Depth (ft bgs)	Date	Lab	VOCs (8260) mg/kg	SVOCs (8270) mg/kg	TPH-Crude/ Waste Oil mg/kg	TPH-Fuel Identification mg/kg	Cyanide mg/kg
SB75-96-1-4	4.0	Jul-96	BC	cis-1,2-DCE=0.2 TCE=0.015			Crude/Waste Oil=37	
SB75-96-1-9	9.0	Jul-96	BC	chlorobenzene=0.011 cis-1,2-DCE=0.09			Crude/Waste Oil=46	
SB75-96-1-14.2	14.2	Jul-96	BC	cis-1,2-DCE=0.0081			ND	
SB75-96-1-19.3	19.3	Jul-96	BC	ND			ND	
SB75-96-1-24.1	24.1	Jul-96	BC	ND			ND	
SB75-96-1-29	29.0	Jul-96	BC	ND			ND	
SB75-96-2-4.7	4.7	Jul-96	BC	ethyl benzene=0.0064 total xylenes=0.034			TPH-Motor Oil=86	
SB75-96-2-9.5	9.5	Jul-96	BC	ND			ND	
SB75-96-2-15.1	15.1	Jul-96	BC	cis-1,2-DCE=0.0061			ND	
SB75-96-2-20	20.0	Jul-96	BC	cis-1,2-DCE=0.015			Hydraulic/Motor Oil=15 Oil and Grease = 32	
SB75-96-3-5.1	5.1	Jul-96	BC	cis-1,2-DCE=0.055			ND	
SB75-96-3-10.1	10.1	Jul-96	BC	ND			ND	
SB75-96-3-15	15.0	Jul-96	BC	ND			ND	
SB75-96-3-19.5	19.5	Jul-96	BC	ND			ND	
SB75-96-4-6	6.0	Jul-96	BC	ND				
SB75-96-4-11	11.0	Jul-96	BC	ND				
SB75-96-4-15.8	15.8	Jul-96	BC	ND				
SB75-96-4-20.8	20.8	Jul-96	BC	ND				
SB75A-96-1-3.8	3.8	Sep-96	BC	ND			Crude/Waste Oil=12	
SB75A-96-1-12.5	12.5	Sep-96	BC	ND			Crude/Waste Oil=29	
SB75A-96-1-17.8	17.8	Sep-96	BC	ND			Diesel=170	
SB75A-96-1-22.5	22.5	Sep-96	BC	ND			Crude/Waste Oil=19	
SB75A-98-1-1.5	1.5	Apr-98	BC	ND				
SB75A-98-1-3.2	3.2	Apr-98	BC	ND				
SB75A-98-1-5.8	5.8	Apr-98	BC	ND				
SB75A-98-1-11	11.0	Apr-98	BC	ND				
SB75A-98-2-1.8	1.8	Apr-98	BC	ND				
SB75A-98-2-3.2	3.2	Apr-98	BC	ND				
SB75A-98-2-6	6.0	Apr-98	BC	cis-1,2-DCE=0.016				
SB75A-98-2-10.8	10.8	Apr-98	BC	ND				
SB75AHW-97-1-1.0	1.0	Jul-97	BC	ND	ND	Crude/Waste Oil=49		<1
SB75AHW-97-1-3.0	3.0	Jul-97	BC	ND	ND	<20		<1
SB75AHW-97-2-1.1	1.1	Jul-97	BC	ND	ND	<20		<1
SB75AHW-97-2-2.6	2.6	Jul-97	BC	ND	ND	<20		<1
SB75AHW-97-3-1.0	1.0	Jul-97	BC	ND	ND	Crued/Waste Oil=38		<1
SB75AHW-97-3-2.6	2.6	Jul-97	BC	ND	ND	Crude/Waste Oil=460		<1
SB75AHW-97-4-1.0	1.0	Jul-97	BC	ND	ND	<20		<1
SB75AHW-97-4-2.5	2.5	Jul-97	BC	ND	ND	Crude/Waste Oil=20		<1
SB75AHW-97-5-1.0	1.0	Jul-97	BC	ND	ND	<20		<1
SB75AHW-97-5-2.8	2.8	Jul-97	BC	ND	ND	<20		<1
SB75AHW-97-6-1.0	1.0	Jul-97	BC	ND	ND	<20		<1
SB75AHW-97-6-2.9	2.9	Jul-97	BC	ND	ND	<20		<1
SB75AHW-97-7-1.0	1.0	Jul-97	BC	ND	Di-n-butyl phthalate=1.5	Crude/Waste Oil=200		<1
SB75AHW-97-7-3.0	3.0	Jul-97	BC	ND	Di-n-butyl phthalate=1.7	<20		<1
SB75AHW-97-8-1.0	1.0	Jul-97	BC	ND	Butyl benzyl phthalate=0.10 Di-n-butyl phthalate=1.8	Crude/Waste Oil=110		<1
SB75AHW-97-8-3.2	3.2	Jul-97	BC	ND	Butyl benzyl phthalate=0.32 Di-n-butyl phthalate=1.9	<20		<1
SB75AHW-97-9-1.3	1.3	Jul-97	BC	ND	ND	Crude/Waste Oil=40		<1
SB75AHW-97-9-3.0	3.0	Jul-97	BC	cis-1,2-DCE=0.013	ND	<20		<1
SB75AHW-97-9-4.7	4.7	Sep-97	BC	cis-1,2-DCE=0.021	ND	<20		<1
SB75AHW-97-10-1.0	1.0	Jul-97	BC	ND	ND	<20		<1
SB75AHW-97-10-3.0	3.0	Jul-97	BC	ND	ND	Crude/Waste Oil=180		<1
SB75AHW-97-11-1.0	1.0	Jul-97	BC	ND	ND	<20		<1
SB75AHW-97-11-2.5	2.5	Jul-97	BC	ND	ND	<20		<1
SB75AHW-97-12-1.0	1.0	Jul-97	BC	ND	ND	<20		<1
SB75AHW-97-12-2.8	2.8	Jul-97	BC	ND	ND	Crude/Waste Oil=120		<1
SB75AHW-97-12-3.2	3.2	Sep-97	BC	ND	Phenanthrene=0.20	Crude/Waste Oil=400		<1
SB75AHW-97-13-1.0	1.0	Mar-98	BC	ND	ND	<20		<0.50
SB75AHW-97-13-2.8	2.8	Mar-98	BC	ND	ND	Crude/Waste Oil=43		<0.50
SB75AHW-97-14-1.1	1.1	Mar-98	BC	ND	ND	<20		<0.49
SB75AHW-97-14-3	3.0	Mar-98	BC	ND	ND	<20		<0.49

Table 2.
Soil Sampling Results for VOCs, SVOCs, TPH, and Cyanide
SWMU 3-6: Building 75 Former Hazardous Waste Handling and Storage Facility

Sample ID	Depth (ft bgs)	Date	Lab	VOCs (8260) mg/kg	SVOCs (8270) mg/kg	TPH-Crude/ Waste Oil mg/kg	TPH-Fuel Identification mg/kg	Cyanide mg/kg
SB75AHW-97-15-1.2	1.2	Mar-98	BC	ND	ND	<20		<0.47
SB75AHW-97-15-3.2	3.2	Mar-98	BC	Methylene chloride=0.012	ND	<20		<0.50
SB75EHW-97-1-1	1.0	Aug-97	BC	PCE=0.0058	ND	<20		<1
SB75EHW-97-1-3.5	3.5	Aug-97	BC	ND	ND	<20		<1
SB75EHW-97-1-4.3	4.3	Sep-97	BC	ND	ND	<20		<1
SB75EHW-97-2-1.1	1.1	Aug-97	BC	ND	ND	<20		<1
SB75EHW-97-2-3.5	3.5	Aug-97	BC	ND	ND	<20		<1
SB75EHW-97-2-5	5.0	Sep-97	BC	ND	ND	<20		<1
SB75EHW-97-3-1.1	1.1	Aug-97	BC	ND	ND	<20		<1
SB75EHW-97-3-2.8	2.8	Aug-97	BC	ND	ND	<20		<1
SB75FLHW-97-1-0.5	0.5	Aug-97	BC	ND	Benzyl alcohol=0.26 Bis(2-ethylhexyl) phthalate=0.34	Crude/Waste Oil=27		<1
SB75FLHW-97-1-3.8	3.8	Aug-97	BC	ND	Benzyl alcohol=0.21	<20		<1
SB75FLHW-97-2-0.5	0.5	Aug-97	BC	ND	ND	Crude/Waste Oil=350*		<1
SB75FLHW-97-2-3	3.0	Aug-97	BC	ND	Benzyl alcohol=0.11	<20		<1
SB75FLHW-97-3-0.5	0.5	Aug-97	BC	ND	Benzyl alcohol=0.22	Crude/Waste Oil=36		<1
SB75FLHW-97-3-3.2	3.2	Aug-97	BC	ND	Benzyl alcohol=0.19	<20		<1
SB75FLHW-97-4-0.5	0.5	Aug-97	BC	ND	Benzyl alcohol=0.32	Crude/Waste Oil=100		<1
SB75FLHW-97-4-2.6	2.6	Aug-97	BC	ND	Benzyl alcohol=0.18	Crude/Waste Oil=28		<1
SB75JHW-97-1-1.8	1.8	Aug-97	BC	ND	ND	Crude/Waste Oil=650		<1
SB75JHW-97-2-1.3	1.3	Sep-97	BC	ND	ND	Crude/Waste Oil=57		<1
SB75LYHW-97-1-0.8	0.8	Aug-97	BC	ND	ND	<20		<1
SB75LYHW-97-1-2.8	2.8	Aug-97	BC	ND	ND	<20		<1
SB75LYHW-97-2-1.2	1.2	Aug-97	BC	PCE=0.025	ND	<20		<1
SB75LYHW-97-2-3.7	3.7	Aug-97	BC	ND	ND	<20		<1
SB75LYHW-97-3-1	1.0	Aug-97	BC	ND	ND	<20		<1
SB75LYHW-97-3-2.5	2.5	Aug-97	BC	ND	ND	<20		<1
SB75LYHW-97-4-1.2	1.2	Aug-97	BC	1,1-DCE=0.0063 1,1,1-TCA=0.015	ND	<20		<1
SB75LYHW-97-4-2	2.0	Aug-97	BC	ND	ND	<20		<1
SB75LYHW-97-5-1	1.0	Aug-97	BC	ND	ND	Crude/Waste Oil=27		<1
SB75LYHW-97-5-2.7	2.7	Aug-97	BC	ND	ND	Crude/Waste Oil=39		<1
SB75LYHW-97-6-0.7	0.7	Aug-97	BC	ND	Benzyl alcohol=0.19	<20		<1
SB75LYHW-97-6-2.8	2.8	Aug-97	BC	ND	Benzyl alcohol=0.28	<20		<1
SB75YHW-97-1-0.5	0.5	Aug-97	BC	ND	ND	<20		<1
SB75YHW-97-1-3.2	3.2	Aug-97	BC	ND	ND	<20		<1
SB75YHW-97-2-0.8	0.8	Aug-97	BC	ND	ND	Crude/Waste Oil=67		<1
SB75YHW-97-2-3	3.0	Aug-97	BC	ND	ND	Crude/Waste Oil=67		<1
SB75YHW-97-3-0.8	0.8	Aug-97	BC	ND	ND	Crude/Waste Oil=37		<1
SB75YHW-97-3-3	3.0	Aug-97	BC	ND	ND	Crude/Waste Oil=160		<1
SB75YHW-97-4-0.7	0.7	Aug-97	BC	ND	ND	<20		<1
SB75YHW-97-4-2.8	2.8	Aug-97	BC	ND	ND	<20		<1
SB75YHW-97-5-0.8	0.8	Aug-97	BC	ND	ND	Crude/Waste Oil=65		<1
SB75YHW-97-5-3	3.0	Aug-97	BC	ND	ND	<20		<1
SB75YHW-97-6-2	2.0	Aug-97	BC	ND	ND	<20		<1
SB75YHW-97-6-3.2	3.2	Aug-97	BC	ND	ND	<20		<1
SB75YHW-97-7-1.2	1.2	Aug-97	BC	ND	ND	<20		<1
SB75YHW-97-7-3	3.0	Aug-97	BC	ND	ND	<20		<1
SB75YHW-97-8-1.3	1.3	Aug-97	BC	PCE=0.028	ND	<20		<1
SB75YHW-97-8-3.5	3.5	Aug-97	BC	PCE=0.14 TCE=0.011	ND	<20		<1
SB75YHW-97-8-4.3	4.3	Sep-97	BC	PCE=0.072 TCE=0.0054	ND	<20		<1
SB75YHW-97-8-5.4	5.4	Sep-97	BC	PCE=0.31 TCE=0.0069	ND	<20		<1
SB75YSWR-97-1-2.6	2.6	Oct-97	BC	PCE=0.0070				<1.0
SB75YSWR-97-1-3.6	3.6	Oct-97	BC	PCE=0.019				<1.0
SB75YSWR-97-2-2.5	2.5	Oct-97	BC	PCE=0.040				<1.0
SB75YSWR-97-2-3.5	3.5	Oct-97	BC	PCE=0.069 TCE=0.026				<1.0

Table 2.

Soil Sampling Results for VOCs, SVOCs, TPH, and Cyanide

SWMU 3-6: Building 75 Former Hazardous Waste Handling and Storage Facility

Sample ID	Depth (ft bgs)	Date	Lab	VOCs (8260) mg/kg	SVOCs (8270) mg/kg	TPH-Crude/ Waste Oil mg/kg	TPH-Fuel Identification mg/kg	Cyanide mg/kg
MW75-96-20-5.2	5.2	Oct-96	CLS	acetone=0.27 chlorobenzene=0.03 cis-1,2-DCE=0.42 trans-1,2-DCE=0.008 p-isopropyltoluene=0.013 PCE=0.019 TCE=0.0077 1,2,4-trimethylbenzene=0.14 1,3,5-trimethylbenzene=0.04 toluene=0.0062 xylenes=0.048				
MW75-96-20-11	11.0	Feb-97	BC	ND				
MW75-96-20-20.5	20.5	Feb-97	BC	ND				
MW75-96-20-30.5	30.5	Feb-97	BC	ND				
MW75-96-20-40.2	40.5	Feb-97	BC	ND				
MW75-96-20-50.8	50.8	Feb-97	BC	ND				
MW75-98-14-5.7	5.7	Sep-98	BC	ND				
MW75-98-14-10.2	10.2	Sep-98	BC	ND				
MW75-98-14-14.1	14.1	Sep-98	BC	ND				
MW75-98-14-19.3	19.3	Sep-98	BC	ND				
MW75-98-14-24.2	24.2	Sep-98	BC	ND				
MW75-98-14-29.2	29.2	Sep-98	BC	ND				
MW75-98-14-34.2	34.2	Sep-98	BC	ND				
MW75-98-15-9.5	9.5	Sep-98	BC	ND				
MW75-98-15-18.5	18.5	Sep-98	BC	ND				
MW75-98-15-28.6	28.6	Sep-98	BC	ND				
MW75-99-4-3.0	3.0	Jul-99	BC	Methylene chloride=0.017				
MW75-99-4-4.5	4.5	Jul-99	BC	ND				
MW75-99-4-6.5	6.5	Jul-99	BC	PCE=0.009				
MW75-99-4-9.2	9.2	Jul-99	BC	PCE=0.019				
MW75-99-4-13.2	13.2	Jul-99	BC	ND				
MW75-99-4-17.0	17.0	Jul-99	BC	ND				
MW75-99-4-18.8	18.8	Jul-99	BC	ND				
MW75-99-4-28.5	28.5	Jul-99	BC	ND				
MW75-99-4-33.7	33.7	Jul-99	BC	ND				
MW91-4-S1 (5.0')	5.0	Nov-91	LBNL	ND				
MW91-4-S2 (10.0')	10.0	Nov-91	LBNL	ND				
MW91-4-S3 (18.5')	18.5	Nov-91	LBNL	ND				
MW91-4-S4 (23.5')	23.5	Nov-91	LBNL	ND				
MW91-4-S5 (34.5')	34.5	Nov-91	LBNL	ND				
MW91-4-S6 (44.5')	44.5	Nov-91	LBNL	ND				
MW91-4-S7 (54.5')	54.5	Nov-91	LBNL	ND				

[blank box] = Not analyzed
[shaded box] ND = Not detected
* - Reported as Kerosene, although chromatogram not typical of kerosene
BC = Analysis by BC Laboratories
CLS = Analysis by California Laboratory Services
LBNL = Analysis by LBNL laboratory

Table 3
Soil Sampling Results for Metals
SWMU 3-6: Building 75 Former Hazardous Waste Handling and Storage Facility
(Concentrations in mg/kg)

Sample ID	Depth (ft bgs)	Date	Sb	As	Ba	Be	Cd	Cr	CrVI	Co	Cu	Pb	Hg	Mo	Ni	Se	Ag	Tl	V	Zn
*Maximum Background Concentrations***			5.5	19.1	323.6	1.0	2.7	99.6		22.2	69.4	16.1	0.4	7.4	119.8	5.6	1.8	27.1	74.3	106.1
USEPA Region 9 PRGs			30	0.38	5200	150	37	210	30	3300	2800	400	22	370	1500	370	370	6	520	22000
California Modified PRGs							9		0.2			130			150					
SB75AHW-97-1-1.0	1.0	Jul-97	<10	4.5	116	<1	<1	56	NA	13	29	5.3	<0.2	<5	55	<1	<2	<10	47	56
SB75AHW-97-1-3.0	3.0	Jul-97	<10	4.5	162	<1	1.0	113	NA	24	61	6.4	<0.2	<5	138	<1	<2	<10	67	93
SB75AHW-97-2-1.1	1.1	Jul-97	<10	5.1	134	<1	<1	62	NA	14	39	5.3	<0.2	<5	60	<1	<2	<10	62	69
SB75AHW-97-2-2.6	2.6	Jul-97	<10	3.5	65	<1	<1	43	NA	13	38	<5	<0.2	<5	61	<1	<2	<10	42	56
SB75AHW-97-3-1.0	1.0	Jul-97	<10	4.6	138	<1	<1	48	NA	14	39	5.1	<0.2	<5	52	<1	<2	<10	51	84
SB75AHW-97-3-2.6	2.6	Jul-97	<10	3.3	83	<1	<1	47	NA	13	29	7.2	<0.2	<5	52	<1	<2	<10	47	73
SB75AHW-97-4-1.0	1.0	Jul-97	<10	6.5	138	<1	<1	50	NA	13	24	7.4	<0.2	<5	57	<1	<2	<10	60	56
SB75AHW-97-4-2.5	2.5	Jul-97	<10	2.3	41	<1	<1	27	NA	12	39	5.7	<0.2	<5	35	<1	<2	<10	37	101
SB75AHW-97-5-1.0	1.0	Jul-97	<10	5.1	135	<1	<1	48	NA	12	38	<5	<0.2	<5	52	<1	<2	<10	55	72
SB75AHW-97-5-2.8	2.8	Jul-97	<10	6.1	134	<1	<1	64	NA	15	48	7.0	<0.2	<5	87	<1	<2	<10	47	71
SB75AHW-97-6-1.0	1.0	Jul-97	<10	2.0	84	<1	<1	68	NA	9.9	31	<5	<0.2	<5	71	<1	<2	<10	42	57
SB75AHW-97-6-2.9	2.9	Jul-97	<10	4.4	146	<1	<1	69	NA	13	31	5.5	<0.2	<5	89	<1	<2	<10	45	65
SB75AHW-97-7-1.0	1.0	Jul-97	<10	4.2	153	<1	<1	99	NA	17	26	<5	<0.2	<5	80	<1	<2	<10	79	50
SB75AHW-97-7-3.0	3.0	Jul-97	<10	4.9	152	<1	<1	75	NA	14	37	<5	<0.2	<5	86	1.1	<2	<10	61	59
SB75AHW-97-8-1.0	1.0	Jul-97	<10	4.7	152	<1	<1	152	NA	28	68	<5	<0.2	<5	167	1.3	<2	<10	65	70
Soluble analyses		Jul-97							0.08						<0.5					
SB75AHW-97-8-3.2	3.2	Jul-97	<10	1.4	216	<1	<1	130	NA	28	44	<5	<0.2	<5	77	1.1	<2	<10	108	44
SB75AHW-97-9-1.3	1.3	Jul-97	<10	5.9	132	<1	<1	55	NA	13	50	5.9	<0.2	<5	61	<1	<2	<10	61	75
SB75AHW-97-9-3.0	3.0	Jul-97	<10	7.4	207	<1	<1	96	NA	16	36	5.6	<0.2	<5	117	<1	<2	<10	63	70
SB75AHW-97-9-4.7	4.7	Sep-97	<10	6.8	122	<1	<1	83	NA	14	33	5.4	<0.2	<5	108	<1	<2	<10	53	57
SB75AHW-97-10-1.0	1.0	Jul-97	<10	4.8	118	<1	<1	46	NA	11	23	<5	<0.2	<5	52	<1	<2	<10	51	50
SB75AHW-97-10-3.0	3.0	Jul-97	<10	4.5	128	<1	<1	177	NA	27	34	5.9	<0.2	<5	272	<1	<2	<10	76	59
Soluble analyses		Jul-97							<0.05						<0.5					
SS-75AHW10-98 REDO		Jul-98	NA	NA	NA	NA	NA	69	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SB75AHW-97-11-1.0	1.0	Jul-97	<10	5.1	136	<1	<1	53	NA	14	54	6.5	<0.2	<5	64	<1	<2	<10	61	65
SB75AHW-97-11-2.5	2.5	Jul-97	<10	5.5	148	<1	<1	49	NA	20	60	6.5	<0.2	<5	70	<1	<2	<10	55	67
SB75AHW-97-12-1.0	1.0	Jul-97	<10	4.6	119	<1	<1	51	NA	12	45	5.0	<0.2	<5	52	<1	<2	<10	49	57
SB75AHW-97-12-2.8	2.8	Jul-97	<10	3.8	87	<1	<1	54	NA	18	37	5.5	<0.2	<5	59	<1	<2	<10	50	59
SB75AHW-97-12-3.2	3.2	Jul-97	<10	4.9	104	<1	<1	58	NA	15	46	6.3	0.27	<5	78	<1	<2	<10	53	75
SB75AHW-97-13-1.0	1.0	Mar-98	<5	4.2	139	0.55	<0.5	46	NA	11	29	9.6	<0.2	<2.5	46	<0.5	<1	<5	52	48
SB75AHW-97-13-2.8	2.8	Mar-98	<10	7.0	131	<1	<1	91	NA	17	40	13	<0.2	<5	106	<1	<2	<10	67	76
SB75AHW-97-14-1.1	1.1	Mar-98	<5	3.3	37	<0.5	<0.5	29	NA	6.3	12	5.8	<0.2	<2.5	31	<0.5	<1	<5	24	26
SB75AHW-97-14-3	3.0	Mar-98	<10	6.3	118	<1	<1	77	NA	14	45	10	<0.2	<5	91	<1	<2	<10	54	67
SB75AHW-97-15-1.2	1.2	Mar-98	<5	4.5	110	0.61	<0.5	45	NA	12	25	9.8	<0.2	<2.5	52	<0.5	<1	<5	47	40
SB75AHW-97-15-3.2	3.2	Mar-98	<10	2.8	181	<1	<1	91	NA	15	37	20	<0.2	<5	100	1.1	<2	<10	62	68
SB75EHW-97-1-1	1.0	Aug-97	<10	9.1	176	<1	<1	75	NA	15	34	5.0	<0.2	<5	107	<1	<2	<10	55	65
SB75EHW-97-1-3.5	3.5	Aug-97	<10	9.0	306	<1	<1	155	NA	16	59	<5	<0.2	<5	146	<1	<2	<10	68	66
SB75EHW-97-1-4.3	4.3	Sep-97	<10	14	198	<1	<1	95	NA	19	39	8.1	<0.2	<5	154	<1	<2	<10	57	80

