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REMEDIATION DESIGN AND REMEDIAL ACTION PLAN FOR THE 1100 AREA HANFORD SITE

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Prepared for
U.S. Department of Energy
Field Office, Richland

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LIST OF ACRONYMS

A-E	Architect-Engineer
ALE	Arid Lands Ecology
BEHP	bis(2-ethylhexyl)phthalate
CENPW	Walla Walla District
DOE	Department of Energy
ECAO	Environmental Criteria and Assessment Office
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
HRL	Horn Rapids Landfill
mg/kg	milligrams per kilogram
NPL	National Priority List
OU	Operable Unit
PCBs	polychlorinated biphenyl
PRGs	Preliminary Remediation Goals
QA	quality assurance
RD/RA	Remedial Design/Remedial Action
SVE	Soil vapor extraction
TCE	trichloroethylene
TPH	Total petroleum hydrocarbons
USACE	U.S. Army Corps of Engineers
UST	underground storage tank
WBS	work breakdown structure
WHC	Westinghouse Hanford Corporation
WIDS	Waste Information Data System

1.0 INTRODUCTION

In preparation for the next phase of activities, the DOE has tasked the CENPW to prepare the next document following the RI/FS and ROD for the 1100 Aggregate Area OUs at the DOE Hanford Site. This task requires the preparation of a document that addresses the activities required for the design and implementation of remedial action. This document is the Remedial Design and Remedial Action Plan.

1.1 WORK PLAN OBJECTIVES

This Remedial Design Work Plan outlines the overall approach to the remedial design for the Operable Units within the 1100 Area of the U.S. Department of Energy's Hanford Site near the northern border of the City of Richland, Washington. This document will identify the scope of work at each remediation site; establish the schedule for remedial design and remedial action; and identify the responsibilities and contributions of different government and local agencies involved. Appendix A of this Remedial Design is the Field Sampling Plan; Appendix B is the Quality Assurance Project Plan; and Appendix C is the Site Health and Safety Plan.

1.2 SITE DESCRIPTION

The 1100 Area National Priority List (NPL) Site was placed on the NPL in July 1989. The 1100 Area has been divided into four operable units (OUs) based on geographic area and common waste sources. The four OUs are identified as 1100-EM-1, 1100-EM-2, 1100-EM-3, and 1100-IU-1. The location of the Hanford Site and the 1100 Area are depicted in Figure 1. During the course of performing RI/FS activities at the 1100 Area, the highest priority was placed on the 1100-EM-1 OU which underwent a full-scale RI/FS. In order to perform all remedial actions at the 1100 Area as a single project, each of the remaining areas was evaluated by using an accelerated process in which existing waste information was evaluated, detailed visual inspections were performed, and interviews with site employees were conducted. The findings for each of the OUs are described below.

1.2.1 Operable Unit 1100-EM-1

Operable Unit 1100-EM-1 (EM-1) encompasses an area on the southeast side of the Hanford site and west of the town of Richland. Due to the close proximity of EM-1 to the North Richland wellfield, the water supply for the town of Richland, EM-1 was assigned the highest priority of the Hanford OUs. EM-1 contains the central warehousing, vehicle maintenance, and transportation distribution center for the entire Hanford site. Additionally, the Horn Rapids Landfill is located in the northern portion of 1100-EM-1. Operations at EM-1 have included the use of solvents, fuels, oils, and polychlorinated biphenyls (PCBs).

During the RI/FS, three areas within EM-1 were determined to contain contaminants at levels that may pose potential long-term risks to human health. These areas of concern include a former landfill, an area of discolored soil, and a runoff collection pool. In addition, groundwater contamination has been identified. A description of each of these three areas is provided below. The location of each area is shown in Figure 2. In addition, an area known as Site 600-2 will also be investigated. This site is south of Horn Rapids Road across from the Horn Rapids Landfill, but its exact location is unknown. However, its general location is depicted in Figure 2.

1.2.1.1 Discolored Soil Site. The Discolored Soil Site lies approximately 2000 feet northwest of Building 1171 and encompasses an east-west trending depression. Previous investigations identified visibly stained soil covering an area of about 6 feet by 10 feet at the eastern end of the depression. The stained soil was determined to be the result of a spill of bis(2-ethylhexyl) phthalate (BEHP) resulting in the known contamination of approximately 130 cubic yards of soil and potentially up to 440 cubic yards. Samples collected from surface soils at this site contained BEHP at a maximum concentration of 25,000 milligrams per kilogram (mg/kg). The remedial objective for this site is to remove and use off-site incineration for all soil with a BEHP concentration in excess of 71 mg/kg.

Figure 1. Location of Hanford Site.

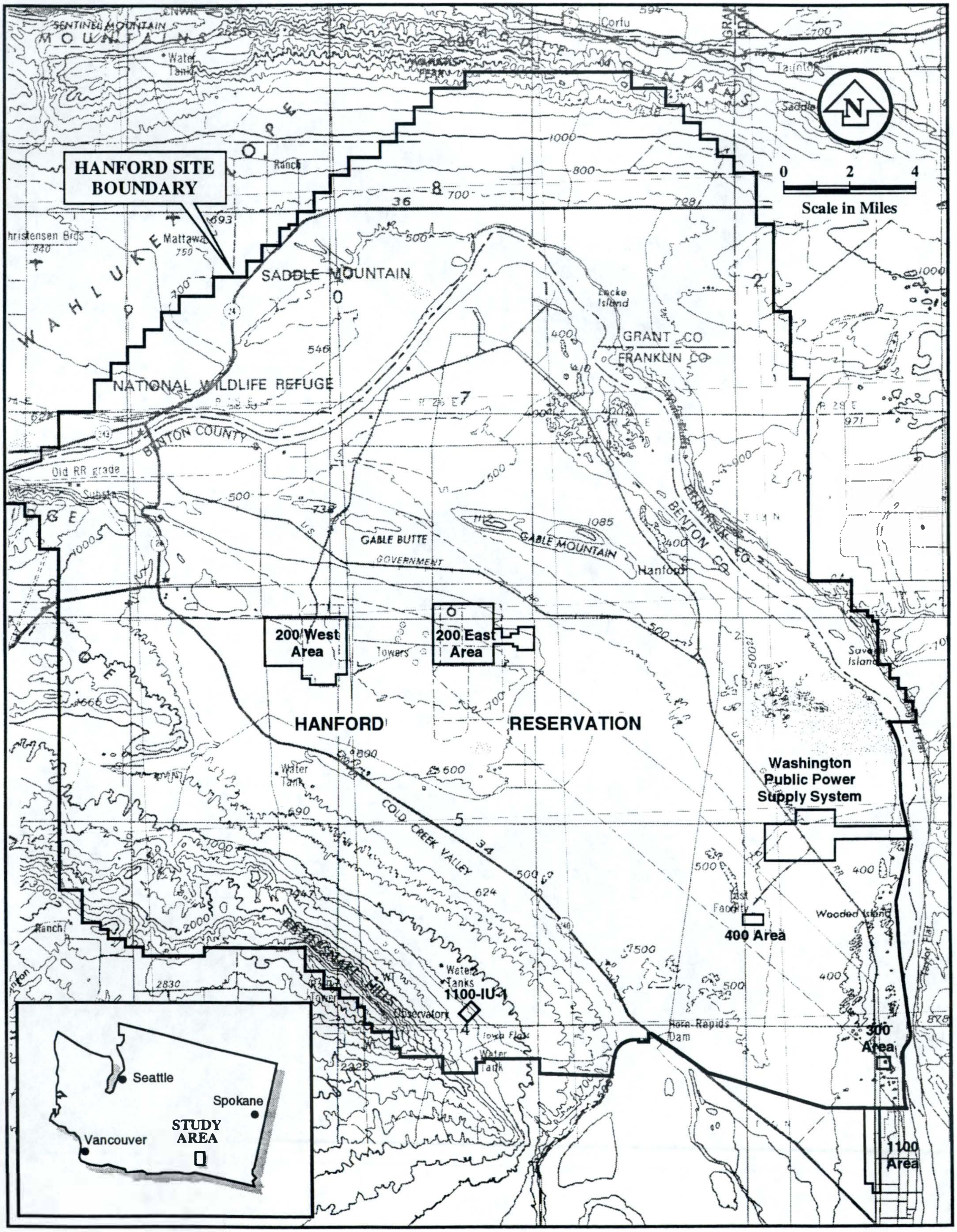
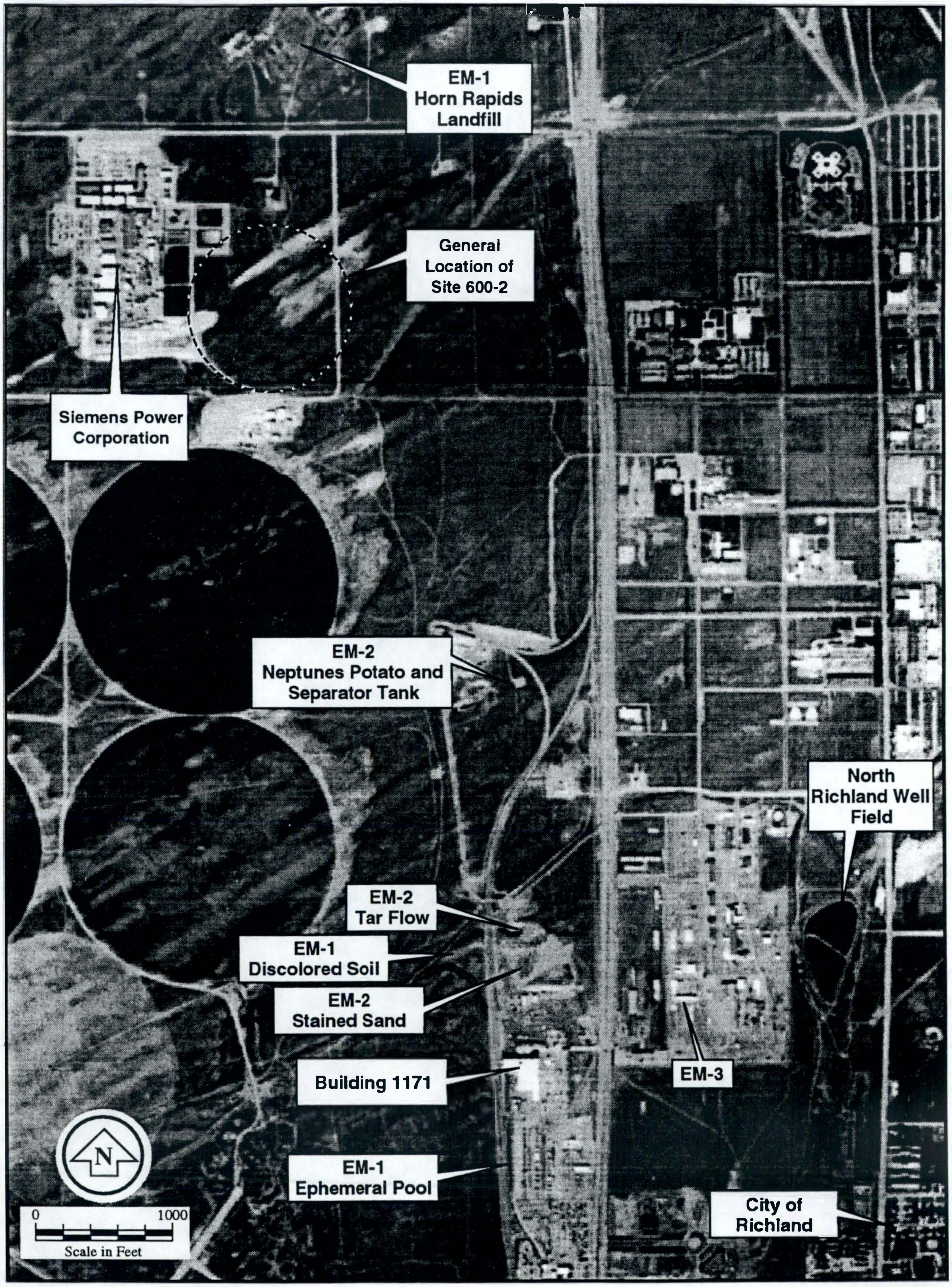


Figure 2. EM Sites.



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1.2.1.2 Ephemeral Pool. The Ephemeral Pool is a 20 foot by 700 foot manmade depression on the western side of the Building 1171 parking lot where runoff water collects and evaporates. Previous investigations have identified the presence of PCB contamination from an unknown release at this site to a maximum concentration of 42 mg/kg. It is estimated that 165 to 340 cubic yards of soil may be contaminated with PCBs. The remedial objective for this site is to excavate and landfill all soil with PCB concentration greater than 1 mg/kg.

