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Work Plan for Additional Investigation at the X-344C Solid Waste Management Unit at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio

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ACRONYMS

ALARA	as low as reasonably achievable
ARAR	applicable or relevant and appropriate requirement
BAT	best available technologies
bgs	below ground surface
BRA	Baseline Risk Assessment
BSI	Background Sampling Investigation
CAS	Cleanup Alternatives Study
CFR	*Code of Federal Regulations*
CMS	Corrective Measures Study
COC	contaminant of concern
COPC	contaminant of potential concern
DOE	U.S. Department of Energy
DPT	direct push technology
DQO	data quality objective
ELCR	excess lifetime cancer risk
ES&H	Environmental, Safety and Health
GC	gas chromatograph
HF	hydrogen fluoride
HI	hazard index
IGWMP	*Integrated Groundwater Monitoring Plan*
ISMS	Integrated Safety Management System
MCL	maximum contaminant level
Ohio EPA	Ohio Environmental Protection Agency
PAH	polycyclic aromatic hydrocarbon
PEMS	Project Environmental Measurements System
PORTS	Portsmouth Gaseous Diffusion Plant
PPE	personal protective equipment
PRG	preliminary remediation goal
QA	quality assurance
QAPP	Quality Assurance Program Plan
QC	quality control
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SVOC	semivolatile organic compound
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
TCE	trichloroethene
TCL	Target Compound List
U.S. EPA	U.S. Environmental Protection Agency
VOC	volatile organic compound

1. INTRODUCTION

This work plan describes the approach that will be implemented to provide additional characterization data for the Gallia groundwater near the former X-344C Hydrogen Fluoride (HF) Storage Building (X-344C facility) site at the U.S. Department of Energy (DOE) Portsmouth Gaseous Diffusion Plant (PORTS). The building and associated HF storage tanks (Figure 1) were demolished and removed in May 2006. The concrete secondary containment pad and storage tank supports were left in place (Figure 2). The investigation also includes sampling the soil beneath the X-344C Solid Waste Management Unit (SWMU). The X-344C SWMU is defined as the vadose zone soils and groundwater beneath the former X-344C facility site. The work plan provides the technical approach, the approximate locations of the samples to be collected, the types of samples to be collected, the sampling regimen, the laboratory methods to be used, and the data evaluation criteria.

Figure 1. Former X-344C HF Storage Building.

1.1 PURPOSE AND SCOPE

In 1993 and 1994, the X-344C HF Storage Building and the X-344D HF Neutralization Pit (formerly located southeast of the former X-344C facility) were investigated as a single unit during the Quadrant IV Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI). It was later determined that the X-344C/X-344D SWMU required further investigation due to the future risk presented from exposure to inorganic compounds in the Gallia groundwater near the former X-344C facility (see Section 1.5.1). In September 2000, the X-344D HF Neutralization Pit was demolished and removed. No further action was required for that unit. The purpose of this investigation is to confirm or refute earlier conclusions that metals contamination exists above target risk goals in the Gallia groundwater near the former X-344C HF Storage Building, and, if substantiated, whether soils beneath the former X-344C facility site may be contributing to the groundwater contamination.

Figure 2. Secondary containment pad and storage tank supports of former X-344C facility.

1.2 AREA DESCRIPTION

Groundwater monitoring and remediation activities are conducted in four areas (or quadrants) defined by the direction of groundwater and surface water flow at the PORTS site. The former X-344C facility site is located in the southwest portion of Quadrant IV, where surface water generally drains toward the North Drainage Ditch into the X-230L North Holding Pond and then into Little Beaver Creek (see Figure 3).

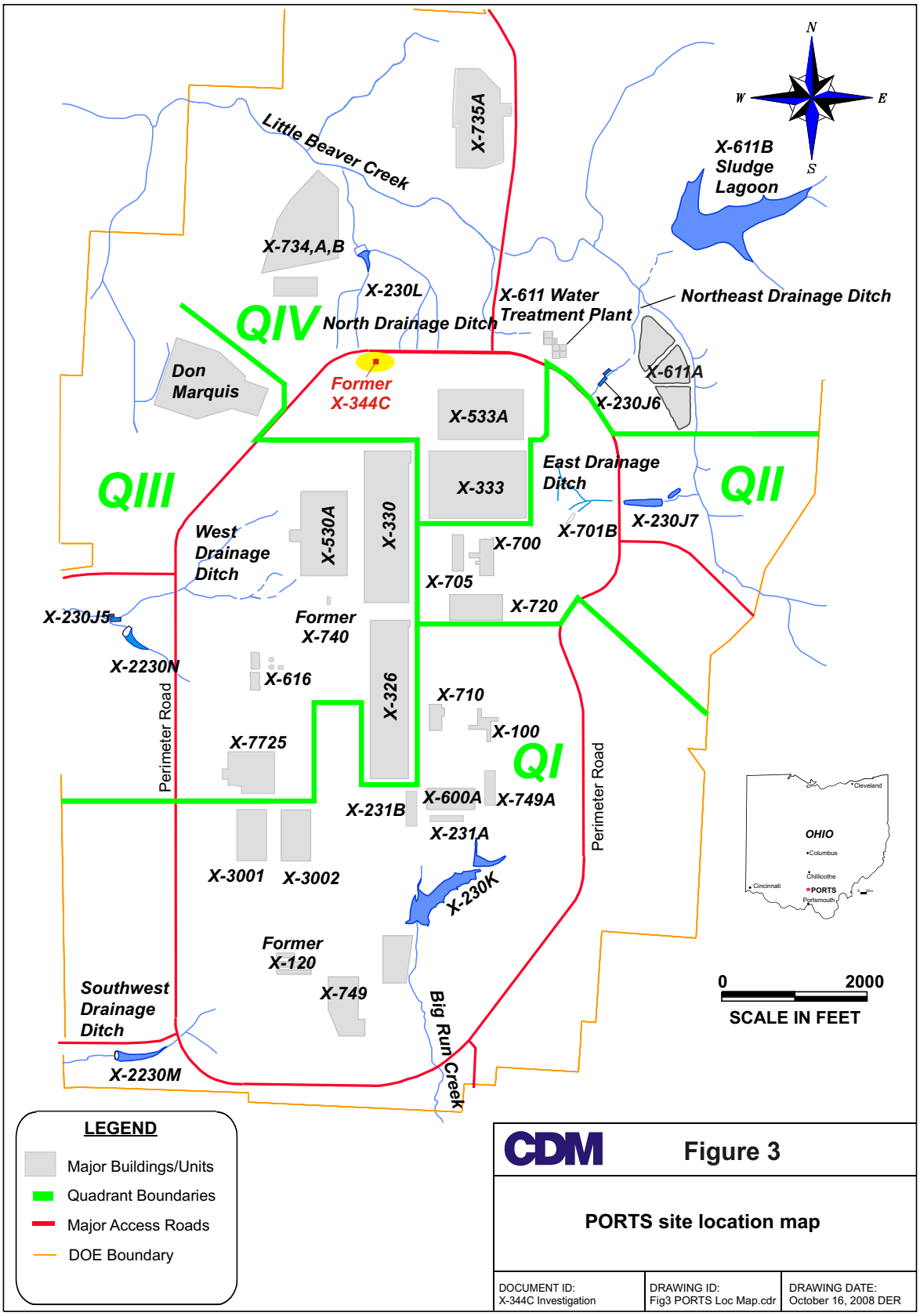
The unconsolidated materials beneath the former X-344C facility site include fill, the Minford Member (Minford) of the Teays Formation, and the Gallia Member (Gallia) of the Teays Formation. The former X-344C HF Storage Building was constructed on an area containing surface fill placed during initial plant site grading. The varying depths of fill are usually composed of Minford soils moved from other areas of the plant site and are usually indistinguishable from the undisturbed Minford. The Minford was deposited as lake sediments during the Pleistocene and is comprised of very fine sand, silt, and clay. The Minford/fill is present to an approximate depth of 26 ft beneath the former X-344C facility site.

The Gallia underlies the Minford and is comprised of silty sand and gravel with some clay. In the vicinity of the former X-344C facility, the Gallia is 3.5 to 5 ft thick and is underlain by bedrock. The Gallia forms the upper-most water-bearing unit beneath the former X-344C facility site. The Gallia groundwater flow in the vicinity of the former X-344C facility site is toward a tributary of the North Drainage Ditch located immediately west-northwest of the unit.

Bedrock under the former X-344C facility site is approximately 30 ft deep and is comprised of the Mississippian Berea Sandstone Formation (Berea). The upper portion of the Berea is composed of a massive (8 to 12 ft thick), very fine-grained, calcareous, light gray sandstone with a few thin shale laminations. The lower portion of the Berea is composed of thinly bedded alternating shale and sandstone with decreasing sandstone and increasing shale with depth. The upper portion of the Berea forms the upper bedrock water-bearing unit beneath the former X-344C facility site. Groundwater flow in the Berea in the vicinity of the former X-344C facility site is toward a tributary of the North Drainage Ditch located northwest of the unit.

1.3 X-344C HF STORAGE BUILDING DESCRIPTION AND HISTORY

The former X-344C facility site is located near the northern portion of Perimeter Road, north of the X-745F North Process Gas Stockpile Yard and south of the X-745G Tails Storage Yard. The former X-344C HF Storage Building covered approximately 1,700 ft^2 and housed three 10,000-gallon storage tanks with a capacity of 70,000 to 80,000 lbs of hydrogen fluoride. The tanks were equipped with a rupture disc system for protection against overpressurization and a vent system for purging in preparation for maintenance. Liquid hydrogen fluoride was transferred by pressure differentials to the hydrogen fluoride vaporizer in the X-342A Feed Vaporization and Fluorine Generation Building. The X-344C facility was contained by concrete dikes, and the floor was sloped toward a covered drain near the southeast corner. The drain discharged to the former X-344D HF Neutralization Pit, which could contain spills of up to 26,000 gallons. Use of the former X-344C tank farm was discontinued in 1986. In May 2006, the building was demolished and removed (down to the concrete supports). The concrete secondary containment pad and storage tank supports were left in place. The demolition of the building was completed in accordance with DOE Orders, the National Environmental Policy Act, and Federal and State of Ohio environmental regulations.


N
W
E
S
Little Beaver Creek
X-735A
X-611B
Sludge
Lagoon
X-734,A,B
X-230L
X-611 Water
Treatment Plant
Northeast Drainage Ditch
QIV
North Drainage Ditch
Don
Marquis
Former
X-344C
X-611A
X-230J6
X-533A
East Drainage
Ditch
QIII
QII
X-333
X-330
X-530A
West
Drainage
Ditch
X-701B
X-230J7
X-700
X-705
X-720
X-230J5
Former
X-740
X-2230N
X-616
X-326
X-710
X-100
Perimeter Road
X-7725
QI
Perimeter Road
X-231B
X-600A
X-749A
X-231A
X-3001
X-3002
X-230K
Cleveland
OHIO
Columbus
Chillicothe
Cincinnati
PORTS
Portsmouth
Former
X-120
X-749
Southwest
Drainage
Ditch
Big Run Creek
X-2230M
0
2000
SCALE IN FEET
LEGEND
Major Buildings/Units
Quadrant Boundaries
Major Access Roads
DOE Boundary
CDM
Figure 3
PORTS site location map
DOCUMENT ID:
X-344C Investigation
DRAWING ID:
Fig3 PORTS Loc Map.cdr
DRAWING DATE:
October 16, 2008 DER

Potential contaminants associated with the X-344C/X-344D SWMU included uranium hexafluoride, hydrogen fluoride, and fluoride. The primary pathways for releases from this unit included airborne emissions, surface runoff, and releases to soils adjacent and beneath the unit. There have been no documented releases from either the X-344C HF Storage Building or the X-344D HF Neutralization Pit (DOE 1992).

1.4 PREVIOUS SAMPLING AND EVALUATIONS

The X-344C HF Storage Building was investigated during Phases I and II of the Quadrant IV RFI. Environmental media sampled during the RFI included surface water, sediment, surface soil (0 to 2 ft), shallow soil (2 to 10 ft), deep soil (>10 ft), and groundwater. Data generated during Phases I and II of the Quadrant IV RFI may be found in the *Quadrant IV RCRA Facility Investigation Final Report* (DOE 1996b), which was approved by the Ohio Environmental Protection Agency (Ohio EPA) and U.S. Environmental Protection Agency (U.S. EPA) in September 1997.

During Phase I of the Quadrant IV RFI, continuous soil samples were collected from ground surface to bedrock at four soil boring locations (X344C-SB01 through X344C-SB04), one adjacent to each side of the X-344C facility, to determine if releases to soils near the building had occurred. In addition, all soil samples were analyzed (Level II) on site with a field gas chromatograph (GC) for trichloroethene (TCE). Soil samples from two hand auger sample locations (X344C-HA01 and X344C-HA02) from the ditch located immediately west of the X-344C building and one random soil sample from each soil boring were collected for Level III analysis for Target Compound List/Target Analyte List (TCL/TAL) constituents, Freon-113, fluoride, and radiological parameters. In addition, groundwater quality and flow in the vicinity of the X-344C facility were evaluated by installing and sampling two Gallia wells (X344C-01G and X745F-01G) and one Berea well (X745F-02B). Groundwater samples were analyzed for radiological parameters and the Appendix IX list of constituents from Title 40 of the *Code of Federal Regulations* (CFR), Part 264, in addition to on-site analysis of TCE with a field GC.

Quadrant IV RFI Phase II samples were collected and analyzed for parameters based on a review of Phase I results. A soil sample (X344C-HA03) was collected using a hand auger from the 4-6 ft interval below ground surface (bgs) to determine the extent of volatile organic compounds (VOCs) detected at soil boring location X344C-SB03 during the Quadrant IV RFI Phase I investigation. The sample was analyzed on site with a field GC for TCE and submitted to a laboratory for analysis of VOCs. Two soil borings (X344D-SB03 and X344D-SB04) were also drilled near the X-344C facility to determine if semivolatile organic compounds (SVOCs) and radiological parameters, detected in the sediment in the X-344D HF Neutralization Pit during Phase I, had been released to the subsurface. Continuous soil samples down to 16 ft bgs were collected and analyzed for TCE by an on-site field GC. Soil samples from the 12-14 ft bgs and 14-16 ft bgs intervals were analyzed for radiological parameters. Additionally, the 14-16 ft bgs interval was analyzed for SVOCs. One Gallia well (NDD-03G) and one Berea well (NDD-04B) were installed downgradient (north) of the X-344C/X-344D area in conjunction with the investigation of the North Drainage Ditch. Continuous soil samples were collected during well installation and analyzed on site with a field GC for TCE. Groundwater samples were collected and analyzed for VOCs, SVOCs, and radiological parameters. Groundwater was also sampled from well X344C-01G, which was installed during the Quadrant IV RFI Phase I investigation, and analyzed for total mobile metals. Figures showing the locations of samples collected at this unit and associated analytical results during the Quadrant IV RFI are provided in Appendix A.

RFI sampling data were used to identify chemicals of potential concern (COPCs) on a SWMU-specific basis, which were then evaluated during the exposure assessment in the Quadrant IV RFI Baseline Risk Assessment (BRA). In the BRA, pathways for potential exposure to contaminants were

considered under the current land use scenarios (on-site worker, off-site resident, and off-site recreational population) and the future land use scenarios designated at that time (on-site worker, on-site resident, and on-site recreational population). The hazard index (HI) for noncarcinogenic effects and the excess lifetime cancer risk (ELCR) for carcinogenic effects were the two criteria used to evaluate risk in the BRA.