Table 3
Soil Sampling Results for Metals
SWMU 3-6: Building 75 Former Hazardous Waste Handling and Storage Facility
(Concentrations in mg/kg)

Sample ID	Depth (ft bgs)	Date	Sb	As	Ba	Be	Cd	Cr	CrVI	Co	Cu	Pb	Hg	Mo	Ni	Se	Ag	Tl	V	Zn
*Maximum Background Concentrations***			5.5	19.1	323.6	1.0	2.7	99.6		22.2	69.4	16.1	0.4	7.4	119.8	5.6	1.8	27.1	74.3	106.1
USEPA Region 9 PRGs			30	0.38	5200	150	37	210	30	3300	2800	400	22	370	1500	370	370	6	520	22000
California Modified PRGs							9		0.2			130			150					
SB75EHW-97-2-1.1	1.1	Aug-97	<10	4.9	118	<1	<1	66	NA	16	47	<5	<0.2	<5	82	<1	<2	<10	48	67
SB75EHW-97-2-3.5	3.5	Aug-97	<10	8.5	196	<1	<1	140	NA	19	34	<5	<0.2	<5	217	<1	<2	<10	59	62
SB75EHW-97-2-5	5.0	Sep-97	<10	10	199	<1	<1	113	NA	18	48	5.3	<0.2	<5	189	<1	<2	<10	50	64
SB75EHW-97-3-1.1	1.1	Aug-97	<10	4.7	117	<1	<1	74	NA	14	36	<5	0.3	<5	85	<1	<2	<10	57	78
SB75EHW-97-3-2.8	2.8	Aug-97	<10	6.4	200	<1	<1	216	NA	18	37	<5	<0.2	<5	181	<1	<2	<10	81	59
SB75FLHW-97-1-0.5	0.5	Aug-97	<10	8.7	165	<1	<1	99	NA	19	51	20	<0.2	<5	148	<1	<2	<10	61	101
SB75FLHW-97-1-3.8	3.8	Aug-97	<10	6.7	347	<1	<1	99	NA	15	38	<5	0.22	<5	110	<1	<2	<10	55	66
SB75FLHW-97-2-0.5	0.5	Aug-97	<10	7.6	276	<1	<1	72	NA	13	45	7.3	<0.2	<5	100	<1	<2	<10	56	84
SB75FLHW-97-2-3	3.0	Aug-97	<10	10	363	<1	<1	73	NA	16	37	7.8	<0.2	<5	102	<1	<2	<10	53	80
SB75FLHW-97-3-0.5	0.5	Aug-97	<10	7.1	230	<1	<1	80	NA	17	49	8.6	<0.2	<5	101	<1	<2	<10	60	89
SB75FLHW-97-3-3.2	3.2	Aug-97	<10	7.1	292	<1	<1	82	NA	17	40	8.3	<0.2	<5	109	<1	<2	<10	60	79
SB75FLHW-97-4-0.5	0.5	Aug-97	<10	6.7	222	<1	<1	82	NA	16	46	12	<0.2	<5	91	<1	<2	<10	64	107
SB75FLHW-97-4-2.6	2.6	Aug-97	<10	6.8	249	<1	<1	96	NA	17	39	6.9	<0.2	<5	112	<1	<2	<10	65	77
SB75JHW-97-1-1.8	1.8	Aug-97	<10	6.0	183	<1	<1	88	NA	15	40	5.3	<0.2	<5	105	<1	<2	<10	58	64
SB75JHW-97-2-1.3	1.3	Sep-97	<10	6.4	155	<1	<1	75	NA	14	39	<5	<0.2	<5	93	<1	<2	<10	49	57
SB75LYHW-97-1-0.8	0.8	Aug-97	<10	8.6	143	<1	<1	103	NA	20	40	5.9	<0.2	<5	150	1.1	<2	<10	59	74
SB75LYHW-97-1-2.8	2.8	Aug-97	<10	8.9	160	<1	<1	93	NA	18	45	6.4	<0.2	<5	127	1.1	<2	<10	68	77
SB75LYHW-97-2-1.2	1.2	Aug-97	<10	4.4	84	<1	<1	242	NA	20	71	<5	<0.2	<5	269	<1	<2	<10	53	80
SB75LYHW-97-2-3.7	3.7	Aug-97	<10	7.5	114	<1	<1	101	NA	17	45	<5	<0.2	<5	176	<1	<2	<10	51	66
SS75LYHW2-98 REDO		Jul-98	NA	NA	NA	NA	NA	116	<0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SB75LYHW-97-3-1	1.0	Aug-97	<10	4.5	132	<1	<1	67	NA	13	49	<5	<0.2	<5	88	<1	<2	<10	47	80
SB75LYHW-97-3-2.5	2.5	Aug-97	<20	9.3	167	<2	<2	75	NA	17	35	<10	<0.2	<10	130	<2	<4	<20	48	62
SB75LYHW-97-4-1.2	1.2	Aug-97	<10	6.4	177	<1	<1	82	NA	20	39	6.0	<0.2	<5	111	<1	<2	<10	56	69
SB75LYHW-97-4-2	2.0	Aug-97	<10	3.3	71	<1	<1	61	NA	12	31	<5	<0.2	<5	94	<1	<2	<10	33	50
SB75LYHW-97-5-1	1.0	Aug-97	<10	6.5	94	<1	<1	82	NA	15	41	5.3	<0.2	<5	110	<1	<2	<10	50	68
SB75LYHW-97-5-2.7	2.7	Aug-97	<10	8.1	161	<1	<1	84	NA	16	41	5.2	<0.2	<5	106	<1	<2	<10	64	70
SB75LYHW-97-6-0.7	0.7	Aug-97	<10	6.2	108	<1	<1	72	NA	14	38	<5	<0.2	<5	98	<1	<2	<10	49	69
SB75LYHW-97-6-2.8	2.8	Aug-97	<10	6.6	123	<1	<1	.79	NA	16	53	8.2	<0.2	<5	108	<1	<2	<10	53	84
SB75YHW-97-1-0.5	0.5	Aug-97	<10	4.0	125	<1	<1	50	NA	11	42	<5	<0.2	<5	69	<1	<2	<10	39	67
SB75YHW-97-1-3.2	3.2	Aug-97	<10	6.2	170	<1	<1	85	NA	15	48	6.0	<0.2	<5	95	<1	<2	<10	64	84
SB75YHW-97-2-0.8	0.8	Aug-97	<10	6.7	195	<1	<1	76	NA	15	43	6.2	<0.2	<5	98	<1	<2	<10	58	70
SB75YHW-97-2-3	3.0	Aug-97	<10	4.8	126	<1	<1	77	NA	14	49	5.8	<0.2	<5	94	<1	<2	<10	42	77
SB75YHW-97-3-0.8	0.8	Aug-97	<10	7.3	299	<1	<1	93	NA	17	42	6.0	<0.2	<5	128	<1	<2	<10	55	73
SB75YHW-97-3-3	3.0	Aug-97	<10	4.8	77	<1	<1	46	NA	8.6	19	<5	<0.2	<5	49	<1	<2	<10	33	40
SB75YHW-97-4-0.7	0.7	Aug-97	<10	11	221	<1	<1	92	NA	17	44	6.7	<0.2	<5	137	1.2	<2	<10	53	79
SB75YHW-97-4-2.8	2.8	Aug-97	<10	9.8	392	<1	<1	100	NA	17	46	6.3	<0.2	<5	124	<1	<2	<10	66	77
SB75YHW-97-5-0.8	0.8	Aug-97	<10	5.6	154	<1	<1	72	NA	15	49	5.4	<0.2	<5	101	1.0	<2	<10	50	79
SB75YHW-97-5-3	3.0	Aug-97	<10	9.2	316	<1	<1	80	NA	16	54	5.8	<0.2	<5	119	<1	<2	<10	49	79

Table 3
Soil Sampling Results for Metals
SWMU 3-6: Building 75 Former Hazardous Waste Handling and Storage Facility
(Concentrations in mg/kg)

Sample ID	Depth (ft bgs)	Date	Sb	As	Ba	Be	Cd	Cr	CrVI	Co	Cu	Pb	Hg	Mo	Ni	Se	Ag	Tl	V	Zn
*Maximum Background Concentrations***			5.5	19.1	323.6	1.0	2.7	99.6		22.2	69.4	16.1	0.4	7.4	119.8	5.6	1.8	27.1	74.3	106.1
USEPA Region 9 PRGs			30	0.38	5200	150	37	210	30	3300	2800	400	22	370	1500	370	370	6	520	22000
California Modified PRGs							9		0.2			130			150					
SB75YHW-97-6-2	2.0	Aug-97	<10	4.5	16	<1	<1	30	NA	6.8	8.0	<5	<0.2	<5	28	<1	<2	<10	21	21
SB75YHW-97-6-3.2	3.2	Aug-97	<10	4.7	32	<1	<1	31	NA	6.6	16	<5	<0.2	<5	35	<1	<2	<10	22	27
SB75YHW-97-7-1.2	1.2	Aug-97	<10	7.2	190	<1	<1	75	NA	16	43	5.9	<0.2	<5	107	1.3	<2	<10	51	78
SB75YHW-97-7-3	3.0	Aug-97	<10	15	170	<1	<1	114	NA	19	55	6.8	<0.2	<5	158	1.4	<2	<10	58	83
SB75YHW-97-8-1.3	1.3	Aug-97	<10	9.2	147	<1	<1	101	NA	16	53	6.1	<0.2	<5	128	1.1	<2	<10	58	79
SB75YHW-97-8-3.5	3.5	Aug-97	<10	10	164	<1	<1	90	NA	20	37	6.7	<0.2	<5	143	1.2	<2	<10	54	70
SB75YHW-97-8-4.3	4.3	Sep-97	<10	18	258	<1	<1	108	NA	17	36	5.8	<0.2	<5	178	<1	<2	<10	47	63
SB75YHW-97-8-5.4	5.4	Sep-97	<10	10	182	<1	<1	204	NA	19	32	<5	<0.2	<5	216	<1	<2	<10	69	54
SB75YSWR-97-1-2.6	2.6	Oct-97	<20	7.4	258	<2	<2	65	NA	17	34	<10	0.24	<10	95	<2	<4	<20	56	68
SB75YSWR-97-1-3.6	3.6	Oct-97	<10	14	293	<1	<1	93	NA	17	54	6.3	<0.2	<5	156	1.5	<2	<10	54	82
SB75YSWR-97-2-2.5	2.5	Oct-97	<10	9.5	188	<1	<1	131	NA	16	45	<5	<0.2	<5	121	<1	<2	<10	65	71
SB75YSWR-97-2-3.5	3.5	Oct-97	<10	8.3	165	<1	<1	90	NA	17	71	6.7	<0.2	<5	114	1.3	<2	<10	57	86
SB75-96-1-4	4.0	Jul-96	<20	5.3	112	<2	<2	83	NA	16	38	<10	<0.2	<10	102	<2	<4	<20	57	72
SB75-96-1-9	9.0	Jul-96	<20	<2	117	<2	<2	129	NA	26	44	<10	<0.2	<10	68	<2	<4	<20	109	59
SB75-96-1-14.2	14.2	Jul-96	<20	<2	133	<2	<2	112	NA	17	44	<10	<0.2	<10	83	<2	<4	<20	82	79
SB75-96-1-19.3	19.3	Jul-96	<20	2.4	96	<2	<2	66	NA	14	36	<10	<0.2	<10	91	<2	<4	<20	47	78
SB75-96-1-24.1	24.1	Jul-96	<20	4.0	145	<2	<2	76	NA	15	41	<10	<0.2	<10	93	<2	<4	<20	49	82
SB75-96-1-29	29.0	Jul-96	<20	2.0	150	<2	<2	65	NA	13	33	<10	0.24	<10	85	<2	<4	<20	44	97
SB75A-96-1-3.8	3.8	Sep-96	<10	1.9	129	<1	<1	114	NA	20	35	<5	<0.2	<5	66	1.4	<2	<10	103	45
SB75A-96-1-12.5	12.5	Sep-96	<10	4.0	95	<1	<1	63	NA	12	32	<5	<0.2	<5	75	<1	<2	<10	49	60
SB75A-96-1-17.8	17.8	Sep-96	<10	11.0	200	<1	<1	82	NA	16	39	5.4	<0.2	<5	91	1.3	<2	<10	69	89
SB75A-96-1-22.5	22.5	Sep-96	<10	8.7	199	<1	<1	83	NA	16	51	5.3	<0.2	<5	106	1.3	<2	<10	66	88
SB75-96-2-4.7	4.7	Jul-96	<20	5.8	109	<2	<2	73	NA	15	61	<10	<0.2	<10	95	<2	<4	<20	45	94
SB75-96-2-9.5	9.5	Jul-96	<20	9.6	146	<2	<2	80	NA	16	43	<10	<0.2	<10	111	<2	<4	<20	55	88
SB75-96-2-15.1	15.1	Jul-96	<20	<2	118	<2	<2	113	NA	20	38	<10	<0.2	<10	66	<2	<4	<20	94	46
SB75-96-2-20	20.0	Jul-96	<20	<2	125	<2	<2	120	NA	22	43	<10	<0.2	<10	67	<2	<4	<20	91	55
SB75-96-3-5.1	5.1	Jul-96	<20	5.8	109	<2	<2	77	NA	15	45	<10	<0.2	<10	111	<2	<4	<20	49	86
SB75-96-3-10.1	10.1	Jul-96	<20	4.2	127	<2	<2	173	NA	23	126	<10	<0.2	<10	200	<2	<4	<20	74	116
SB75-96-3-15	15.0	Jul-96	<20	5.3	151	<2	<2	206	NA	30	32	<10	<0.2	<10	277	<2	<4	<20	78	57
SB75-96-3-19.5	19.5	Jul-96	<20	5.4	187	<2	<2	194	NA	22	47	<10	<0.2	<10	234	<2	<4	<20	72	69
SB75-96-4-6-20.8Comp	20.8	Jul-96	<20	4.4	163	<2	<2	105	NA	19	45	<10	<0.2	<10	157	<2	<4	<20	65	79
MW91-4-S1 (5.0')	5.0	Nov-91	<2	1	150	0.6	<0.2	74	NA	15	35	14	<0.2	<0.6	100	<2	<0.2	10	57	67
MW91-4-S2 (10.0')	10.0	Nov-91	<2	2	140	0.7	<0.2	88	NA	16	48	16	<0.2	<0.6	97	<2	<0.2	14	62	84
MW91-4-S3 (18.5')	18.5	Nov-91	<2	<1	220	0.8	<0.2	85	NA	19	26	14	<0.2	<0.6	76	<2	<0.2	11	71	49
MW91-4-S4 (23.5')	23.5	Nov-91	<2	1	140	0.8	<0.2	77	NA	17	29	16	<0.2	<0.6	96	<2	<0.2	16	62	77
MW91-4-S5 (34.5')	34.5	Nov-91	<2	1	220	0.7	0.3	62	NA	15	29	15	<0.2	<0.6	100	<2	<0.2	4	48	68
MW91-4-S6 (44.5')	44.5	Nov-91	<2	<1	170	0.6	0.3	60	NA	15	36	13	<0.2	<0.6	88	<2	<0.2	10	42	70
MW91-4-S7 (54.5')	54.5	Nov-91	<2	<1	240	0.6	<0.2	65	NA	14	30	13	<0.2	<0.6	84	<2	<0.2	4	53	66

Table 3
Soil Sampling Results for Metals
SWMU 3-6: Building 75 Former Hazardous Waste Handling and Storage Facility
(Concentrations in mg/kg)

Sample ID	Depth (ft bgs)	Date	Sb	As	Ba	Be	Cd	Cr	CrVI	Co	Cu	Pb	Hg	Mo	Ni	Se	Ag	Tl	V	Zn
*Maximum Background Concentrations***			5.5	19.1	323.6	1.0	2.7	99.6		22.2	69.4	16.1	0.4	7.4	119.8	5.6	1.8	27.1	74.3	106.1
USEPA Region 9 PRGs			30	0.38	5200	150	37	210	30	3300	2800	400	22	370	1500	370	370	6	520	22000
California Modified PRGs							9		0.2			130			150					
MW75-96-20-5.2	5.2	Oct-96	<0.9	<1	8.4	<0.5	<1	<1	NA	<5	<1	<5	<0.2	<4	<5	<1	<0.4	<4	1.8	<5
MW75-96-20-11	11.0	Feb-97	<10	3.2	161	<1	<1	107	<0.1	21	24	<5	<0.2	<5	61	<1	<2	<10	90	48
MW75-96-20-20.5	20.5	Feb-97	<10	11	152	<1	<1	71	NA	14	31	5.0	<0.2	<5	85	<1	<2	<10	54	66
MW75-96-20-30.5	30.5	Feb-97	<10	6.3	206	<1	<1	72	NA	15	37	6.1	<0.2	<5	89	<1	<2	<10	55	70
MW75-96-20-40.2	40.2	Feb-97	<10	2.9	167	<1	<1	60	NA	12	25	<5	<0.2	<5	62	<1	<2	<10	57	53
MW75-96-20-50.8	50.8	Feb-97	<10	6.9	242	<1	<1	83	NA	16	46	7.5	<0.2	<5	91	<1	<2	<10	53	68
MW75-99-4-3.0	3.0	Jul-99	<10	10	123	<1	<1	117	<0.1	17	32	<5	<0.2	<5	**168**	<1	<2	<10	57	60
MW75-99-4-3.0 (WET TEST)	3.0	Jul-99	NA	NA	NA	NA	NA	<0.1mg/L	NA	NA	NA	NA	NA	NA	<0.5mg/L	NA	NA	NA	NA	NA
MW75-99-4-4.5	4.5	Jul-99	<10	17	114	<1	<1	97	NA	17	30	5	<0.2	<5	**154**	1.1	<2	<10	60	66
MW75-99-4-6.5	6.5	Jul-99	<10	12	140	<1	<1	97	NA	17	30	<5	<0.2	<5	**192**	1.2	<2	<10	63	63
MW75-99-4-9.2	9.2	Jul-99	<10	5.5	307	<1	<1	97	NA	17	34	<5	<0.2	<5	**154**	<1	<2	<10	56	57
MW75-99-4-13.5	13.5	Jul-99	<10	2.3	291	<1	<1	86	NA	14	36	<5	<0.2	<5	120	<1	<2	<10	56	55
MW75-99-4-18.8	18.8	Jul-99	<10	6.4	226	1.0	<1	74	NA	14	34	5.3	<0.2	<5	**132**	1.3	<2	<10	71	74
MW75-99-4-28.5	28.5	Jul-99	<10	1.2	98	<1	<1	121	NA	13	27	<5	<0.2	<5	**154**	1.0	<2	<10	52	49
MW75-99-4-33.7	33.7	Jul-99	<10	1.7	149	<1	<1	113	NA	13	24	<5	<0.2	<5	**142**	<1	<2	<10	63	43

NA = Not analyzed
<5 = Not detected (reporting limit shown)
25 = Concentration above background but below PRG.
40 = Concentration above both background and PRG.