1.2.1.3 Horn Rapids Landfill. The Horn Rapids Landfill covers approximately 50 acres northeast of the Siemens Power Corporation facility and north of Horn Rapids Road. The landfill was operated as an uncontrolled landfill from the late 1940s until the 1970s. Disposal of office and construction waste, asbestos wastes, sewage sludge, and fly ash is known to have occurred at the landfill. Previous investigations have identified asbestos contamination and an area contaminated by PCBs. The remedial objective for this site is to excavate all soil containing a PCB concentration over 5 mg/kg (approximately 300 cubic yards) and to cap the entire landfill.

1.2.1.4 Groundwater. Groundwater contaminated with trichloroethylene (TCE) has been identified both upgradient and downgradient of the Horn Rapids Landfill. Monitoring data and hydrogeologic modeling indicate that the TCE contamination is the result of multiple limited spill events occurring at an upgradient source. The TCE plume is approximately one mile long and 0.2 mile wide, and contaminants within the plume are moving in a northeasterly direction. The maximum detected TCE concentration is 110 mg/L.

1.2.1.5 Site 600-2. As indicated above, this site is located South of Horn Rapids Road across from the Horn Rapids Landfill on Siemens Nuclear Power Corporation property. Site 600-2 was listed on Hanford's Waste Information Data System (WIDS) on April 24, 1992. This site was apparently used for dumping military debris. Nothing else is known about this site. The initial objective is to positively identify the location of this site and to perform a detailed inspection. Subsequent actions will depend on the results of the inspection.

1.2.2 Operable Unit 1100-EM-2

Operable Unit 1100-EM-2 (EM-2) lies within the area of EM-1 in the southwest corner of the Hanford site and near the northern boundary of the City of Richland. Past and present activities in the EM-2 OU include vehicle maintenance and repair in Building 1171, which is located in the middle of EM-2. Operations at EM-2 potentially included the use of solvents, fuels, oils, and PCBs.

During the accelerated RI/FS process, three areas within EM-2 were identified that will require further investigation and/or remediation. These areas of concern include the Tar Flow Area, the Stained Sand Area, and the Neptunes Potato and Separator Tank. A description of each of these three areas is provided below. The location of each area is shown in Figure 2.

1.2.2.1 Tar Flow Area. Investigation activities have identified a soft tar-like substance on the ground surface about 1,050 feet north of the northwest corner of Building 1171. The tar-like substance was observed to cover an area of approximately 110 feet by 30 feet. A conservative estimate of the volume of contaminated soil has been established at 110 cubic yards. Sampling has not been conducted at this site; therefore, no further information regarding the type and extent of contamination is currently available.

1.2.2.2 Stained Sands Area. Previous investigations have identified an area of visibly stained sands on the east slope of a sand dune located about 900 feet north of the northwest corner of Building 1171. The stained soils were observed to cover an area of approximately 20 feet by 20 feet. A conservative estimate of the volume of contaminated soil has been established at 45 cubic yards. Sampling has not been conducted at this site; therefore, no further information regarding the type and extent of contamination is currently available.

1.2.2.3 Neptunes Potato and Separator Tank. Previous investigations (WIDS, December 7, 1992) have identified a trench on the north side of EM-2 that appears to have been a transmission trench leading to a drain field. The trench is 2600 feet long and 4 feet wide. A 1948 aerial photograph shows three distribution trenches at the end of the main trench; these distribution trenches are no longer visible. While sampling has not been conducted at this site, the trenches may have been used for disposal of chlorinated and nonchlorinated solvent wastes.

1.2.3 Operable Unit 1100-EM-3

Operable Unit 1100-EM-3 (EM-3) is located to the northwest of EM-2 and encompasses a fenced industrial area containing numerous permanent buildings. Past and present activities in EM-3 include maintenance and warehousing in support of the Hanford site. Operations at EM-3 included the use of solvents, fuels, oils, and PCBs.

Previous investigations have identified nine areas within EM-3 that will require further investigation and/or remediation. These areas of concern include spill areas, disposal areas, storage tanks, and equipment rinse pads. A description of each of these nine areas is provided below. The location of each area is shown in Figure 3.

1.2.3.1 1240 Suspect Spill Area. Previous investigations have identified an area of visibly stained soils on the south end of Building 1240. The spill is reportedly a pliable adhesive mixed with metal fragments and floor sweepings covering a 10 foot square area. Sampling has not been conducted at this site; therefore, no further information regarding type and extent of contamination is currently available.

1.2.3.2 1240 French Drain. The 1240 French Drain is located on the west side of Building 1240 by a loading dock. Although no evidence of spills into the drain was observed during previous investigations, a PCB collection area was located close to the drain. The drain reportedly discharges directly into the surrounding soils. Sampling has not been conducted at this site; therefore, no further information regarding type and extent of contamination is currently available. However, based on the proximity of the PCB collection area to the drain, PCBs could be present.

1.2.3.3 1226 Suspect Waste Oil Disposal Area. The 1226 Suspect Waste Oil Disposal Area is located between Buildings 1212 and 1226 and encompasses an area of about 50 square feet. According to interviews, for a period of 20 years, waste oil was disposed in this area by spraying on the ground. Since the area has been covered with gravel, previous investigations did not observe visually contaminated soils. Sampling has not been conducted at this site. Potential contaminants include hydrocarbons and metals.

1.2.3.4 1212/1217 Suspect Battery Acid Disposal Area. Interviews have indicated that for a period of 20 years prior to 1980, batteries were emptied at the 1212/1217 Suspect Battery Acid Disposal Area. Since the area has been covered with gravel, previous investigations did not observe visually contaminated soils. Sampling has not been conducted at this site. Potential contaminants based on the site history include metals and VOCs.

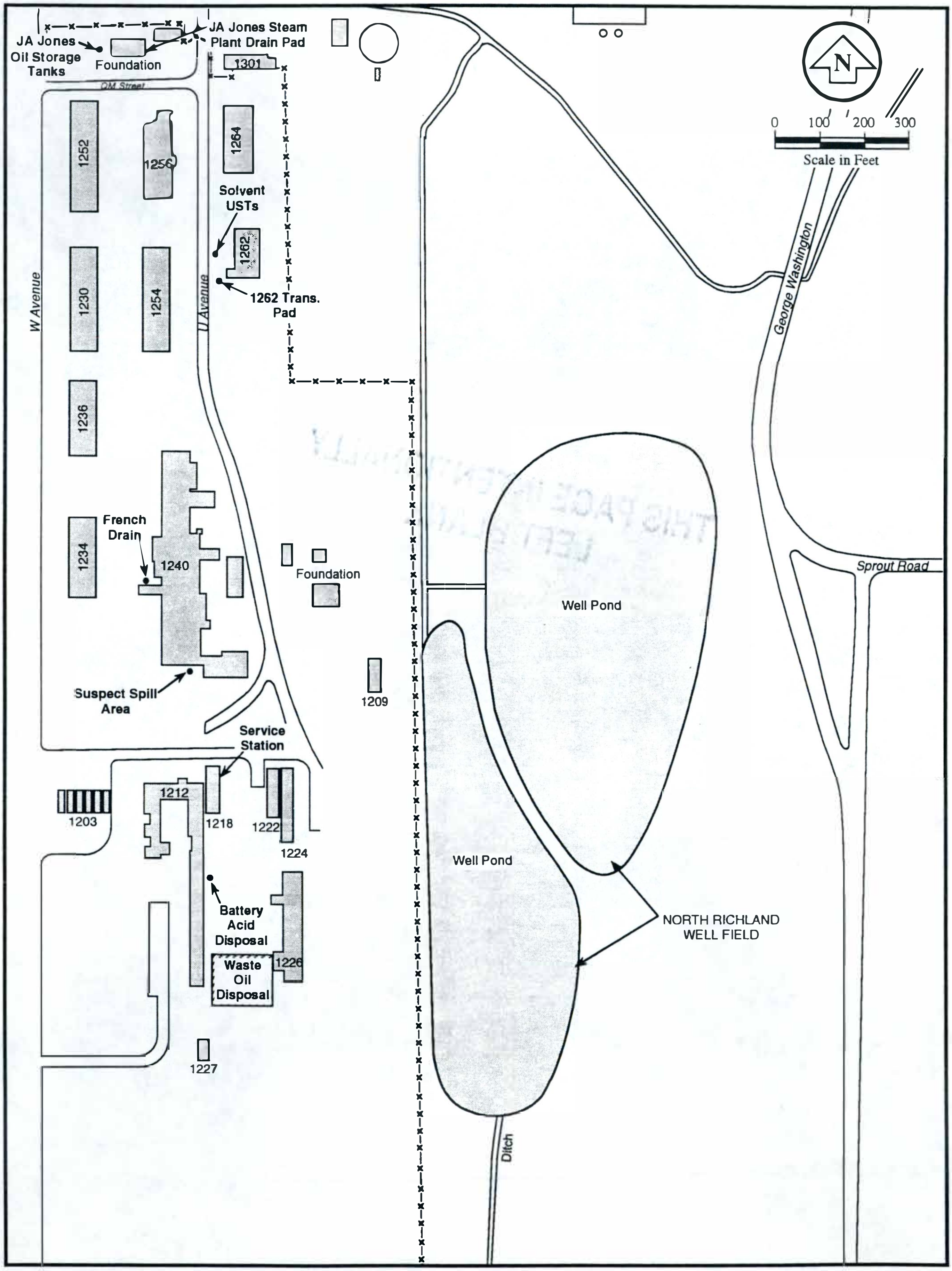
1.2.3.5 1218 Service Station. Previous investigations have located possible underground storage tanks (USTs) at the 1218 Service Station. No other information on this site is currently available. However, the presence of a service station and the possibility of associated USTs at this site indicate potential contaminants may include petroleum hydrocarbons.

1.2.3.6 1262 Solvent Tanks. The 1262 Solvent Tanks are located on the west side of Building 1262. Previous investigations have identified four USTs that previously contained cleaning solvents (possibly carbon tetrachloride). Based on this information, potential contaminants at this site may include chlorinated (and possibly nonchlorinated) solvents. Sampling has not been conducted at this site; therefore, further information regarding type and extent of contamination is not currently available.

1.2.3.7 1262 Transformer Pad. Previous investigations have located a 6-foot by 6-foot pad that apparently held transformers in the past. No visible evidence of staining was observed. Due to the past presence of transformers, potential contaminants at this site include PCBs. Sampling has not been conducted at this site; therefore, no further information regarding type and extent of contamination is currently available.

1.2.3.8 JA Jones Oil Storage Tanks. Fuel storage tanks for the JA Jones Steam Plant were reportedly located on the north side of EM-3 (JA Jones site sketch). Previous investigations did not locate the tanks, and it is not known if the tanks were above or below ground. The possibility of fuel tanks indicates petroleum hydrocarbons are potential contaminants at this site. No other information on this site is currently available.

Figure 3. EM-3 Location of Site.



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1.2.3.9 JA Jones Steam Plant Drain Pad. Previous investigations have located a 20-foot by 10-foot drain pad on the north side of EM-3. Inspections of the pad did not determine the discharge point for the drain. No visible signs of contamination were encountered. Sampling has not been conducted at this site; therefore, no further information regarding type and extent of contamination is currently available. Potential contaminants may include a variety of constituents such as solvent wastes, metals, and lubricating and fuel oils.

1.2.4 Operable Unit 1100-IU-1

Operable Unit 1100-IU-1 (IU-1) is a former missile base located 15 miles west of the EM-1 area and is shown in Figure 4. This OU consists of two areas. One area is located at the top of Rattlesnake Mountain north of the main missile launch facility. It is a compound with a pumphouse, small support structures, and launch control facilities as shown in Figure 5. The second area is located on the southeast slope of the Rattlesnake Hills and includes a number of permanent structures used in the maintenance of the missile site and housing of operations personnel. This area is referred to as the Missile Area and is shown in Figure 6. The majority of the facilities within this OU lie within the main Missile Area site on the southeast slope. All of the Missile Area facilities have been abandoned with the exception of a barracks building at the main site which houses the Arid Lands Ecology (ALE) Reserve Headquarters. IU-1 is located within the 120 square mile ALE Reserve.

During operations, missile maintenance activities included use of solvents, fuels, acids, hydraulic fluid, and paints. Interviews conducted with former workers at the missile site have indicated that all wastes generated during operations were disposed of in on-site landfills or dumped nearby off-site. Areas of concern at IU-1 include former septic fields that may have been used for solvent disposal, storage tanks, disposal sites, and landfills. Previous investigations have identified 32 areas within IU-1 that will require further investigation and/or remediation. A description of each of the 32 areas is provided below.