The X-344C HF Storage Building and the X-344D HF Neutralization Pit were evaluated as a single unit for the risk estimates in the BRA. A total HI = 4 and a total ELCR = 5×10^{-4} were determined for the future on-site worker exposure scenario. These risks were driven by exposure to inorganic compounds in Gallia groundwater: arsenic and vanadium for noncarcinogenic (HI) effects and arsenic and beryllium for carcinogenic (ELCR) effects. Similarly, a total HI = 10 and a total ELCR = 3×10^{-3} were determined for the on-site resident exposure scenario due to inorganic compounds in Gallia groundwater. The on-site resident HI value was driven by exposure to arsenic, chromium, nickel, and vanadium. The on-site resident ELCR value was driven by exposure to arsenic and beryllium.

It should be noted that tentative background data from an initial on-site background investigation conducted in 1991 were used in the BRA to assess the potential risks from background. A second background sampling investigation was later performed pursuant to the direction of Ohio EPA and U.S. EPA at locations off the DOE reservation to adequately characterize background levels of metals and naturally-occurring radionuclides in soil and groundwater. Upper tolerance limits for soil, Gallia groundwater, and Berea groundwater were included in the *Background Sampling Investigation of Soil and Groundwater Final Report* (BSI, DOE 1996a), which was approved by Ohio EPA and U.S. EPA in July 1996. Therefore, approved background values presented in the BSI were not incorporated in the risk assessment for the X-344C SWMU.

After the RFI and the BRA were completed, the PORTS Decision Team (comprised of U.S. EPA, Ohio EPA, and DOE) determined that the industrial areas of the site (mainly those areas within the security fence) would likely remain industrial into the future and the remaining property at the site (excluding landfills and other currently industrialized areas) would be evaluated for risk on the basis of an industrial/commercial or recreational scenario. Consequently, the exposure scenarios considered in the *Quadrant IV Cleanup Alternatives Study/Corrective Measures Study Final Report* (CAS/CMS, DOE 1998) were:

- Industrial/commercial use for areas inside the limited access (security fence) area,
- Recreational use for on-site creeks between the security fence and the DOE property boundary, and
- Residential use for locations at the DOE property boundary.

The Quadrant IV RFI soil data for the X-344C and X-344D SWMUs were screened using updated preliminary remediation goals (PRGs) in the Quadrant IV CAS/CMS. Barium and xylenes exceeded associated PRGs in one soil sample each, but were not listed in the RFI as presenting risk. The exceedances were the result of selected PRGs being based on background values (for barium) or leaching-based values (for xylenes) that were lower than the RFI risk goals (HI $\leq$ 1 and ELCR $\leq 1 \times 10^{-6}$). Polycyclic aromatic hydrocarbons (PAHs) in soil exceeded the selected PRGs in two samples, but did not present risk in the RFI. All of these constituents except one, benzo(a)pyrene, had no risk value. Benzo(a)pyrene exceeded the selected PRG in only one soil sample. The PAHs detected at the SWMU were presumed to be the result of continuing infrastructure sources, such as runoff from roofs and roads, and not a release of contaminants from the SWMU. Therefore, no further action was recommended for soils at the unit.

The Quadrant IV RFI groundwater data for the X-344C and X-344D SWMUs were also screened using updated PRGs. The following metals exceeded selected PRGs in one groundwater sample each, but were not listed in the RFI as exceeding target risk levels: cadmium, chromium, lead, and nickel. These PRG exceedances were due to the selected PRGs being based on maximum contaminant levels (MCLs) and background values that were lower than the RFI risk values (HI $\leq$ 1 and ELCR $\leq 1 \times 10^{-6}$). Beryllium and vanadium exceeded the selected PRGs in Gallia groundwater, which was in agreement with the Quadrant IV RFI BRA. Although arsenic in groundwater exceeded target risk goals in the RFI, the selected PRG was not exceeded because the background value for arsenic is higher than the risk value.

1.5 DATA QUALITY OBJECTIVES

Project planning discussions between Ohio EPA and DOE resulted in the development of the project data quality objectives (DQOs) discussed in the following sections.

1.5.1 Description of the Problem

In September 1996, the PORTS Decision Team determined that the X-344C/X-344D SWMU required further investigation due to the future risk from exposure to inorganic compounds in the Gallia groundwater and deferred remediation activities to decontamination and decommissioning. The evaluation of risk in the Quadrant IV RFI BRA from exposures to groundwater for inorganic compound data was based on the evaluation of unfiltered sample results (i.e., total metals concentrations) in accordance with U.S. EPA risk assessment guidance. During Phases I and II of the Quadrant IV RFI, groundwater samples were collected using bailers. This sampling methodology is more likely to have yielded colloid-sized or larger particles often found in turbid samples that may erroneously influence or produce higher concentrations of detected metals and radiological parameters. Therefore, the risk identified for the X-344C/X-344D SWMU from exposure to inorganic compounds in groundwater may be overestimated and not representative of actual water-bearing unit conditions.

1.5.2 Decision Statements and Inputs

The purpose of this investigation is to confirm or refute earlier conclusions that metals contamination exists above target risk goals in the Gallia groundwater near the former X-344C HF Storage Building. The activities conducted through this investigation will support the regulatory decision that possible remedial action is required or that no further corrective actions are necessary for the X-344C SWMU.

The principal study questions identified for this investigation were:

1. Do the concentrations of metals in the Gallia groundwater near the former X-344C HF Storage Building currently exceed groundwater PRGs?

2. Do the concentrations of metals in the subsurface soil beneath the foundation footprint of the former X-344C HF Storage Building exceed soil PRGs?

Two decision statements were developed based on the principal study questions, and information required to address the decision statements were identified. Data requirements to address each of these decision statements are outlined below.

Decision Statement #1: Determine whether metals identified in the Quadrant IV RFI BRA and Quadrant IV CAS/CMS as exceeding target risk goals (in Gallia groundwater) for the X-344C SWMU continue to pose a potential future threat to human health and the environment, thereby requiring further evaluation or

a remedial action of the groundwater media at the unit. If it is determined that concentrations of the metal COPCs in the Gallia groundwater do not exceed PRGs, no further evaluation or corrective actions is necessary for groundwater at the X-344C SWMU.

- Groundwater samples will be collected (two sampling events) using low-flow/low-volume sampling techniques that are currently employed at the site in accordance with the *Integrated Groundwater Monitoring Plan* (IGWMP) from the same Gallia groundwater monitoring wells that were sampled in the vicinity of the X-344C SWMU during the Quadrant IV RFI (see Table 3). The groundwater samples will be analyzed for the targeted metals of potential concern (Table 1).

Table 1. X-344C investigation targeted metals of potential concern

List of Metals
Arsenic (As)
Beryllium (Be)
Cadmium (Cd)
Chromium (Cr)
Lead (Pb)
Nickel (Ni)
Vanadium (V)

- Groundwater contaminant (metals) concentrations will be compared to the Gallia groundwater PRGs.
- In addition to analysis for metals, the Ohio EPA requested during the DQO planning meetings that the groundwater sample collected from well X344C-01G also be analyzed for VOCs, total uranium, and technetium-99. The purpose of these analyses is to substantiate previous RFI findings. Elevated levels of gross alpha and gross beta activity detected in the groundwater at well X344C-01G during the Quadrant IV RFI were presumed to have been influenced by turbidity in groundwater samples obtained using bailers. [Additional groundwater sampling during Phase II of the Quadrant IV RFI indicated that total uranium and technetium-99 (the primary alpha and beta emitters at the site, respectively) were below risk-based levels.] The groundwater sample collected from well X344C-01G during this investigation is being analyzed for VOCs due to the detection of low concentrations of VOCs in soil samples collected at 16 ft bgs from location X344C-SB02 during the Quadrant IV RFI.

Decision Statement #2: Determine whether the subsurface soil beneath the foundation footprint of the former X-344C HF Storage Building exhibits contamination for metals and warrants further evaluation or remediation. If it is determined that concentrations of the metal COPCs in the soil do not exceed PRGs, no further evaluation or corrective actions is necessary for soils at the X-344C SWMU.

- Soil samples will be collected at four depths at four locations (Table 4) from beneath the foundation footprint of the former X-344C HF Storage Building via direct push technology (DPT) down to 12 ft bgs and analyzed for the targeted metals of potential concern (Table 1). The number of soil sampling locations were agreed to by Ohio EPA based on information noted in the Description of Current Conditions (DOE 1992) and data collected during the Quadrant IV RFI.

- Soil contaminant (metals) concentrations will be compared to soil PRGs.
- In addition to analysis for metals, the Ohio EPA requested during the DQO planning meetings that the soil sample collected at the 10 to 12-ft depth interval from the DPT location nearest previous RFI sampling location X344C-SB02 also be analyzed for VOCs. The purpose of the VOC sample is to substantiate previous RFI findings. Ethylbenzene and xylenes were detected below risk-based levels at location X344C-SB02 during the Quadrant IV RFI.

1.5.3 Investigation Boundaries

Except for inorganic constituents in groundwater, data obtained during the Quadrant IV RFI were considered sufficient to adequately confirm the presence or absence of contaminants of concern (COCs) and their respective maximum concentrations as well as the extent of contamination within each environmental medium (DOE 1998). Data derived from groundwater samples served as conservative upper limits of potential inorganic contamination to determine inorganic COCs. However, these data could not be used to define the extent of inorganic compound contamination due to the inherent measurement error included in the results from sample turbidity (which could lead to a false acceptance/negative decision error).

Groundwater (Gallia) was the only environmental medium at the X-344C SWMU for which target risk goals were exceeded and identified as a pathway of concern. As previously discussed, the concentration and extent of metals in groundwater may be overestimated and requires further evaluation. Therefore, the spatial boundary of this investigation is limited to wells monitoring the Gallia groundwater in the vicinity of the X-344C SWMU (Figure 4). Because soils in the X-344C/X-344D unit were previously investigated during the Quadrant IV RFI, only the subsurface soil beneath the footprint of the former X-344C HF Storage Building will be assessed for metals contamination.

1.5.4 Decision Rules

The initial cleanup goal for remediation at PORTS is to achieve PRGs when practicable. However, it may not be possible to develop cost-effective clean-up alternatives utilizing best available technologies (BAT) in some areas. Therefore, to realize cost-effective risk reduction in full compliance with applicable environmental regulations and guidance, future land use and as low as reasonably achievable (ALARA) principles should be considered when formulating cleanup strategies for contaminated media.

The PRGs are media-specific concentrations that correspond to a level of acceptable risk to human health based on several assumptions and decisions concerning remediation. For example, metals in soil and groundwater cannot be cleaned up to concentrations below background levels established for PORTS (DOE 1998). Selected PRGs are used as screening levels to identify COCs for further potential remedial consideration. If an applicable or relevant and appropriate requirement (ARAR) exists for a parameter in a given media (e.g., an MCL for groundwater), the PRG is based on the ARAR unless the background concentration is greater than the ARAR-based PRG. If no ARAR-based PRG exists, the risk-based PRG for the future commercial/industrial worker is then compared with the background level and the larger of these values becomes the selected PRG.

Analytical (metals) data for groundwater and soil samples collected during this investigation will be evaluated according to the decision process discussed in the following subsections. Sample results will be compared to selected PRGs for metals (Table 2), which meet the approved risk goals above background concentrations for both groundwater and soil or meet the leach-based values above background concentrations for soils that are protective of groundwater. In those instances where more than one COPC is detected and exceeds a PRG, a cumulative risk assessment will be performed to ensure

that target risk goals will be met. Metals that exceed selected PRGs and exhibit a cumulative risk above the target risk goals will be designated as COCs for further potential remedial consideration.

Table 2. Selected PRGs for the X-344C metal COPCs

Chemical	Selected Gallia Groundwater PRG (µg/L)	Basis	Selected Soil PRG (mg/kg)	Basis
Arsenic	92	Background	31	Background
Beryllium	6.5	Background	3.2[a]	Leach-based
Cadmium	6.5	Background	2.0	Background
Chromium	100	ARAR	1400 – 140,000[b]	Risk (Industrial)
Lead	16[c]	Background	400[d]	ARAR
Nickel	100	ARAR	34	Background
Vanadium	260[e]	Risk (Tap water)	260[a]	Leach-based

[a]The PRG value is based on the U.S. EPA Region 9 soil screening level for the protection of groundwater.
[b]The PRG value is based on the U.S. EPA Region 9 screening level for industrial soil corresponding to a 10^{-6}–10^{-4} cancer risk level.
[c]The PRG value for lead was updated based on revised action levels for lead in drinking water.
[d]The ARAR value is based on U.S. EPA Office of Solid Waste and Emergency Response guidance.
[e]The PRG value is based on the U.S. EPA Region 9 screening level for tap water.

1.5.4.1 Decision Rule 1 – Groundwater

Decision Rule 1 – Groundwater. If low-flow groundwater sampling results from the two sampling events indicate that the concentration of a metal of potential concern is above the selected PRG, then calculate the cumulative risk posed by the metal COC(s) for the projected future land use scenario (industrial/commercial) and compare against target risk goals. If target risk goals are exceeded, then discuss potential remedial alternatives with Ohio EPA. If the concentration of a metal of potential concern is above the selected PRG for only one sampling event, then discuss the need for further evaluation (e.g., additional sampling under the IGWMP) with Ohio EPA; otherwise, no further corrective action is warranted for groundwater at the X-344C SWMU.

Step 1. Compare the low-flow groundwater sampling results for the metal COPCs for the two sampling events against the selected PRGs for Gallia groundwater. If the concentration of a metal COPC exceeds the selected PRG, then proceed to Step 2; otherwise, no further evaluation is required.

Step 2. If the concentration of the metal COPC exceeds the selected PRG for both groundwater sampling events, then identify the constituent as a COC and proceed to Step 3. If the selected PRG for the metal COPC is only exceeded for one of the two groundwater sampling events, then review the results with Ohio EPA and discuss whether the COPC should be evaluated further through routine monitoring.

Step 3. Review the results with Ohio EPA and, if the cumulative risk posed by the identified metal COCs exceeds target risks goals, discuss the need for sampling under the IGWMP and/or groundwater corrective actions at the X-344C SWMU.

1.5.4.2 Decision Rule 2 – Soil

Decision Rule 2 – Soil. If the concentration of a metal of potential concern is above the selected PRG, then determine the lateral and vertical extent of contamination and calculate the cumulative risk posed by the metal COC(s) for the projected future land use scenario (industrial/commercial) and compare against target risk goals. If target risk goals are exceeded, then discuss potential remedial alternatives with Ohio EPA; otherwise, no further corrective action is warranted for soils at the X-344C SWMU.

Step 1. Compare the soil sampling results for the metal COPCs against the selected PRGs for soil. If the concentration of a metal COPC exceeds the selected PRG, then identify the constituent as a COC and proceed to Step 2; otherwise, a release from the X-344C unit has not occurred and no further evaluation is required.

Step 2. Review and discuss the results with Ohio EPA. Additional samples may be needed to determine the lateral and vertical extent of contamination. A typical scenario may include "stepping out" approximately 10 ft from the original location in order to determine the extent of contamination. The specific approach to be used at each location where contamination is identified will be discussed with Ohio EPA and agreed to prior to implementation in the field. Samples beyond 20 ft of the concrete pad are not planned or included in this work plan. After completion of sampling, the cumulative risk posed by the metal COCs in the soil will be calculated for the projected future land use scenario (industrial/commercial). If the cumulative risk posed by the identified metal COCs exceeds target risks goals, then discuss the potential remedial alternatives to be evaluated for the unit with Ohio EPA.