Table 4a

Chicken Creek Surface Water Sampling Results

(Concentrations in µg/L)

Location	Date	8260		8270	
Chicken Creek Culvert	Jan-93	(L)	ND		
Chicken Creek	Aug-93	(L)	ND	(C)	ND
	Mar-94	(L)	ND		
	Jul-94	(L)	ND		
	Jan-95	(BC)	ND		
	Jul-95	(L)	ND		
	Jan-96	(L)	ND		
	Apr-96	(L)	ND*		
	Apr-97	(L)	ND		
	Jan-98	(L)	ND		
	Apr-99	(L)	ND		

* = Sample missed holding time

ND (shaded) = Not detected
(blank) = Not analyzed

(BC) = Analysis by BC Laboratories
(C) = Analysis by Chromalab
(L) = Analysis by LBNL EML

Table 4b
Chicken Creek Surface Water Sampling Results
Metals
(Concentrations in µg/L)

Location	Date	Lab	Sb	As	Ba	Be	Cd	Cr	Co	Cu	Pb	Hg	Mo	Ni	Se	Ag	Tl	Vn	Zn
		MCL:	6	50	1000	4	5	50	NS	1000 (a)	15 (b)	2	NS	100	50	100 (a)	2	NS	5000 (a)
Chicken Creek	Aug-93	C	<20	<5	72	<1	<1	<10	<10	6.0	<10	<1	<5	<20	<10	<5	<10	<10	<5
	Jul-94	BC	<100	3.0	<100	<10	<5	<10	<10	<10	<5	<0.2	<10	<50	<2	<10	<5	<50	<50
	Aug-95	BC	<4	<2	110	<10	<5	<10	<10	<10	<1	<0.2	<10	<50	<2	<10	<5	<50	<10
	Jan-96	BC	<4	4.0	<100	<10	<10	<10	<50	<10	<5	<0.2	<50	<50	<2	<10	<5	<10	61
			<4	4.2	<100	<10	<10	<10	<50	<10	<5	<0.2	<50	<50	<2	<10	<5	<10	65
	Apr-96	L	<50	3.4	<50	<5	<40	<50	<50	<50	<40	<0.2	<50	<50	<1	<50	<50	<50	22
	Apr-97	L	<4	4.2	118	<4	<5	<5	<5	<5	<5	<0.2	<50	<50	2.6	<5	<1	<50	<20
	Jan-98	L	<1	<2	55.8	<1	<1	<5	<5	4.2	<1	<0.1	<5	<5	<2	<1	<1	3.7	18.9
	Apr-99	L	<1	3.4	109	<1	<1	8.9	<1	3.4	<1	<0.2	1.6	1.6	7.6	<1	<1	23.1	16.4

< = Less than detection limit

BC = Analysis by BC Laboratories
C = Analysis by Chromalab
L = Analysis by LBNL

MCL: Maximum contaminant level for drinking water (determined by California DTSC)
(a): secondary MCL
(b): action level
NS: Not Specified

Table 5a
Chicken Creek Sediment Sampling Results
VOCs, SVOCs, PAHs, PCBs, and TPH

(Concentrations in mg/kg)

Sample ID	Date	Lab	8240/8260	8270	PAH	8080/PCB	TPH-Diese	TPH-Gas
SSCH-1/2A-0.2	Apr-93	Q	ND	ND			63**	<0.2
SS-Chick-96-1A-0	Aug-96	BC	ND	ND				
SS-Chick-96-2A-0			ND	ND				
SS-Chick-96-3A-0			ND	ND				
SS-Chick-96-4A-0			p-isopropyltoluene=0.0058	ND				
SS-Chick-96-5A-0			ND	ND				
SS-Ckn-98-1-0.0	Jan-98	BC			ND	<0.02		
SS-Ckn-98-2-0.0					Benzo(a)pyrene=0.075 Chrysene=0.028	<0.02		
SS-Ckn-98-2A-0.0	Feb-98	BC			ND	PCB 1254=0.014		
SS-Ckn-98-3-0.0	Jan-98	BC			ND	<0.02		
SS-Ckn-98-4-0.0	Feb-98	BC			ND	<0.01		
SS-Ckn-98-5-0	Jun-98	BC				<0.003*		
SS-Ckn-98-6-0						<0.003*		
SS-Ckn-98-7-0						<0.003*		

BC = Analysis by BC Laboratories
Q = Analysis by Quanteq

(blank)	= Not analyzed
ND	= Not detected
<	= Not detected

** = oil detected
* = 8080 analysis only included Aldrin, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, and Dieldrin

Table 5b
Chicken Creek Sediment Sampling Results
Metals

(Concentrations in mg/kg)

Sample ID	Date	Lab	Sb	As	Ba	Be	Cd	Cr	Co	Cu	Pb	Hg	Mo	Ni	Se	Ag	Tl	Vn	Zn
SSCH-1/2A-0.2	Apr-93	Q	<2	2	83	<0.2	0.5	45	9.1	34	35	0.2	<0.6	43	<2	0.5	<3	28	150
SS-Chick-96-1A-0	Aug-96	BC	<10	2.5	71	<1	<1	47	11	22	9.3	<0.2	<5	42	1.2	<2	<10	46	94
SS-Chick-96-2A-0	Aug-96	BC	<10	3.6	145	<1	<1	44	19	19	14	<0.2	<5	59	1.2	<2	<10	48	97
SS-Chick-96-3A-0	Aug-96	BC	<10	3.1	84	<1	<1	30	12	22	15	0.21	<5	37	<1	<2	<10	41	114
SS-Chick-96-4A-0	Aug-96	BC	<10	5.7	134	<1	2.2	58	14	69	38	<0.2	<5	55	1.5	<2	<10	49	257
SS-Chick-96-5A-0	Aug-96	BC	<10	5	116	<1	1.4	52	14	35	58	<0.2	<5	54	1.2	<2	<10	58	149

< (shaded) = Not detected

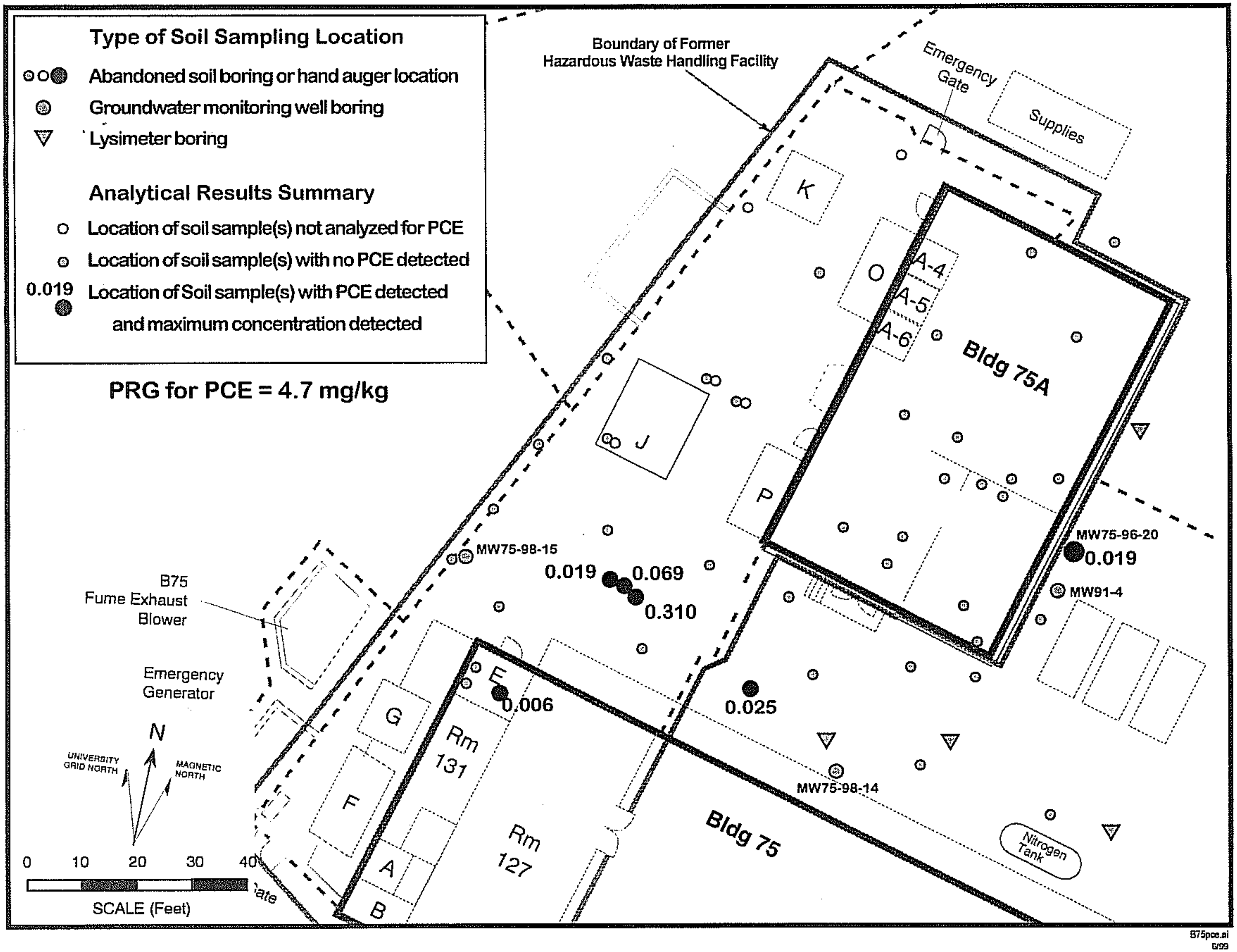
BC = Analysis by BC Laboratories
Q = Analysis by Quanteq

APPENDIX A

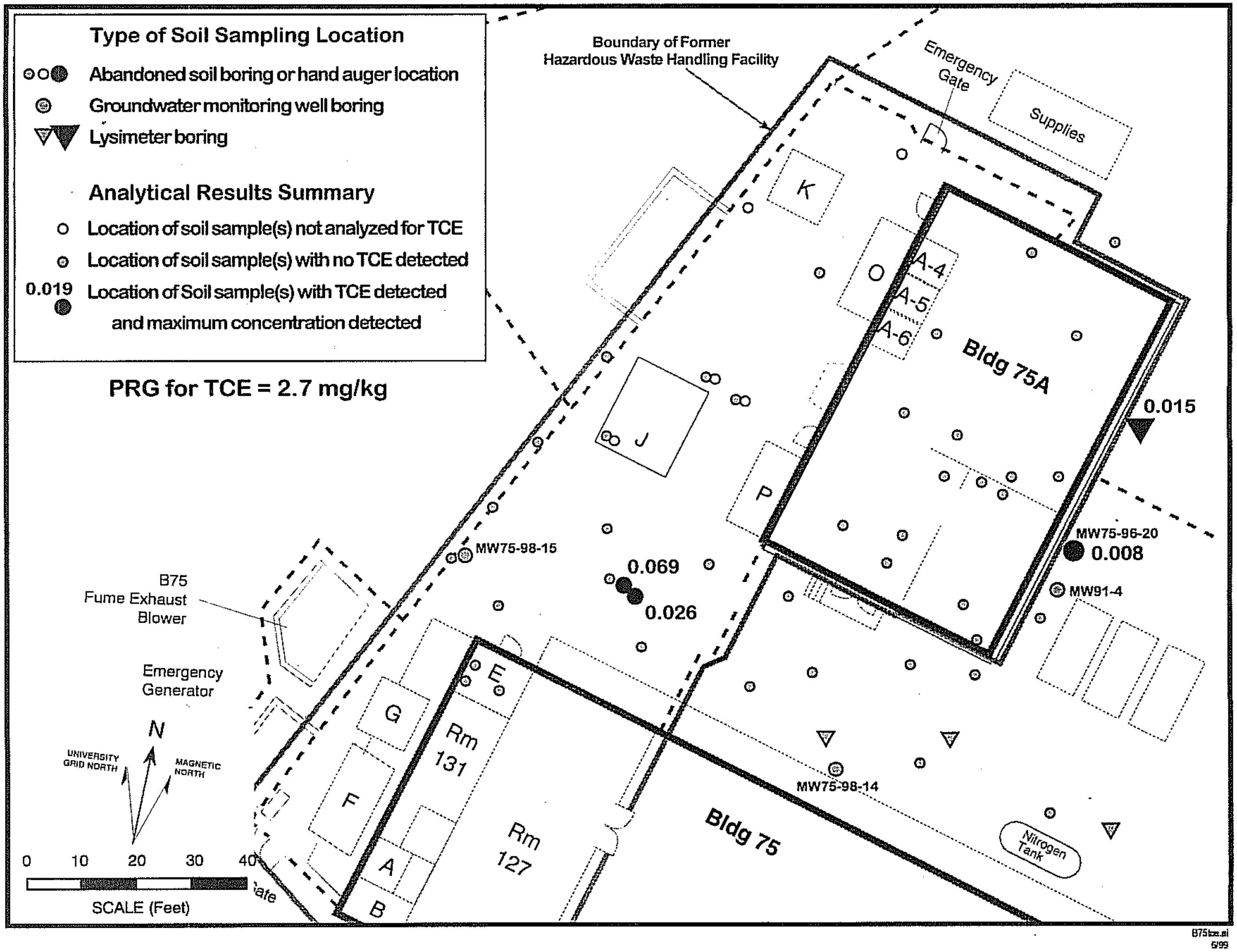
Maps Showing the Locations and Concentrations of Analytes (Excluding PCBs) Detected in Soil Samples

(Berkeley Lab, 1999f)

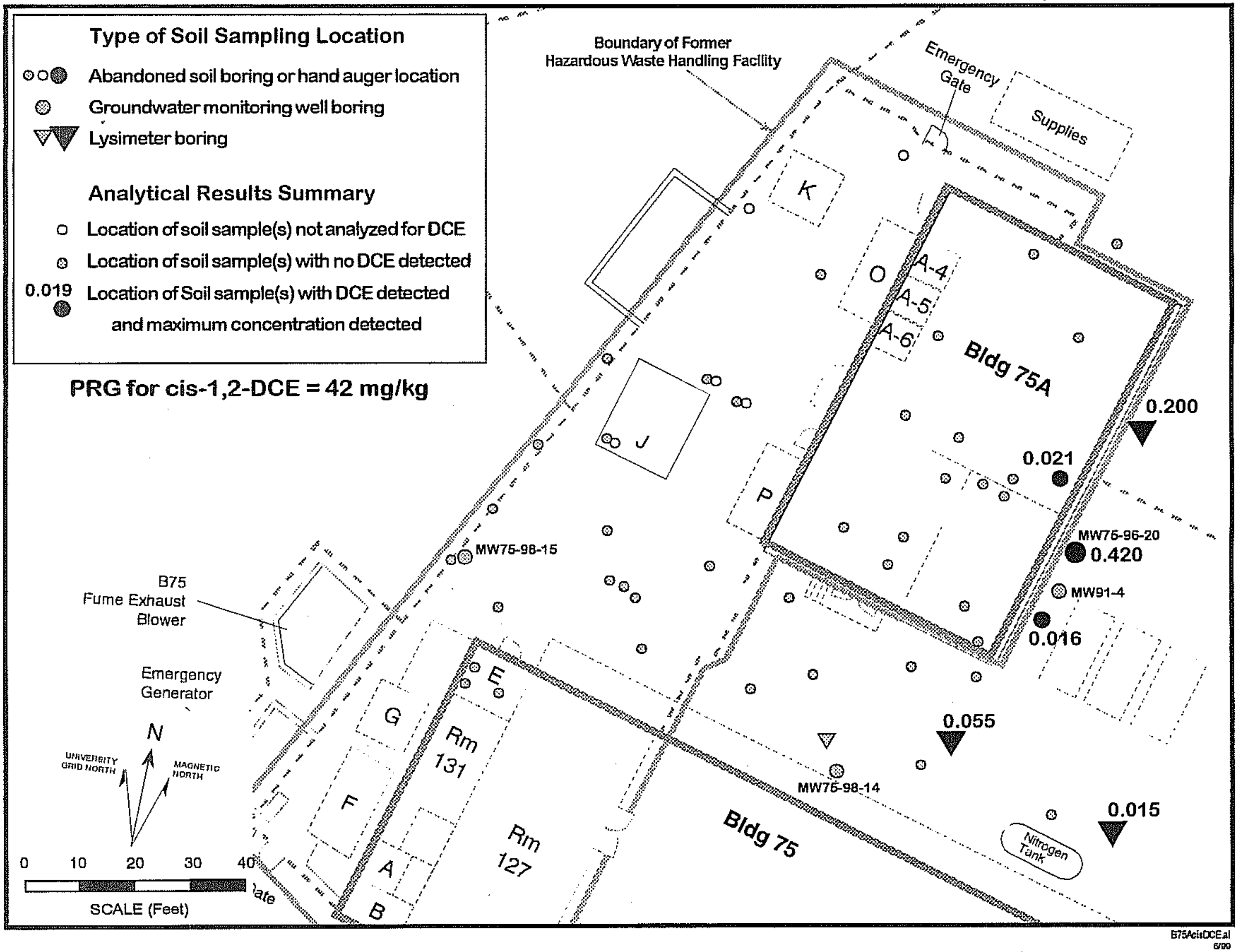
Halogenated and Non-Aromatic Hydrocarbons



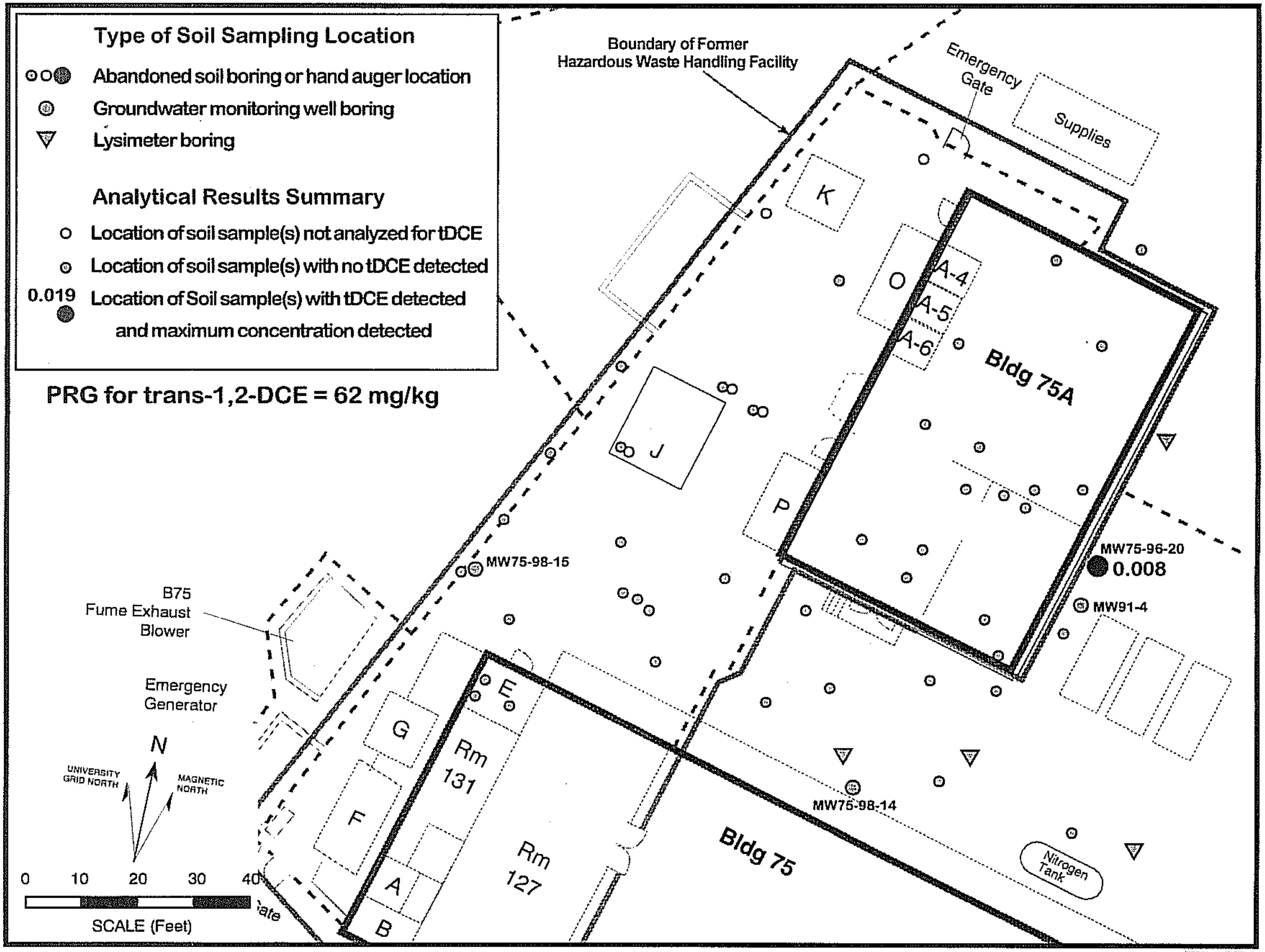
PCE in Soil, Building 75 Former Hazardous Waste Handling Facility