1.2.4.1 6652-C SSL Active Septic System. Discharge from this septic system has been observed over a slope northeast of the administrative building (see Figure 5). The estimated area covered by the septic system field is 35 by 7 feet. In addition, a 2500-gallon septic tank is associated with this septic system. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available. However, solvents were regularly used in site processes and are thought to have been discharged into the septic systems for disposal; therefore, potential contaminants include chlorinated and nonchlorinated solvents.

1.2.4.2. 6652-C SSL Inactive Septic System. Due to the possibility that solvents and other wastes were disposed of in septic systems, this area has identified as requiring additional investigation. The estimated area covered by the septic system field is 30 by 300 feet (Figure 5). In addition, a 2500-gallon septic tank is associated with this septic system. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available. However, solvents were regularly used in site processes and are thought to have been discharged into the septic systems for disposal. Therefore, potential contaminants include chlorinated and nonchlorinated solvents.

1.2.4.3 Radar Berm and Pads. Large amounts of hydraulic fluid were used in these areas to rotate radar tracking equipment. There are three pads, each of which is 16 by 16 feet (Figure 5). Visible contamination has not been observed on the pads or surrounding berms. No sampling has been conducted in this area. Potential contaminants include petroleum hydrocarbons (hydraulic fluid).

1.2.4.4 H-52-C Surface Gas Tank Area. Previous investigations have identified two 475-gallon surface gasoline tanks in this area (Figure 5). Interviews with former site personnel have indicated that this area was also used for cleanup of paintbrushes and other items. No containment was provided during paintbrush cleanup. No visible staining was observed during previous investigations. The estimated area covered by the tanks and used for cleanup purposes is 20 by 20 feet. Potential contaminants at this site include petroleum hydrocarbons (gasoline) from the gas storage tanks, and solvents (chlorinated and nonchlorinated) and metals from cleanup of painting materials.

1.2.4.5 Control Center Disposal Pits. Four pits approximately 3 feet in diameter and 2 feet in depth have been identified in this area (Figure 5) and are believed to contain solid wastes.

Figure 4. IU-1 Site.

Figure 5. IU-1 Missile Control Center.

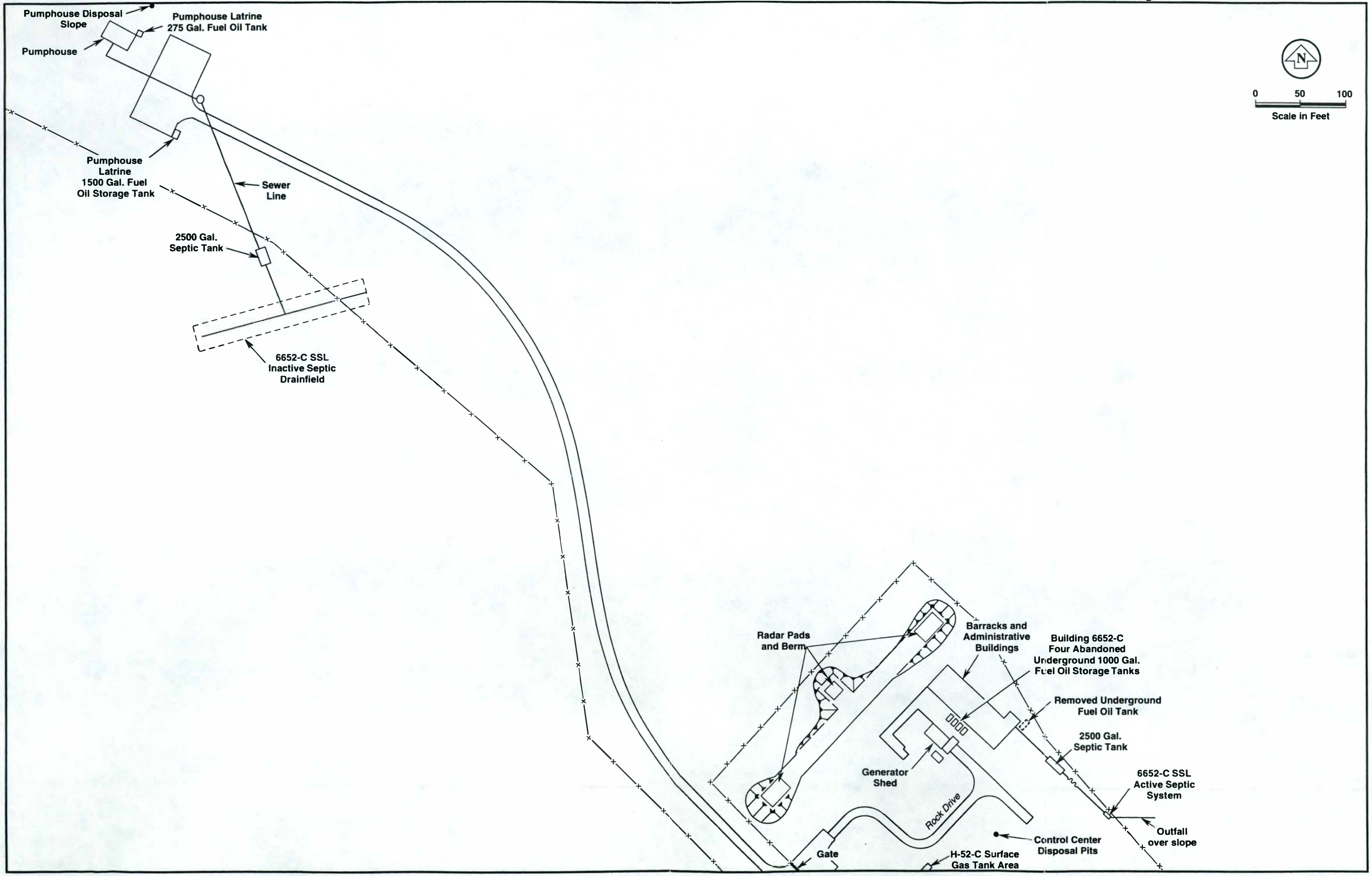
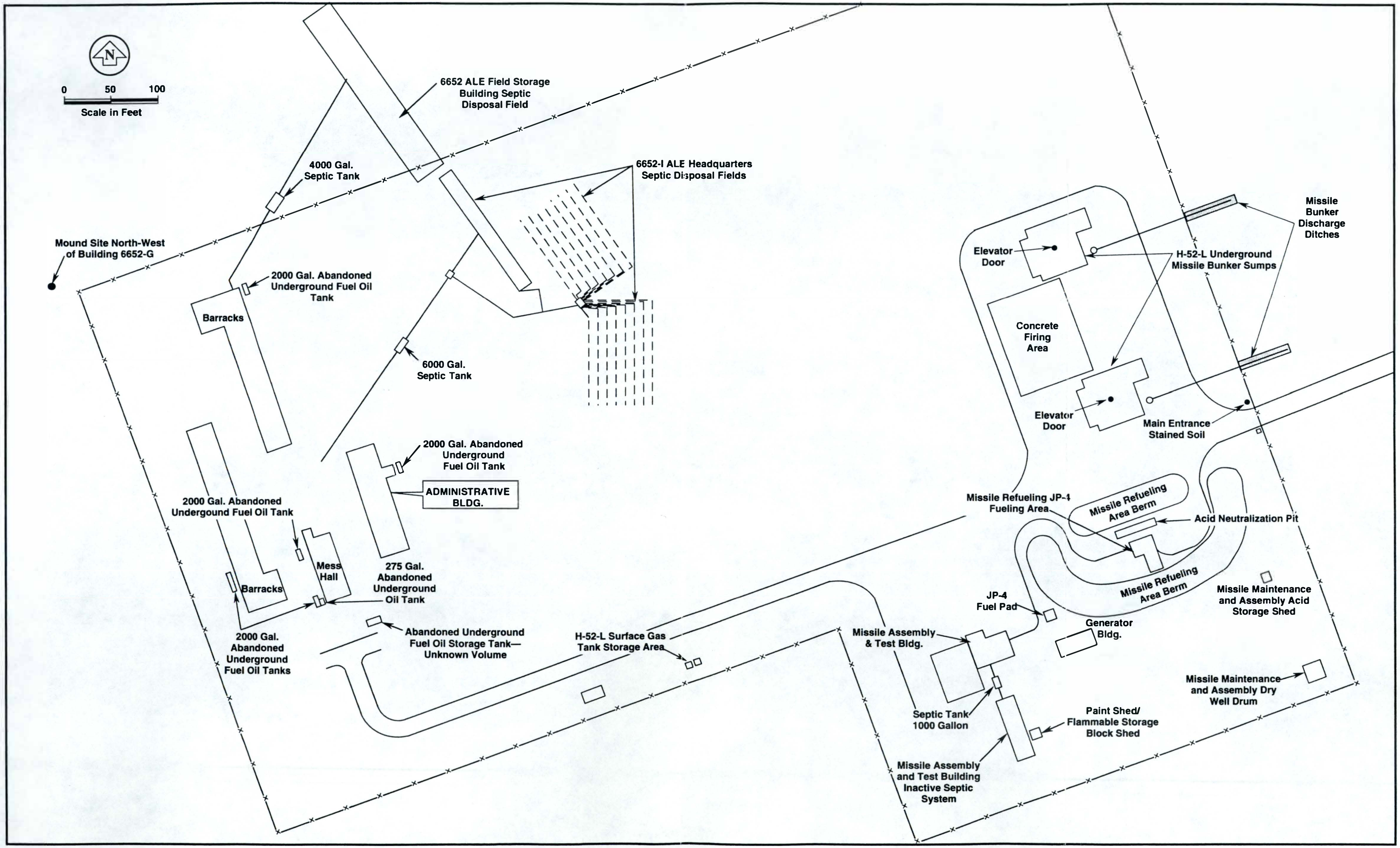


Figure 6. IU-1 Missile Area



However, no sampling has been conducted to confirm if contaminants are present. Potential contaminants in this area could include anything used at the base, such as chlorinated solvents, petroleum hydrocarbons, acids, and metals.

1.2.4.6 Building 6652-C Abandoned USTs. Interviews with former site personnel have identified the presence of four 1000-gallon fuel oil USTs in the Building 6652-C area (Figure 5). During a previous site visit, the position of the tanks could not be determined. However, an additional tank was discovered located on the east corner of the building. In addition, site plans indicate that there are a total of five USTs associated with this area. Interviews indicate that the UST on the east corner of the building has been removed. No samples were collected during removal of the tank to document if contamination was present. No other information is currently available. Potential contaminants at this site include petroleum hydrocarbons (fuel oil or diesel) from the abandoned USTs.

1.2.4.7 Pumphouse Disposal Slope. Previous investigations have identified dumping of solid waste on a slope by the pumphouse (Figure 5). A small pile of debris was observed at the top, and piles of concrete were observed on the slope. The estimated volumes of the debris piles are 5 feet by 5 feet by 2 feet and 85 feet by 10 feet by 1 foot. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available.

1.2.4.8 Pumphouse Latrine 1500-Gallon Fuel Oil Storage Tank. This tank was known to be above ground, and has been removed (Figure 5). No other information is currently available. Potential contaminants at this site include petroleum hydrocarbons (fuel oil or diesel) from the storage tank.

1.2.4.9 Pumphouse Latrine 275 Gallon Fuel Oil Storage Tank. This tank was known to be above ground, and has been removed (Figure 5). No other information is currently available. Potential contaminants at this site include petroleum hydrocarbons (fuel oil or diesel) from the storage tank.

1.2.4.10 6652 ALE Field Storage Building Septic System. Due to the possibility that solvents and other wastes were disposed of in septic systems, this area has been identified as requiring additional investigation (Figure 6). The estimated area covered by the septic system field is 200 feet by 40 feet. In addition, a 4000-gallon septic tank is associated with this septic system. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available. However, potential contaminants include chlorinated and nonchlorinated solvents that may have been discharged into the septic system for disposal.

1.2.4.11 Mound Site Northwest of Building 6652-G. The Mound Site, identified during past site visits, appears to be a windbreak or the location of a soil research project by the ALE laboratory (Figure 6). No other information is currently available. Potential contaminants at this site are unknown.

1.2.4.12 6652-I ALE Headquarters Septic System. The septic field for this system includes three separate areas: a 15-foot by 150-foot field; a 70-foot by 100-foot field; and a 70-foot by 100-foot field (Figure 6). In addition, a 6000-gallon septic tank is associated with the system. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available. Potential contaminants include chlorinated and nonchlorinated solvents that may have been discharged into the septic system or disposal.

1.2.4.13 Abandoned Underground Storage Tanks. Interviews with former site personnel indicate that six USTs, ranging in size from 275 gallons to 2000 gallons, were abandoned (Figure 6). Some or all of the tanks may still contain fuel. The tanks have not been located. Potential contaminants at this site include petroleum hydrocarbons (fuel oil) from the storage tanks.