2. SCOPE OF WORK

This section describes the field activities for the investigation of suspect metals contamination in groundwater near the X-344C SWMU and subsurface soil beneath the former X-344C HF Storage Building site to meet the DQOs discussed in Section 1.5.

2.1 GEOPHYSICAL SURVEY

A geophysical, or subsite, survey will be conducted at proposed soil sampling locations to identify underground utilities before the sampling locations are finalized. If a soil sample cannot be collected within 5 ft laterally of a proposed sample location and 1 ft vertically of a proposed depth interval, an alternate sample point or depth will be selected based upon mutual agreement between DOE and Ohio EPA.

2.2 GROUNDWATER AND SOIL SAMPLING AND ANALYSIS ACTIVITIES

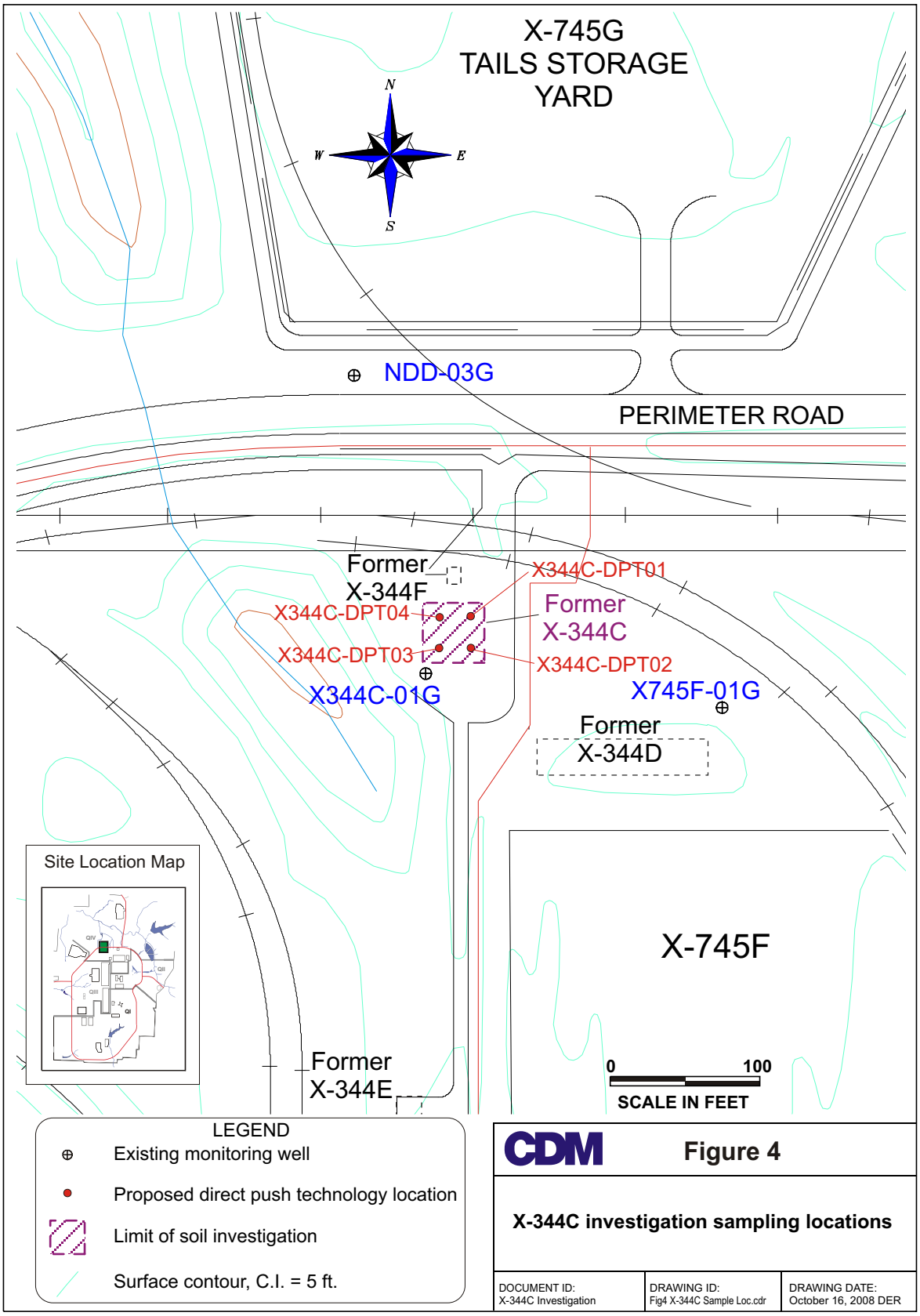
2.2.1 Groundwater Sampling

Groundwater samples will be collected from the same three Gallia groundwater monitoring wells that were sampled and evaluated for the X-344C/X-344D SWMU during the Quadrant IV RFI (see Figure 4): X344C-01G, X745F-01G, and NDD-03G. These wells have not been sampled within the last several years and may have collected substantial silt in the well casing. Prior to sampling, the wells will be developed sufficiently to remove excess silt to the extent possible from the well casing and sand pack, dislodge screen obstructions, and stabilize field parameters (e.g., conductivity, pH, turbidity, and temperature).

Groundwater samples will be acquired during two sampling events utilizing low-flow sampling methods (e.g., bladder or peristaltic pumps) in accordance with IGWMP procedures. A minimum 30-day period between sampling events will be instituted to ensure the collection of independent samples. All groundwater samples will be analyzed at a fixed-base laboratory for selected metals. In addition, the groundwater sample collected from well X344C-01G will also be analyzed for selected VOCs and radiological parameters. The groundwater sampling locations and associated analytical suites are summarized in Table 3.

Table 3. X-344C investigation groundwater sample locations and analytical suites

Well ID	Analytical Suite
X344C-01G	METALS, VOCS, RADS
X745F-01G	METALS
NDD-03G	METALS


X-745G
TAILS STORAGE
YARD
N
W
E
S
NDD-03G
PERIMETER ROAD
Former
X-344F
X344C-DPT01
X344C-DPT04
Former
X-344C
X344C-DPT03
X344C-DPT02
X344C-01G
X745F-01G
Former
X-344D
Site Location Map
X-745F
Former
X-344E
0
100
SCALE IN FEET
LEGEND
Existing monitoring well
Proposed direct push technology location
Limit of soil investigation
Surface contour, C.I. = 5 ft.
CDM
Figure 4
X-344C investigation sampling locations
DOCUMENT ID:
X-344C Investigation
DRAWING ID:
Fig4 X-344C Sample Loc.cdr
DRAWING DATE:
October 16, 2008 DER

2.2.2 Soil Sampling

DPT will be utilized to collect soil samples from beneath the footprint of the former X-344C HF Storage Building during the field investigation. Soil samples will be collected from four DPT locations, resulting in approximately 425 ft^2 per sample average coverage over the entire investigation area. Figure 4 shows the planned layout for the sample locations.

Project personnel will core through the concrete pad and collect soil samples via DPT to a depth of 12 ft bgs. Soil samples will be collected from 2-ft intervals at bottom depths of 2 ft bgs, 6 ft bgs, 9 ft bgs, and 12 ft bgs starting immediately below the base of the concrete pad/gravel subgrade. All soil samples will be analyzed at a fixed-base laboratory for selected metals. In addition, a soil sample will be collected at the 10 to 12-ft depth interval from DPT location X344C-DPT02 and analyzed for selected VOCs. Following the collection of soil samples, the DPT locations will be filled with bentonite/grout to prevent surface runoff from migrating to the subsurface. The soil sampling locations, depths, and associated analytical suites are summarized in Table 4.

Table 4. X-344C investigation soil sample locations and analytical suites

Sample Location	Sample Depth / Interval (in ft bgs)	Analytical Suite
X344C-DPT01	2 / 0 – 2	METALS
	6 / 4 – 6	METALS
	9 / 7 – 9	METALS
	12 / 10 – 12	METALS
X344C-DPT02	2 / 0 – 2	METALS
	6 / 4 – 6	METALS
	9 / 7 – 9	METALS
	12 / 10 – 12	METALS, VOCS
X344C-DPT03	2 / 0 – 2	METALS
	6 / 4 – 6	METALS
	9 / 7 – 9	METALS
	12 / 10 – 12	METALS
X344C-DPT04	2 / 0 – 2	METALS
	6 / 4 – 6	METALS
	9 / 7 – 9	METALS
	12 / 10 – 12	METALS

2.2.3 Laboratory Analyses

Samples collected during the investigation will be analyzed at a fixed-base laboratory. Laboratory analyses will be conducted for the analytes listed in Table 5 in accordance with the referenced analytical methods.

Table 5. List of analytical suites, analytes, and laboratory methods

Analytical Suite	Analyte	Method Number[a]
METALS	Arsenic Beryllium Cadmium Chromium Lead Nickel Vanadium	SW846-6010/6020
VOCS	1,1-Dichloroethane 1,2-Dichloroethane 1,1-Dichloroethene cis-1,2-Dichloroethene trans-1,2-Dichloroethene Benzene Ethylbenzene Toluene Trichloroethene Vinyl chloride Xylenes, total	SW846-5035/8260
RADS	Total Uranium Uranium-233/234 Uranium-235 Uranium-236 Uranium-238 Technetium-99	(Approved method per laboratory QA plan)[b]

[a]Samples shall be analyzed for the listed analyte(s) in accordance with the referenced method number or equivalent.

[b]Standard approved methods do not exist for radiological parameters; therefore, method numbers are not listed for these analytes. Analyses for radiological parameters will be conducted in accordance with the approved method(s) per the laboratory's quality assurance plan.

3. QUALITY ASSURANCE/QUALITY CONTROL

The DOE Prime Contractor's Quality Assurance (QA) Program will provide the appropriate resources to facilitate quality work. The QA Program includes a framework for achieving quality, contains explanations of various elements that may be applicable to project work, and includes procedures to effectively implement the elements. Inclusion of the applicable quality elements and procedures during project planning helps build quality into the project. Certain quality procedures assist in properly dealing with problems if they arise during project activities. The key quality elements are planning the project, qualification of personnel, technical review of project work, procurement of technical services and measurement, assessment of the work, and rapid correction of problems.

The QA Program also includes a QA staff that is available to provide information and guidance in quality matters and to assist in meeting QA requirements. The project and QA staff share a common goal to achieve high quality project products and results. The QA staff will work to customize the QA procedures to identify the quality measures that will be most helpful to this project. A QA staff member will work with the project team to achieve these common goals in this regard.

The QA/quality control (QC) measures will be communicated to the project team through planning documents, procedures, work instructions, and thorough training and orientation meetings. Management and project assessments will verify that adequate QA/QC controls are in place to perform the sampling task. Prior to commencement of work activities, management will make certain that project staff are properly trained and qualified.

During project execution, the adequacy of QA/QC measures will be assessed by team members and management to determine if the scope of work and governing documents are being implemented effectively. All project team members and workers are responsible for identifying and reporting project difficulties, and for suggesting improvements to work processes. If necessary, QA/QC measures will be modified using the change control process and communication to the project team. Lessons learned and other feedback will be provided to foster continuous improvement.

3.1 PROJECT MANAGEMENT

The DOE Prime Contractor's Project Manager is responsible for the full implementation of project QA and QC procedures. The DOE Prime Contractor's QA Manager is authorized to make QA decisions on all work elements and is responsible for auditing QA/QC performance for this project. Specifically, the QA Manager ensures proactive implementation of QA/QC procedures and policies, quality in all planning and deliverables, and documentation and implementation of any corrective actions. The QA Manager also works with all project personnel to ensure an understanding and implementation of QA procedures and protocols and ensures that project staff receives the required training and that training records are current.

3.2 FIELD AND LABORATORY QA/QC MEASURES

Field QC measures will include samples collected or prepared in the field during sampling activities and submitted to the laboratory to assess the quality of the sample collection process, sample handling and shipment, and sample analysis (for total measurement error). For purposes of this work plan, field QC samples include field duplicates, field/rinsate blanks, and trip blanks.

- Field Duplicates – One field duplicate will be obtained for every twenty samples collected. Field duplicates will be analyzed for the same set of analytical parameters as the regular (non-QC) samples being collected. The purpose of field duplicates is to determine precision that is a function of variance in sample composition, sampling techniques, and analytical techniques. Duplicate samples will be collected in the same manner as the regular samples.

- Field/Rinsate Blanks – One field blank and one rinsate blank will be obtained for every thirty samples collected. Field blanks are preserved bottles taken to the sampling location and filled with water that meets or exceeds the standards for deionized, ultra-filtered water. Rinsate blanks are samples of deionized, ultra-filtered water that has been used to rinse decontaminated sampling equipment. These blanks will be analyzed for the analytes of concern at the applicable sampling location. The purpose of field and rinsate blanks is to verify that the presence of a given analyte in a sample is not due to a source of external contamination (e.g., water used in the decontamination process, contaminated sampling equipment, airborne contamination from an adjacent facility or operation, etc.).

- Trip Blanks – One trip blank will be included with each shipment of VOC samples. Trip blanks will be analyzed for the same set of VOC parameters as the regular samples being collected. The purpose of trip blanks is to ensure that the presence of VOCs in a given sample is not due to cross-contamination (e.g., from another more contaminated sample that may be included in the same cooler).

For the purposes of this work plan, laboratory QA measures are those checks that an analyst routinely runs to determine the precision and accuracy of the analytical methods and equipment (method error). Laboratory QA measures typically include blanks, standards, duplicates, standard reference materials, and standard additions (matrix spikes). The QA measures will be specified in the contract with the laboratory that performs the analyses on the samples collected during this investigation. The laboratory will be a DOE Consolidated Audit Program approved laboratory.

The Quality Assurance Program Plan (QAPP) and Quality Implementation Plan requirements will be applied to all activities in a manner consistent with the nature of the work performed and the requirements applicable to each work activity. The QAPP establishes the responsibilities and requirements which personnel are committed to in the performance of day-to-day work activities. Procedures have been developed to establish the methods used to accomplish specific elements of the QAPP. These procedures typically fall into two categories: administrative (covering generic topics such as training, reviews, document control, nonconformance reporting, and records) and technical (covering such topics as sampling).

3.3 SAMPLE MANAGEMENT

All sampling and data management activities including generation of field chain-of-custody documentation, labeling of sample containers, and generation of laboratory chain-of-custody documentation will be performed using the Project Environmental Measurements System (PEMS).

3.4 SAMPLING PROCEDURES

Sampling activities will be conducted in accordance with the latest revisions on file for the following procedures:

LPP-ER-N004	Direct Push Technology (DPT) Drilling, Sampling, & Micro Well Installation
LPP-PO-1623	Sample Shipping of Non-Hazardous Samples to Off-Site Laboratories
LPP-PORTS-GWS 004	Collection of Groundwater Samples
LPP-PORTS-GWS 006	Decontamination of Sampling Equipment
LPP-PORTS-GWS 007	Conducting Field Measurements
LPP-PORTS-GWS 009	Field Logbooks
LPP-PORTS-GWS 015	Monitoring Well Development
LPP-SOP-1-2	Sample Custody
LPP-SOP-1-4	Subsurface Soil Sampling

Soil for VOC analysis will be collected using the sampling method for low concentration soil samples delineated in procedure LPP-SOP-1-4.

4. WASTE MANAGEMENT

Waste materials from this project will be managed in accordance with all applicable federal, state, and DOE site requirements. The management of wastes may include the collection of wastes, characterization of wastes, and management of the 90-day RCRA storage area. All wastes will be characterized by analysis or process knowledge prior to shipment to appropriate treatment and/or disposal facilities. Both liquid and solid waste will be generated during this investigation.