TCE in Soil, Building 75 Former Hazardous Waste Handling Facility



cis-1,2-DCE in Soil, Building 75 Former Hazardous Waste Handling Facility



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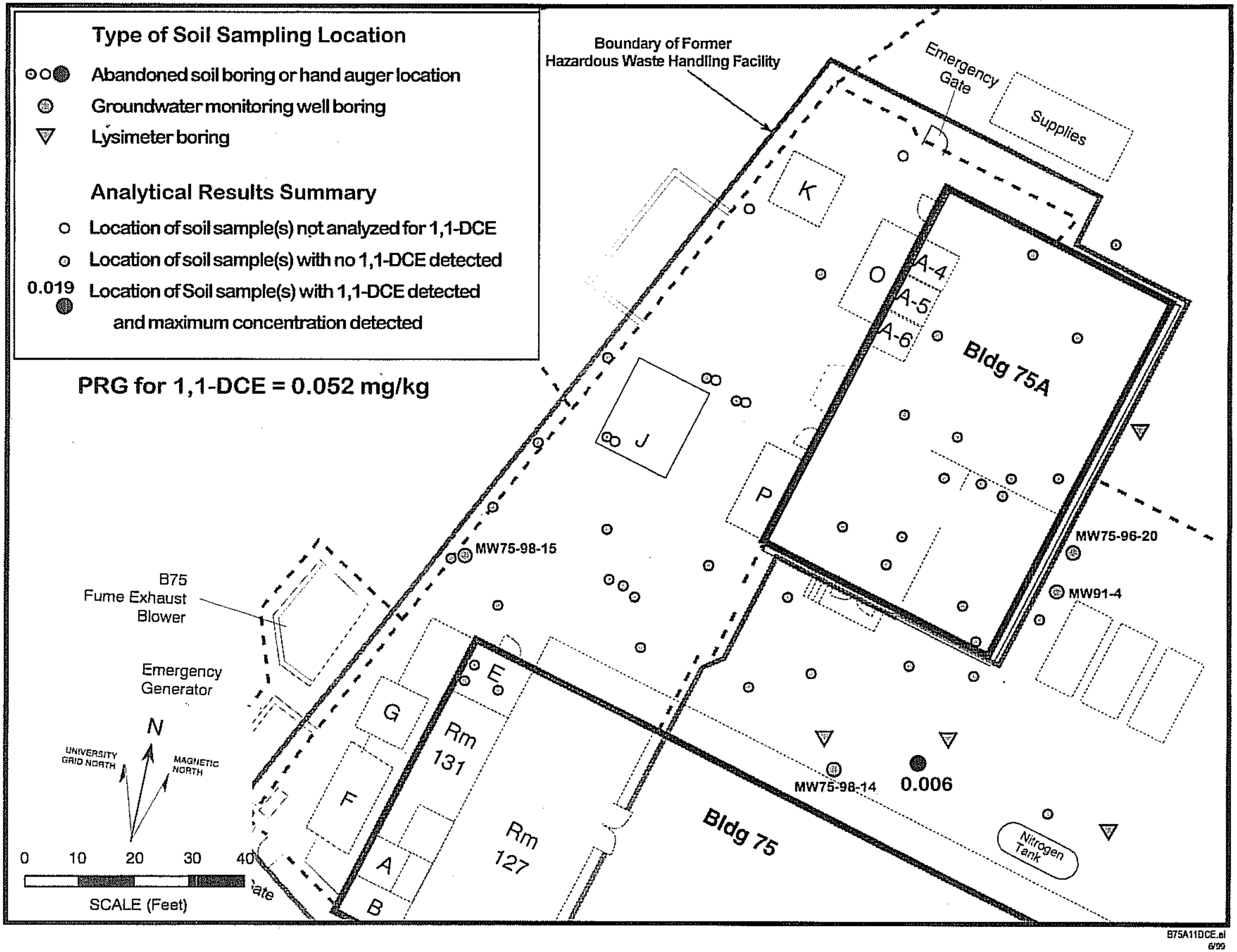
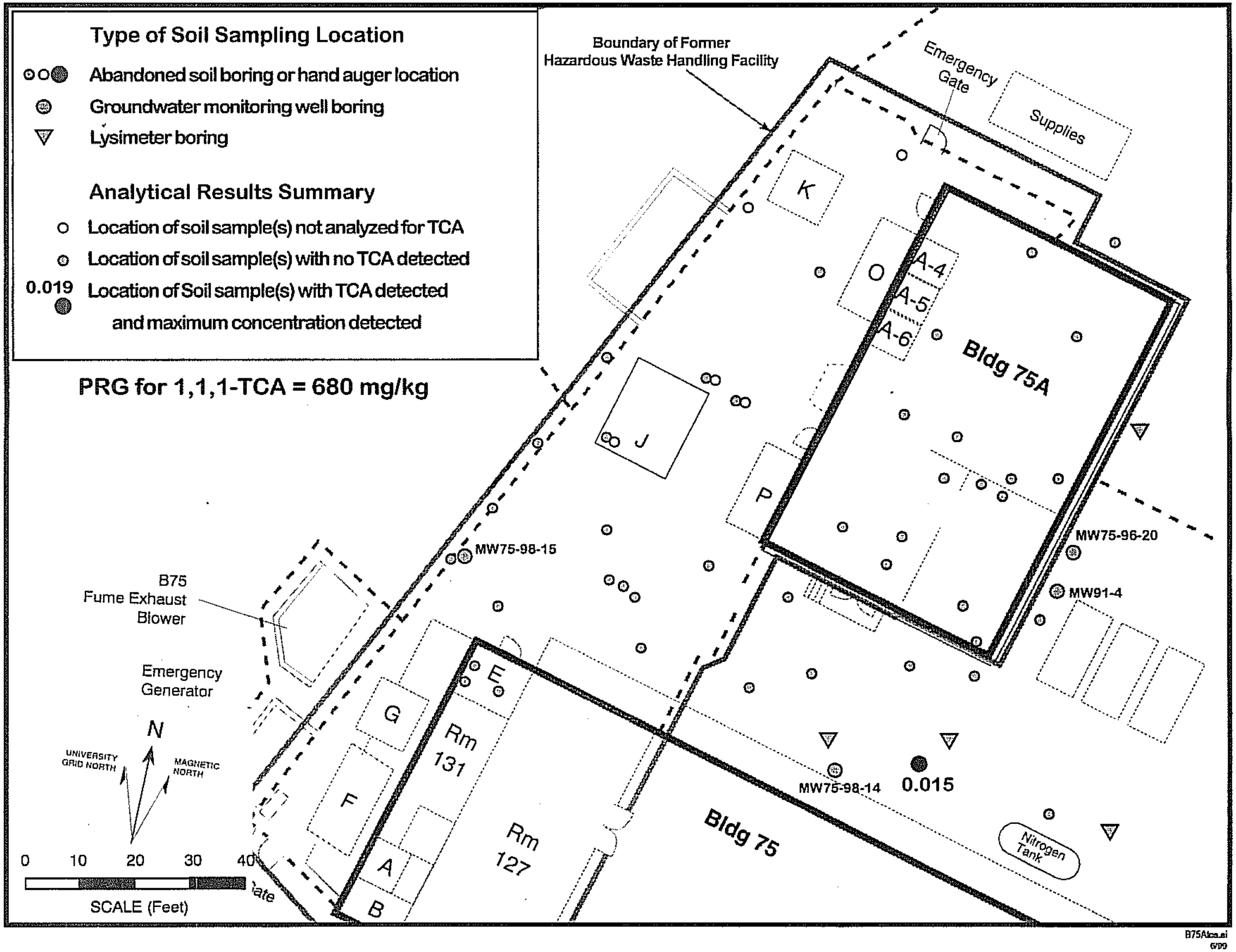
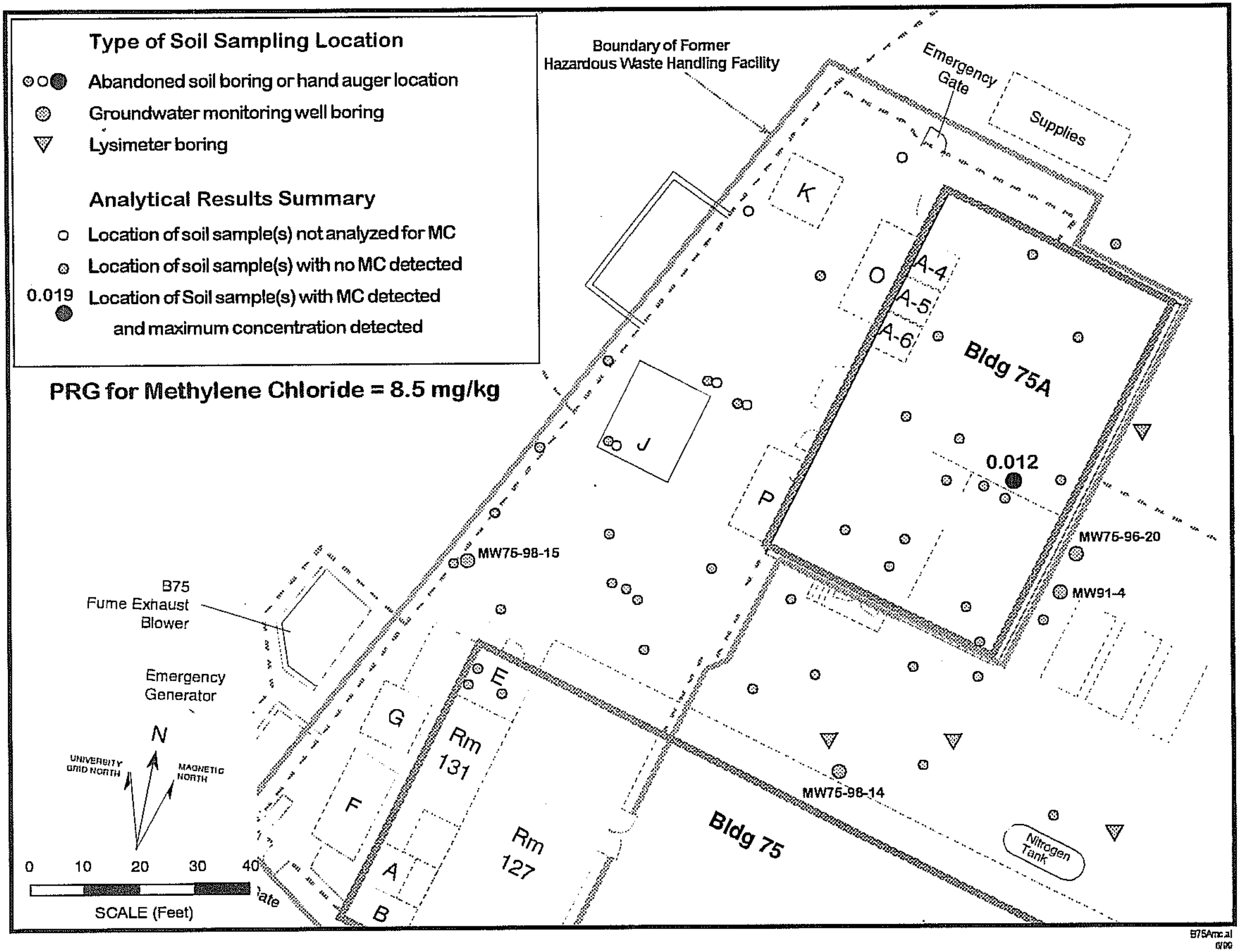
trans-1,2-DCE in Soil, Building 75 Former Hazardous Waste Handling Facility



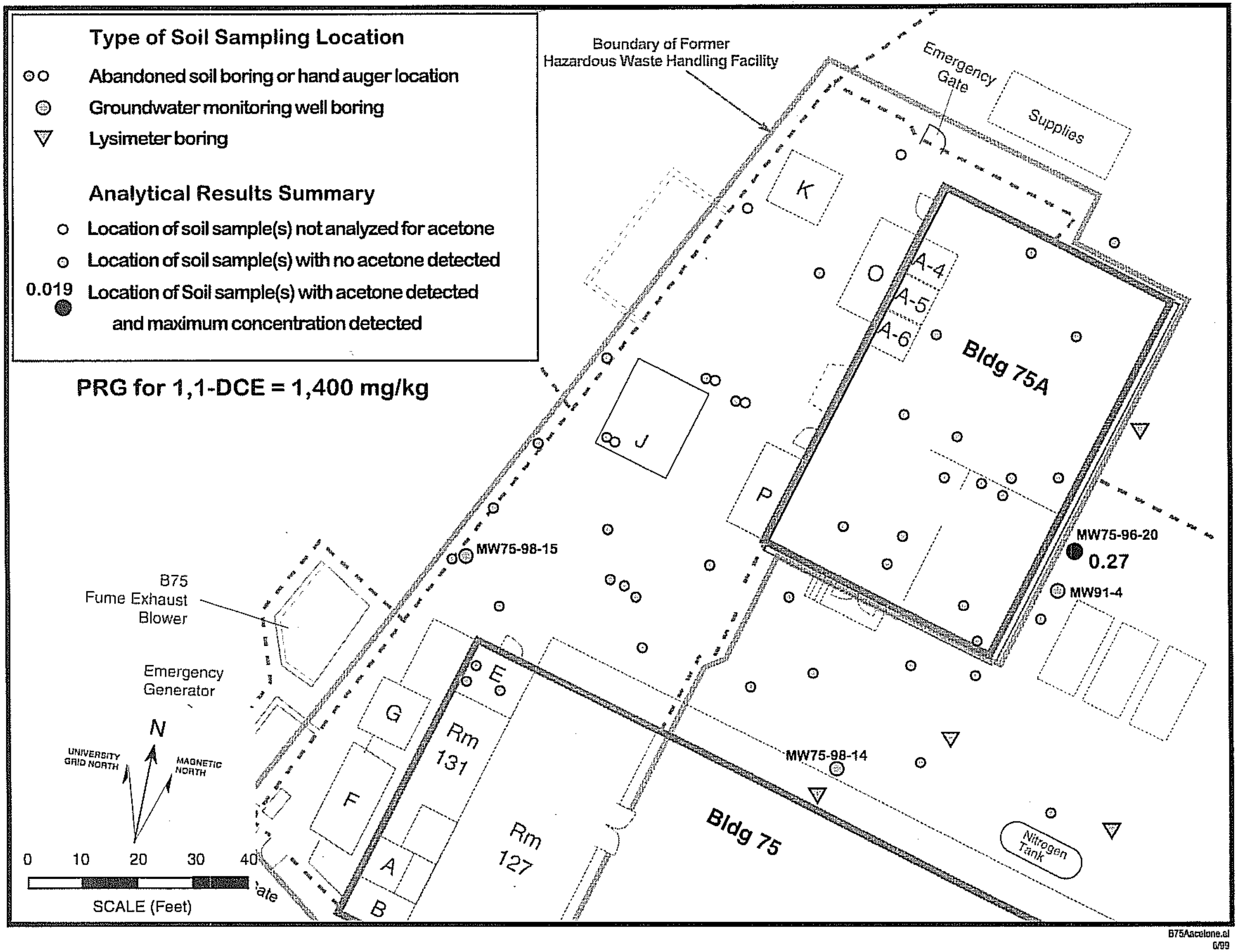
1,1-DCE in Soil, Building 75 Former Hazardous Waste Handling Facility



1,1,1-TCA in Soil, Building 75 Former Hazardous Waste Handling Facility

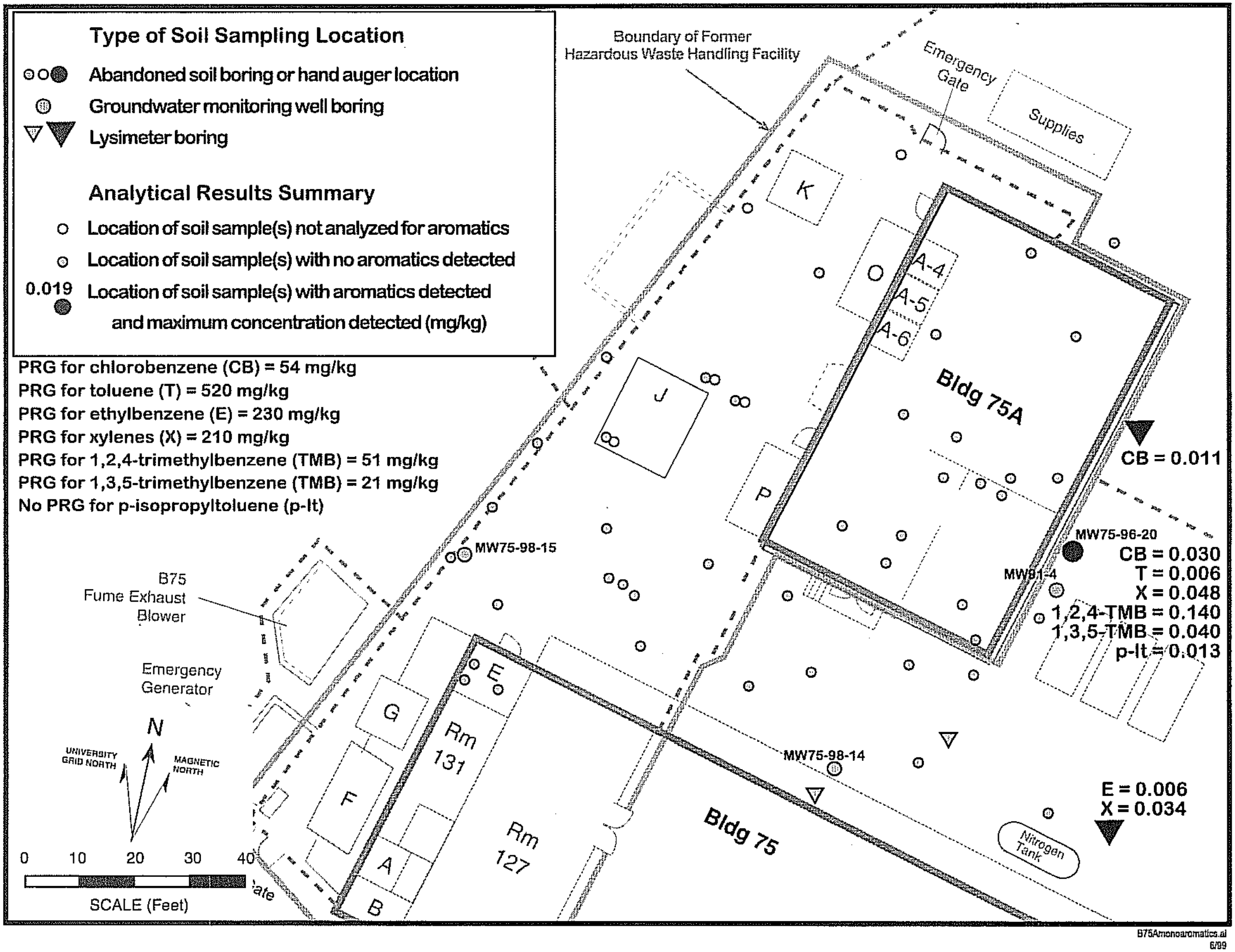


Methylene Chloride in Soil, Building 75 Former Hazardous Waste Handling Facility



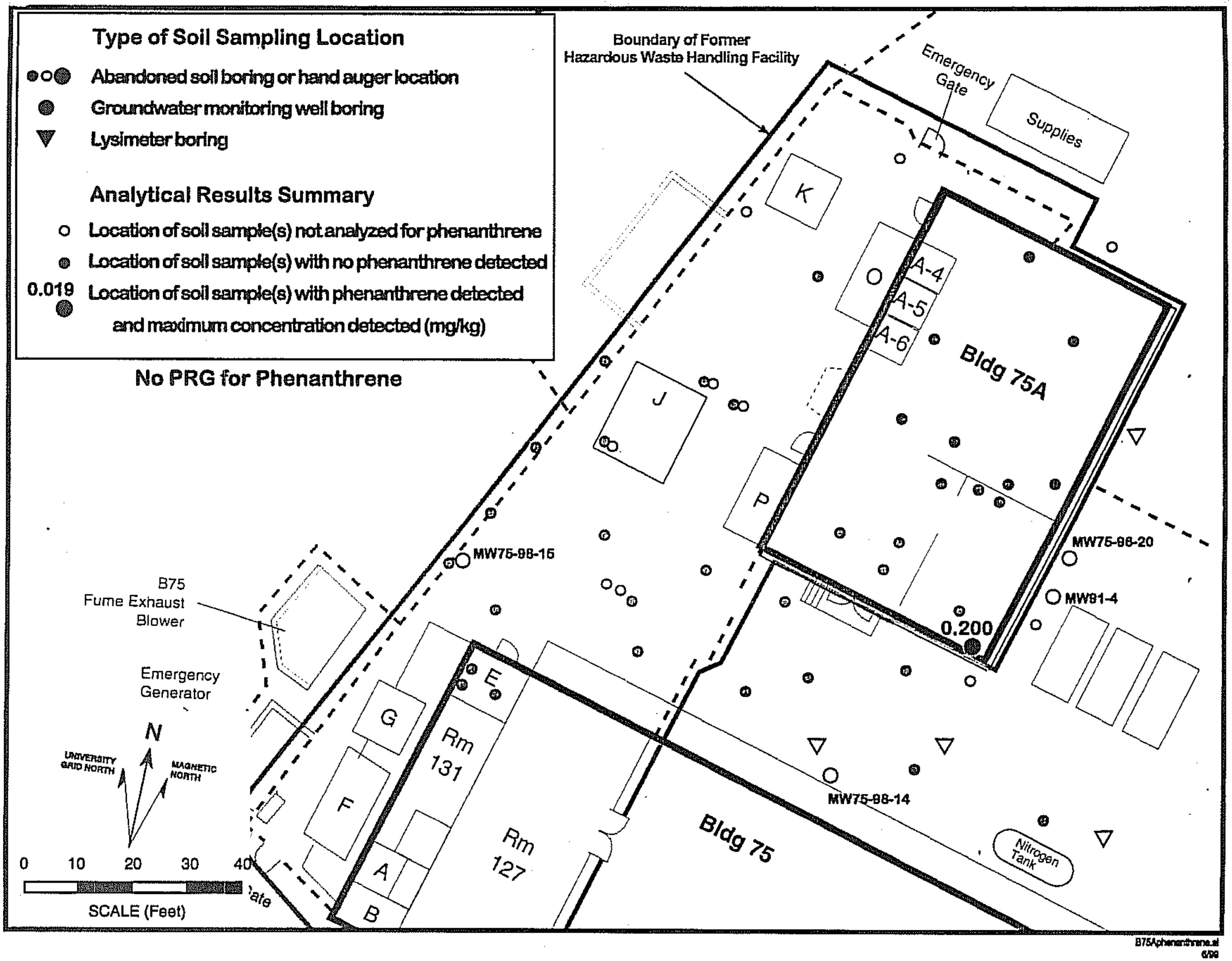
Acetone in Soil, Building 75 Former Hazardous Waste Handling Facility