1.2.4.14 H-52-L Missile Bunker Sump. The Missile Bunker Sump is an underground facility that was found to contain batteries, discarded transformers, and asbestos insulation during previous investigations. The area also potentially contains discarded missile fuel (which contains red fuming nitric acid, aniline, furfuryl alcohol, JP-3/JP-4, and hydrazine) and hydraulic fluid tanks. In addition to the planned investigation activities, the asbestos will be removed and disposed. The building will eventually be closed.

1.2.4.15 Missile Bunker Landfill. Interviews with former site personnel indicate this landfill was used for disposal of construction and demolition debris. Previous investigations identified construction debris on the landfill surface. The estimated area of the landfill is 1.25 acres (Figure 4). Potential contaminants could include anything used at the base, such as solvents (both chlorinated and nonchlorinated), discarded missile fuel, petroleum hydrocarbons (fuels, waste oil, hydraulic fluid), acids, and metals.

1.2.4.16 Missile Refueling Area Berm. Potential historical use of herbicide and/or defoliant on this berm has been identified (Figure 6). The estimated volume of the berm is 600 cubic yards. Sampling has not been conducted at this site, so no definitive information regarding the type and extent of contamination is available.

1.2.4.17 Acid Neutralization Pit. A concrete drainage pit presently filled with soil and vegetation has been identified (Figure 6). The estimated size of the pit is 40 feet by 5 feet. Site plans identify this area as an acid neutralization pit. In addition, JP-4 from a nearby refueling area is thought to have drained into the pit. No other information is currently available. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available. However, contaminants may include petroleum hydrocarbons (JP-4) and metals associated with acids.

1.2.4.18 Missile Refueling JP-4 Fueling Area. This area was identified during previous investigations as a refueling area (Figure 6). Excess fuel may have drained into the adjacent acid neutralization pit. The estimated size of the area is 20 feet by 20 feet. Sampling has not been conducted at this site, so no information regarding type and extent of contamination is available. However, based on past use of the area, potential contaminants include petroleum hydrocarbons (JP-4).

1.2.4.19 Missile Assembly and Test Building Inactive Septic System. Building 6652-O, which is connected to this septic system, was determined through interviews to be the location of the electrical parts cleaning operation (Figure 6). The estimated area covered by the septic system field is 70 feet by 20 feet. A 1000-gallon septic tank is also associated with this system. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available. However, solvents were regularly used in site processes. The location of a parts cleaning operation on this septic system indicates that solvents may have been discharged into this septic systems for disposal. Therefore, potential contaminants include chlorinated and nonchlorinated solvents.

1.2.4.20 Missile Maintenance and Assembly Area Acid Storage Shed. Previous investigations identified discolored soil and stressed vegetation in the area of this shed (Figure 6). In addition, a drainage ditch that runs near the shed was observed to contain discolored soil. The estimated size of the shed is 15 feet by 15 feet. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available.

1.2.4.21 JP-4 Fuel Pad. This area was identified as a 10-foot by 10-foot concrete pad where fueling operations took place (Figure 6). No evidence of spills or staining has been observed on the pad. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available. However, based on past use of the area, potential contaminants include petroleum hydrocarbons (JP-4).

1.2.4.22 Missile Bunker Drainfield. The estimated area covered by the septic system field is 15 feet by 50 feet. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available. However, potential contaminants may include chlorinated and nonchlorinated solvents that could have been discharged into the septic system for disposal.

1.2.4.23 Missile Bunker Discharge Ditch. During previous site visits, water was observed discharging into this ditch from an unknown source (Figure 6). The discharge water was observed to contain particulate material. The estimated area of the ditch is 70 feet by 5 feet. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available.

1.2.4.24 Main Entrance Stained Soil. An 18-foot by 15-foot area of discolored soil and debris was discovered by the main entrance to the missile launch site (Figure 6). Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available.

1.2.4.25 H-52-L Surface Gas Tank Storage Area. Previous investigations have identified two 475-gallon surface gasoline tanks in this area (Figure 6). Interviews with former site personnel have indicated that this area was also used for cleanup of paintbrushes and other items. No containment was provided during paintbrush cleanup. No staining was visible during previous investigations. The estimated area covered by the tanks and used for cleanup purposes is 20 feet by 20 feet. Potential contaminants at this site include petroleum hydrocarbons (gasoline) from the gas storage tanks and solvents (chlorinated and nonchlorinated) and metals from cleanup of painting materials.

1.2.4.26 Generator Building. During previous site visits, abandoned transformers and other electrical equipment were observed at this site (Figure 6). Sumps may have collected leakage from the transformers and generators. The building was observed to be collapsing. Potential contaminants from the generator building include petroleum hydrocarbons and PCBs. In addition, the potential for asbestos and lead particulates from the collapsing building exists. In addition to the planned investigation activities, the asbestos will be removed, bagged, and disposed of, and the building will eventually be demolished.

1.2.4.27 Horseshoe Site. This 0.5-acre site was identified as a possible disposal site. Large pieces of dried paint and general debris were observed on the surface of the area (Figure 4). No other information is currently available. Potential contaminants could include anything used at the base, such as solvents, discarded missile fuel, petroleum hydrocarbons, acids, and metals.

1.2.4.28 Elevator Doors. During previous site visits, a tar-like sealant that may contain PCBs was observed around the launch pads and elevator doors (Figure 6). Included in this area are two 12-foot by 33-foot launch pads and the elevator doors.

1.2.4.29 Flammable Storage Block Shed. Discolored soil and stressed vegetation was observed around this shed (Figure 6). Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available.

1.2.4.30 Missile Maintenance and Assembly Area Paint Shed. This shed has been removed and may have been replaced with the Flammable Storage Block Shed. No visible stains were observed in the area, which is an estimated 10 feet by 10 feet. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available.

1.2.4.31 Missile Maintenance and Assembly Area Dry Well Drum. During previous site visits, a 55-gallon drum was observed buried in this area (Figure 6). Another 55-gallon drum was observed laying on its side near the buried drum. The unburied drum was marked "Dry cleaning solution (60-10-4F)". Vegetation was sparse in the area, which is an estimated 5 feet by 5 feet. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available. However, based on the drum labeling, potential contaminants may include chlorinated solvents.

1.2.4.32 H-52-L NIKE Base Landfill. This landfill is located 100 yards southeast of the main gate to the missile base (Figure 4). Interviews with former site personnel have indicated that everything used in base support operations was disposed of in a landfill close to the base. During previous investigations, numerous areas of discolored soil and stressed vegetation were observed on the surface of the landfill. Various debris was also observed at the surface. The estimated size of the landfill is 1.5 acres. No other information is currently available. Potential contaminants could include anything used at the base, such as solvents (both chlorinated and nonchlorinated), discarded missile fuel (which contains red fuming nitric acid, aniline, furfuryl alcohol, JP-3/JP-4, and hydrazine), petroleum hydrocarbons (fuels, waste oil, hydraulic fluid), acids, and metals.

1.3 SCOPE OF WORK

1.3.1 EM-1

Section 1.2.1 contained a description of EM-1 with estimated contaminant volumes and a description of the preferred remedial alternatives for each site. This section describes the scope of work proposed for the RD/RA activities within EM-1. The EM-1 operable unit underwent a full-scale RI/FS. Therefore, the three sites and the groundwater contamination associated with EM-1 have been characterized well enough that full development of remedial alternatives for EM-1 was possible. The preferred remedial alternatives for the Discolored Soil Site, the Ephemeral Pool, the Horn Rapids Landfill, and the contaminated groundwater associated with EM-1 are described in the ROD (EPA, 1993) and are discussed below.

The selected remedial alternative for the Discolored Soil Site involves excavation of BEHP-contaminated soils. Based on visual identification of the contaminants, the soils will be excavated, transported by a licensed hazardous waste hauler, and treated in a permitted incinerator. The resulting ash will be disposed in an off-site, RCRA-permitted landfill. The excavated area will be backfilled with imported, clean fill material following sampling to verify that remaining soil is below the remediation criterion of 71 mg/kg for BEHP.

Those soils at the Ephemeral Pool site contaminated with PCBs above 1 mg/kg will be excavated, transported by a licensed waste hauler, and disposed in a TSCA-permitted landfill facility. Prior to excavation, sampling will be performed to further delineate the limits of contamination. Following excavation, additional sampling will be conducted to verify that remaining soil is below the 1 mg/kg remediation criterion for PCBs. The excavated area will be backfilled with imported, clean fill material.

The selected remedial alternative for the Horn Rapids Landfill will involve the off-site disposal of approximately 300 cubic yards of material within the landfill which is contaminated with PCBs above a level of 5 mg/kg. The PCB-contaminated soils will be excavated, transported by a licensed waste hauler, and disposed in a TSCA-permitted landfill facility. Following sampling to verify that materials contaminated above the 5 mg/kg level for PCBs have been removed, the Landfill will be capped with two feet of clean soil to meet the requirements of 40 CFR 61.151 for capping landfills containing asbestos. A perimeter chain link fence will be erected and will be posted with warning signs to deter public access.

Since no significant gains would be made by extraction and treatment, the groundwater contamination associated with EM-1 will be allowed to attenuate naturally. Groundwater monitoring and modeling indicate that the TCE plume is expected to attenuate to levels below Maximum Contaminant Levels (MCLs) by the year 2017. Well restrictions will be enforced during this period. Additional monitoring wells will be installed along George Washington Way and regularly monitored as an early warning system. In the event that TCE concentrations exceed MCLs at the well sites, active groundwater remediation such as extraction and treatment will be evaluated.

1.3.2 EM-2, EM-3, and IU-1

Operable Units EM-2, EM-3, and IU-1 contain wastes that consist primarily of tanks used for fuel and chemical solvent storage, transformers and pads, spills, and disposal areas. These three OUs have only been investigated through the accelerated RI/FS process, therefore, the waste management sites associated with these OUs have not been fully characterized. These sites will require further characterization as the first step in the remediation process. Activities involved in this first step may include field screening tests, soil gas surveys and geophysical surveys to determine the presence of contaminants and underground piping or tanks. Trenching may also be used in conjunction with these surveys as needed. Site characterization activities will be conducted in accordance with the Field Sampling Plan which has been developed for the Hanford 1100 Area NPL.

Since OUs EM-2, EM-3, and IU-1 have not been fully characterized, specific remediation criteria for each site have not been developed. Instead, cleanup goals were recommended based on potential contaminants that may be encountered during remediation. The cleanup goals are human health risk-based values for soil contaminants developed by the U.S. Environmental Protection Agency (EPA) Region 10 and the Washington State Department of Ecology (Ecology). The cleanup goals for EM-2, EM-3, and IU-1 are summarized in Table 1 and are taken from Table 19 of the ROD. Based on results obtained during the site characterization step, remediation alternatives will be selected and contaminated soils will be remediated to below the levels identified in Table 1. In the event that substantially different types or quantities of contaminants than those expected are found during the characterization of the EM-2, EM-3, and IU-1 sites, the EPA and Ecology will consider this information and decide if a different remedial approach may be more appropriate. Such situations and/or substantial changes to the remedy may include the opportunity for additional public comment.

Table 1. Cleanup Goals for EM-2, EM-3, and IU-1 in Soils

Contaminant	Cleanup Goal (mg/kg)
Acetone	8,000
Aniline	175
Benzene	34.5
Carbon Tetrachloride	5.0
Chromium	1,600
Ethylbenzene	20
Lead	250
PAHs (carcinogenic)[a]	1.0
PCB Mixtures	1.0
Tetrachloroethylene	18[b]
Toluene	40
TPH (gasoline)	100
TPH (diesel)	200
1,1,1-Trichloroethane	20
Trichloroethylene	91[b]
Xylenes	20

PAH Polyaromatic hydrocarbon
PCB Polychlorinated biphenyl
TPH Total petroleum hydrocarbons

(a) Includes benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and ideno (1,2,3-cd)pyrene.

(b) Calculated from Equation 3 and an oral slope factor of 0.055 $(mg/kg/day)^{-1}$ for tetrachloroethylene and 0.011 $(mg/kg/day)^{-1}$ for trichloroethylene. These slope factors are taken from EPA's Environmental Criteria and Assessment Office (ECAO), as cited by EPA Region IX in *Region IX Preliminary Remediation Goals (PRGs) Third Quarter, 1993.*

Based on current understanding of the waste sites associated with EM-2, EM-3, and IU-1, a designation of the preferred alternatives to clean up the site have been presented in the ROD. Following characterization activities described above, soil and debris requiring remediation would be transported and disposed of off-site in accordance with applicable State and Federal requirements. If soil contamination is identified that has potential impact to groundwater, groundwater monitoring will be conducted to identify appropriate remedial measures.