Liquid waste will include well development water, well purge water, and decontamination water. All liquid wastes will be containerized and treated at existing, permitted on-site groundwater treatment facilities and/or sent to an appropriately permitted off-site facility for treatment and/or disposal.

Solid waste may include excess soil from soil sampling and personal protective equipment (PPE). Solid wastes will be managed in a 90-day RCRA storage area and/or RCRA Part B permitted storage area, characterized, and sent to an approved off-site facility for disposal, except as documented below. Containerized soils will be analyzed and landscaped if found to be non-hazardous and non-radiologically contaminated. The PPE used during the field investigation (e.g., disposable safety suits, gloves, etc.) will be decontaminated to a RCRA-clean standard per Ohio Administrative Code Rule 3745-270-45 and surveyed by site radiological control personnel. Any PPE meeting radiological off-site release criteria will be disposed at a sanitary landfill. If radiological contamination is found, the low-level radioactive waste will be sent to an approved off-site facility for disposal.

Samples will be collected in accordance with applicable procedures and will be analyzed to determine treatment and disposal requirements. Specific waste characterization requirements, including sampling (collection method) and analysis (analytical methods) will be dependent on the waste acceptance criteria for receiving facilities. Laboratories used for characterization will be certified as required by the receiving facility and state/federal regulations.

5. ENVIRONMENT, HEALTH AND SAFETY

The Environmental, Health and Safety (ES&H) Program is designed to minimize the number of injuries and illnesses, with an ultimate goal of zero accidents and injuries. The appropriate supervision, training, and PPE will be provided to keep employees safe. Management and staff share responsibility for health and safety, and all levels are accountable for specific health and safety activities. Full participation by, and cooperation with, all employees are crucial to the overall success of the ES&H Program for this project. Principles that will be adhered to during the performance of work include:

- Occupationally caused injuries and illnesses are preventable;
- Preventing occupationally caused injuries and illnesses is one of the highest responsibilities;
- Providing safe working conditions in the field and in the office is a priority;
- Employees have the right to information and training;
- Working safely is a condition of employment and is a shared responsibility between management and staff; and
- The project cannot succeed unless injuries and exposures are mitigated, managed, and prevented.

Safety is the responsibility of each employee. Ultimately, however, the successful implementation of the ES&H Program depends on the integrated activities of the managers, health and safety staff, and employees. Through oversight and coordination of all health and safety functions, compliance will be achieved with all applicable health and safety regulations.

A primary consideration for all operations is the health and safety of its personnel. The protection of the general public and the environment is also an important consideration in developing and implementing the ES&H Program. The application of standardized health and safety procedures by trained personnel reduces the possibility of injury or exposure.

Manager and employee cooperation is required in all health and safety matters. The objective is and will always be an ES&H Program that reduces the number of accidents, injuries, and illnesses to a minimum.

The Integrated Safety Management System (ISMS) integrates safety into management and work practices at all levels so that missions are accomplished efficiently while protecting the worker, the public, and the environment. Those involved with this action must be committed to this system and must recognize that it is fundamental to successful execution of work. ISMS provides a formal, organized process to ensure the safe conduct of work. The principles of ISMS will be integrated into all environmental, safety, and health programs on site.

6. SCHEDULE AND MILESTONES

The proposed milestones for the project are presented in this section of the work plan. The actual milestones will be highly variable; therefore the milestones are provided for non-enforceable, informational purposes only.

6.1 INVESTIGATION SCHEDULE

Initiation of field activities is contingent upon Ohio EPA approval of the Work Plan. Additional time to complete the investigation may be needed based on circumstances, such as, inclement weather or discussions with Ohio EPA regarding overall approach.

6.2 INVESTIGATION MILESTONES

Proposed milestones to track progress are outlined in Table 6.

Table 6. Milestones for the former X-344C HF Storage Building investigation

Milestone	Action Date
Initiate field investigation (groundwater sampling activities)	45 calendar days after Ohio EPA approval of the work plan
Data review with Ohio EPA	45 calendar days after receipt of final sampling analytical results

7. REFERENCES

DOE 1992. *Quadrant IV Description of Current Conditions for the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, Martin Marietta Energy Systems, Inc., Piketon, Ohio.

DOE 1996a. *Background Sampling Investigation of Soil and Groundwater Final Report for the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/OR/11-1323&D6, Lockheed Martin Energy Systems, Inc., Piketon, Ohio.

DOE 1996b. *Quadrant IV RCRA Facility Investigation Final Report for the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/OR/11-1180/V1&D3, Lockheed Martin Energy Systems, Inc., Piketon, Ohio.

DOE 1998. *Quadrant IV Cleanup Alternatives Study/Corrective Measures Study Final Report for the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/OR/12-1332&D3, Jacobs Engineering, Piketon, Ohio.

DOE 1999. *Report of Findings: Special Study for Metals and Radiological Parameters in Groundwater for the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/OR/11-3029&D2, Bechtel Jacobs Company LLC, Piketon, Ohio.

APPENDIX A

Quadrant IV (X-344C) RFI
Sampling Locations and Results

UNIT: X344C
PORTS LAB
SOILS

X344C-GP26-12

ANALYTE	VALUE / QA CODE		PQL	UNITS
ALPHA, TOTAL	5	U	10	pCi/gm
BETA, TOTAL	9	U	40	pCi/gm
TC-99 BETA	0.1	U	1	pCi/gm
URANIUM, TOTAL	4.1		1	ug/g

X344C-GP26-16

ANALYTE	VALUE / QA CODE		PQL	UNITS
ALPHA, TOTAL	4	U	10	pCi/gm
BETA, TOTAL	5	U	40	pCi/gm
TC-99 BETA	0.0	U	1	pCi/gm
URANIUM, TOTAL	3.6		1	ug/g

X344C-GP28-08

ANALYTE	VALUE / QA CODE		PQL	UNITS
ALPHA, TOTAL	5	U	10	pCi/gm
BETA, TOTAL	16	U	40	pCi/gm
TC-99 BETA	0.1	U	1	pCi/gm
URANIUM, TOTAL	2.9		1	ug/g

X344C-GP28-12

ANALYTE	VALUE / QA CODE		PQL	UNITS
ALPHA, TOTAL	10		10	pCi/gm
BETA, TOTAL	9	U	40	pCi/gm
TC-99 BETA	0.0	U	1	pCi/gm
URANIUM, TOTAL	3.7		1	ug/g

X344C-GP28-16

ANALYTE	VALUE / QA CODE		PQL	UNITS
ALPHA, TOTAL	10	U	10	pCi/gm
BETA, TOTAL	11	U	40	pCi/gm
URANIUM, TOTAL	4.3		1	ug/g

UNIT: X344C
PORTS LAB
SOILS

X344C-GP30-08

ANALYTE	VALUE / QA CODE		PQL	UNITS
ALPHA, TOTAL	2	U	10	pCi/gm
BETA, TOTAL	3	U	40	pCi/gm
TC-99 BETA	0.2	U	1	pCi/gm
URANIUM, TOTAL	3.5		1	ug/g

X344C-GP30-12

ANALYTE	VALUE / QA CODE		PQL	UNITS
ALPHA, TOTAL	6	U	10	pCi/gm
BETA, TOTAL	6	U	40	pCi/gm
TC-99 BETA	0.1	U	1	pCi/gm
URANIUM, TOTAL	4.4		1	ug/g

X344C-GP30-16

ANALYTE	VALUE / QA CODE		PQL	UNITS
ALPHA, TOTAL	9	U	10	pCi/gm
BETA, TOTAL	3	U	40	pCi/gm
TC-99 BETA	0.0	U	1	pCi/gm
URANIUM, TOTAL	3.8		1	ug/g

X344C-GP32-08

ANALYTE	VALUE / QA CODE		PQL	UNITS
ALPHA, TOTAL	10		10	pCi/gm
BETA, TOTAL	12	U	40	pCi/gm
TC-99 BETA	0.0	U	1	pCi/gm
URANIUM, TOTAL	3.7		1	ug/g

X344C-GP32-12

ANALYTE	VALUE / QA CODE		PQL	UNITS
ALPHA, TOTAL	3	U	10	pCi/gm
BETA, TOTAL	8	U	40	pCi/gm
TC-99 BETA	0.1	U	1	pCi/gm
URANIUM, TOTAL	4.5		1	ug/g

QUADRANT IV PHASE II INVESTIGATIVE UNIT: X344C
PORTS LABORATORY RADIOLOGICAL RESULTS
SOILS (LEVEL II)

X344C-GP01-08

ANALYTE	VALUE / QA CODE		PQL	UNITS
ALPHA, TOTAL	8	U	10	pCi/gm
BETA, TOTAL	9	U	40	pCi/gm
TC-99 BETA	0.2	U	1	pCi/gm
URANIUM, TOTAL	4.3		1	ug/g

X344C-GP01-12

ANALYTE	VALUE / QA CODE		PQL	UNITS
ALPHA, TOTAL	4	U	10	pCi/gm
BETA, TOTAL	7	U	40	pCi/gm
TC-99 BETA	0.2	U	1	pCi/gm
URANIUM, TOTAL	3.4		1	ug/g

X344C-GP01-16

ANALYTE	VALUE / QA CODE		PQL	UNITS
ALPHA, TOTAL	3	U	10	pCi/gm
BETA, TOTAL	14	U	40	pCi/gm
TC-99 BETA	0.1	U	1	pCi/gm
URANIUM, TOTAL	4.1		1	ug/g

X344C-GP07-08

ANALYTE	VALUE / QA CODE		PQL	UNITS
ALPHA, TOTAL	5	U	10	pCi/gm
BETA, TOTAL	9	U	40	pCi/gm
TC-99 BETA	0.2	U	1	pCi/gm
URANIUM, TOTAL	3.5		1	ug/g

X344C-GP07-12

ANALYTE	VALUE / QA CODE		PQL	UNITS
ALPHA, TOTAL	7	U	10	pCi/gm
BETA, TOTAL	4	U	40	pCi/gm
TC-99 BETA	0.2	U	1	pCi/gm
URANIUM, TOTAL	3.9		1	ug/g

X344C-GP07-16

ANALYTE	VALUE / QA CODE		PQL	UNITS
ALPHA, TOTAL	5	U	10	pCi/gm
BETA, TOTAL	-2	U	40	pCi/gm
TC-99 BETA	0.2	U	1	pCi/gm
URANIUM, TOTAL	3.9		1	ug/g

X344C-GP25-08

ANALYTE	VALUE / QA CODE		PQL	UNITS
ALPHA, TOTAL	6	U	10	pCi/gm
BETA, TOTAL	6	U	40	pCi/gm
TC-99 BETA	0.2	U	1	pCi/gm
URANIUM, TOTAL	3.4		1	ug/g

X344C-GP25-12

ANALYTE	VALUE / QA CODE		PQL	UNITS
ALPHA, TOTAL	8	U	10	pCi/gm
BETA, TOTAL	5	U	40	pCi/gm
TC-99 BETA	0.1	U	1	pCi/gm
URANIUM, TOTAL	4.0		1	ug/g

X344C-GP25-16

ANALYTE	VALUE / QA CODE		PQL	UNITS
ALPHA, TOTAL	1	U	10	pCi/gm
BETA, TOTAL	3	U	40	pCi/gm
TC-99 BETA	0.2	U	1	pCi/gm
URANIUM, TOTAL	3.7		1	ug/g

X344C-GP26-08

ANALYTE	VALUE / QA CODE		PQL	UNITS
ALPHA, TOTAL	6	U	10	pCi/gm
BETA, TOTAL	5	U	40	pCi/gm
TC-99 BETA	0.1	U	1	pCi/gm
URANIUM, TOTAL	3.9		1	ug/g

Quadrant IV (X-344C) RFI Phase II
Level II Radiological Analytical Results

SAMPLE ID	MATRIX	HEADSPACE VALUE (ppb)	SAMPLE VALUE* (ppb)	DETECTION LIMIT	QA CODE
X344A-01G	WATER	0.00	ND	5.0	U
X344A-01G-28	SOIL	0.00	ND	5.0	U
X344A-01G-30	SOIL	14.70	ND	5.0	U
X344A-01G-32	SOIL	12.70	ND	5.0	U
X344A-01G-34	SOIL	50.80	ND	5.0	U
X344A-10G	WATER	38.50	ND	5.0	U
X344A-SB01-02	SOIL	11.40	ND	5.0	U
X344A-SB01-04	SOIL	24.00	ND	5.0	U
X344A-SB01-06	SOIL	99.50	ND	5.0	U
X344A-SB01-08	SOIL	276.00	5.5	5.0	
X344A-SB01-10	SOIL	157.00	ND	5.0	U*
X344A-SB01-12	SOIL	78.20	ND	5.0	U*
X344A-SB01-14	SOIL	5.30	ND	5.0	U
X344A-SB01-16	SOIL	17.10	ND	5.0	U
X344A-SB01-18	SOIL	0.00	ND	5.0	U
X344A-SB01-20	SOIL	0.00	ND	5.0	U
X344A-SB01-22	SOIL	0.00	ND	5.0	U
X344A-SB01-24	SOIL	0.00	ND	5.0	U
X344A-SB01-26	SOIL	0.00	ND	5.0	U
X344A-SB01-28	SOIL	0.00	ND	5.0	U
X344A-SB01-30	SOIL	6.80	ND	5.0	U
X344A-SB01-32	SOIL	21.60	ND	5.0	U
X344A-SB02-02	SOIL	10.30	ND	5.0	U
X344A-SB02-04	SOIL	559.00	11	5.0	
X344A-SB02-06	SOIL	362.00	7.2	5.0	*
X344A-SB02-08	SOIL	175.00	ND	5.0	U*
X344A-SB02-10	SOIL	48.20	ND	5.0	U*
X344A-SB02-12	SOIL	44.30	ND	5.0	U*
X344A-SB02-14	SOIL	135.00	ND	5.0	U*
X344A-SB02-16	SOIL	148.00	ND	5.0	U*
X344A-SB02-18	SOIL	28.50	ND	5.0	U
X344A-SB02-20	SOIL	29.10	ND	5.0	U
X344A-SB02-22	SOIL	0.00	ND	5.0	U
X344A-SB02-24	SOIL	0.00	ND	5.0	U
X344A-SB02-26	SOIL	0.00	ND	5.0	U
X344A-SB02-28	SOIL	0.00	ND	5.0	U
X344A-SB02-30	SOIL	9.70	ND	5.0	U
X344A-SB02-32	SOIL	0.00	ND	5.0	U
X344A-SB02-34	SOIL	16.00	ND	5.0	U*
X344C-01G	WATER	29.30	ND	5.0	JU
X344C-HA03-02	SOIL	0.00	ND	5.0	U
X344C-HA03-04	SOIL	0.00	ND	5.0	U
X344C-HA03-06	SOIL	0.00	ND	5.0	U
X344D-SB01-02	SOIL	0.00	ND	5.0	U
X344D-SB01-04	SOIL	0.00	ND	5.0	U
X344D-SB01-06	SOIL	0.00	ND	5.0	U
X344D-SB01-08	SOIL	0.00	ND	5.0	U*
X344D-SB01-10	SOIL	34.50	ND	5.0	U*
X344D-SB01-12	SOIL	0.00	ND	5.0	U
X344D-SB01-14	SOIL	319.00	6.4	5.0	Q*
X344D-SB01-16	SOIL	37.50	ND	5.0	U*
X344D-SB02-02	SOIL	0.00	ND	5.0	U
X344D-SB02-04	SOIL	0.00	ND	5.0	U
X344D-SB02-06	SOIL	0.00	ND	5.0	U
X344D-SB02-08	SOIL	0.00	ND	5.0	U
X344D-SB02-10	SOIL	0.00	ND	5.0	U
X344D-SB02-12	SOIL	0.00	ND	5.0	U
X344D-SB02-14	SOIL	0.00	ND	5.0	U
X344D-SB02-16	SOIL	0.00	ND	5.0	U
X344D-SB02-18	SOIL	0.00	ND	5.0	U
X344D-SB02-20	SOIL	0.00	ND	5.0	U
X344D-SB02-22	SOIL	0.00	ND	5.0	U
X344D-SB02-24	SOIL	0.00	ND	5.0	U
X344D-SB02-26	SOIL	5.50	ND	5.0	U
X344D-SB02-28	SOIL	0.00	ND	5.0	U
X344D-SB03-02	SOIL	0.00	ND	5.0	U
X344D-SB03-04	SOIL	0.00	ND	5.0	U
X344D-SB03-06	SOIL	5.30	ND	5.0	U
X344D-SB03-08	SOIL	0.00	ND	5.0	U
X344D-SB03-10	SOIL	0.00	ND	5.0	U
X344D-SB03-12	SOIL	0.00	ND	5.0	U
X344D-SB03-14	SOIL	0.00	ND	5.0	U
X344D-SB03-16	SOIL	0.00	ND	5.0	U*
X344D-SB04-02	SOIL	0.00	ND	5.0	U
X344D-SB04-04	SOIL	0.00	ND	5.0	U
X344D-SB04-06	SOIL	0.00	ND	5.0	U
X344D-SB04-08	SOIL	547.00	11	5.0	*
X344D-SB04-10	SOIL	66.80	ND	5.0	U*
X344D-SB04-12	SOIL	10.80	ND	5.0	U*
X344D-SB04-14	SOIL	0.00	ND	5.0	U
X344D-SB04-16	SOIL	0.00	ND	5.0	U
X533-02G	WATER	14.60	ND	5.0	U
X533-06G	WATER	0.00	ND	5.0	U
X533-06G-02	SOIL	0.00	ND	5.0	U
X533-06G-04	SOIL	0.00	ND	5.0	U
X533-06G-06	SOIL	0.00	ND	5.0	U
X533-06G-08	SOIL	0.00	ND	5.0	U
X533-06G-10	SOIL	0.00	ND	5.0	U
X533-06G-12	SOIL	0.00	ND	5.0	U
X611-03GA	WATER	0.00	ND	5.0	U
X630-01G	WATER	0.00	ND	5.0	U
X630-02G	WATER	0.00	ND	5.0	U
X630-03G	WATER	0.00	ND	5.0	U