Monoaromatic Hydrocarbons

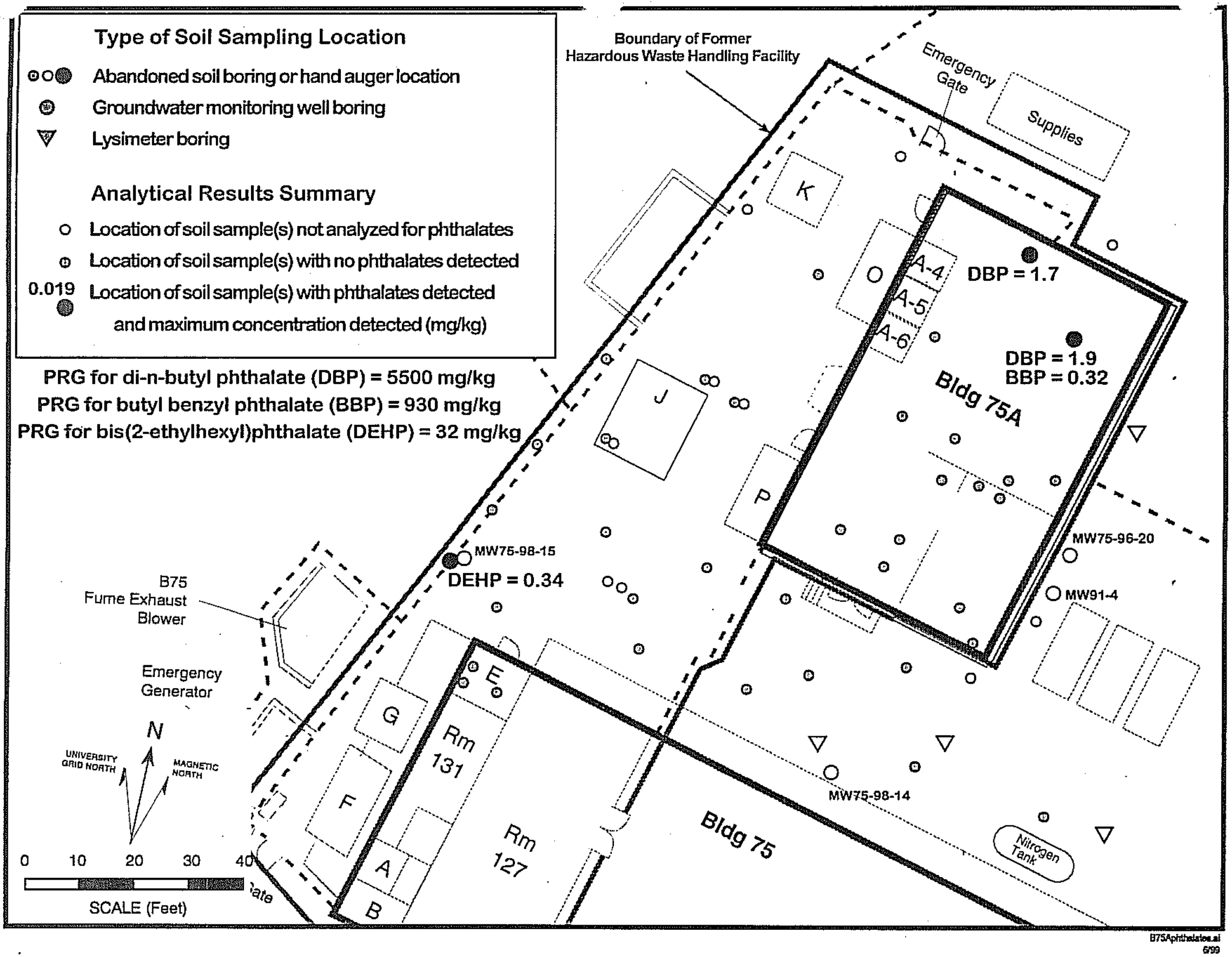


Monoaromatics in Soil, Building 75 Former Hazardous Waste Handling Facility

Semi-Volatile Organic Compounds

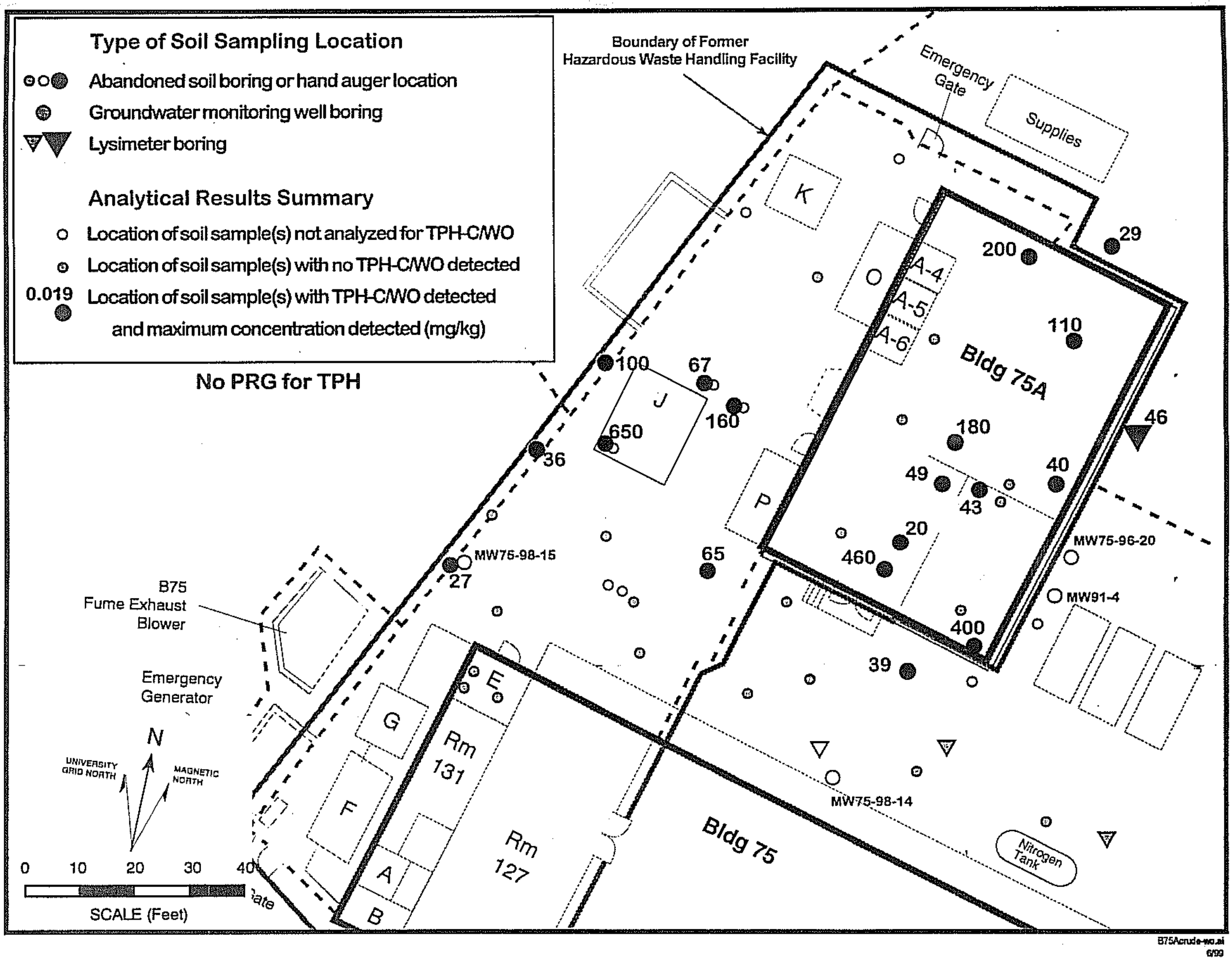


Phenanthrene in Soil, Building 75 Former Hazardous Waste Handling Facility

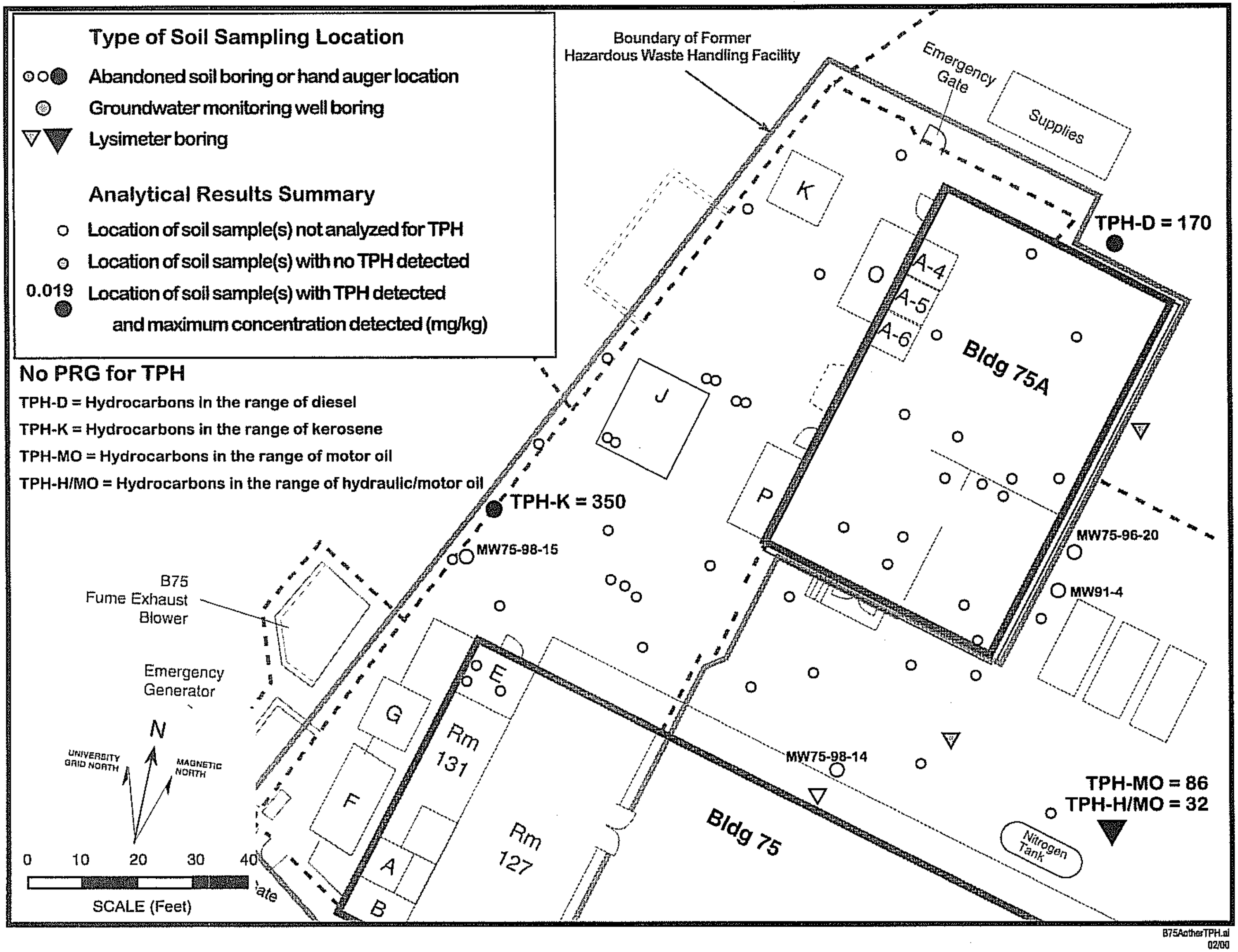


Phthalates in Soil, Building 75 Former Hazardous Waste Handling Facility

Total Petroleum Hydrocarbons

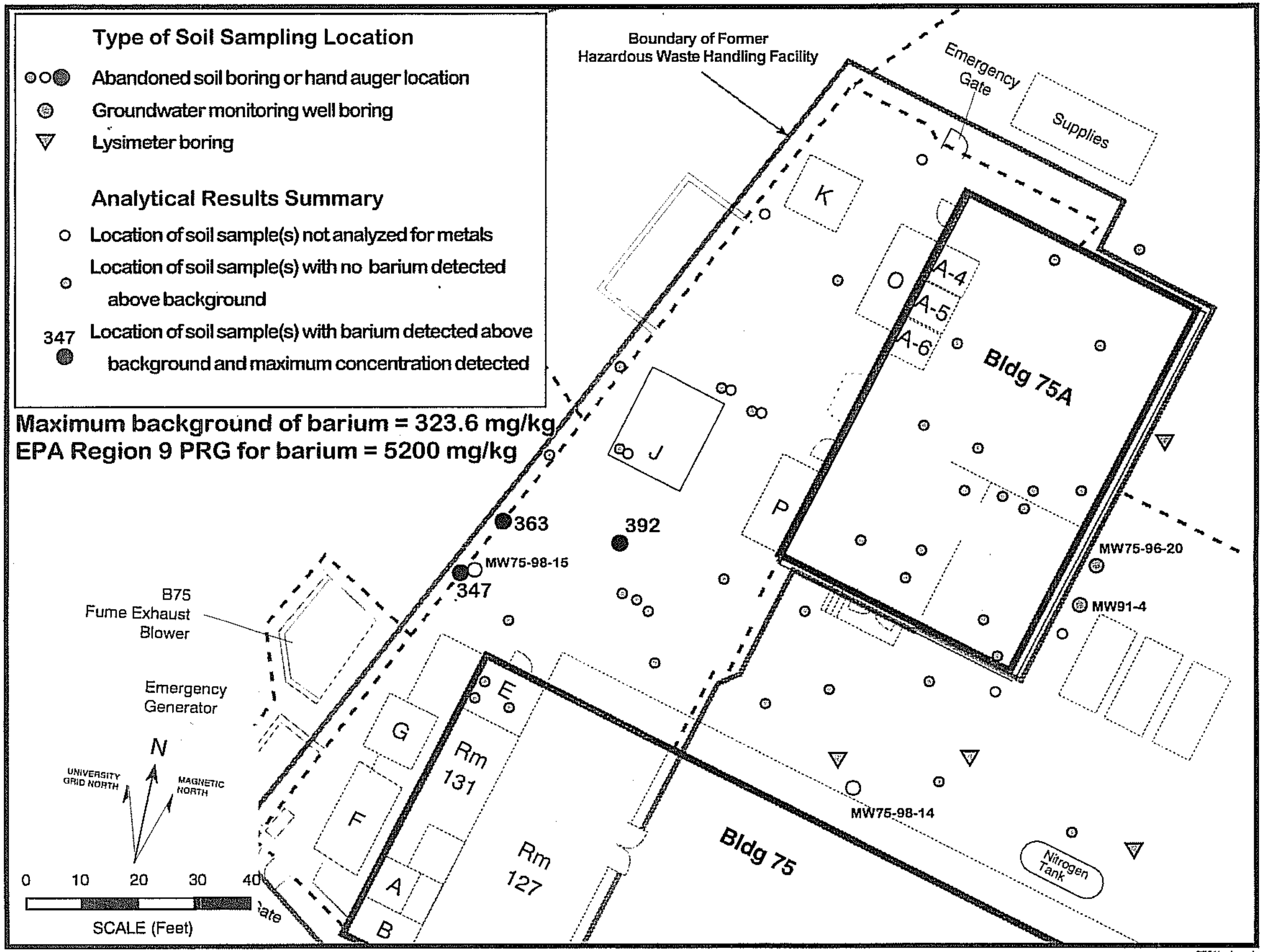


Hydrocarbons (TPH) in the Range of Crude/Waste Oil in Soil, Building 75 Former Hazardous Waste Handling Facility



Hydrocarbons (TPH) in Other Boiling Point Ranges in Soil, Building 75 Former Hazardous Waste Handling Facility

Metals Above Background Levels



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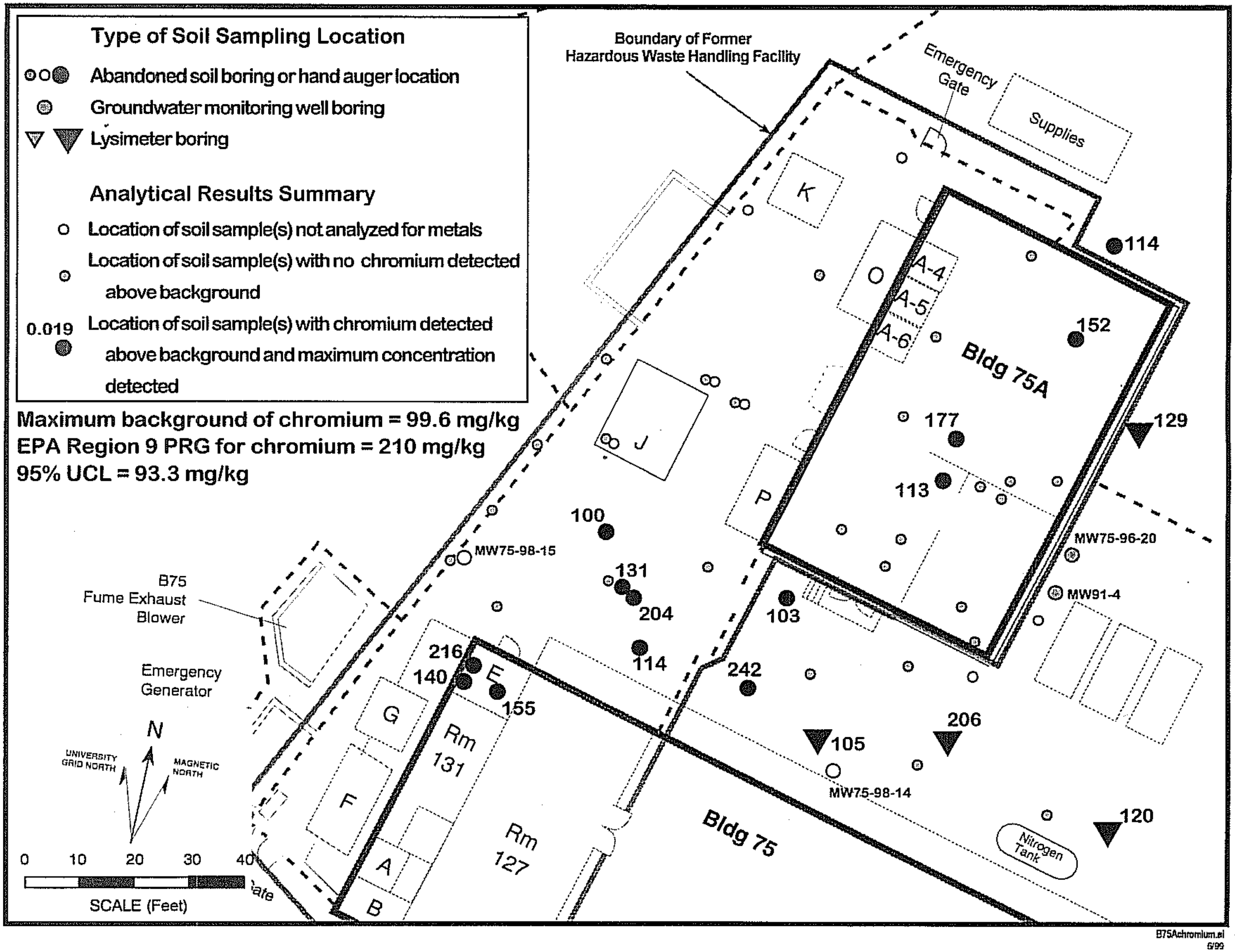
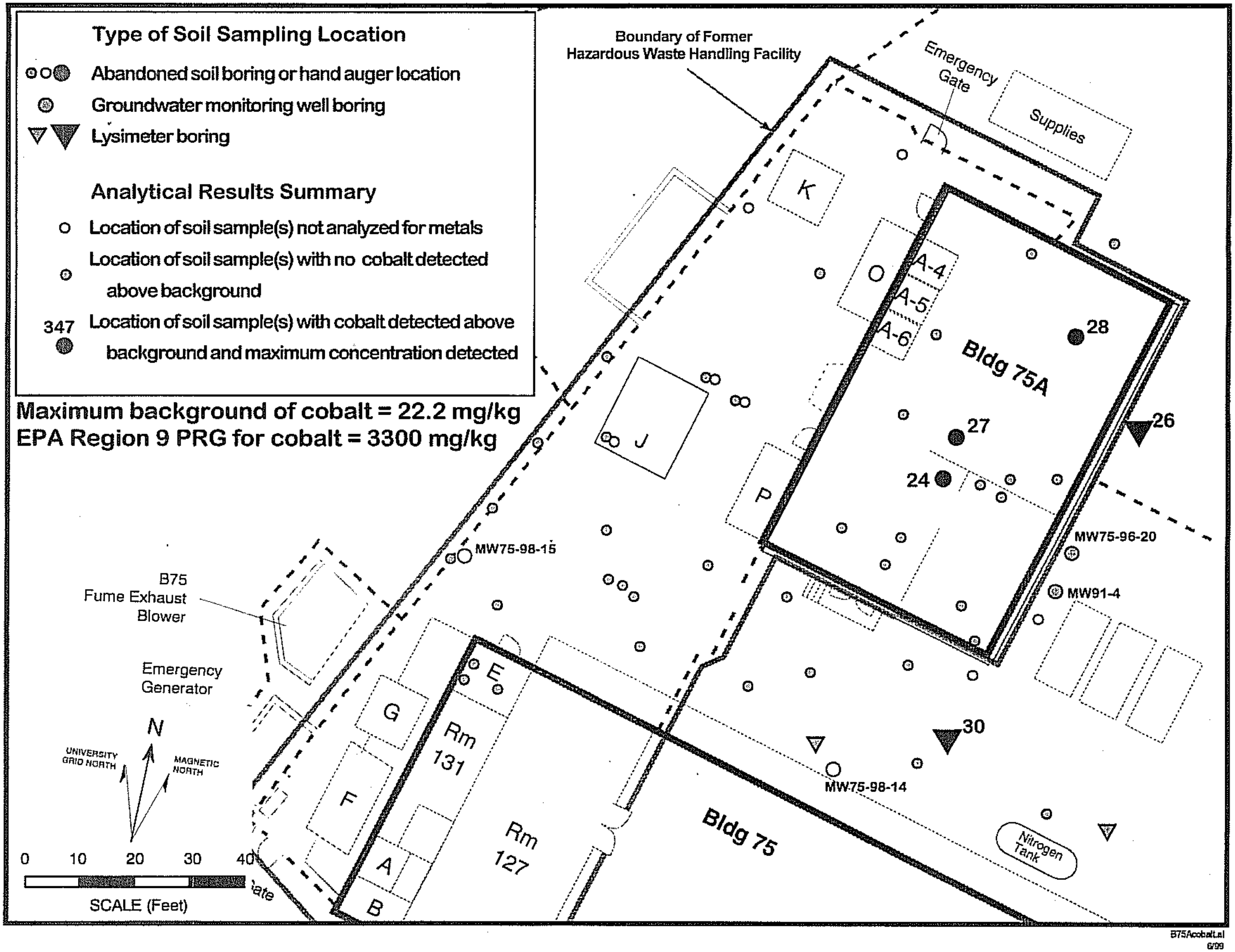
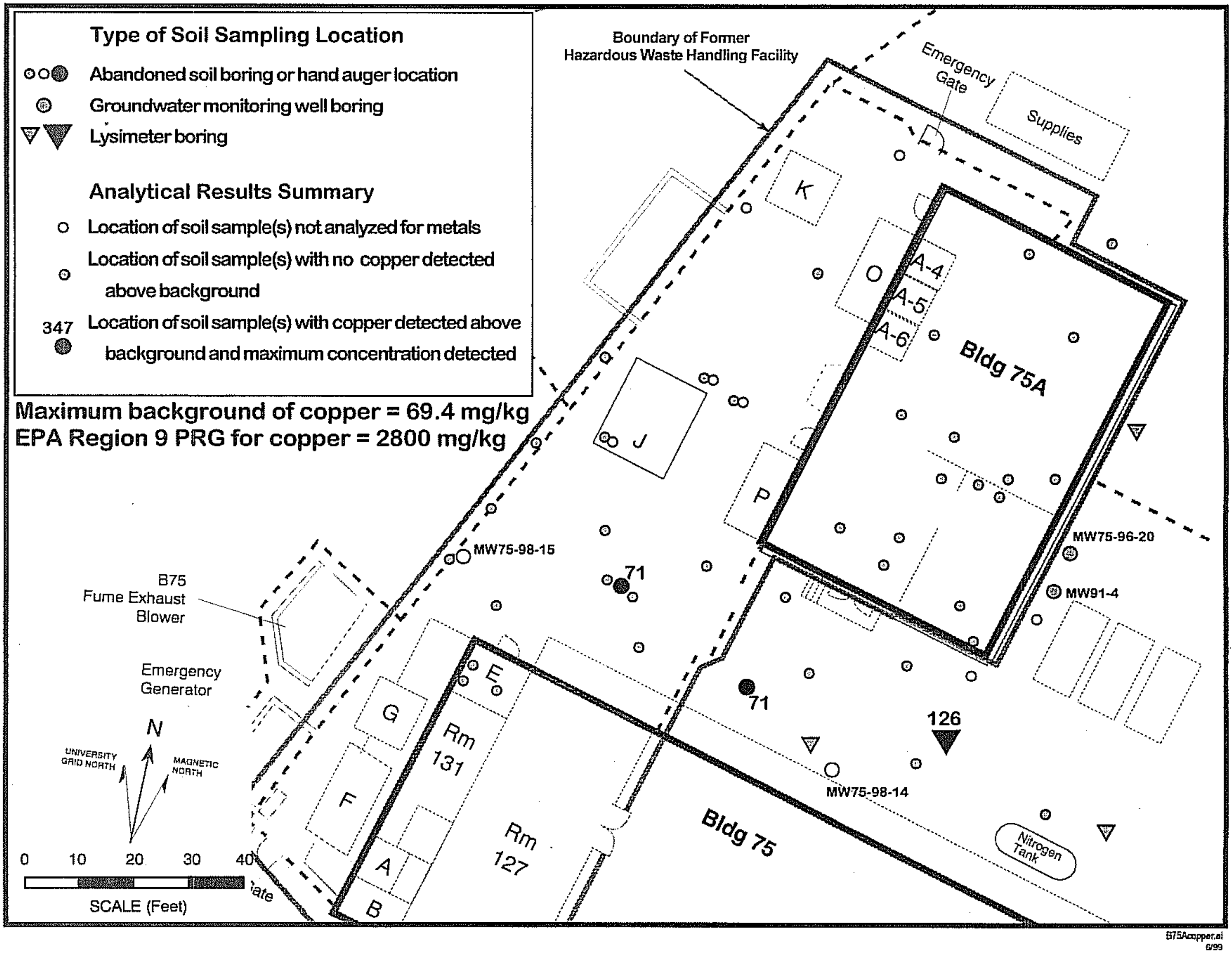
Barium in Soil, Building 75 Former Hazardous Waste Handling Facility