There is some uncertainty that the alternatives selected in the ROD will be the most applicable or appropriate remediation technologies. Actual site conditions may warrant consideration of other technologies or approaches to remediation. Based on the expected contaminants, a table of alternate remedial technologies is offered in Section 5.0.

1.4 FUNCTIONS AND RESPONSIBILITIES

Several entities will be involved in the remedial design and remedial action at the Hanford 1100 Area. These entities may function in an oversight role or may actually perform work at the site. The functions and responsibilities of the parties involved with the Hanford site are described below. Figure 7 presents the lines of authority and project organization for the remedial design/remedial action at the Hanford site.

1.4.1 Department of Energy

The Department of Energy (DOE) is responsible for operation of the Hanford site. DOE has contracted with Westinghouse Hanford Corporation (WHC) for operation of the site. The DOE is responsible for coordinating the design and performance of the remedial action at Hanford and has tasked the U.S. Army Corps of Engineers (USACE), Walla Walla District (CENPW) to meet this objective. The DOE has the ultimate responsibility for ensuring that the Hanford site is satisfactorily remediated.

1.4.2 U.S. Army Corps of Engineers

The CENPW, acting as an agent for the DOE, is responsible for developing the remedial design and coordinating the remedial action at the 1100 Area within the Hanford site. CENPW will select the contractor(s) to perform the remedial activities at the Hanford 1100 Area NPL Site. CENPW has the responsibility and authority to review and comment on all documents prepared and work performed during the remedial action at the Hanford site. CENPW is responsible for ensuring that all state and federal regulations which govern these activities are complied with.

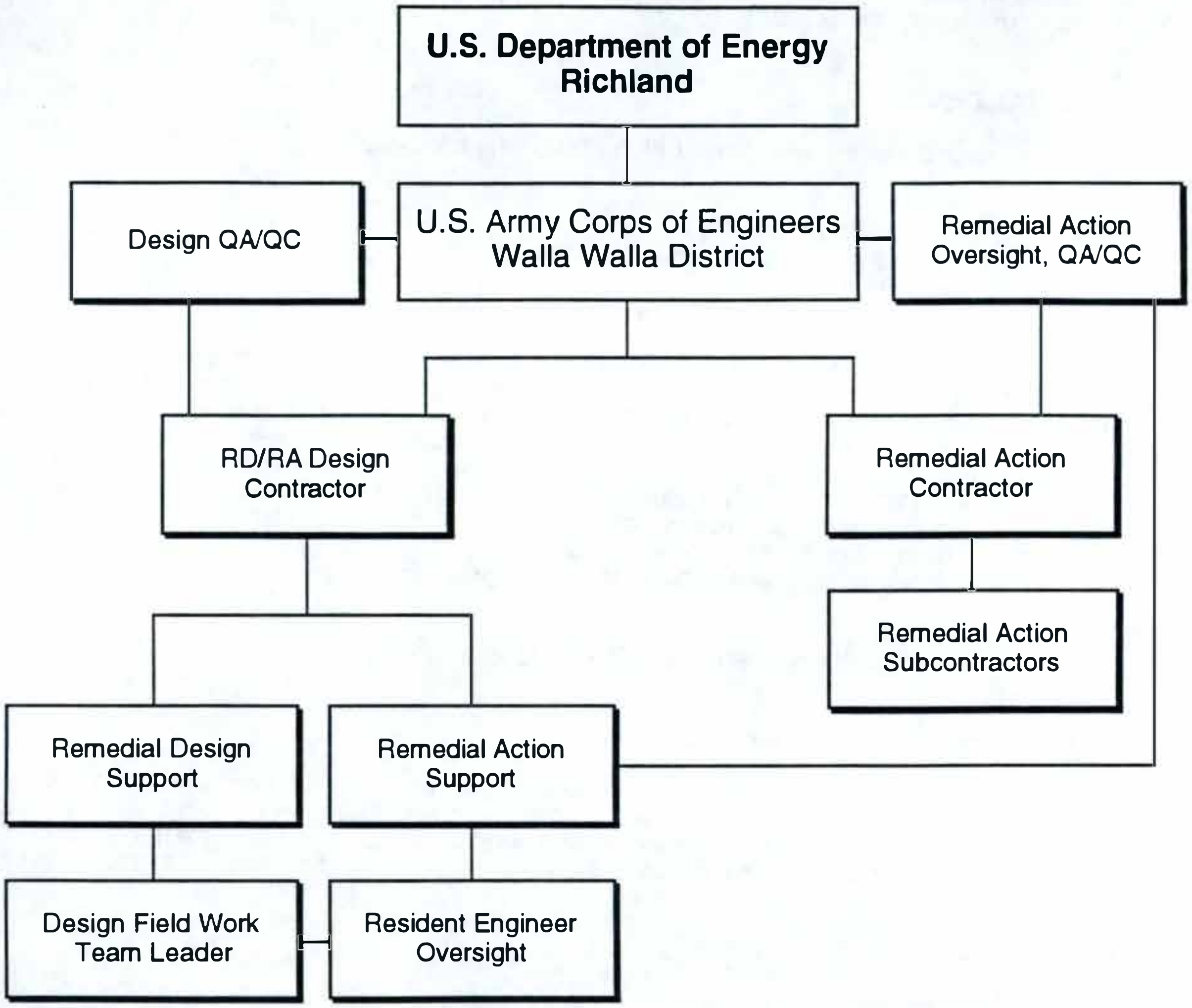
1.4.3 Remedial Design and Action Contractors

The contractor(s) selected through a competitive bidding process shall be responsible for performance of the remedial design and remedial action at the Hanford site in accordance with the requirements set forth in the documents prepared by the CENPW.

1.4.4 U.S. Environmental Protection Agency and Washington State Department of Ecology

The U.S. Environmental Protection Agency (EPA) and Washington State Department of Ecology (Ecology) are the driving forces behind the remedial actions to be performed at the Hanford site. The EPA and Ecology will provide review and approval of the remedial action at the Hanford site. EPA and Ecology will be kept apprised of site activities and the remedial action schedule. The remedial action will not be considered complete until EPA and Ecology have approved the work.

Figure 7. Remedial Design/Remedial Action Team Organization.



2.0 TASK DESCRIPTIONS

The Remedial Design/Remedial Action (RD/RA) for the 1100 Area will follow an integrated approach to both design and remediation. This will be accomplished by expediting the RD/RA process to reduce the time required to go from characterization to cleanup and by reducing the level of effort needed to go from design to start of remedial activities. This section will present and detail the tasks and subtasks within the work breakdown structure (WBS) used to complete the RD/RA. A copy of the WBS has been included in Section 4.0.

The scope of the RD/RA will include a remedial design task and a remedial action task as described in the following sections.

2.1 REMEDIAL DESIGN

The remedial design will consist of the following subtasks:

- Data Review
- Remedial Design Work Plan
- Conducting Additional Investigative Activities
- Predesign Report
- 100 percent Design Documents

The predesign report and the design documents will be divided into several packages that will be developed in parallel and bid independently during the remedial action. The design packages will be grouped to include work that is common between all the operable units, or of a distinct nature, with the exception of IU-1. There is an existing agreement in principle between the DOE, EPA and Ecology that requires having the IU-1 area take precedence during the RD/RA activities within the 1100 Area. As a result, remedial design for the IU-1 site will be abbreviated and organized as a separate package of documents and instructions from the other OUs. This will allow work to begin independently of other areas.
The designs have been subdivided into the following groups:

- 1100 IU-1 Area
- Monitoring well installation for EM-1, EM-2, and EM-3
- Soil removal actions at EM-1
- UST sites, EM-1, EM-2, and EM-3
- Landfill cap, Horn Rapids Landfill

Each design grouping given has been listed in order of importance, with the 1100 IU-1 Area being the first priority. Each group will be developed independently from the others with a goal to provide the remedial contractor with a separate package of bid documents for each group. The following sections describe the scope of work for each task and subtask outlined above.

2.1.1 Data Review

This task will be the first effort in the design process. This task will include a review of the Remedial Investigation and Feasibility Study prepared for the EM-1 Area and the Draft Limited Field Investigation/Focused Feasibility Study prepared for EM-2, EM-3, and IU-1. The purpose of this task will be to identify and implement relevant DOE Orders and USACE design criteria, including the recommended remedial alternative as presented for the EM-1 Area. Review of these reports and other data will help define the information required to complete design criteria for EM-2, EM-3, and U I-1. This activity will closely coordinate with additional field investigative work to ensure that adequate data is collected from the sites. Since the IU-1 Area requires the first priority, the data review will initially focus on collecting information on that area to prepare for any additional investigative activities.

In addition to review of the RI/FS data, the Remedial Design contractor will review any other remedial design project plans and procure maps, building plans, and any other previously generated information that can be used during design. The contractor will rely on CENPW to expedite access to and supply copies of these documents.

2.1.2 Remedial Design Plan

This task will involve preparation of a report (this document) which will detail the scope and schedule for designing the remedial alternatives selected for the 1100 Area Operable Units. The Remedial Design Plan will identify the work breakdown elements of the project and establish the level of effort for each. This document will serve as the draft Remedial Design Plan. A final document will be prepared that will incorporate the review comments from CENPW, DOE, and the regulatory agencies.

2.1.3 Additional Investigative Activities

This task was developed to allow for collection of additional information that is relevant to the design process. It has been subdivided to include the process of obtaining site permits and scheduling services through Hanford site contractors. The field activities have been further divided to identify information and samples to be collected from each of the waste management units within each operable unit. Since the IU-1 OU is to be the first priority, the field investigations relevant to this area will begin as soon as possible. This may require that field crews conduct a large number of sampling and surveying activities, including excavation of test pits and geophysical surveys. Once the field investigation activities have been completed and the data has been analyzed, a Draft Field Investigation Report will be written for the IU-1 area summarizing the information. Concurrent with, or following these activities, field investigations will be underway for the other OUs and a field investigation report summarizing all the work within the 1100 area will be prepared, including the IU-1 data. A Field Sampling Plan is being prepared concurrently with this Remedial Design Plan that will detail the sampling efforts needed at each site or waste management unit.

2.1.4 Predesign Report - 30 Percent

The Pre-Design Report will be a 30 percent design document that summarizes the information available for each of the operable units and lists the design criteria for each site. It will be divided into several sub-sections which address design of the 1100 IU-1 Area, Monitoring wells at EM-1, EM-2, and EM-3, Soil Removal Action at EM-1, EM-2, and EM-3, UST sites at EM-2 and EM-3, and the Landfill Cap at the Horn Rapids Landfill. The 1100 IU-1 Area will not proceed through the formal design report process. Remediation will be based on the Pre-Remedial Sampling Report generated at the conclusion of the field investigation. The Predesign Report will include preliminary design details for each of the sub-sections, grading plans, and a list of contemplated specifications, where appropriate. The Predesign Report will include the design calculations that reflect a 30 percent design level of completion and a project phasing schedule that establishes the time frame for beginning specific remedial actions. The Predesign Report will also present information necessary to evaluate the remedial action for compliance with ARARs, the scope of work, and good engineering practices.

More detail on each of the tasks in the Predesign Report are included in Section 4.0

2.1.5 Remedial Design Report - 100 Percent

The 100 Percent Remedial Design Report will contain the final design calculations and detailed construction drawings and specifications of a quality and completeness that will allow the remedial action contractor to begin construction. Comments from the 30 percent review will be incorporated into the 100 Percent Remedial Design Report so that it can be submitted as a final product prior to release for construction. As with the other submittals, each group will follow an independent schedule to permit concurrent work on operable units. As the designs are completed for all of the 1100 areas they will be assembled into a single report.

2.2 REMEDIAL ACTION

The Remedial Action will require project plans and documents to guide the contractor and provide standards for quality assurance and safety. In addition, there will be several logistical issues that require planning prior to start of Remedial Action. These items are listed below and summarized in the following sections.

- Preparation of Remedial Action Work Plan
- Complete NEPA Compliance Activities
- Acquiring Construction Excavation Permits
- Completing Transportation Manifests
- Providing Procurement Activities Technical Support
- Remedial Action Technical Support

2.2.1 Preparation of Remedial Action Work Plan

The Remedial Action Work Plan will address the roles and relationships of the Remedial Action Team, describe how the RA contractor will conduct the work, and outline how the contractor must comply with the regulatory guidance. The outline for this plan will be prepared concurrently with the Remedial Design Report by the remedial design contractor. The selected remediation contractor(s) will complete the document and submit it for review as part of the preliminary activities that lead to remediation. This plan will be prepared prior to start of any remedial action.

2.2.2 Complete NEPA Compliance Activities (CENPW Responsibility)

A significant lead time for completing NEPA compliance documentation must be considered. These tasks include the completion of flora and fauna surveys and cultural resource surveys. Work is already underway to complete this documentation.