Quadrant IV (X-344C) RFI Phase II
Field GC Analytical Results

SAMPLE ID	MATRIX	HEADSPACE VALUE (ppb)	SAMPLE VALUE* (ppb)	DETECTION LIMIT	QA CODE
X344C-SB02-12	SOIL	894.00	18	5.0	MQ*
X344C-SB02-14	SOIL	2460.00	49	5.0	Q*
X344C-SB02-16	SOIL	1620000.00	32400	5.0	EMQ*
X344C-SB02-18	SOIL	37200.00	744	5.0	MQ*
X344C-SB02-20	SOIL	1110.00	22	5.0	M*
X344C-SB02-22	SOIL	46.30	ND	5.0	U*
X344C-SB02-24	SOIL	6.10	ND	5.0	U*
X344C-SB02-26	SOIL	5.60	ND	5.0	U*
X344C-SB02-28	SOIL	8.60	ND	5.0	U*
X344C-SB02-30	SOIL	0.00	ND	5.0	U
X344C-SB02-32	SOIL	4.60	ND	5.0	U
X344C-SB03-02	SOIL	140.00	ND	5.0	U
X344C-SB03-04	SOIL	430.00	9.0	5.0	
X344C-SB03-06	SOIL	2500.00	50	5.0	*
X344C-SB03-08	SOIL	482.00	10	5.0	*
X344C-SB03-10	SOIL	236.00	5.0	5.0	*
X344C-SB03-12	SOIL	16.50	ND	5.0	U*
X344C-SB03-14	SOIL	0.00	ND	5.0	U
X344C-SB03-16	SOIL	0.00	ND	5.0	U
X344C-SB03-18	SOIL	0.00	ND	5.0	U
X344C-SB03-20	SOIL	0.00	ND	5.0	U
X344C-SB03-22	SOIL	0.00	ND	5.0	U
X344C-SB03-24	SOIL	0.00	ND	5.0	U
X344C-SB03-26	SOIL	0.00	ND	5.0	U
X344C-SB03-28	SOIL	0.00	ND	5.0	U
X344C-SB03-30	SOIL	0.00	ND	5.0	U
X344C-SB03-32	SOIL	0.00	ND	5.0	U
X344C-SB04-02	SOIL	17.90	ND	5.0	U
X344C-SB04-04	SOIL	18.60	ND	5.0	U
X344C-SB04-06	SOIL	10.80	ND	5.0	U
X344C-SB04-08	SOIL	50.40	ND	5.0	U
X344C-SB04-10	SOIL	29.90	ND	5.0	U
X344C-SB04-12	SOIL	0.00	ND	5.0	U*
X344C-SB04-14	SOIL	0.00	ND	5.0	U
X344C-SB04-16	SOIL	0.00	ND	5.0	U
X344C-SB04-18	SOIL	0.00	ND	5.0	U
X344C-SB04-20	SOIL	13.40	ND	5.0	U*
X344C-SB04-22	SOIL	0.00	ND	5.0	U
X344C-SB04-24	SOIL	0.00	ND	5.0	U
X344C-SB04-26	SOIL	0.00	ND	5.0	U
X344C-SB04-28	SOIL	0.00	ND	5.0	U
X344C-SB04-30	SOIL	0.00	ND	5.0	U
X344C-SB04-32	SOIL	0.00	ND	5.0	U
X344C-SB04-34	SOIL	0.00	ND	5.0	U
X344D-SS01	SOIL	5.80	ND	5.0	U*
X344D-SS02	SOIL	0.00	ND	5.0	U
X344D-SS03	SOIL	0.00	ND	5.0	U
X344D-SS04	SOIL	0.00	ND	5.0	U

SAMPLE ID	MATRIX	HEADSPACE VALUE (ppb)	SAMPLE VALUE* (ppb)	DETECTION LIMIT	QA CODE
X344D-SW01	WATER	0.00	ND	5.0	U
X344D-SW02	WATER	0.00	ND	5.0	U
X344D-SW02D	WATER	0.00	ND	5.0	U
X344D-SW03	WATER	0.00	ND	5.0	U
X344D-SW04	WATER	0.00	ND	5.0	U
X533-01B	WATER	6.40	ND	5.0	U*
X533-02G	WATER	31.60	ND	5.0	U*
X533-02G-02	SOIL	0.00	ND	5.0	U
X533-02G-04	SOIL	0.00	ND	5.0	U
X533-02G-06	SOIL	0.00	ND	5.0	U
X533-02G-08	SOIL	0.00	ND	5.0	U
X533-02G-10	SOIL	0.00	ND	5.0	U
X533-02G-12	SOIL	0.00	ND	5.0	U
X533-02G-14	SOIL	0.00	ND	5.0	U
X533-02G-16	SOIL	0.00	ND	5.0	U
X533-02G-18	SOIL	1450.00	29	5.0	M*
X533-03G	WATER	0.00	ND	5.0	U
X533-03G-02	SOIL	0.00	ND	5.0	U
X533-03G-04	SOIL	13.40	ND	5.0	U
X533-03G-06	SOIL	11.00	ND	5.0	U
X533-03G-08	SOIL	12.90	ND	5.0	U
X533-03G-10	SOIL	0.00	ND	5.0	U
X533-03G-12	SOIL	0.00	ND	5.0	U
X533-03G-14	SOIL	0.00	ND	5.0	U
X533-03G-16	SOIL	0.00	ND	5.0	U
X533-03G-18	SOIL	0.00	ND	5.0	U*
X533-04G	WATER	0.00	ND	5.0	U
X533-04G-02	SOIL	0.00	ND	5.0	U
X533-04G-04	SOIL	0.00	ND	5.0	U
X533-04G-06	SOIL	0.00	ND	5.0	U
X533-04G-08	SOIL	0.00	ND	5.0	U
X533-04G-10	SOIL	0.00	ND	5.0	U
X533-04G-12	SOIL	0.00	ND	5.0	U
X533-04G-14	SOIL	0.00	ND	5.0	U
X533-04G-16	SOIL	0.00	ND	5.0	U
X533-04G-18	SOIL	0.00	ND	5.0	U
X533-05G	WATER	0.00	ND	5.0	U
X533-05G-02	SOIL	0.00	ND	5.0	U
X533-05G-04	SOIL	6.10	ND	5.0	U
X533-05G-06	SOIL	0.00	ND	5.0	U
X533-05G-06(2)	SOIL	0.00	ND	5.0	U
X533-05G-08	SOIL	7.90	ND	5.0	U*
X533-05G-08(2)	SOIL	0.00	ND	5.0	U
X533-05G-10	SOIL	0.00	ND	5.0	U

SAMPLE ID	MATRIX	HEADSPACE VALUE (ppb)	SAMPLE VALUE* (ppb)	DETECTION LIMIT	QA CODE
X334-HA03	SOIL	0.00	ND	5.0	U
X334-HA04	SOIL	0.00	ND	5.0	U
X342C-01G	WATER	0.00	ND	5.0	U
X342C-01G-02	SOIL	9.10	ND	5.0	U
X342C-01G-04	SOIL	78.60	ND	5.0	U
X342C-01G-06	SOIL	984.00	20	5.0	*
X342C-01G-08	SOIL	984.00	20	5.0	
X342C-01G-10	SOIL	3350.00	67	5.0	*
X342C-01G-12	SOIL	444.00	9	5.0	*
X342C-01G-14	SOIL	47.50	ND	5.0	U*
X342C-01G-16	SOIL	44.00	ND	5.0	U*
X342C-01G-18	SOIL	21.30	ND	5.0	U*
X342C-01G-20	SOIL	13.40	ND	5.0	U
X342C-01G-22	SOIL	0.00	ND	5.0	U
X342C-01G-24	SOIL	6.20	ND	5.0	U
X342C-01G-26	SOIL	16.00	ND	5.0	U
X342C-01G-28	SOIL	46.90	ND	5.0	U
X342C-01G-30	SOIL	66.10	ND	5.0	U*
X342C-SB01-02	SOIL	0.00	ND	5.0	U
X342C-SB01-04	SOIL	0.00	ND	5.0	U
X342C-SB01-06	SOIL	0.00	ND	5.0	U
X342C-SB01-08	SOIL	0.00	ND	5.0	U
X342C-SB01-10	SOIL	0.00	ND	5.0	U
X342C-SB01-12	SOIL	0.00	ND	5.0	U
X342C-SB01-14	SOIL	0.00	ND	5.0	U
X342C-SB01-16	SOIL	0.00	ND	5.0	U
X342C-SB01-18	SOIL	0.00	ND	5.0	U
X342C-SB01-20	SOIL	0.00	ND	5.0	U
X342C-SB02-02	SOIL	7.50	ND	5.0	U*
X342C-SB02-04	SOIL	6.40	ND	5.0	U
X342C-SB02-06	SOIL	139.00	ND	5.0	U*
X342C-SB02-08	SOIL	10.90	ND	5.0	U*
X342C-SB02-10	SOIL	0.00	ND	5.0	U
X342C-SB02-12	SOIL	45.20	ND	5.0	U*
X342C-SB02-14	SOIL	9.70	ND	5.0	U*
X342C-SB02-16	SOIL	0.00	ND	5.0	U
X342C-SB02-18	SOIL	0.00	ND	5.0	U
X342C-SB02-20	SOIL	0.00	ND	5.0	U
X342C-SB02-22	SOIL	0.00	ND	5.0	U
X342C-SB02-24	SOIL	0.00	ND	5.0	U
X342C-SB02-26	SOIL	0.00	ND	5.0	U
X342C-SB02-28	SOIL	0.00	ND	5.0	U
X342C-SS01	SOIL	0.00	ND	5.0	U
X342C-SW03	WATER	0.00	ND	5.0	U
X344A-SS01	SOIL	67100.00	1342	5.0	E

SAMPLE ID	MATRIX	HEADSPACE VALUE (ppb)	SAMPLE VALUE* (ppb)	DETECTION LIMIT	QA CODE
X344A-SS02	SOIL	135000.00	2700	5.0	E*
X344A-SS03	SOIL	219000.00	4380	5.0	E*
X344A-SW01	WATER	12500.00	250	5.0	
X344A-SW02	WATER	11400.00	228	5.0	
X344A-SW03	WATER	6520.00	130	5.0	
X344C-01G	WATER	0.00	ND	5.0	U
X344C-01G-02	SOIL	0.00	ND	5.0	U
X344C-01G-04	SOIL	0.00	ND	5.0	U
X344C-01G-06	SOIL	0.00	ND	5.0	U
X344C-01G-08	SOIL	0.00	ND	5.0	U*
X344C-01G-10	SOIL	0.00	ND	5.0	U
X344C-01G-12	SOIL	33.50	ND	5.0	U*
X344C-01G-14	SOIL	215.00	ND	5.0	U*
X344C-01G-16	SOIL	7.00	ND	5.0	U*
X344C-01G-18	SOIL	49.80	ND	5.0	U*
X344C-01G-20	SOIL	0.00	ND	5.0	U
X344C-01G-22	SOIL	0.00	ND	5.0	U
X344C-01G-24	SOIL	0.00	ND	5.0	U
X344C-01G-26	SOIL	0.00	ND	5.0	U
X344C-01G-28	SOIL	0.00	ND	5.0	U
X344C-01G-30	SOIL	0.00	ND	5.0	U
X344C-01G-32	SOIL	0.00	ND	5.0	U
X344C-HA01	WATER	0.00	ND	5.0	U
X344C-HA02	WATER	0.00	ND	5.0	U
X344C-SB01-02	SOIL	0.00	ND	5.0	U
X344C-SB01-04	SOIL	0.00	ND	5.0	U
X344C-SB01-06	SOIL	14.20	ND	5.0	U
X344C-SB01-08	SOIL	7.30	ND	5.0	U
X344C-SB01-10	SOIL	5.40	ND	5.0	U
X344C-SB01-12	SOIL	0.00	ND	5.0	U
X344C-SB01-14	SOIL	10.20	ND	5.0	U*
X344C-SB01-16	SOIL	0.00	ND	5.0	U
X344C-SB01-18	SOIL	0.00	ND	5.0	U
X344C-SB01-20	SOIL	0.00	ND	5.0	U
X344C-SB01-22	SOIL	0.00	ND	5.0	U
X344C-SB01-24	SOIL	0.00	ND	5.0	U
X344C-SB01-26	SOIL	0.00	ND	5.0	U
X344C-SB01-28	SOIL	0.00	ND	5.0	U
X344C-SB01-30	SOIL	10.60	ND	5.0	U
X344C-SB02-02	SOIL	2150.00	43	5.0	
X344C-SB02-06	SOIL	1220.00	24	5.0	
X344C-SB02-08	SOIL	0.00	ND	5.0	U*
X344C-SB02-10	SOIL	0.00	ND	5.0	U*