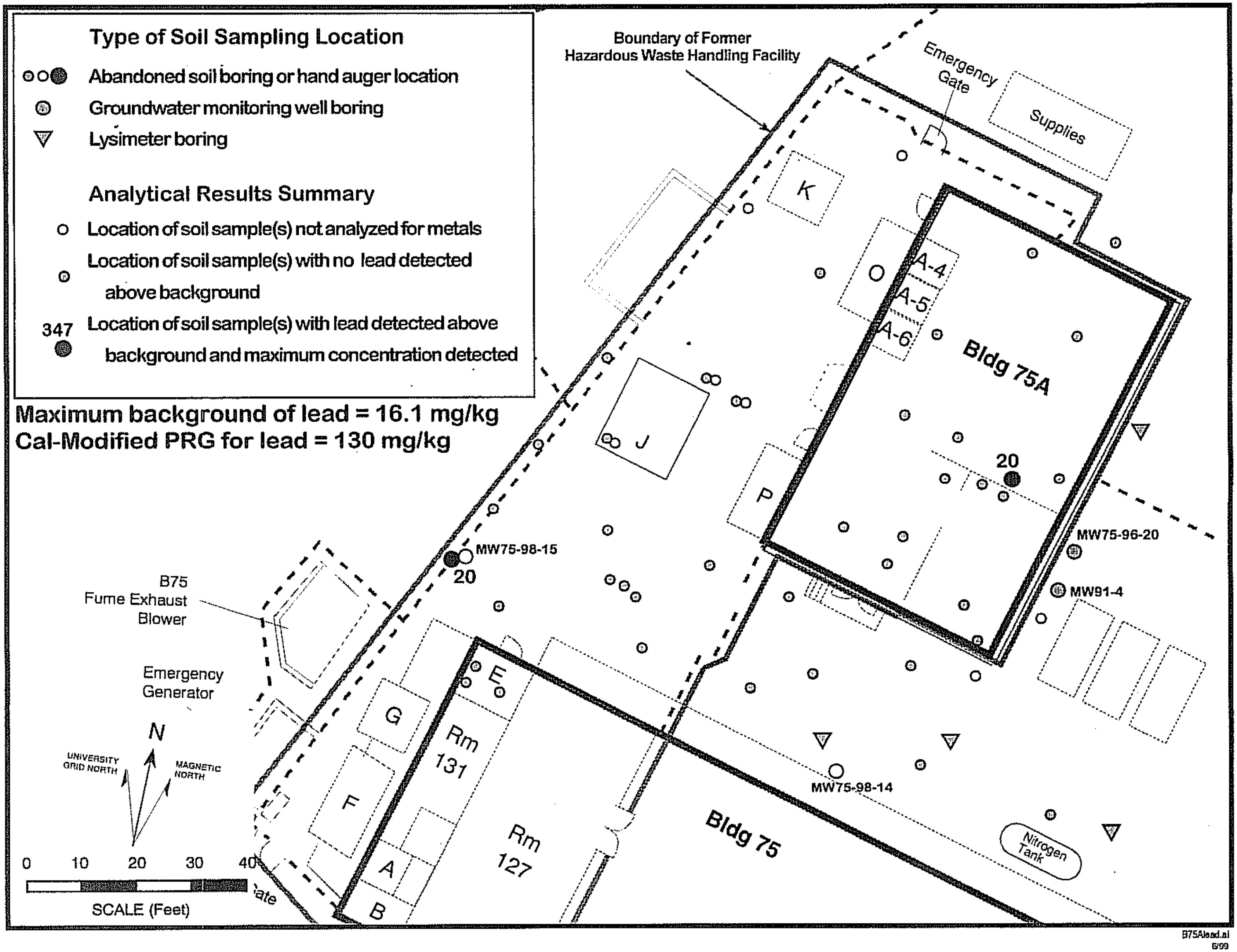
Total Chromium in Soil, Building 75 Former Hazardous Waste Handling Facility



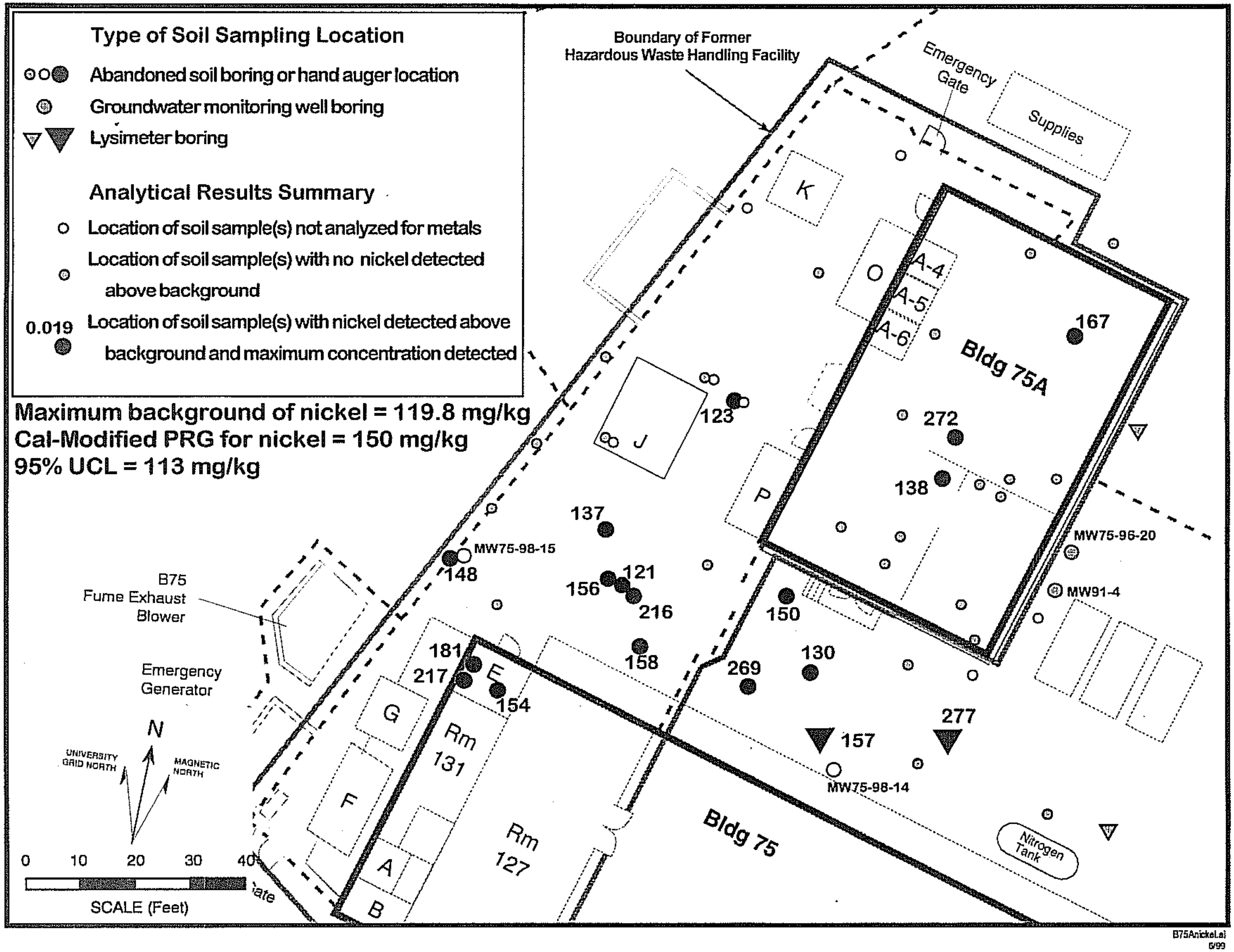
Cobalt in Soil, Building 75 Former Hazardous Waste Handling Facility



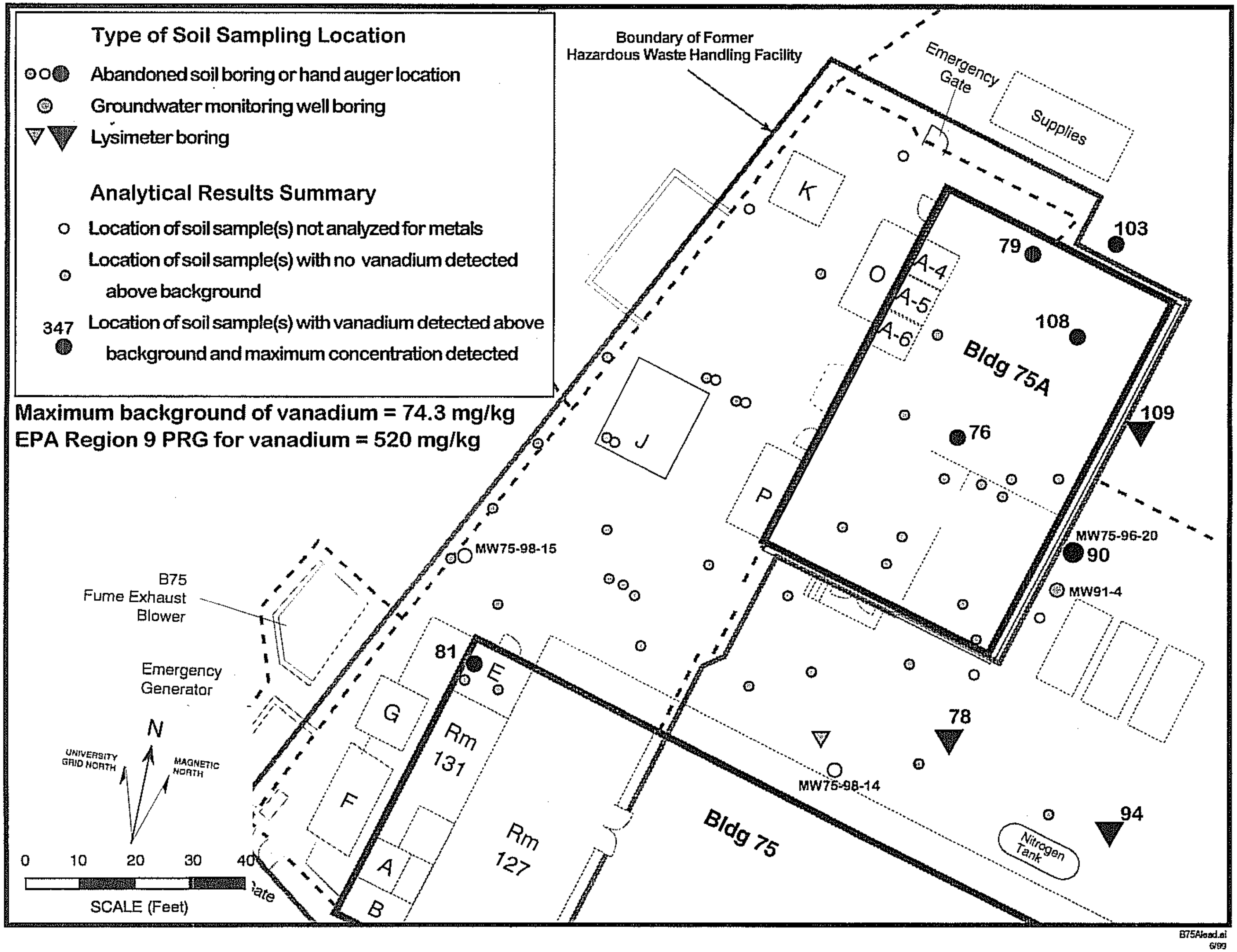
Copper in Soil, Building 75 Former Hazardous Waste Handling Facility



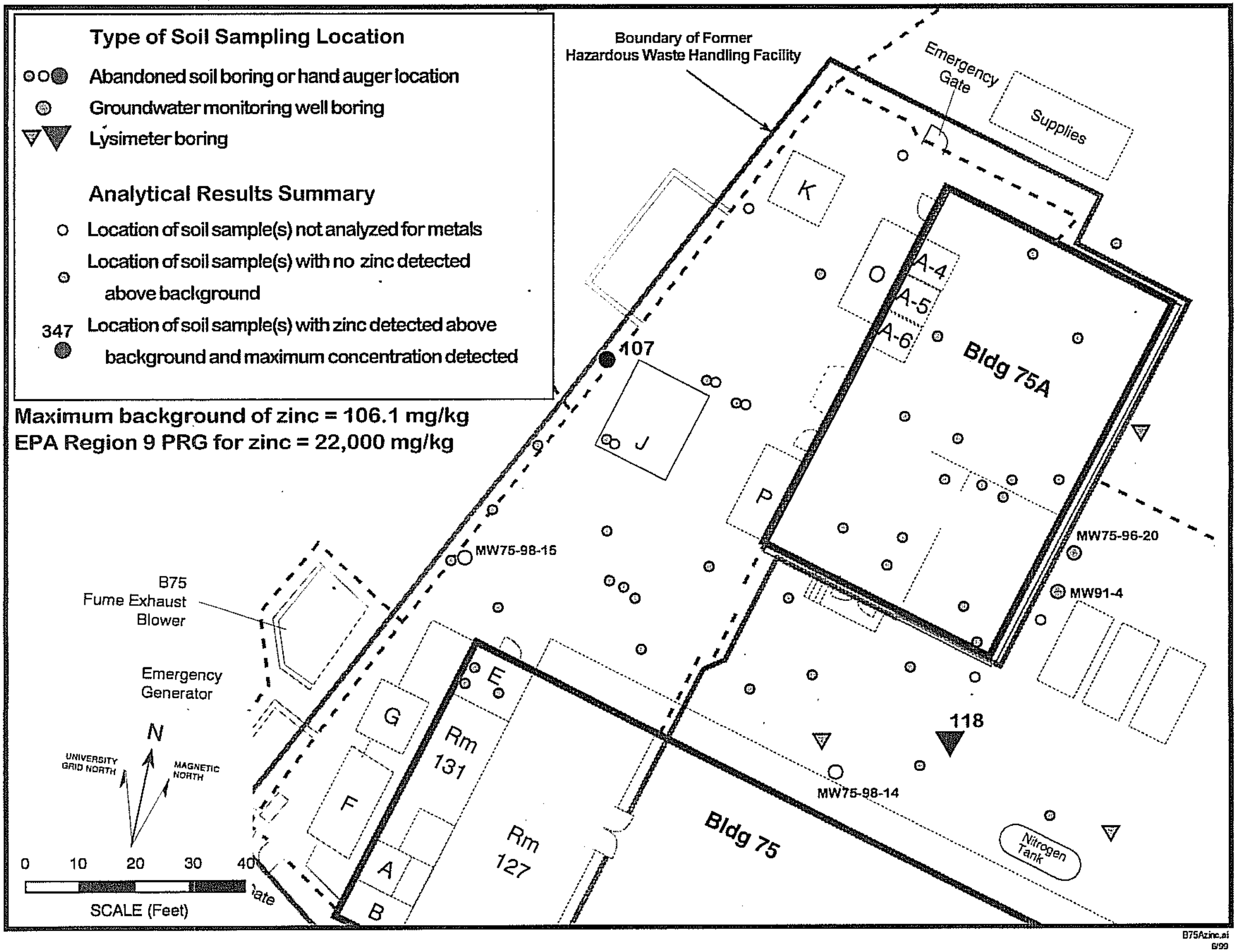
Lead in Soil, Building 75 Former Hazardous Waste Handling Facility



Nickel in Soil, Building 75 Former Hazardous Waste Handling Facility



Vanadium in Soil, Building 75 Former Hazardous Waste Handling Facility



Zinc in Soil, Building 75 Former Hazardous Waste Handling Facility

ATTACHMENT 1

Berkeley Lab Response to Specific Comments on SWMU 3-6
Contained in the April 30, 1999 DTSC Notice of Deficiency,
dated May 28, 1999

LBNL RESPONSE TO DTSC COMMENTS
(Notice of Deficiency for NFA or NFI Status Request for SWMUs 3-6 and 9-6 and AOCs 8-7, 9-8, and 10-3, Lawrence Berkeley National Laboratory, Berkeley, CA. EPA ID No. CA 4890 008 986. Dated April 30, 1999)

The following are Lawrence Berkeley National Laboratory (LBNL) Environmental Restoration Program (ERP) responses to comments received from the Department of Toxic Substances Control (DTSC) on LBNL's request for NFI status for SWMU 3-6, contained in a letter dated April 30, 1999 from Salvatore Ciriello to Iraj Javandel of LBNL. Each of the DTSC's comments is given, followed by the LBNL response in boxed text.

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1. Characterize the full extent of contamination associated with this unit, clearly identifying any migration of contaminants to ground and surface waters.

LBNL Response

Based on historical site information, LBNL has analyzed soil samples at the HWHF for contamination by PCBs, metals, SVOCs, and VOCs. Migration of the contaminants detected in soil at the unit to surface water has been evaluated. Water and sediment samples have been collected in storm drains (e.g., catch basins) and creeks downstream of the unit. The results of the downstream sampling have been reported in the quarterly progress reports and will be evaluated in a revised NFA/NFI request package and in the ecological risk assessment. Potential migration of contaminants from soil to groundwater will be further evaluated.

As noted in the DTSC's Comment 3 below, for purposes of further investigation and remediation the contaminants of concern at the Hazardous Waste Handling Facility (HWHF) are metals detected above background and PCBs. Although other compounds (VOCs and SVOCs) were detected in soils at depths down to 5.4 feet, these compounds are not considered analytes for purposes of further investigation or remediation at the HWHF because they were detected only sporadically at very low concentrations (less than EPA Region IX PRGs for residential soil).

Refer to LBNL's responses to the DTSC's general comments on Extent of Contamination and Pathways to Water Bearing Units for general discussions of characterizing the "full extent of contamination" and "clearly identifying any migration of contaminants to ground and surface waters." Also, refer to LBNL's response to the DTSC's general comment regarding Groundwater Data Interpretation for further explanation of LBNL's intent to investigate sources of groundwater contamination at units that are approved for NFA/NFI Status.

Proposed Work

A work plan for additional characterization will be submitted to the DTSC. Soil borings will be drilled to further characterize the vertical and lateral extent of PCBs and metals in soil. The analysis of the metals data will include a comparison to background concentrations. Samples will be collected in a grid pattern to further delineate the PCB hot spot. In addition, an additional monitoring well will be installed to further evaluate potential migration of contaminants to groundwater.

2. Provide statistical support for the maximum concentration determined from the sampling described. This figure may not constitute the true maximum concentration if representative sampling has not been conducted.

LBNL Response

The maximum measured PCB concentration (48 mg/kg) may not be the "true maximum concentration" at the HWHF. In fact, a measured maximum will always be an estimate of the "true maximum concentration" and it is unlikely that the "true maximum concentration" will be found even if representative sampling has been conducted. In any case, it is not necessary to identify the true maximum PCB concentration at SWMU 3-6 because soil samples already exceed the decision criterion (i.e., the residential PRGs for soils) for proceeding to the CMS and because future evaluations of the site for remediation and risk assessment purposes will use estimates of the average concentration (e.g., 95% upper confidence limit on the mean) of analytes in soil.

3. Provide a plan for characterizing impact of PCB and metal contamination on groundwater. At a minimum, this plan should involve down gradient sampling of groundwater and screening for suspect contaminants and byproducts.

LBNL Response

A work plan for additional site characterization will be submitted as requested. Also, refer to LBNL's response to the DTSC's general comment regarding Analysis of Findings for a discussion of "suspect contaminants and byproducts."

4. Eliminate ambiguous language in the "Groundwater Contamination" and in the "Rationale for NFI Status" sections of the request for this unit, including phrases such as "Groundwater in <u>some</u> locations at the site is contaminated…", "the <u>approximate</u> extent of soil contamination has been established…" and "These chemicals have been detected in <u>either</u> MW91-4 or MW75-96-20…".

LBNL Response

Such ambiguous language will not be used in future work plans and NFA/NFI request packages.

ATTACHMENT 2

Results of Transport and Fate Modeling

Environment, Health and Safety Division
Environmental Restoration Program

Mr. Tony Natera
Facility Permitting Branch
Cal EPA-DTSC
700 Heinz Avenue, Suite 200
Berkeley, CA 94710-2737

October 8, 1999
ERP-2507

Subject: Building 75B Former Hazardous Waste Handling Facility (SWMU 3-6)

Dear Mr. Natera:

In response to the Department of Toxic Substances Control (DTSC) comments noted in your August 23, 1999, letter on Berkeley Lab's Draft Workplan for SWMU 3-6, we conducted modeling of two types: ***transport and fate of PCBs in soil,*** and ***potential partitioning of PCBs between soil and groundwater*** at the Building 75 Former Hazardous Waste Handling and Storage Facility (SWMU 3-6).