2.2.3 Obtain Construction Excavation Permits (CENPW Responsibility)

This task, required under Hanford administrative practices, must be performed prior to any excavation at the site. Permits may be required for test pits and exploratory work planned during the additional field investigation work. The remedial design contractor will be responsible for compiling a list of required permits and supplying them to the CENPW. The CENPW will be responsible for securing the permits from Westinghouse Hanford Corporation (WHC) while coordinating closely with the field sampling crew. If the permits are historically long lead-time items they must be scheduled in advance to prevent delay of the data collection activities. Several other excavation permits will be required to conduct UST removals and contaminated soil cleanups. These will be necessary prior to remedial activities. The cultural resource review process must be completed before excavation permits can be granted.

2.2.4 Prepare Off-Site Transportation Manifests (Hanford Site Services)

This activity is a preparatory step to allowing excavated materials that are classified as hazardous wastes from leaving the site. Prior to shipping, each truck must have a transportation manifest completed and signed by the proper Hanford authorities. Copies of these manifests will be provided to EPA and Ecology on a weekly basis during periods when off-site shipments are occurring. This can also be a long lead-time item and has been included in the schedule to streamline the remediation process.

2.2.5 Procurement Activities Technical Support

This task will include support during the bidding/procurement phase of the project. Questions related to the plans and specifications will be addressed by the remedial design contractor prior to award of the contract.

2.2.6 Remedial Action Technical Support

This task will allow for technical and management assistance to the remedial action contractor. Since the nature of the RD/RA is to integrate the design and remedial action as much as possible. There is likely to be a significant field support effort during the Remedial Action activities. This effort may include but not be limited to the following:

- Review of remedial contractor submittals.
- Provide field verification and confirmation sampling services
- Interpret lab results and guide further remedial actions
- Generate site closure plans
- Interpret and explain plans and specifications
- Visit project site, attend meetings
- Resolve design problems associated with project changes
- Document contractor's activities and review pay requests
- Professionally certify the remedial actions were completed according to regulatorally approved plans.

Oversight of the remedial action contractors on site activities will be conducted by CENPW Construction Division and DOE/RL-ERB site engineers/inspectors.

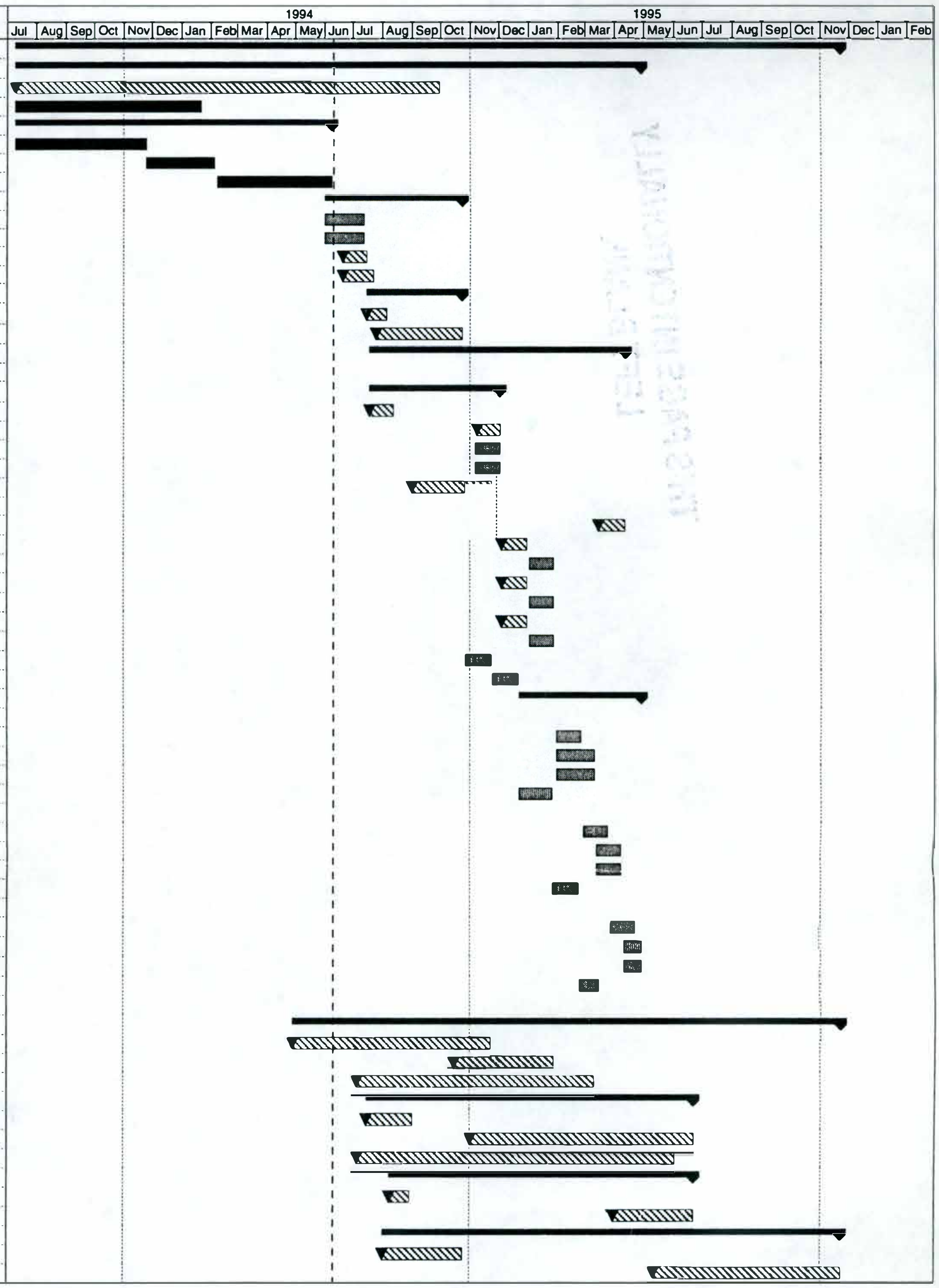
2.3 PROJECT SCHEDULE

The Remedial Design for the 1100 Area Operable Units will require an ambitious schedule to complete the design documents and award the Remedial Action contract within 15 months of signing the ROD. This is especially true for the IU-1 Area Design and Remedial Action. Subsequent to signing of the ROD in September of 1993, DOE, EPA, and Ecology have amended the Tri-Party Agreement which established a milestone for completion of remedial actions at the IU-1 of October 1994. This will require an expedited design approach, a streamlined review process and an immediate field effort to gather information. The schedule provided on the following page shows one possible scenario for conducting the remedial design and remedial action activities with a short duration schedule. The schedule is constructed using a Gantt chart that shows the duration and start/finish dates for each activity shown in the Work Breakdown Structure. Table 2 following the schedule lists the successor and predecessor activities for each of the tasks. Reports required for the Remedial Action and activities that precede actual cleanup work are shown on the schedule such that they may be completed concurrently with the design tasks.

2.4 IDENTIFICATION OF REQUIREMENTS FROM OTHER ENTITIES

This section identifies information required from other agencies and organizations in order to proceed with remedial design and remedial action activities. It is anticipated that CENPW will be the principal contact during the design and will both provide input and technical guidance as well as expedite delivery of necessary information for design purposes. DOE and its contractors will provide documents and information for various phases of the project, including technical review and guidance where necessary. A list of the requirements needed to proceed with remedial design and remedial action and the agencies responsible are shown in Table 3.

WBS	Name
1	RD/RA for the 1100 Area
1.1	Remedial Design
1.1.1	Project and Technical Management
1.1.2	Data Review
1.1.3	Remedial Design Work Plan
1.1.3.1	Draft RDWP
1.1.3.2	Review RDWP
1.1.3.3	Final RDWP
1.1.4	Conduct Additional Investigative Activities
1.1.4.1	Obtain Hanford Site Permits
1.1.4.2	Required Hanford Site Services
1.1.4.3	Conduct IU-1 Field Investigation Activities
1.1.4.4	Other Field Investigation Activities
1.1.4.5	Prepare Field Investigation Report
1.1.4.5.1	IU-1 Site
1.1.4.5.2	Other Sites
1.1.5	Prepare Predesign Report 30%
1.1.5.1	1100 IU-1 Area (No Activity)
1.1.5.2	Monitoring Wells
1.1.5.2.1	EM 1 Site
1.1.5.2.2	EM 2, EM 3 Sites
1.1.5.3	Soil Removal Actions at EM-1, EM-2, EM-3
1.1.5.4	UST Sites EM-2, EM-3
1.1.5.5	Landfill Cap HRL
1.1.5.6	Review PDR IU-1 (No Activity)
1.1.5.7	Response to Comments
1.1.5.8	Review PDR Monitoring Wells
1.1.5.9	Response to Comments
1.1.5.10	Review PDR Soil Removal Actions
1.1.5.11	Response to Comments
1.1.5.12	Review PDR UST Sites
1.1.5.13	Response to Comments
1.1.5.14	Review PDR Landfill Cap
1.1.5.15	Response to Comments
1.1.6	Remedial Design Report - 100 Percent
1.1.6.1	Prepare 100 % RDR IU-1 Area (No Activity)
1.1.6.2	Prepare 100 % RDR Monitoring Wells
1.1.6.3	Prepare 100 % RDR Soil Removal Actions
1.1.6.4	Prepare 100 % RDR UST Sites
1.1.6.5	Prepare 100 % RDR Landfill Cap
1.1.6.6	Review 100 % RDR IU-1 Area (No Activity)
1.1.6.7	Review 100 % RDR Monitoring Wells
1.1.6.8	Review 100 % RDR Soil Removal Actions
1.1.6.9	Review 100 % RDR UST Sites
1.1.6.10	Review 100 % RDR Landfill Cap
1.1.6.11	Prepare Final 100 % RDR IU-1 Area (No Activity)
1.1.6.12	Prepare Final 100 % RDR Monitoring Wells
1.1.6.13	Prepare Final 100 % RDR Soil Removal Actions
1.1.6.14	Prepare Final 100 % RDR UST Sites
1.1.6.15	Prepare Final 100 % RDR Landfill Cap
1.2	Remedial Action
1.2.1	Project and Technical Management
1.2.2	Remedial Action Work Plan Outlines
1.2.3	Complete NEPA Compliance Activities
1.2.4	Obtain Construction Excavation Permits
1.2.4.1	IU-1 Site
1.2.4.2	Other Sites
1.2.5	Prepare Offsite Transport Manifests
1.2.6	Procurement Activities Technical Support
1.2.6.1	IU-1 Site
1.2.6.2	Other Sites
1.2.7	Remedial Action Technical Support
1.2.7.1	IU-1 Site
1.2.7.2	Other Sites



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Date: 6/10/94

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Table 2.