Quadrant IV (X-344C) RFI Phase I
Field GC Analytical Results

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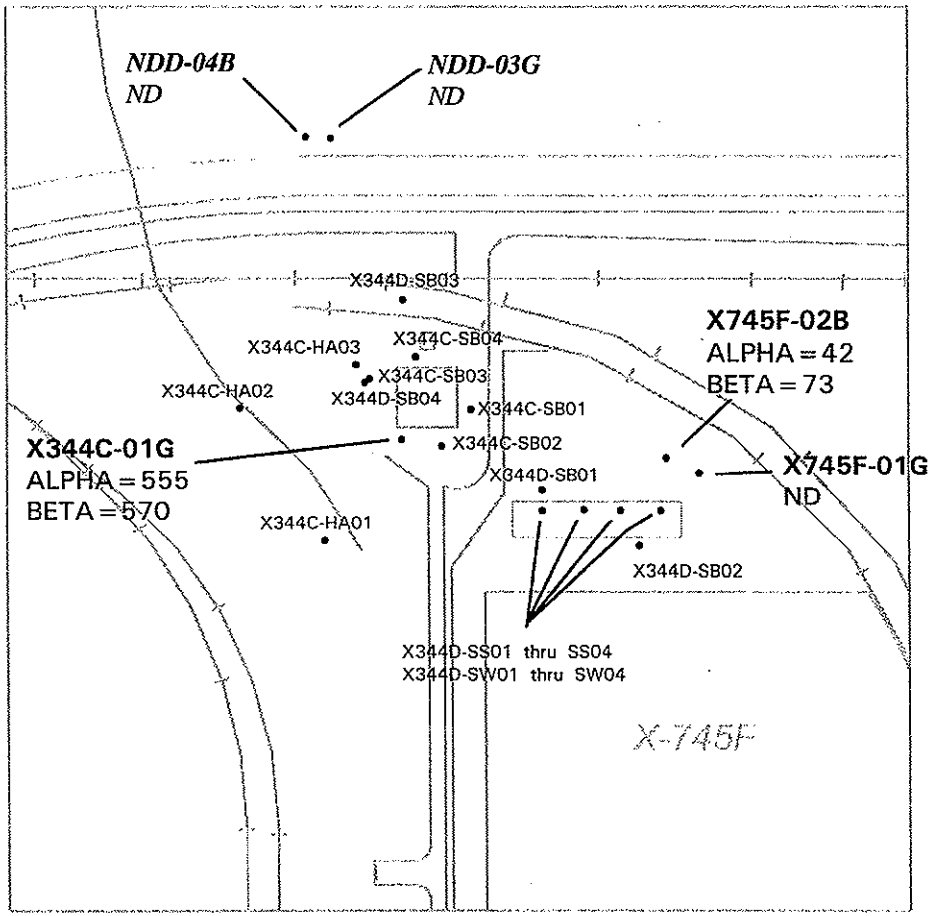
Figure 4.10m Concentration of Radiological Parameters in Groundwater Samples at X-344C HF Storage Facility and X-344D HF Neutralization Pit



RADIOLOGICAL PARAMETERS

U = TOTAL URANIUM (mg/l)
ALPHA = GROSS ALPHA (pCi/l)
Tc = TECHNETIUM (pCi/l)
BETA = GROSS BETA (pCi/l)

J = ESTIMATED VALUE
ND = NO RADIOLOGICAL PARAMETERS DETECTED

PHASE II DATA IN ITALICS

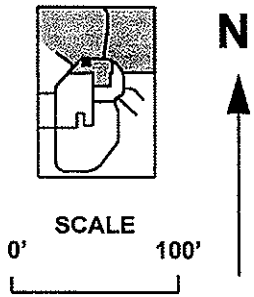


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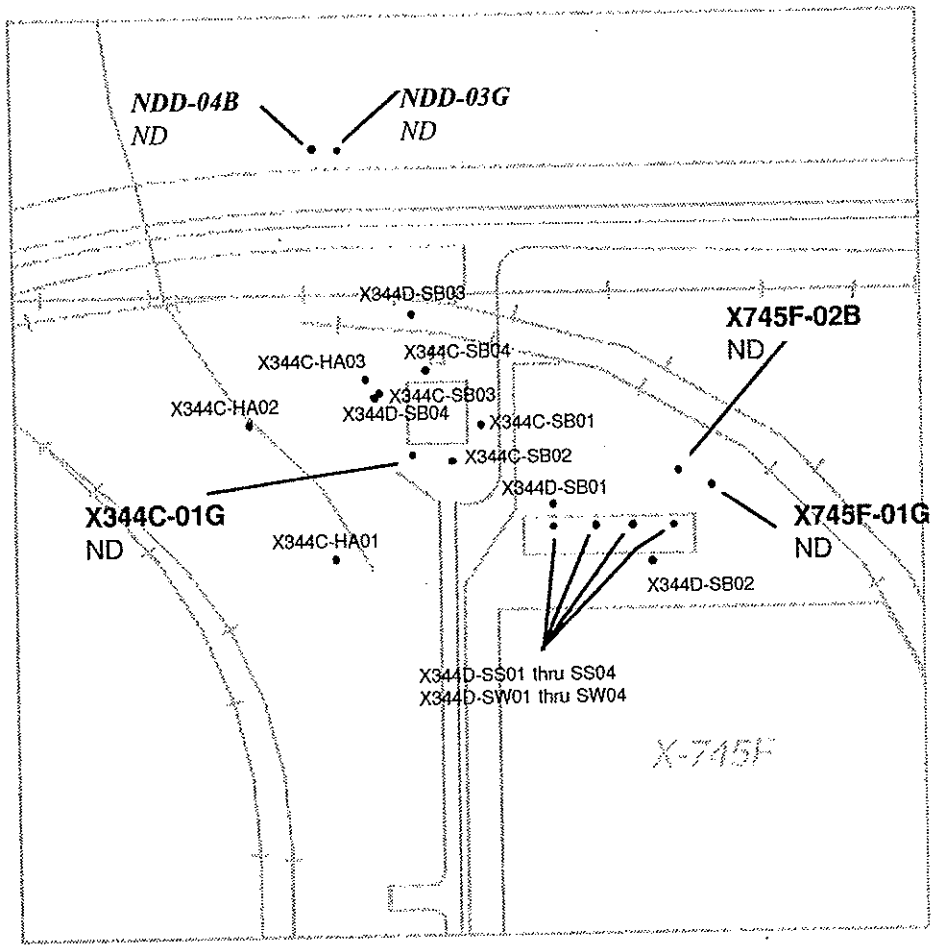
Figure 4.101 Concentration of SVOCs, PCBs, and Pesticides in Groundwater Samples at X-344C HF Storage Facility and X-344D HF Neutralization Pit



INDICATOR SVOCs and PCBs / PESTICIDES (ug/kg)

A=ACENAPHTHENE
C=CHRYSENE
F=FLUORANTHENE
P=PYRENE
PCB54=AROCLOR-1254
PCB60=AROCLOR-1260

J=ESTIMATED VALUE
ND=NO SVOCs / PCBs DETECTED
*=SVOCs OTHER THAN INDICATORS PRESENT

PHASE II DATA IN ITALICS

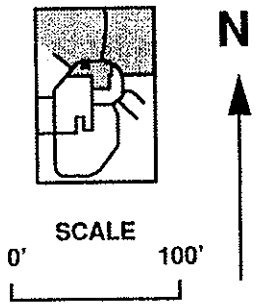


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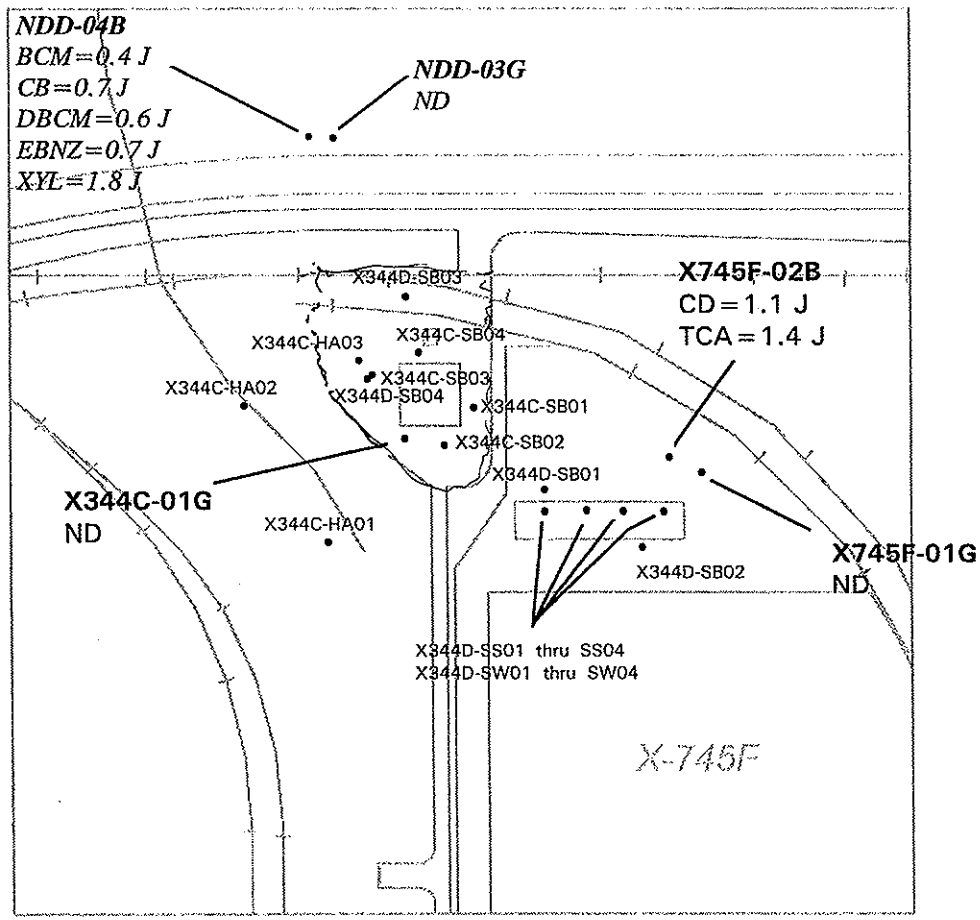
Figure 4.10k Concentration of VOCs in Groundwater Samples at X-344C HF Storage Facility and X-344D HF Neutralization Pit



VOCs (ug/l)

BCM=BROMODICHLOROMETHANE
CB=CHLOROBENZENE
CD=CARBON DISULFIDE
DBCM=DIBROMOCHLOROMETHANE
EBNZ=ETHYLBENZENE
TCA=1,1,1-TRICHLOROETHANE
XYL=XYLENE (TOTAL)

J=ESTIMATED VALUE
ND=NO VOCs DETECTED

PHASE II DATA IN ITALICS

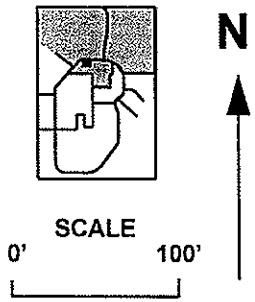


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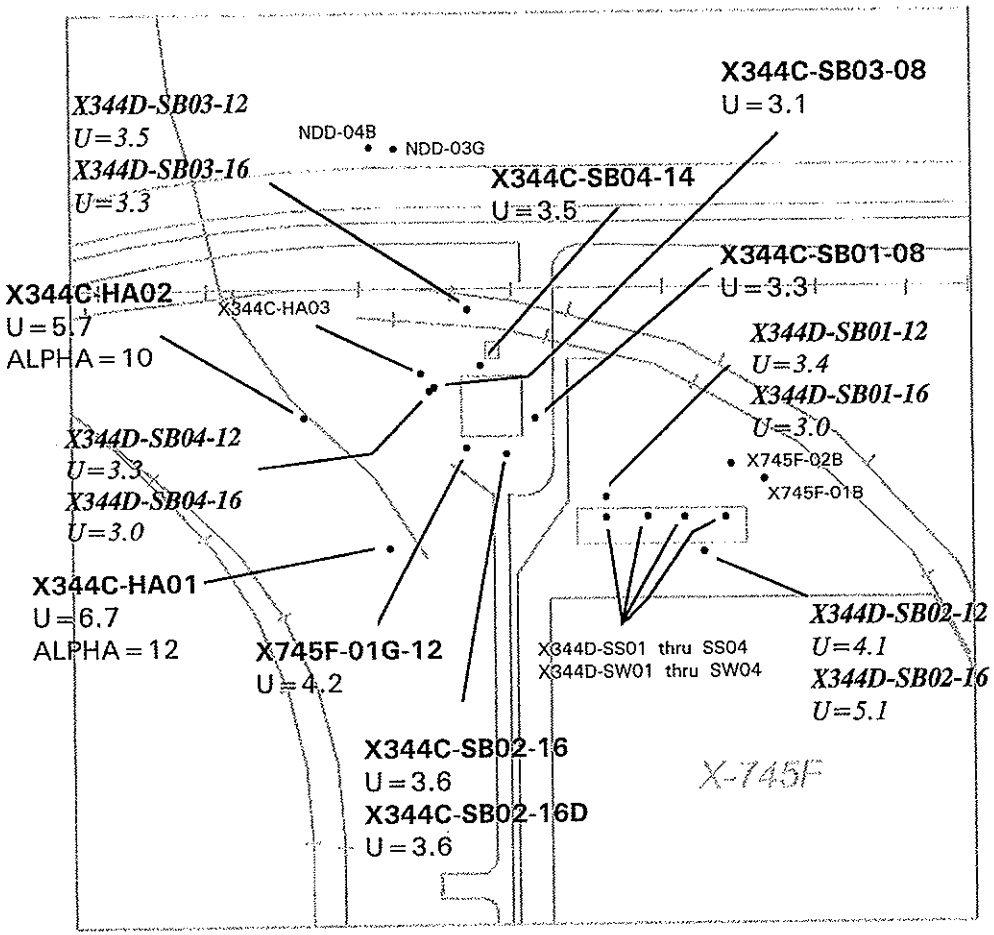
Figure 4.10j Concentration of Radiological Parameters in Soil Samples at X-344C HF Storage Facility and X-344D HF Neutralization Pit



RADIOLOGICAL PARAMETERS

U = TOTAL URANIUM (mg/kg)
ALPHA = GROSS ALPHA (pCi/g)
Tc = TECHNETIUM (pCi/g)
BETA = GROSS BETA (pCi/g)