The results of the modeling are summarized in the attached memorandum for your review. The transport and fate modeling predicts that PCBs migrating vertically through the vadose zone will not impact groundwater quality. The partitioning modeling was performed to estimate the concentration of PCBs dissolved in groundwater resulting from contact with contaminated soil, and predicts concentrations of PCBs dissolved in groundwater would not be detectable.

Since the modeling has assumed uniform properties for the soil, and has neglected any potential preferential pathways, we propose to install two pairs of monitoring wells at two locations where maximum concentrations of PCBs have been detected in the soil in order to supplement modeling results. Details of the design of these monitoring wells will be presented in a work plan.

Please let me know if DTSC concurs with this line of action or if you have any questions.

Sincerely,

Iraj Javandel
Environmental Restoration Program

Encls.

cc: J. Thomas (LBNL)

Ernest Orlando Lawrence Berkeley National Laboratory
One Cyclotron Road | Berkeley, California 94720 | Mail Stop 14-116 | Tel: 510.486.6106 | Fax: 510.486.8694

Modeling of the Transport and Fate of PCBs in the Vadose Zone and Partitioning of PCBs Between Soil and Groundwater

Building 75 Former Hazardous Waste Handling and Storage Facility (SWMU 3-6) Lawrence Berkeley National Laboratory

During the RCRA Facility Investigation (RFI) conducted by the Lawrence Berkeley National Laboratory (LBNL) Environmental Restoration Program (ERP), polychlorinated biphenyls (PCBs) have been detected in soil at the Building 75 Former Hazardous Waste Handling and Storage Facility (SWMU 3-6). The detected concentrations of PCBs range from 0.013 mg/kg (the detection limit is 0.01 mg/kg) to a maximum value of 48 mg/kg (detected at a depth of 0.8 feet). This report summarizes mathematical modeling conducted by LBNL in response to comments by the DTSC (DTSC, 1999).

The modeling described here consists of two parts. Part One is transport and fate modeling that was performed to assess potential impacts to groundwater from vertical migration of PCBs in the vadose zone. Part Two is modeling performed to predict the concentration of PCBs dissolved in groundwater at the site resulting from partitioning of PCBs in soil should soil contamination come into contact with groundwater. Part One modeling was performed for two separate scenarios. The first scenario simulates a surface spill of PCBs and characterizes downward migration of PCBs by using the highest concentration of PCBs detected at the site (48 mg/kg). The second predicts the potential effect on groundwater from residual PCBs remaining in soil after excavation of soil with PCBs above 1 mg/kg.

PART ONE: TRANSPORT AND FATE MODELING OF PCBs IN VADOSE ZONE SOIL

Model Description

Transport of PCBs in the vadose zone is three-dimensional due to the limited size of the contamination source and the non-uniform distribution of contaminants. To use a conservative approach for this analysis, a one-dimensional model is used; the vadose zone is assumed to be homogeneous (one layer), and the near-surface soil (upper 2.4 feet) is given a uniform concentration of PCBs (the *maximum* concentration detected at the site). Below 2.4 feet, the vadose zone is assumed to have no PCBs in order to simulate initial conditions after a surface spill of PCBs (the probable release mechanism at the site).

The model simulates vertical transport of PCBs as a process of infiltration of water, diffusion in water and air, and adsorption to soil. Shan and Stephens (1995) developed an analytical solution for vertical chemical transport in the vadose zone [see Equations 16a through 20b in the attached reprint], which was used in the modeling described here. This analytical solution was successfully used in verifying and calibrating a numerical model (VLEACH) recommended by the USEPA.

Input Parameters

A. *Thickness of Vadose Zone:* 300 cm (10 feet). In the model calculation, we assumed that the groundwater table is at a depth of 10 feet (300 cm), which is the shallowest depth measured to date at the site (see Figure 1 for depths to groundwater in monitoring wells at the site).

B. *Properties of Soil:* Porosity = 0.2 (20%); Moisture Content = 0.1 (10%); Bulk Density = 2.12 g/cm^3; f_{oc} (organic carbon fraction in soil) = 0.0016 (0.16%). Values of porosity, moisture, and bulk density were estimated based on soil type. The selected value for f_{oc} is less than the mean value of total organic carbon (TOC) as measured in laboratory analysis of seven soil samples collected at the site.

C. *Properties of PCBs:* K_{oc} (Partition Coefficient) = 530,000 mL/g (USEPA, 1986); K_H (Dimensionless Henry's Law Constant) = 0.04 (USEPA, 1986); D_w (Diffusion Coefficient in Water) = 1 cm^2/d (typical value); D_a (Diffusion Coefficient in Air) = 10,000 cm^2/d (typical value).

D. *Infiltration Rate*: v_L = 0.01 cm/d. The actual infiltration rate is most likely lower than 0.01 cm/d, because (a) 0.01 cm/d represents about 6% of the average annual precipitation (64 cm/y = 0.175 cm/d), and (b) the ground surface is paved with asphalt that limits infiltration. Therefore, using v_L = 0.01 cm/d is a conservative approach. A sensitivity analysis has shown that even if all the annual precipitation is assumed to infiltrate into the subsurface, the result is negligible, because the adsorption mechanism dominants the transport process.

E. *Boundary Conditions:* The ground surface is kept at the atmospheric pressure, and the groundwater table constitutes the lower boundary of the study zone. PCBs may enter the atmosphere through gas diffusion and migrate to the groundwater through infiltration in water.

Modeling Results

Case 1 - Historical Transport of PCBs

In the first case, a uniform initial concentration of 48 mg/kg PCBs is assumed for soil from the ground surface to a depth of 2.4 feet (see Figure 2a) in 1978. We then calculated the concentration profile of PCBs in soil after 20 years (in 1998). This profile from modeling results, shown in Figure 2b, illustrates that PCBs, given the parameters of the model, do not migrate below approximately 90 cm (about 3 feet). This indicates strong adsorption of PCBs to soil resulting in slow migration of PCBs in the vadose zone.

Case 2 - Future Transport of PCBs

In the second case a uniform initial concentration of 1 mg/kg PCBs is assumed for soil between depths of 5.7 feet (175 cm) to 7.4 feet (225 cm) (see Figure 3a), which represents a conservative assumption after contaminated soil is excavated down to a depth of approximately 5.7 feet. This is a conservative assumption, because in the soil samples that have been collected between these depths at the site (5.7 to 7.4 feet), the maximum concentration detected has been 0.64 mg/kg. The modeling predicts concentrations of PCBs in soil water after 10 years, 100 years, and 1,000 years; the three concentration profiles are shown in Figure 3b. PCBs are predicted not to be present in soil water at the water table (approximately 10 feet) after 10 years or 100 years. The concentration of PCBs in soil water at the water table is predicted as approximately 0.1 μg/L after 1,000 years, which is less than the MCL for PCBs in drinking water (0.5 μg/L).

Conclusions

The model predicts that PCBs migrating vertically through the vadose zone will not impact groundwater quality.

PART TWO: PARTITIONING MODELING OF PCBs IN SOIL BELOW THE WATER TABLE

This modeling was performed to evaluate equilibrium partitioning of PCBs between soil and groundwater at the Building 75 Former Hazardous Waste Handling and Storage Facility (SWMU 3-6). The purpose of the modeling is to predict the concentration of PCBs that would be dissolved in groundwater at the site based on the maximum PCB concentration detected in soil below the water table at the site.

Model Description

The soil-to-water distribution coefficient (K_D) is commonly used to describe the tendency for a dissolved organic contaminant to sorb onto the aquifer matrix. K_D can be used to estimate the concentration of an organic chemical in water that is in equilibrium with a known concentration of that contaminant in soil. From the simple expression of equilibrium sorption as a linear isotherm, K_D can be expressed as follows:

$$K_D = \frac{Csoil}{Cwater} \qquad \text{Equation 1}$$

where: K_D = distribution coefficient (mL/g)
C_{soil} = contaminant concentration sorbed onto soil (g/g)
C_{water} = contaminant concentration dissolved in water (g/mL)

If the average concentration of a contaminant in soil is known, this equation can be used to predict the contaminant concentration dissolved in water. To do this, K_D must first be determined.

There are a number of methods used for calculating the value of K_D. Results of numerous published laboratory batch and column tests have determined that relationships exist between the amount of organic carbon present in the aquifer matrix and the degree of hydrophobicity exhibited by the contaminant. This is expressed by K_D as being proportional to the natural organic carbon fraction of the aquifer matrix (f_{oc}) multiplied by a proportionality constant, k_{oc}:

$$K_D = k_{oc}\, f_{oc} \qquad \text{Equation 2}$$

where: K_D = distribution coefficient (mL/g)
k_{oc} = soil sorption coefficient normalized for organic carbon content in aquifer matrix (mL/g)
f_{oc} = Natural organic carbon fraction in aquifer matrix (g organic carbon per g soil)

Because k_{oc} values are normalized to organic carbon, values of k_{oc} are dependent only on the properties of the compound and not on the type of soil. Values of k_{oc} have been determined for a wide range of chemicals and are readily available in the technical literature.

Input Parameters

As described in Part One of this report, the assumed thickness of the vadose zone is 300 cm (10 feet), which is the shallowest depth to groundwater measured to date at the site (see Figure 1 for water level measurements in monitoring wells at the site). A total of 87 soil samples have been collected at the site from depths of 10 feet or below (within the saturated zone) and analyzed for PCBs. PCBs were detected in only one of the 87 samples (0.067 mg/kg at 12.1 feet). As a conservative approach to partitioning modeling, the average concentration of PCBs in soil in the saturated zone was assumed to be 0.067 mg/kg. The input value of f_{oc} (organic carbon fraction in soil) was 0.0016 (0.16%). As described in Part One, the selected input value for f_{oc} is less than the mean value of total organic carbon (TOC) concentrations as measured in laboratory analysis of seven soil samples collected at the site. Also, a given literature value of 530,000 mL/g was used for k_{oc} (USEPA, 1986).

Modeling Results

Equations 1 and 2 are used to estimate the concentration of PCBs dissolved in groundwater at the site resulting from contact with the contaminated soil. Equation 2 results in a K_D of 848 mL/g. Then, the predicted concentration of PCBs dissolved in water at the site using Equation 1 is 8×10^{-11} g/mL (equivalent to 0.08 μg/L). The results calculated from the model are shown in the table below. The predicted concentration of PCBs in groundwater at the site would not be detectable based on the partitioning model.

Input Parameters and Calculated Results from Partitioning Modeling

Model	*Parameter*		*Value*	*Units*
Input	Organic carbon partitioning coefficient	K_{oc}	530,000	mL/g
Input	Organic carbon fraction in soil	F_{oc}	0.0016	g/g
Calculated	Soil-to-water partitioning coefficient	K_D	848	mL/g
Input	Average PCB concentration in soil	C_{soil}	0.07	mg/kg
			0.00000007	g/g
Calculated	Predicted PCB concentration in groundwater	C_{water}	0.00000000008	g/mL
			0.08	μg/L

REFERENCES

DTSC (1999). *Comments on the August 1999 draft workplan for SWMU 3-6, Building 75, Lawrence Berkeley National Laboratory, USEPA ID Number CA 489 000 8986.* Letter from Tony Natera (DTSC) to Iraj Javandel (LBNL), August 23, 1999.

Shan, C., and D. B. Stephens (1995). *An analytical solution for vertical transport of volatile chemicals in the vadose zone.* Journal of Contaminant Hydrology 18:259-277.

USEPA (1986). *Superfund Public Health Evaluation Manual.* U.S. Government Printing Office, Washington, D.C., EPA/540/1-86-060, Appendix A-1.

Figure 1. Depth to Groundwater Former B75 HWHF

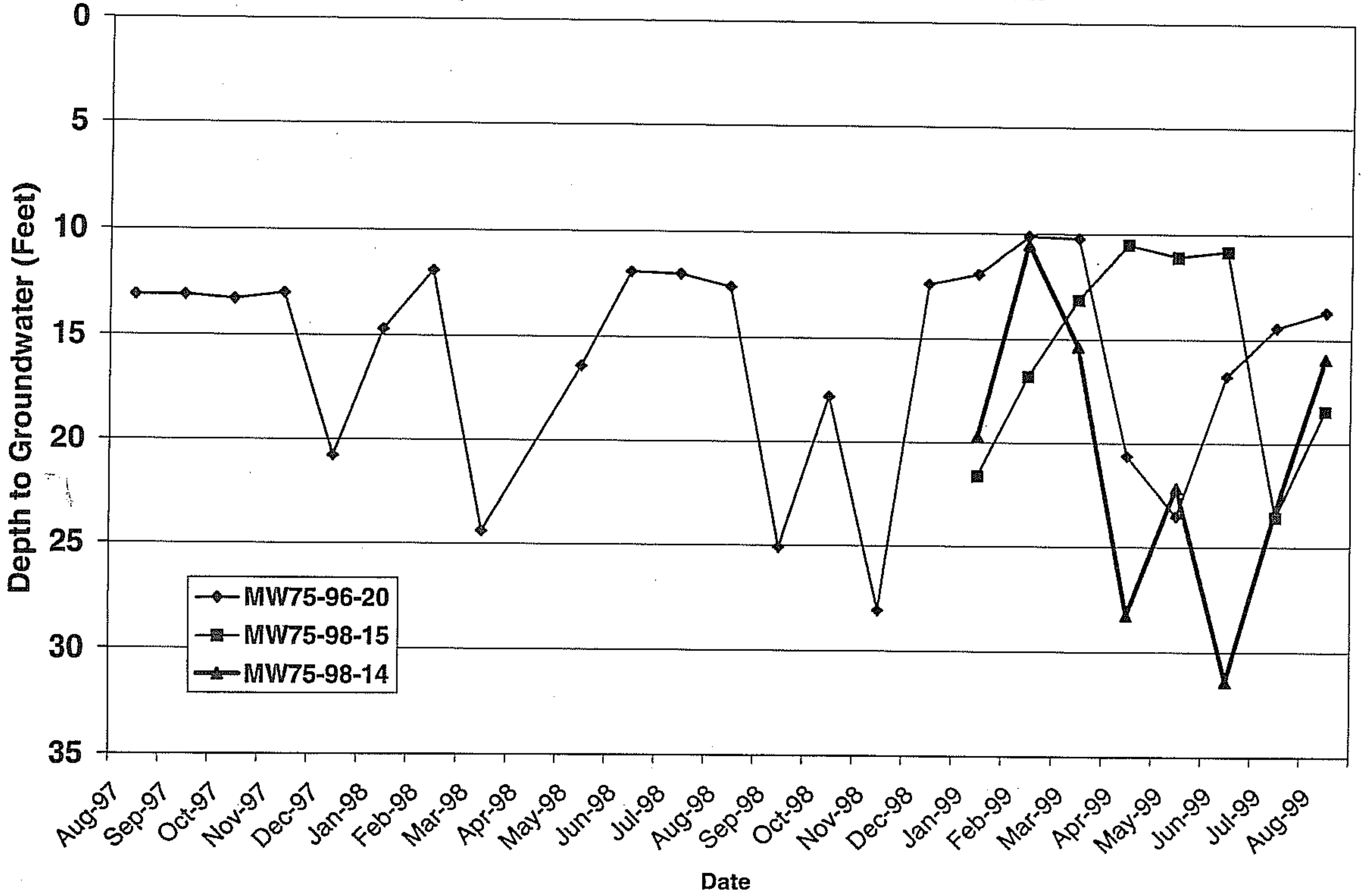


Figure 2a. Schematic View of the Conceptual Model for Historical Transport of PCBs