WBS	ID	Name	Duration	Scheduled Start	Scheduled Finish	Predecessors
1	1	RD/RA for the 1100 Area	123.8w	Jul 9 '93	Nov 22 '95	
1.1	2	Remedial Design	94.2w	Jul 9 '93	Apr 28 '95	
1.1.1	3	Project and Technical Management	64w	Jul 9 '93	Sep 29 '94	
1.1.2	4	Data Review	28.2w	Jul 9 '93	Jan 21 '94	
1.1.3	5	Remedial Design Work Plan	47.8w	Jul 9 '93	Jun 8 '94	
1.1.3.1	6	Draft RDWP	19.8w	Jul 9 '93	Nov 24 '93	
1.1.3.2	7	Review RDWP	10.6w	Nov 24 '93	Feb 4 '94	6
1.1.3.3	8	Final RDWP	17.6w	Feb 7 '94	Jun 8 '94	7
1.1.4	9	Conduct Additional Investigative Activities	20.6w	Jun 1 '94	Oct 23 '94	
1.1.4.1	10	Obtain Hanford Site Permits	6w	Jun 1 '94	Jul 12 '94	
1.1.4.2	11	Required Hanford Site Services	6w	Jun 1 '94	Jul 12 '94	
1.1.4.3	12	Conduct IU-1 Field Investigation Activities	4w	Jun 20 '94	Jul 15 '94	
1.1.4.4	13	Other Field Investigation Activities	5w	Jun 20 '94	Jul 22 '94	
1.1.4.5	14	Prepare Field Investigation Report	14.2w	Jul 15 '94	Oct 23 '94	12
1.1.4.5.1	15	IU-1 Site	3.2w	Jul 15 '94	Aug 5 '94	
1.1.4.5.2	16	Other Sites	13w	Jul 25 '94	Oct 23 '94	15
1.1.5	17	Prepare Predesign Report 30%	38.4w	Jul 18 '94	Apr 11 '95	16
1.1.5.1	18	1100 IU-1 Area (No Activity)				
1.1.5.2	19	Monitoring Wells	20w	Jul 18 '94	Dec 2 '94	14
1.1.5.2.1	20	EM 1 Site	4w	Jul 18 '94	Aug 12 '94	
1.1.5.2.2	21	EM 2, EM 3 Sites	3.8w	Nov 8 '94	Dec 2 '94	
1.1.5.3	22	Soil Removal Actions at EM-1, EM-2, EM-3	4w	Nov 6 '94	Dec 2 '94	14
1.1.5.4	23	UST Sites EM-2, EM-3	4w	Nov 6 '94	Dec 2 '94	14
1.1.5.5	24	Landfill Cap HRL	8w	Sep 1 '94	Oct 26 '94	14
~~1.1.5.6~~	25	~~Review PDR IU-1~~ (No Activity)				
1.1.5.7	26	Response to Comments	4w	Mar 15 '95	Apr 11 '95	
1.1.5.8	27	Review PDR Monitoring Wells	4w	Dec 4 '94	Dec 30 '94	
1.1.5.9	28	Response to Comments	4w	Jan 2 '95	Jan 27 '95	27
1.1.5.10	29	Review PDR Soil Removal Actions	4w	Dec 4 '94	Dec 30 '94	
1.1.5.11	30	Response to Comments	4w	Jan 2 '95	Jan 27 '95	29
1.1.5.12	31	Review PDR UST Sites	4w	Dec 4 '94	Dec 30 '94	
1.1.5.13	32	Response to Comments	4w	Jan 2 '95	Jan 27 '95	31
1.1.5.14	33	Review PDR Landfill Cap	4w	Oct 27 '94	Nov 23 '94	24
1.1.5.15	34	Response to Comments	4w	Nov 24 '94	Dec 21 '94	33
1.1.6	35	Remedial Design Report - 100 Percent	18.4w	Dec 22 '94	Apr 28 '95	
1.1.6.1	36	Prepare 100 % RDR IU-1 Area (No Activity)				
1.1.6.2	37	Prepare 100 % RDR Monitoring Wells	4w	Jan 30 '95	Feb 24 '95	28
1.1.6.3	38	Prepare 100 % RDR Soil Removal Actions	6w	Jan 30 '95	Mar 10 '95	30
1.1.6.4	39	Prepare 100 % RDR UST Sites	6w	Jan 30 '95	Mar 10 '95	32
1.1.6.5	40	Prepare 100 % RDR Landfill Cap	5w	Dec 22 '94	Jan 25 '95	34
1.1.6.6	41	Review 100 % RDR IU-1 Area (No Activity)				
1.1.6.7	42	Review 100 % RDR Monitoring Wells	4w	Feb 27 '95	Mar 24 '95	37
1.1.6.8	43	Review 100 % RDR Soil Removal Actions	4w	Mar 13 '95	Apr 7 '95	38
1.1.6.9	44	Review 100 % RDR UST Sites	4w	Mar 13 '95	Apr 7 '95	39
1.1.6.10	45	Review 100 % RDR Landfill Cap	4w	Jan 26 '95	Feb 22 '95	40
1.1.6.11	46	Prepare Final 100 % RDR IU-1 Area (No Activity)				
1.1.6.12	47	Prepare Final 100 % RDR Monitoring Wells	4w	Mar 27 '95	Apr 21 '95	42
1.1.6.13	48	Prepare Final 100 % RDR Soil Removal Actions	3w	Apr 10 '95	Apr 28 '95	43
1.1.6.14	49	Prepare Final 100 % RDR UST Sites	3w	Apr 10 '95	Apr 28 '95	44
1.1.6.15	50	Prepare Final 100 % RDR Landfill Cap	3w	Feb 23 '95	Mar 15 '95	45
	51					
1.2	52	Remedial Action	82w	Apr 28 '94	Nov 22 '95	
1.2.1	53	Project and Technical Management	29.8w	Apr 28 '94	Nov 22 '94	
1.2.2	54	Remedial Action Work Plan Outlines	75d	Oct 15 '94	Jan 27 '95	
1.2.3	55	Complete NEPA Compliance Activities	179d	Jul 5 '94	Mar 10 '95	
1.2.4	56	Obtain Construction Excavation Permits	48.8w	Jul 15 '94	Jun 21 '95	
1.2.4.1	57	IU-1 Site	7w	Jul 15 '94	Sep 1 '94	
1.2.4.2	58	Other Sites	33.4w	Nov 1 '94	Jun 21 '95	57
1.2.5	59	Prepare Offsite Transport Manifests	47.6w	Jul 5 '94	Jun 1 '95	58
1.2.6	60	Procurement Activities Technical Support	45.6w	Aug 8 '94	Jun 21 '95	46
1.2.6.1	61	IU-1 Site	3.2w	Aug 8 '94	Aug 29 '94	
1.2.6.2	62	Other Sites	12w	Mar 30 '95	Jun 21 '95	
1.2.7	63	Remedial Action Technical Support	68.6w	Aug 1 '94	Nov 22 '95	
1.2.7.1	64	IU-1 Site	12.2w	Aug 1 '94	Oct 24 '94	
1.2.7.2	65	Other Sites	28w	May 11 '95	Nov 22 '95	

Table 3. List of Requirements from Other Entities.

Date Required	Activity Description	WBS Task Element	Responsible Entity
	Provide Existing Characterization Data	1.1.2	CENPW
	Assist in Obtaining Site Permits	1.1.4.1	CENPW/WHC
	Assist in Obtaining Hanford Site Services	1.1.4.2	CENPW/WHC
	Preliminary Selection of Borrow Material	1.1.5.5.5	CENPW
	NEPA Compliance	1.2.3	CENPW/WHC/PNL
	Construction Excavation Permits	1.2.4	CENPW/WHC
	Transportation Manifests	1.2.5	CENPW/WHC

3.0 REFERENCES

Hanford, 1989, *Proposed Plan for Cleanup of the 1100 Area Superfund Site at Hanford.*

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4.0 WORK BREAKDOWN STRUCTURE (WBS), DESCRIPTION OF WBS ELEMENTS

WORK BREAKDOWN STRUCTURE HANFORD 1100 AREA REMEDIAL DESIGN / REMEDIAL ACTION PLAN

1.0 REMEDIAL DESIGN AND REMEDIAL ACTION FOR THE 1100 AREA

1.1 REMEDIAL DESIGN

1.1.1 Project and Technical Management

1.1.2 Data Review

1.1.3 Remedial Design Work Plan

1.1.3.1 Prepare Draft Remedial Design Work Plan

1.1.3.2 Review Draft Remedial Design Work Plan

1.1.3.3 Prepare Final Remedial Design Work Plan

1.1.4 Conduct Additional Investigative Activities

1.1.4.1 Obtain Hanford Site Permits

1.1.4.2 Required Hanford Site Services

1.1.4.3 Conduct IU-1 Field Investigation Activities
- 1.1.4.3.1 Collect Soil Samples and Field Screening Samples
- 1.1.4.3.2 Conduct Geophysical Surveys
- 1.1.4.3.3 Conduct Soil Gas Surveys
- 1.1.4.3.4 Prepare Draft Field Investigation Report for IU-1 Area
- 1.1.4.3.5 Review Draft Field Investigation Report for IU-1 Area

1.1.4.4 Field Investigation Activities For EM-1, EM-2, EM-3
- 1.1.4.4.1 Collect Soil Samples and Field Screening Samples
- 1.1.4.4.2 Conduct Geophysical Surveys
- 1.1.4.4.3 Conduct Soil Gas Surveys

1.1.4.5 Preparation of Field Investigation Report
- 1.1.4.5.1. IU-1 Site
  - 1.1.4.5.1.1 Prepare Draft Field Investigation Report
  - 1.1.4.5.1.2 Review Draft Field Investigation Report
  - 1.1.4.5.1.3 Prepare Final Field Investigation Report
- 1.1.4.5.2. Other Sites
  - 1.1.4.5.2.1 Prepare Draft Field Investigation Report
  - 1.1.4.5.2.2 Review Draft Field Investigation Report
  - 1.1.4.5.2.3 Prepare Final Field Investigation Report

1.1.5 Predesign Report (30% Design)

1.1.5.1 1100 IU-1 Area
(This element will not be used)

1.1.5.2 Monitoring Wells
- 1.1.5.2.1 IU-1 Site
  - 1.1.5.2.1.1 Preliminary Design Criteria
  - 1.1.5.2.1.2 Preliminary Location Plan
  - 1.1.5.2.1.3 30% Drawings
- 1.1.5.2.2 EM2, EM3 Site
  - 1.1.5.2.2.1 Preliminary Design Criteria
  - 1.1.5.2.2.2 Preliminary Location Plan
  - 1.1.5.2.2.3 30% Drawings

1.1.5.3 Soil Removal Actions at EM-1, EM-2, EM-3
- 1.1.5.3.1 Preliminary Design Criteria
- 1.1.5.3.2 Site Survey, Utility Location
- 1.1.5.3.3 Permits
- 1.1.5.3.4 Preliminary Volume Estimates
- 1.1.5.3.5 30% Drawings

1.1.5.4 UST Sites EM-2, EM-3
- 1.1.5.4.1 Preliminary Site Maps
- 1.1.5.4.2 Preliminary Remediation Guidelines
- 1.1.5.4.3 Preliminary Tank Removal Procedures
- 1.1.5.4.4 30% Drawings

1.1.5.5 Landfill Cap, Horn Rapids Landfill (HRL)
- 1.1.5.5.1 Preliminary Landfill Cap Design Criteria
- 1.1.5.5.2 Preliminary Cap Design
- 1.1.5.5.3 Preliminary Volume Estimates
- 1.1.5.5.4 Preliminary Selection of Borrow Materials (CENPW)
- 1.1.5.5.5 30% Drawings

1.1.5.6 Review Pre-Design Report 1100 IU-1 Area
(This element will not be used)

1.1.5.7 Response to Comments 1100 IU-1 Area

1.1.5.8 Review Pre-Design Report (EM-1, EM-2, EM-3 Monitoring Wells)

1.1.5.9 Response to Comments (EM-1, EM-2, EM-3 Monitoring Wells)

1.1.5.10 Review Pre-Design Report (Soil Removal Actions at EM-1, EM-2, EM-3)

1.1.5.11 Response to Comments (Soil Removal Actions at EM-1, EM-2, EM-3)

1.1.5.12 Review Pre-Design Report (UST Sites, EM-2, EM-3)

1.1.5.13 Response to Comments (UST Sites, EM-2, EM-3)

1.1.5.14 Review Pre-Design Report (Landfill Cap, HRL)

1.1.5.15 Response to Comments (Landfill Cap, HRL)

1.1.6 Remedial Design Report-100 Percent

1.1.6.1 Prepare 100 Percent Remedial Design Report 1100 IU-1 Area
(This element will not be used)

1.1.6.2 Prepare 100 Percent Remedial Design Report EM-1, EM-2, EM-3 Monitoring Wells
- 1.1.6.2.1 100 % Design Documents (Plans and Specifications)
- 1.1.6.2.2 100 % Cost Estimate

1.1.6.3 Prepare 100 Percent Remedial Design Report Soil Removal Actions at EM-1
- 1.1.6.3.1 100 % Design Documents (Plans and Specifications)
- 1.1.6.3.2 100 % Cost Estimate

1.1.6.4 Prepare 100 Percent Remedial Design Report UST Sites, EM-2, EM-3
- 1.1.6.4.1 100 % Design Documents (Plans and Specifications)
- 1.1.6.4.2 100 % Cost Estimate

1.1.6.5 Prepare 100 Percent Remedial Design Report Landfill Cap, HRL
- 1.1.6.5.1 100 % Design Documents (Plans and Specifications)
- 1.1.6.5.2 100 % Cost Estimate

1.1.6.6 Review of 100% Remedial Design Report 1100 IU-1 Area (This element will not be used)

1.1.6.7 Review of 100% Remedial Design Report EM-1, EM-2, EM-3 Monitoring Wells

1.1.6.8 Review of 100% Remedial Design Report Soil Removal Actions at EM-1, EM-2, EM-3

1.1.6.9 Review of 100% Remedial Design Report UST Sites, EM-2, EM-3

1.1.6.10 Review of 100% Remedial Design Report Landfill Cap, HRL

1.1.6.11 Prepare Final 100 Percent Remedial Design Report 1100 IU-1 Area (This element will not be used)

1.1.6.12 Prepare Final 100 Percent Remedial Design Report EM-1, EM-2, EM-3 Monitoring Wells
- 1.1.6.12.1 Final 100 % Design Documents (Plans and Specifications)
- 1.1.6.12.2 Final 100 % Cost Estimate

1.1.6.13 Prepare Final 100 Percent Remedial Design Report Soil Removal Actions at EM-1, EM-2, EM-3
- 1.1.6.13.1 Final 100 % Design Documents (Plans and Specifications)
- 1.1.6.13.2 Final 100 % Cost Estimate

1.1.6.14 Prepare Final 100 Percent Remedial Design Report UST Sites, EM-2, EM-3
- 1.1.6.14.1 Final 100 % Design Documents (Plans and Specifications)
- 1.1.6.14.2 Final 100 % Cost Estimate

1.1.6.15 Prepare Final 100 Percent Remedial Design Report Landfill Cap, HRL
- 1.1.6.15.1 Final 100 % Design Documents (Plans and Specifications)
- 1.1.6.15.2 Final 100 % Cost estimate

1.2 REMEDIAL ACTION

1.2.1 Project and Technical Management

1.2.2 Prepare Remedial Action Work Plan Outline

1.2.3 Complete NEPA Permitting Requirements

1.2.4 Obtain Construction Excavation Permits
- **1.2.4.1 IU-1 Site**
- **1.2.4.2 Other Sites**

1.2.5 Prepare Off-Site Transport Manifests

1.2.6 Procurement Activities Technical Support
- **1.2.6.1 IU-1 Site**
- **1.2.6.2 Other Sites**

1.2.7 Remedial Action Technical Support
- **1.2.7.1 IU-1 Site**
- **1.2.7.2 Other Sites**

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DESCRIPTION OF WORK BREAKDOWN STRUCTURE ELEMENTS

1.0 Remedial Design and Remedial Action for the 1100 Area

The work breakdown structure (WBS) for conducting the Remedial Design/Remedial Action for the Hanford 1100 Area is discussed below. The work tasks have been grouped into two major components, Remedial Design (WBS element 1.1) and Remedial Action (WBS element 1.2).