J = ESTIMATED VALUE
ND = NO RADIOLOGICAL PARAMETERS DETECTED

PHASE II DATA IN ITALICS

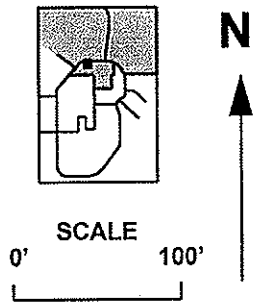


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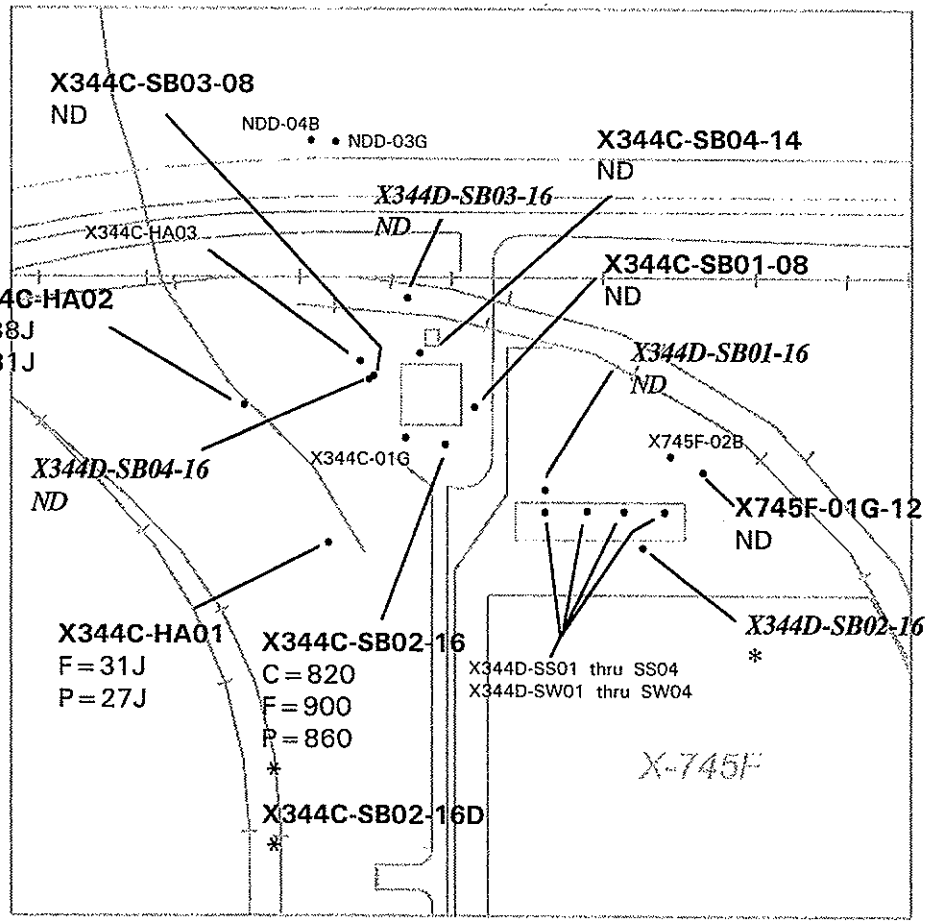
Figure 4.10i Concentration of SVOCs, PCBs, and Pesticides in Soil Samples at X-344C HF Storage Facility and X-344D HF Neutralization Pit



INDICATOR SVOCs and PCBs / PESTICIDES (ug/kg)

A = ACENAPHTHENE
C = CHRYSENE
F = FLUORANTHENE
P = PYRENE
PCB54 = AROCLOR-1254
PCB60 = AROCLOR-1260

J = ESTIMATED VALUE
ND = NO SVOCs / PCBs DETECTED
* = SVOCs OTHER THAN INDICATORS PRESENT

PHASE II DATA IN ITALICS

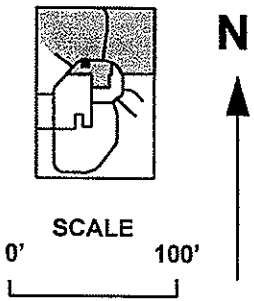


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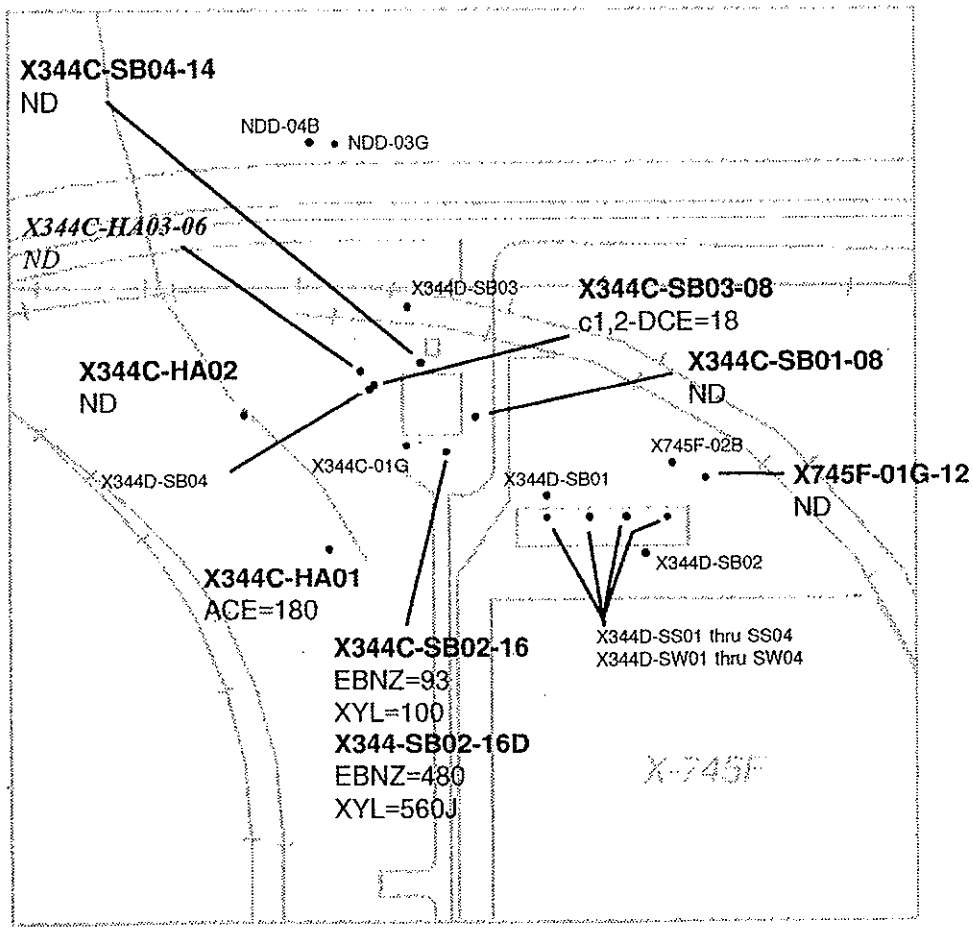
Figure 4.10h Concentration of VOCs in Soil Samples at X-344C HF Storage Facility and X-344D HF Neutralization Pit



VOCs (ug/kg)

ACE=ACETONE
c1,2-DCE=CIS-1,2-DICHLOROETHENE
EBNZ=ETHYLBENZENE
XYL=XYLENES (TOTAL)

J=ESTIMATED VALUE
ND=NO VOCs DETECTED

PHASE II DATA IN ITALICS

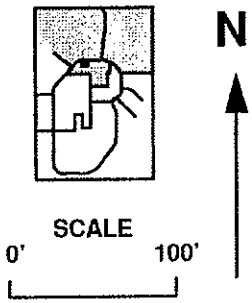


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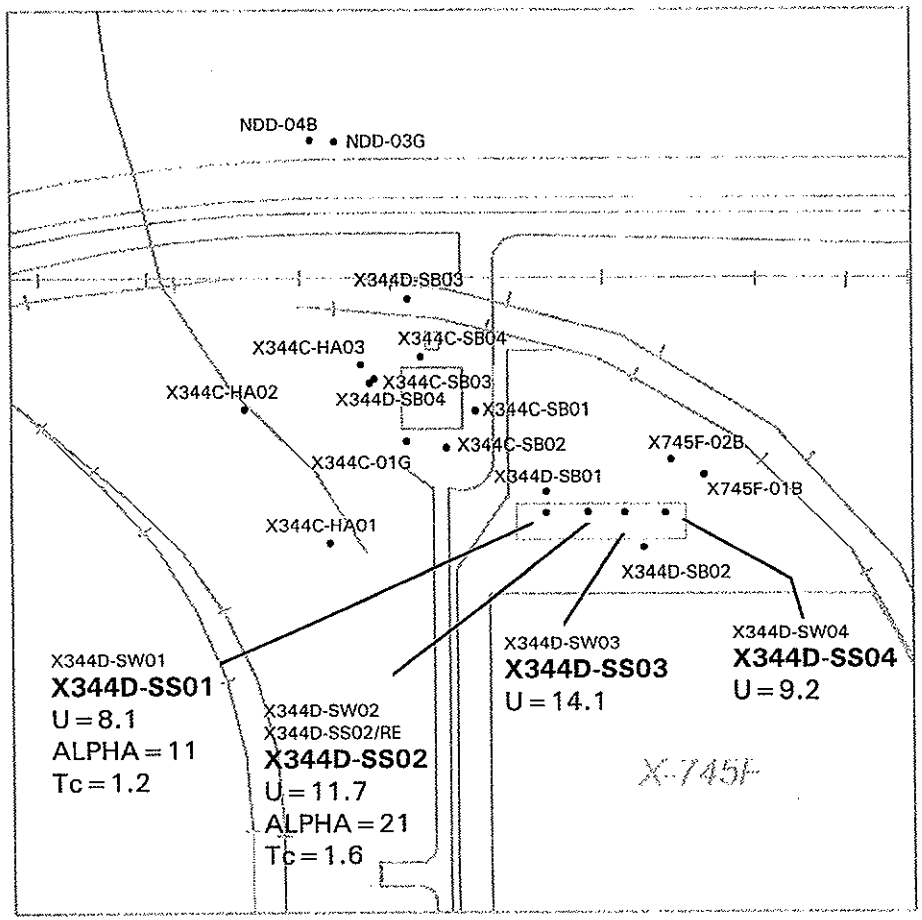
Figure 4.10g Concentration of Radiological Parameters in Sediment Samples at X-344C HF Storage Facility and X-344D HF Neutralization Pit



RADIOLOGICAL PARAMETERS

U = TOTAL URANIUM (mg/kg)
ALPHA = GROSS ALPHA (pCi/g)
Tc = TECHNETIUM (pCi/g)
BETA = GROSS BETA (pCi/g)

J = ESTIMATED VALUE
ND = NO RADIOLOGICAL PARAMETERS DETECTED

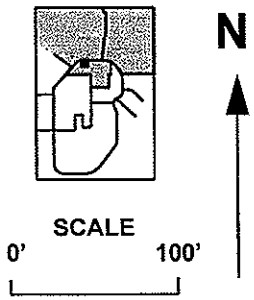


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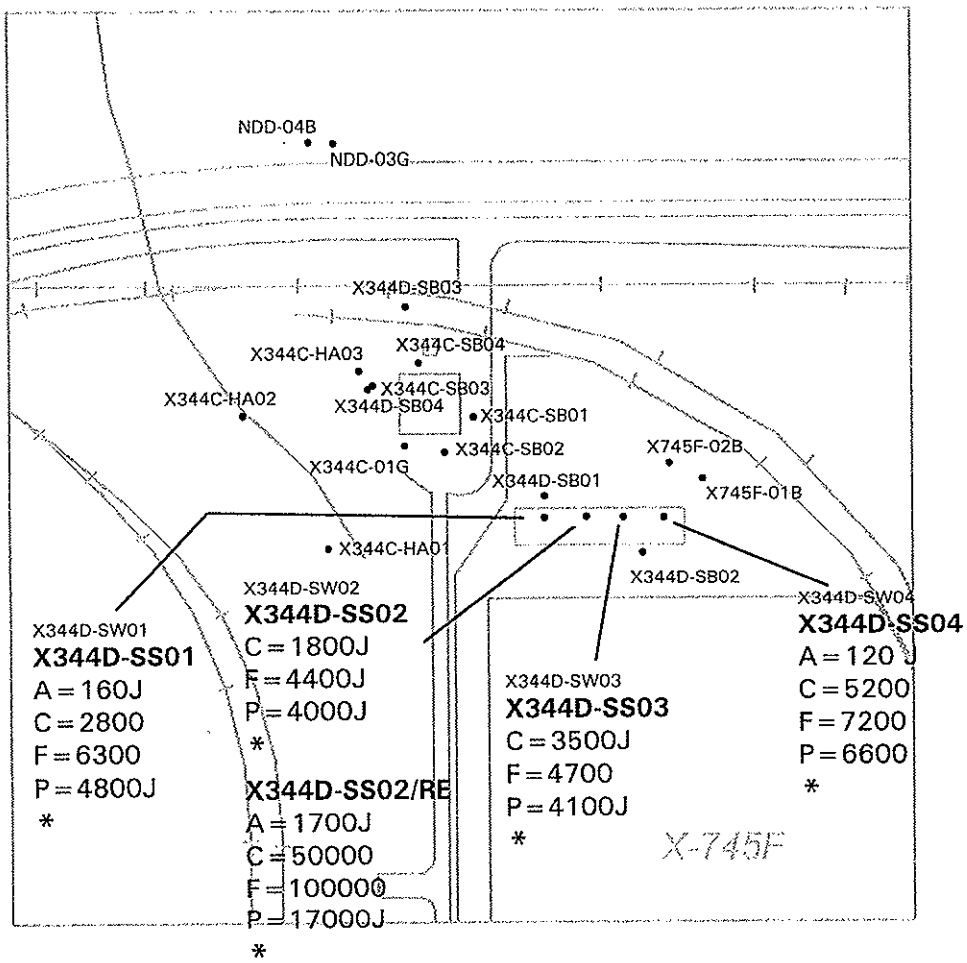
Figure 4.10f Concentration of SVOCs, PCBs, and Pesticides in Sediment Samples at X-344C HF Storage Facility and X-344D HF Neutralization Pit



INDICATOR SVOCs and PCBs / PESTICIDES (ug/kg)

A = ACENAPHTHENE
C = CHRYSENE
F = FLUORANTHENE
P = PYRENE
PCB54 = AROCLOR-1254
PCB60 = AROCLOR-1260

J = ESTIMATED VALUE
ND = NO SVOCs / PCBs DETECTED
* = SVOCs OTHER THAN INDICATORS PRESENT

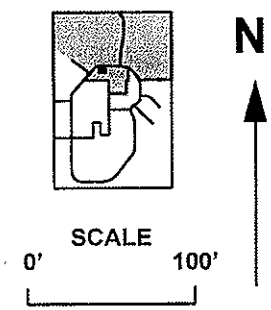


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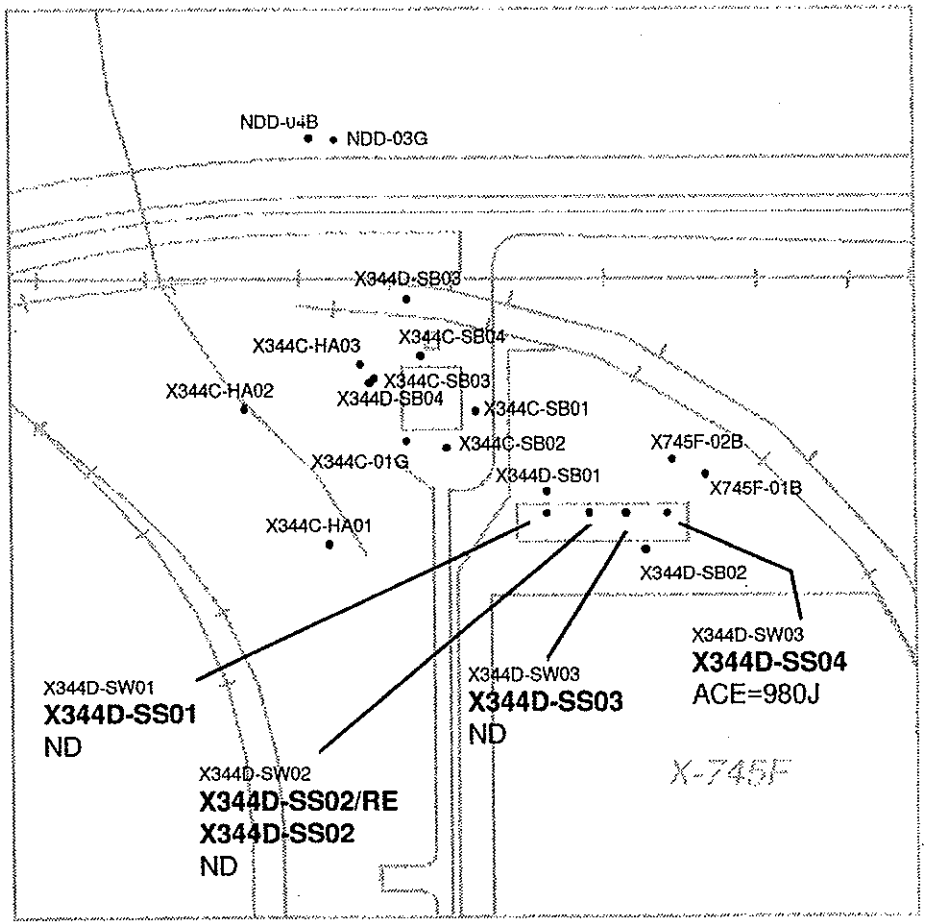
Figure 4.10e Concentration of VOCs in Sediment Samples at X-344C HF Storage Facility and X-344D HF Neutralization Pit