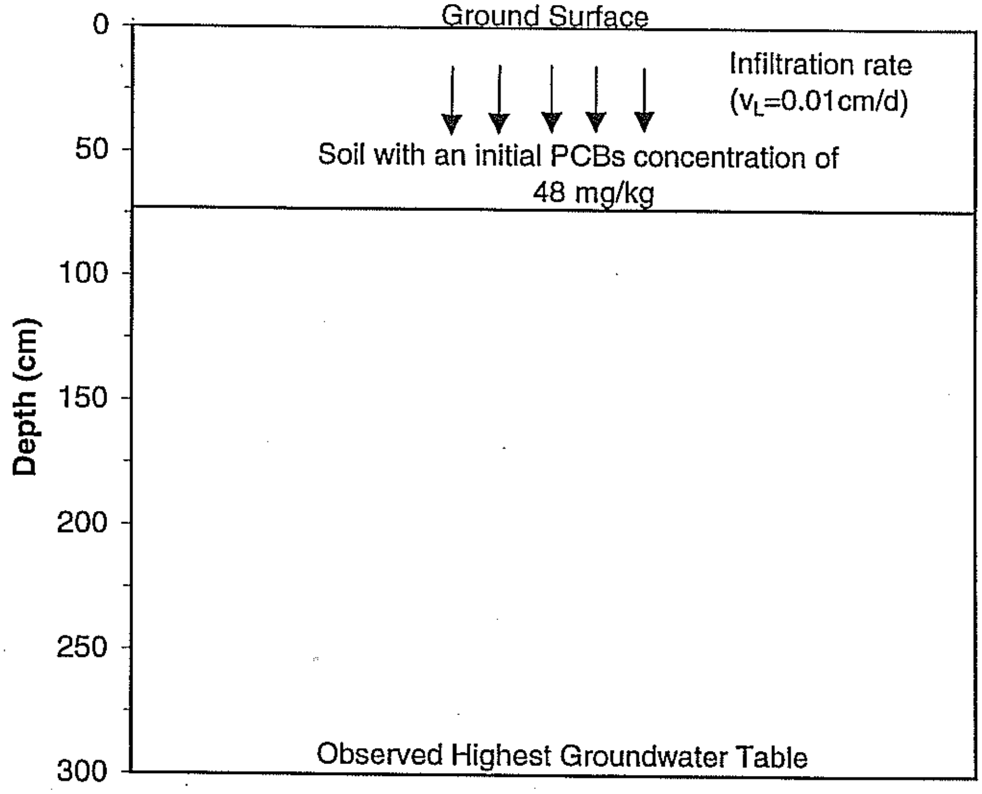


Figure 2b. PCBs Concentration (mg/kg) in Soil in 1998

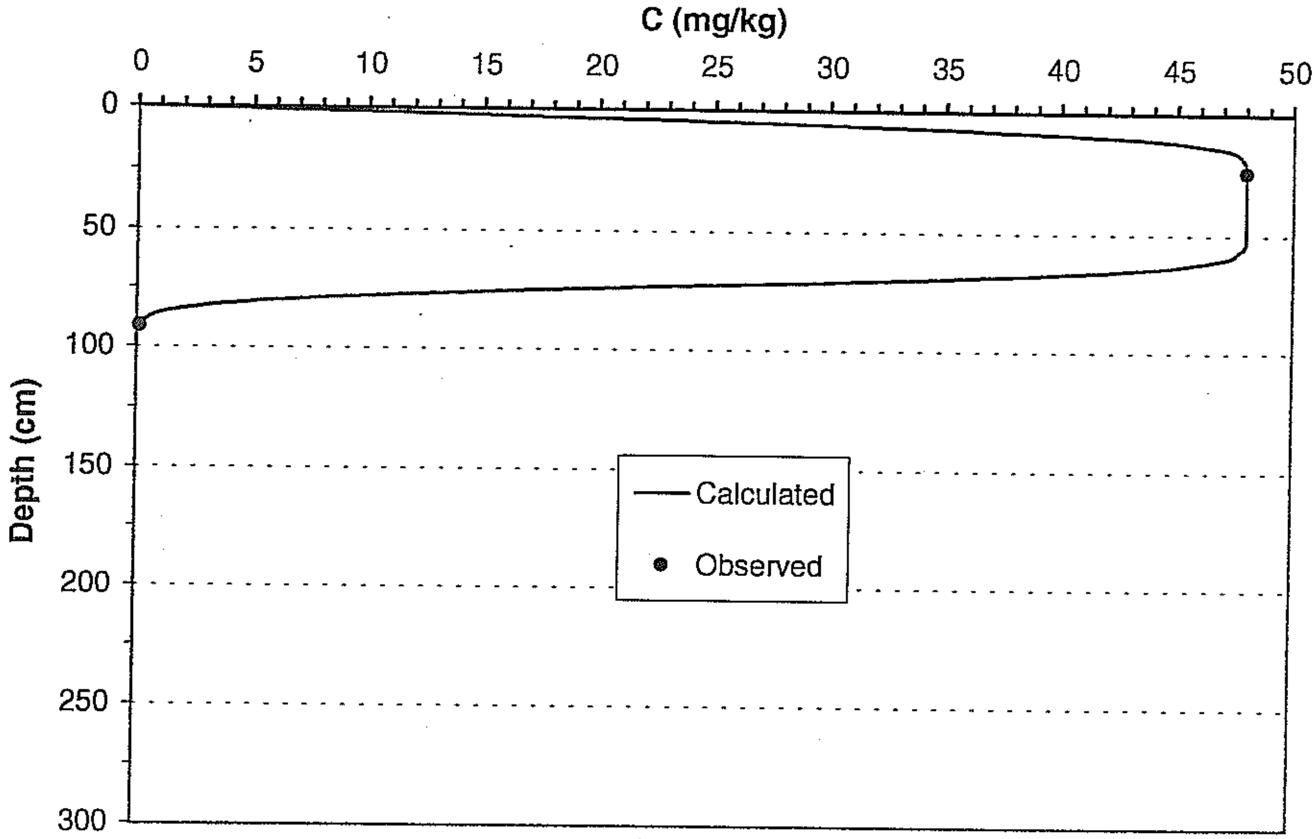


Figure 3a. Schematic View of the Conceptual Model for Future Transport of PCBs

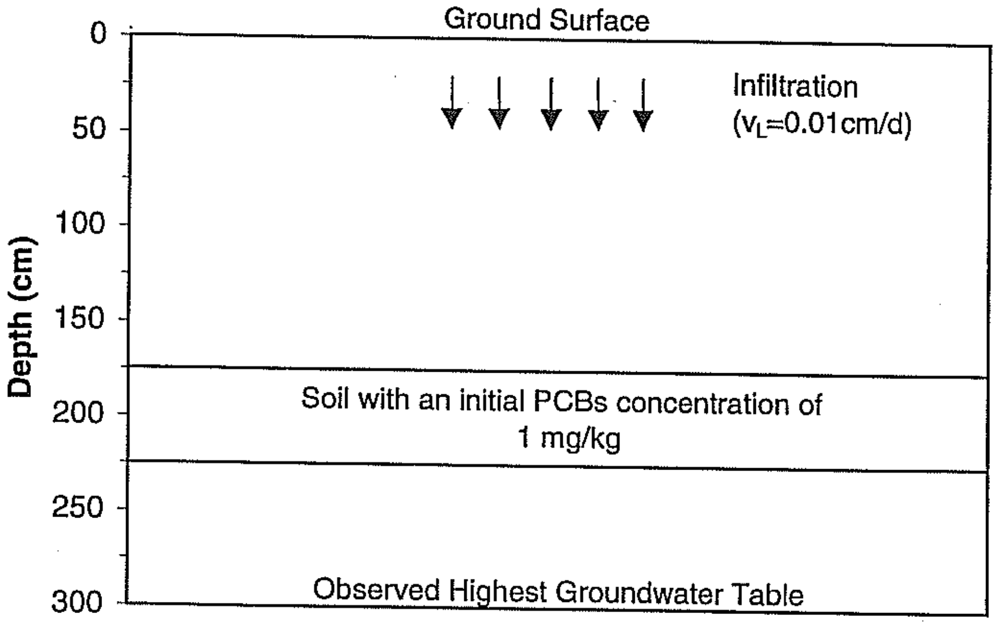
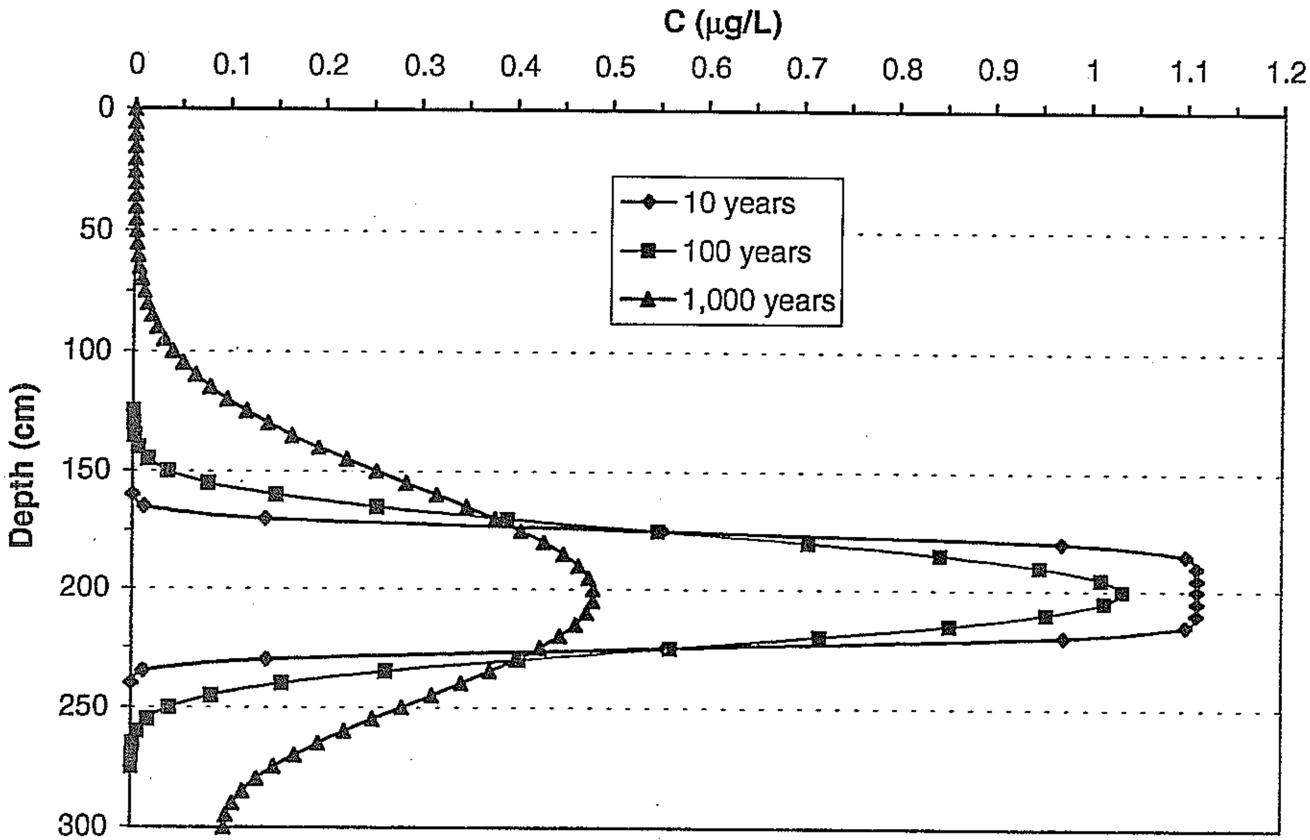


Figure 3b. Predicted PCBs Concentration (μg/L) in Soil Water



ATTACHMENT 3

Laboratory Reports for Sampling of Groundwater for PCBs

BC Laboratories, Inc

PCB Analysis
(EPA Method 8080)

LAWRENCE BERKELEY NATIONAL LABORATORY
ENVIRONMENTAL RESTORATION DEPARTMENT
1 CYCLOTRON ROAD, MAIL STOP 90-1116
BERKELEY, CA 94720
Attn: DR. IRAJ JAVANDEL 510-486-6106

Date Reported: 04/27/99
Date Received: 04/22/99
Laboratory No.: 99-04768-4

Project Number: ERP-99-4-19
COC Number:
Sampling Location: ERP-99-4-19
Sample ID: 4-99-103 75-96-20 grab
Sample Matrix: GW - Groundwater
Sample Collected By: PAUL TRAPANI/TOM DONOVAN

Date Collected: 04/22/99 @ 07:40AM

Constituents	Results	Units	P.Q.L.	Method	Run Date	Analyst	Dilution	Instrument	Prep Method	Prep Date	LLNL Method	LLNL Code
PCB-1016	None Detected	µg/L	0.2	8080	04/24/99	JKR	1.	GC-6	3510	04/23/99	E8080	6450
PCB-1221	None Detected	µg/L	0.2	8080	04/24/99	JKR	1.	GC-6	3510	04/23/99	E8080	6500
PCB-1232	None Detected	µg/L	0.2	8080	04/24/99	JKR	1.	GC-6	3510	04/23/99	E8080	6550
PCB-1242	None Detected	µg/L	0.2	8080	04/24/99	JKR	1.	GC-6	3510	04/23/99	E8080	6600
PCB-1248	None Detected	µg/L	0.2	8080	04/24/99	JKR	1.	GC-6	3510	04/23/99	E8080	6650
PCB-1254	None Detected	µg/L	0.2	8080	04/24/99	JKR	1.	GC-6	3510	04/23/99	E8080	6700
PCB-1260	None Detected	µg/L	0.2	8080	04/24/99	JKR	1.	GC-6	3510	04/23/99	E8080	6750
Total PCB's (Summation)	None Detected	µg/L	0.2	8080	04/24/99	JKR	1.	GC-6	3510	04/23/99	E8080	6825

Quality Control Data

Surrogates	% Recovery	Control Limits
Decachlorobiphenyl	98.	60-140

BC Laboratories, Inc

PCB Analysis
(EPA Method 8080)

LAWRENCE BERKELEY NATIONAL LABORATORY
ENVIRONMENTAL RESTORATION DEPARTMENT
1 CYCLOTRON ROAD, MAIL STOP 90-1116
BERKELEY, CA 94720
Attn: DR. IRAJ JAVANDEL 510-486-6106

Date Reported: 04/27/99
Date Received: 04/22/99
Laboratory No.: 99-04768-4

Sample Description: ERP-99-4-19, ERP-99-4-19, 4-99-103, 04/22/99 @ 07:40AM, PAUL TRAPANI/TOM DONOVAN

California D.O.H.S. Cert. #1186

Stuart G. Buttram
Department Supervisor

BC Laboratories, Inc

PCBs
(EPA Method 8082)

LAWRENCE BERKELEY NATIONAL LABORATORY
ENVIRONMENTAL RESTORATION DEPARTMENT
1 CYCLOTRON ROAD, MAIL STOP 90-1116
BERKELEY, CA 94720
Attn: DR. IRAJ JAVANDEL 510-486-6106

Date Reported: 11/22/99
Date Received: 11/09/99
Laboratory No.: 99-13269-5

Project Number: COC #ERP-99-11-9
COC Number: ERP-99-11-9
Sample ID: 11-99-67 75-98-14
Sample Matrix: Groundwater
Sample Collected By: S. LOUIE, H. PIETROPAOLI

Date Collected: 11/09/99 @ 09:15AM

Constituents	Results	Units	P.Q.L.	Method	Run Date	Analyst	Dilution	Instrument	Prep Method	Prep Date	LLNL Method	LLNL Code
PCB-1016	None Detected	µg/L	0.2	8082	11/15/99	JKR	1.	GC-6	3510	11/11/99	E8082	6450
PCB-1221	None Detected	µg/L	0.2	8082	11/15/99	JKR	1.	GC-6	3510	11/11/99	E8082	6500
PCB-1232	None Detected	µg/L	0.2	8082	11/15/99	JKR	1.	GC-6	3510	11/11/99	E8082	6550
PCB-1242	None Detected	µg/L	0.2	8082	11/15/99	JKR	1.	GC-6	3510	11/11/99	E8082	6600
PCB-1248	None Detected	µg/L	0.2	8082	11/15/99	JKR	1.	GC-6	3510	11/11/99	E8082	6650
PCB-1254	None Detected	µg/L	0.2	8082	11/15/99	JKR	1.	GC-6	3510	11/11/99	E8082	6700
PCB-1260	None Detected	µg/L	0.2	8082	11/15/99	JKR	1.	GC-6	3510	11/11/99	E8082	6750
Total PCB's (Summation)	None Detected	µg/L	0.2	8082	11/15/99	JKR	1.	GC-6	3510	11/11/99	E8082	6825

Quality Control Data

Surrogates	% Recovery	Control Limits
Decachlorobiphenyl	107.	60-140

4100 Atlas Court * Bakersfield, CA 93308 * (661) 327-4911 * FAX (661) 327-1918 * www.bclabs.com

PCBs
(EPA Method 8082)

LAWRENCE BERKELEY NATIONAL LABORATORY
ENVIRONMENTAL RESTORATION DEPARTMENT
1 CYCLOTRON ROAD, MAIL STOP 90-1116
BERKELEY, CA 94720
Attn: DR. IRAJ JAVANDEL 510-486-6106

Date Reported: 11/22/99
Date Received: 11/09/99
Laboratory No.: 99-13269-5

Sample Description: COC #ERP-99-11-9, 11-99-67, 11/09/1999 @ 09:15, S. LOUIE, H. PIETROPAOLI

California D.O.H.S. Cert. #1186

Stuart G. Buttram
Department Supervisor

BC Laboratories, Inc.

PCBs
(EPA Method 8082)

LAWRENCE BERKELEY NATIONAL LABORATORY
ENVIRONMENTAL RESTORATION DEPARTMENT
1 CYCLOTRON ROAD, MAIL STOP 90-1116
BERKELEY, CA 94720
Attn: DR. IRAJ JAVANDEL 510-486-6106

Date Reported: 11/12/99
Date Received: 11/06/99
Laboratory No.: 99-13170-1

Project Number: COC #ERP-99-11-6
Sample ID: 11-99-32 75-98-15
Sample Matrix: Groundwater
Sample Collected By: S. LOUIE/H. PIETROPAOLI

Date Collected: 11/03/99 @ 08:10AM
Date Extracted: 11/09/99
Date Analyzed: 11/10/99
Dilution Used: 1

Constituents	Analysis Results	Reporting Units	Practical Quantitation Limit
PCB-1016	None Detected	µg/L	0.2
PCB-1221	None Detected	µg/L	0.2
PCB-1232	None Detected	µg/L	0.2
PCB-1242	None Detected	µg/L	0.2
PCB-1248	None Detected	µg/L	0.2
PCB-1254	None Detected	µg/L	0.2
PCB-1260	None Detected	µg/L	0.2
Total PCB's (Summation)	None Detected	µg/L	0.2

Quality Control Data

Surrogates	% Recovery	Control Limits
Decachlorobiphenyl	89.	60-140

California D.O.H.S. Cert. #1186

Stuart G. Buttram
Department Supervisor

4100 Atlas Court * Bakersfield, CA 93308 * (661)327-4911 * Fax(661)327-1918 * www.bclabs.com

BC Laboratories, Inc

PCBs
(EPA Method 8082)

LAWRENCE BERKELEY NATIONAL LABORATORY
ENVIRONMENTAL RESTORATION DEPARTMENT
1 CYCLOTRON ROAD, MAIL STOP 90-1116
BERKELEY, CA 94720
Attn: DR. IRAJ JAVANDEL 510-486-6106

Date Reported: 11/22/99
Date Received: 11/09/99
Laboratory No.: 99-13269-4

Project Number: COC #ERP-99-11-9
COC Number: ERP-99-11-9
Sample ID: 11-99-63 75-99-4
Sample Matrix: Groundwater
Sample Collected By: S. LOUIE, H. PIETROPAOLI

Date Collected: 11/08/99 @ 11:30AM

Constituents	Results	Units	P.Q.L.	Method	Run Date	Analyst	Dilution	Instrument	Prep Method	Prep Date	LLNL Method	LLNL Code
PCB-1016	None Detected	µg/L	0.2	8082	11/15/99	JKR	1.	GC-6	3510	11/11/99	E8082	6450
PCB-1221	None Detected	µg/L	0.2	8082	11/15/99	JKR	1.	GC-6	3510	11/11/99	E8082	6500
PCB-1232	None Detected	µg/L	0.2	8082	11/15/99	JKR	1.	GC-6	3510	11/11/99	E8082	6550
PCB-1242	None Detected	µg/L	0.2	8082	11/15/99	JKR	1.	GC-6	3510	11/11/99	E8082	6600
PCB-1248	None Detected	µg/L	0.2	8082	11/15/99	JKR	1.	GC-6	3510	11/11/99	E8082	6650
PCB-1254	None Detected	µg/L	0.2	8082	11/15/99	JKR	1.	GC-6	3510	11/11/99	E8082	6700
PCB-1260	None Detected	µg/L	0.2	8082	11/15/99	JKR	1.	GC-6	3510	11/11/99	E8082	6750
Total PCB's (Summation)	None Detected	µg/L	0.2	8082	11/15/99	JKR	1.	GC-6	3510	11/11/99	E8082	6825

Quality Control Data

Surrogates	% Recovery	Control Limits
Decachlorobiphenyl	105.	60-140

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ENVIRONMENTAL RESTORATION DEPARTMENT
1 CYCLOTRON ROAD, MAIL STOP 90-1116
BERKELEY, CA 94720
Attn: DR. IRAJ JAVANDEL 510-486-6106

Date Reported: 11/22/99
Date Received: 11/09/99
Laboratory No.: 99-13269-4

Sample Description: COC #ERP-99-11-9, 11-99-63, 11/08/1999 @ 11:30, S. LOUIE, H. PIETROPAOLI

California D.O.H.S. Cert. #1186

Stuart G. Buttram
Department Supervisor

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BERKELEY, CA 94720
Attn: DR. IRAJ JAVANDEL 510-486-6106

Date Reported: 01/19/2000
Date Received: 01/18/2000
Laboratory No.: 00-00702-2

Project Number: COC #ERP-00-1-12
COC Number: 00-1-12
Sample ID: 1-00-47 75-99-6
Sample Matrix: GW - Groundwater
Sample Collected By: P. TRAPANI, S. LOUIE, J.C.

Date Collected: 01/13/2000 @ 14:00

Constituents	Results	Units	P.Q.L.	Method	Run Date	Analyst	Dilution	Instrument	Prep Method	Prep Date	LLNL Method	LLNL Code
PCB-1016	None Detected	µg/L	0.2	8082	01/19/00	SPB	1.	GC-6	3510	01/19/00	E8082	6450
PCB-1221	None Detected	µg/L	0.2	8082	01/19/00	SPB	1.	GC-6	3510	01/19/00	E8082	6500
PCB-1232	None Detected	µg/L	0.2	8082	01/19/00	SPB	1.	GC-6	3510	01/19/00	E8082	6550
PCB-1242	None Detected	µg/L	0.2	8082	01/19/00	SPB	1.	GC-6	3510	01/19/00	E8082	6600
PCB-1248	None Detected	µg/L	0.2	8082	01/19/00	SPB	1.	GC-6	3510	01/19/00	E8082	6650
PCB-1254	None Detected	µg/L	0.2	8082	01/19/00	SPB	1.	GC-6	3510	01/19/00	E8082	6700
PCB-1260	None Detected	µg/L	0.2	8082	01/19/00	SPB	1.	GC-6	3510	01/19/00	E8082	6750
Total PCB's (Summation)	None Detected	µg/L	0.2	8082	01/19/00	SPB	1.	GC-6	3510	01/19/00	E8082	6825

Quality Control Data

Surrogates	% Recovery	Control Limits
Decachlorobiphenyl	104.	60-140

PCBs
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ENVIRONMENTAL RESTORATION DEPARTMENT
1 CYCLOTRON ROAD, MAIL STOP 90-1116
BERKELEY, CA 94720
Attn: DR. IRAJ JAVANDEL 510-486-6106

Date Reported: 01/19/2000
Date Received: 01/18/2000
Laboratory No.: 00-00702-2

Sample Description: COC #ERP-00-1-12, 1-00-47, 01/13/2000 @ 14:00, P. TRAPANI, S. LOUIE, J.C.

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Department Supervisor

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BERKELEY, CA 94720
Attn: DR. IRAJ JAVANDEL 510-486-6106

Date Reported: 12/09/1999
Date Received: 12/03/1999
Laboratory No.: 99-14308-5

Project Number: COC #ERP-99-12-6
COC Number: 99-12-6
Sample ID: 12-99-30 75-99-7
Sample Matrix: WW - Wastewater
Sample Collected By: S. LOUIE, P. TRAPANI, E. GONZALEZ

Date Collected: 12/02/1999 @ 10:40

Constituents	Results	Units	P.Q.L.	Method	Run Date	Analyst	Dilution	Instrument	Prep Method	Prep Date	LLNL Method	LLNL Code
PCB-1016	None Detected	µg/L	0.2	8082	12/09/99	JKR	1.	GC-6	3510	12/07/99	E8082	6450
PCB-1221	None Detected	µg/L	0.2	8082	12/09/99	JKR	1.	GC-6	3510	12/07/99	E8082	6500
PCB-1232	None Detected	µg/L	0.2	8082	12/09/99	JKR	1.	GC-6	3510	12/07/99	E8082	6550
PCB-1242	None Detected	µg/L	0.2	8082	12/09/99	JKR	1.	GC-6	3510	12/07/99	E8082	6600
PCB-1248	None Detected	µg/L	0.2	8082	12/09/99	JKR	1.	GC-6	3510	12/07/99	E8082	6600
PCB-1254	None Detected	µg/L	0.2	8082	12/09/99	JKR	1.	GC-6	3510	12/07/99	E8082	6650
PCB-1260	None Detected	µg/L	0.2	8082	12/09/99	JKR	1.	GC-6	3510	12/07/99	E8082	6700
Total PCB's (Summation)	None Detected	µg/L	0.2	8082	12/09/99	JKR	1.	GC-6	3510	12/07/99	E8082	6825

Quality Control Data

Surrogates	% Recovery	Control Limits
Decachlorobiphenyl	120.	60-140

PCBs
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ENVIRONMENTAL RESTORATION DEPARTMENT
1 CYCLOTRON ROAD, MAIL STOP 90-1116
BERKELEY, CA 94720
Attn: DR. IRAJ JAVANDEL 510-486-6106

Date Reported: 12/09/1999
Date Received: 12/03/1999
Laboratory No.: 99-14308-5

Sample Description: COC #ERP-99-12-6, 12-99-30, 12/02/1999 @ 10:40, S. LOUIE. P. TRAPANI, E. GONZALEZ

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Department Supervisor

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BERKELEY, CA 94720
Attn: DR. IRAJ JAVANDEL 510-486-6106

Date Reported: 01/19/2000
Date Received: 01/18/2000
Laboratory No.: 00-00702-1

Project Number: COC #ERP-00-1-12
COC Number: 00-1-12
Sample ID: 1-00-46 75-99-8
Sample Matrix: GW - Groundwater
Sample Collected By: P. TRAPANI, S. LOUIE, J.C.

Date Collected: 01/13/2000 @ 13:30

Constituents	Results	Units	P.Q.L.	Method	Run Date	Analyst	Dilution	Instrument	Prep Method	Prep Date	LLNL Method	LLNL Code
PCB-1016	None Detected	µg/L	0.2	8082	01/19/00	SPB	1.	GC-6	3510	01/19/00	E8082	6450
PCB-1221	None Detected	µg/L	0.2	8082	01/19/00	SPB	1.	GC-6	3510	01/19/00	E8082	6500
PCB-1232	None Detected	µg/L	0.2	8082	01/19/00	SPB	1.	GC-6	3510	01/19/00	E8082	6550
PCB-1242	None Detected	µg/L	0.2	8082	01/19/00	SPB	1.	GC-6	3510	01/19/00	E8082	6600
PCB-1248	None Detected	µg/L	0.2	8082	01/19/00	SPB	1.	GC-6	3510	01/19/00	E8082	6650
PCB-1254	None Detected	µg/L	0.2	8082	01/19/00	SPB	1.	GC-6	3510	01/19/00	E8082	6700
PCB-1260	None Detected	µg/L	0.2	8082	01/19/00	SPB	1.	GC-6	3510	01/19/00	E8082	6750
Total PCB's (Summation)	None Detected	µg/L	0.2	8082	01/19/00	SPB	1.	GC-6	3510	01/19/00	E8082	6825

Quality Control Data

Surrogates	% Recovery	Control Limits
Decachlorobiphenyl	99.	60-140

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BERKELEY, CA 94720
Attn: DR. IRAJ JAVANDEL 510-486-6106

Date Reported: 01/19/2000
Date Received: 01/18/2000
Laboratory No.: 00-00702-1

Sample Description: COC #ERP-00-1-12, 1-00-46, 01/13/2000 @ 13:30, P. TRAPANI, S. LOUIE, J.C.

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Stuart G. Buttram
Department Supervisor