VOCs (ug/kg)

ACE=ACETONE
J=ESTIMATED VALUE
ND=NO VOCs DETECTED

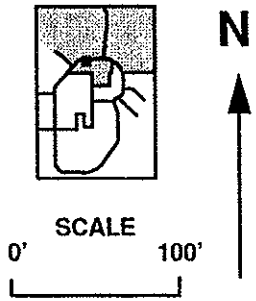


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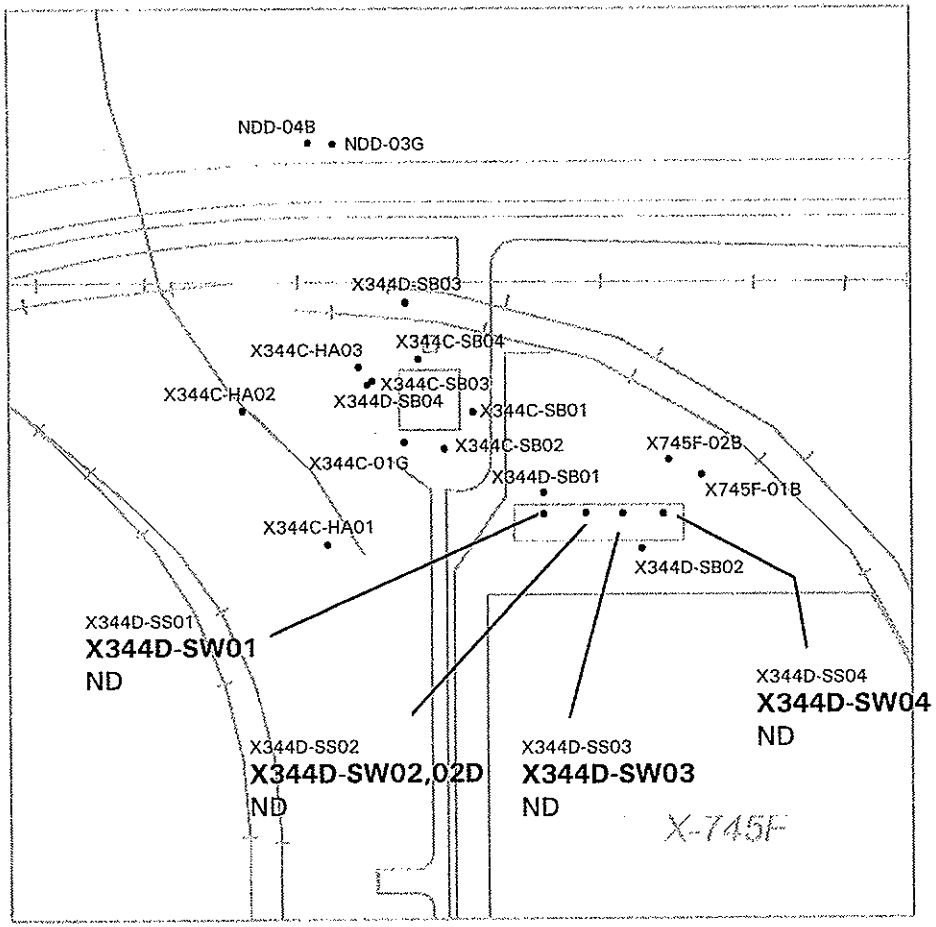
Figure 4.10d Concentration of Radiological Parameters in Surface-Water Samples at X-344C HF Storage Facility and X-344D HF Neutralization Pit



RADIOLOGICAL PARAMETERS

U = TOTAL URANIUM (mg/l)
ALPHA = GROSS ALPHA (pCi/l)
Tc = TECHNETIUM (pCi/l)
BETA = GROSS BETA (pCi/l)

J = ESTIMATED VALUE
ND = NO RADIOLOGICAL PARAMETERS DETECTED

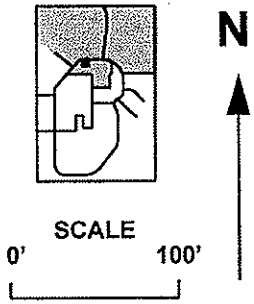


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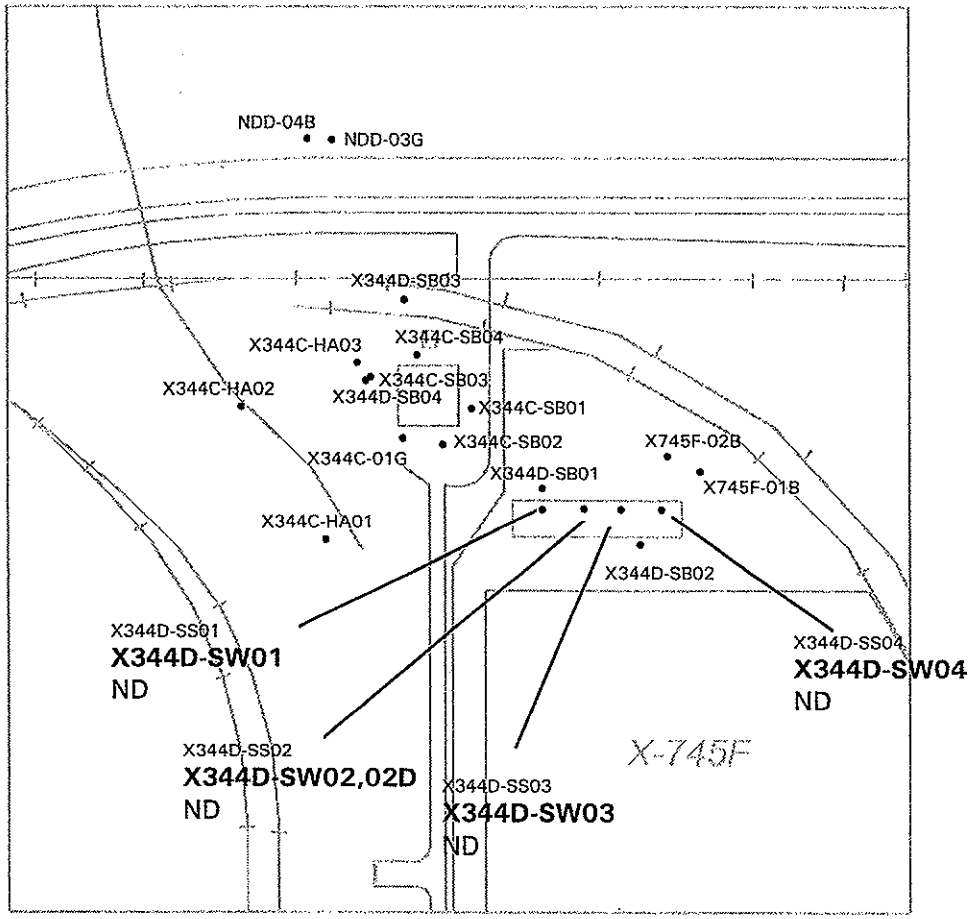
Figure 4.10c Concentration of SVOCs, PCBs, and Pesticides in Surface-Water Samples at X-344C HF Storage Facility and X-344D HF Neutralization Pit



INDICATOR SVOCs and PCBs / PESTICIDES (ug/l)

A = ACENAPHTHENE
C = CHRYSENE
F = FLUORANTHENE
P = PYRENE
PCB54 = AROCLOR-1254
PCB60 = AROCLOR-1260

J = ESTIMATED VALUE
ND = NO SVOCs / PCBs DETECTED
* = SVOCs OTHER THAN INDICATORS PRESENT

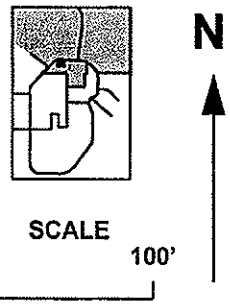


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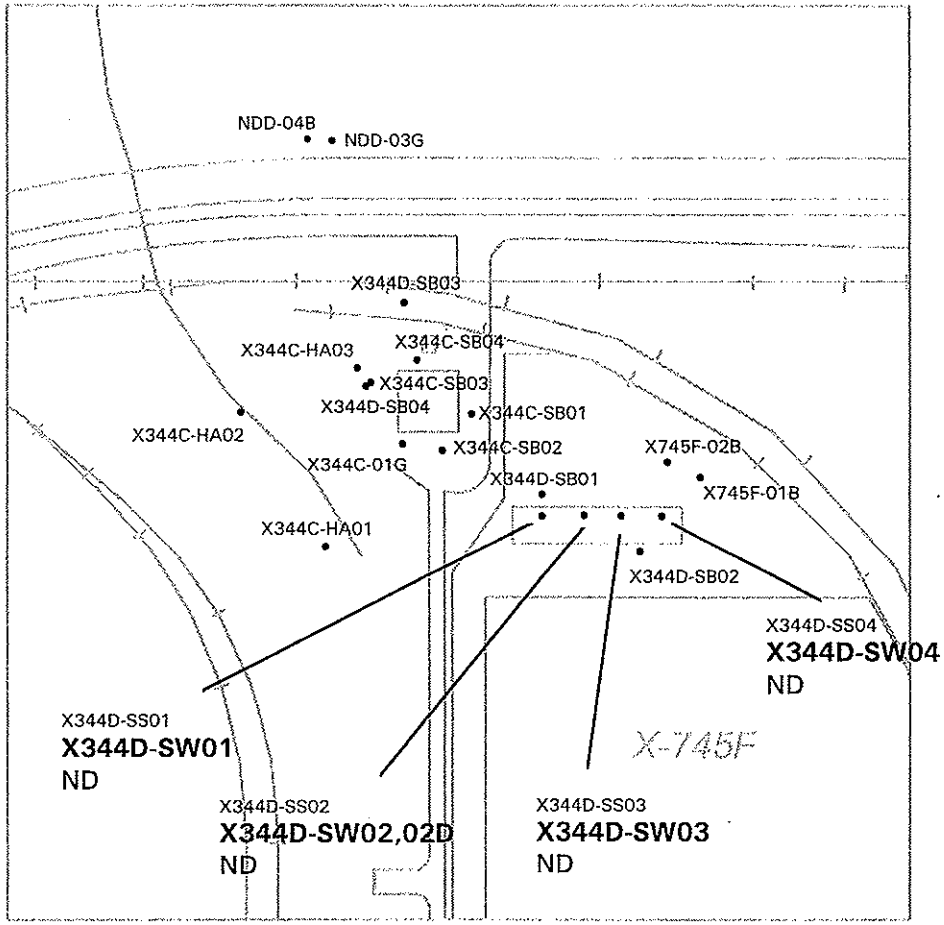
Figure 4.10b Concentration of VOCs in Surface-Water Samples at X-344C HF Storage Facility and X-344D HF Neutralization Pit



VOCs (ug/l)

J=ESTIMATED VALUE
ND=NO VOCs DETECTED

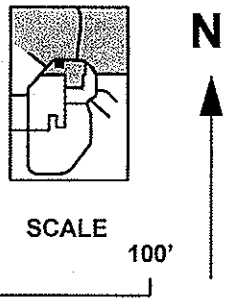


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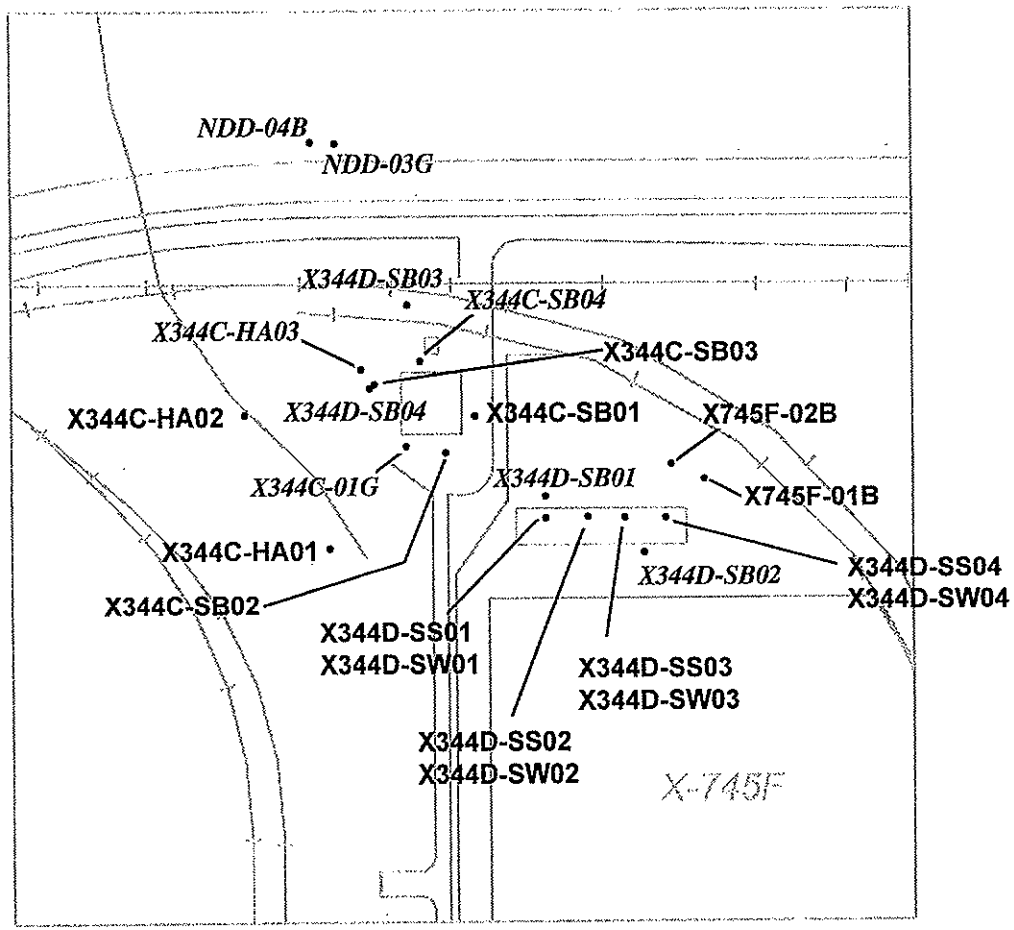
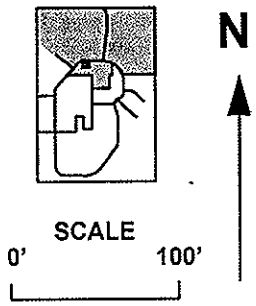
Figure 4.10a Sample Locations at X-344C HF Storage Facility and X-344D HF Neutralization Pit



PHASE II LOCATIONS IN ITALICS



UNIT: X344C
PORTS LAB
SOILS

X344C-GP32-16

ANALYTE	VALUE / QA CODE		PQL	UNITS
ALPHA, TOTAL	8	U	10	pCi/gm
BETA, TOTAL	8	U	40	pCi/gm
TC-99 BETA	0.0	U	1	pCi/gm
URANIUM, TOTAL	4.1		1	ug/g

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