1.1 Remedial Design

The components of the Remedial Design for the Hanford 1100 Area are discussed below.

1.1.1 Project and Technical Management

Project management tasks by the U.S. Army Corps of Engineers (USACE) Walla Walla District (CENPW) and its remedial design contractor will be conducted under this task. CENPW will prepare status reports, attend meetings, track budgets, and oversee the Architect-Engineer (A-E). The A-E will conduct general management activities (i.e., monthly reports, meetings, coordination resource allocation, scheduling, etc.) required for the successful execution of the project. All quality assurance (QA) activities will be performed under this element, including internal audits, surveillances, participation in and external audits of the A-E, planning/procedures updates, document distribution, preparation of records turnover packages, and any other QA requirements.

1.1.2 Data Review

This task will include a review of the Remedial Investigation and Feasibility Study prepared for the EM-1 Area, and the Draft Limited Field Investigation/Focused Feasibility Study prepared for EM-2, EM-3, and IU-1. Relevant design criteria and any supplementary data needs will be identified for each site.

1.1.3 Remedial Design Work Plan

This task includes the preparation of the work plan describing the scope and schedule for designing the remedial alternatives selected for the 1100 Area Operable Units. The Remedial Design Work Plan will identify the work breakdown elements of the project and establish the level of effort for each.

1.1.3.1 Prepare Draft Remedial Design Work Plan. This task includes the preparation of the Draft Remedial Design Work Plan. Internal report review and other QA activities will be included.

1.1.3.2 Review Draft Remedial Design Work Plan. This task includes review of the Draft Remedial Design Work Plan by the DOE, Ecology, and CENPW.

1.1.3.3 Prepare Final Remedial Design Work Plan. This task involves the preparation of the Final Remedial Design Work Plan responding to and incorporating DOE, Ecology, and the CENPW comments.

1.1.4 Conduct Additional Investigative Activities

Additional information that is relevant to the design process will be collected. The process of obtaining site permits, scheduling services through Hanford site contractors, and additional field activities are included as sub-elements for this task.

1.1.4.1 Obtain Hanford Site Permits. This task involves obtaining permits to access restricted areas within the Hanford site. This will be a cooperative effort between the remedial design contractor and the USACE.

1.1.4.2 Required Hanford Site Services. This task involves making arrangements for Hanford Site Services, such as the location of utility lines, provision of maps and as-builts of areas of interest for the remedial design. This will also be a cooperative effort involving CENPW with input from the remedial design contractor.

1.1.4.3 Conduct IU-1 Field Investigation Activities. Field investigations relevant to the IU-1 Operable Unit will begin as soon as possible. Field crews will conduct a large number of sampling and surveying activities, including excavation of test pits and geophysical surveys.

1.1.4.3.1 Collect Soil Samples and Field Screening Samples. Soil samples will be collected from both soil borings and test pits. A subcontractor will be obtained as required for these activities and each activity will require field oversight. Field screening techniques will include the use of immunoassay tests and gas chromatography, and will require a mobile laboratory. Further details concerning sampling procedures are outlined in the Field Sampling Plan.

1.1.4.3.2 Conduct Geophysical Surveys. A subcontractor will be obtained to conduct geophysical surveys in areas where metallic wastes (i.e., drums or storage tanks) are suspected to be buried. Oversight of geophysical surveying activities will be required.

1.1.4.3.3 Conduct Soil Gas Surveys. Soil gas surveys will be conducted by a subcontractor. Oversight of the soil gas surveys will be required.

1.1.4.3.4 Prepare Draft Field Investigation Report for IU-1 Area. A draft report will be prepared describing the field activities and presenting data obtained from field sampling. This task also includes the necessary task-specific QA activities, such as internal report review.

1.1.4.3.5 Review Draft Field Investigation Report for IU-1 Area. The Draft Field Investigation Report for IU-1 Area will be reviewed by DOE, Ecology, EPA, and CENPW.

1.1.4.4 Other Field Investigation Activities. Field work will also be conducted at operable units 1100-EM-1, 1100-EM-2, and 1100-EM-3. Task descriptions are identical to those discussed above for the 1100-IU-1 operable unit.

1.1.4.4.1 Collect Soil Samples and Field Screening Samples. See discussion under WBS 1.1.4.3.1.

1.1.4.4.2 Conduct Geophysical Surveys. See discussion under WBS 1.1.4.3.2.

1.1.4.4.3 Conduct Soil Gas Surveys. See discussion under WBS 1.1.4.3.3.

1.1.4.5 Preparation of Field Investigation Report. This task includes the preparation of the report summarizing the results of all field activities at the 1100 Area operable units. This task also includes the necessary task-specific QA/QC activities, such as internal report review and documentation.

1.1.4.5.1 IU-1 Site

1.1.4.5.1.1 Prepare Draft Field Investigation Report. This task includes the preparation of the Draft Field Investigation Report. Internal report review and associated QA activities will also be included.

1.1.4.5.1.2 Review Draft Field Investigation Report. This task is for review of the Draft Field Investigation Report by the EPA, DOE, Ecology, and the CENPW. It includes a review conference for discussing CENPW comments, attended by two to three professionals representing the remedial design contractor.

1.1.4.5.1.3 Prepare Final Field Investigation Report. This task involves the preparation of the Draft Field Investigation Report incorporating the DOE, EPA, Ecology, and the CENPW comments.

1.1.4.5.2 Other Sites

1.1.4.5.2.1 Prepare Draft Field Investigation Report. This task includes the preparation of the Draft Field Investigation Report. Internal report review and associated QA activities will also be included.

1.1.4.5.2.2 Review Draft Field Investigation Report. This task is for review of the Draft Field Investigation Report by the EPA, DOE, Ecology, and the CENPW. It includes a review conference for discussing CENPW comments, attended by two to three professionals representing the remedial design contractor.

1.1.4.5.2.3 Prepare Final Field Investigation Report. This task involves the preparation of the Draft Field Investigation Report incorporating the DOE, EPA, Ecology, and the CENPW comments.

1.1.5 Predesign Report (30% Design)

The Pre-Design Report will be a 30% design document that summarizes the information available at each of the operable units and lists the design criteria for each site. Preliminary design details with preliminary calculations and topographical maps will be included.

1.1.5.1 1100 IU-1 Area. (This element will not be used. Remediation for the 1100 IU-1 Area will be based on the Pre-Remedial Summary Report.)

1.1.5.2 EM-1, EM-2, EM-3 Monitoring Wells. Proposed design criteria and locations of additional monitoring wells at EM-1, EM-2, and EM-3 will be included in this portion of the Pre-Design Report. This information will come from existing USACE guide specifications and available site maps.

1.1.5.2.1 IU-1 Site

1.1.5.2.1.1 Preliminary Design Criteria. Preliminary well construction design criteria will be presented in the Pre-Design Report.

1.1.5.2.1.2 Preliminary Location Plan. A map of proposed monitoring well locations for EM-1, EM-2, and EM-3 will be included.

1.1.5.2.1.3 30% Drawings. This will include removal details, site sketches and show preliminary location data.

1.1.5.2.2 Other Sites

1.1.5.2.2.1 Preliminary Design Criteria. Preliminary well construction design criteria will be presented in the Pre-Design Report.

1.1.5.2.2.2 Preliminary Location Plan. A map of proposed monitoring well locations for EM-1, EM-2, and EM-3 will be included.

1.1.5.2.2.3 30% Drawings. This will include removal details, site sketches and show preliminary location data.

1.1.5.3 Soil Removal Actions at EM-1, EM-2, and EM-3. Preliminary design details and criteria for soil removal will be included in the Pre-Design Report.

1.1.5.3.1 Preliminary Design Criteria. Design criteria for removal of soils will be presented and will include data gathered previously and more recently during the field investigation.

1.1.5.3.2 Site Survey, Utility Location. A review of available topographic site survey data will be conducted for EM-1, EM-2, and EM-3 to summarize whatever site information is presently available and will be presented in draft form in the Pre-Design Report. This information will be required to estimate soil volumes for remedial activities.

1.1.5.3.3 Permits. Prior to excavation of soils at each site, a permit must be secured from Hanford. This will be the draft submittal task for such permits.

1.1.5.3.4 Preliminary volume estimates. Soil volume estimates for excavation, removal, transport, incineration and backfill will be calculated and presented in the Pre-Design Report.

1.1.5.3.5 30% Drawings. This drawing set will include preliminary topographic maps, sketches, and site plans necessary to illustrate excavation areas and grading of sites.

1.1.5.4 UST Sites EM-2, EM-3. Remedial Design criteria and general information for USTs found during the additional investigative activities will be included. This will consist of maps and sketches with available UST guidance information applicable to the areas involved.

1.1.5.4.1 Preliminary Site Maps. Site maps indicating locations of documented existing USTs at sites EM-2 and EM-3 will be created and included in the Pre-Design Report.

1.1.5.4.2 Preliminary Remediation Guidelines. Plans for remediation of USTs at EM-2 and EM-3 will be presented in the Pre-Design Report. Actions proposed for soil and/or groundwater cleanup will be included.

1.1.5.4.3 Preliminary Tank Removal Procedures. Plans for tank removal will be outlined in the Pre-Design Report and will follow applicable UST closure regulations.

1.1.5.4.4 30% Drawings. Preliminary (30%) drawings and sketches will be generated to show tank locations, removal details, and other civil features.

1.1.5.5 Landfill Cap, Horn Rapids Landfill (HRL). The asbestos-contaminated sections of the Horn Rapids Landfill will be contained in place and capped. The PCB-contaminated area within the HRL will be excavated and removed with the work described in section 1.1.5.3.

1.1.5.5.1 Preliminary Landfill Cap Design Criteria. Landfill cap design criteria for the HRL will be presented in the Pre-Design Report. The design criteria will provide the project team with a summary description of the design requirements for capping the asbestos-containing sections of the landfill.

1.1.5.5.2 Preliminary Cap Design. A 30% landfill cap design (including materials to be used, dimensions of the cap etc.) will be presented in the Pre-Design Report.

1.1.5.5.3 Preliminary Volume Estimates. Volume estimates of capping material will be estimated and included in the Pre-Design Report.

1.1.5.5.4 Preliminary Selection of Borrow Materials. The location and characterization of borrow materials to be used for the HRL capping will be presented in the Pre-Design Report.

1.1.5.5.5 30% Drawings. Preliminary drawings for the HRL will be full-sized CAD-style drawings depicting the existing topographic features of the site, grading plans and capping details. An environmental protection plan showing stormwater control and drainage will be necessary as part of the construction process.

1.1.5.6 Review Pre-Design Report 1100 IU-1 Area. (This element will not be used.) The Pre-Remedial Summary Report will be reviewed by the DOE, EPA, Ecology, and the CENPW. The review will include a one-day meeting to discuss comments attended by two to three professionals representing the remedial design contractor.

1.1.5.7 Response to Comments 1100 IU-1 Area. Comments to the IU-1 Pre-Remedial Summary Report will be addressed in writing and returned to the reviewers.

1.1.5.8. Review Pre-Design Report (EM-1, EM-2, EM-3 Monitoring Wells). The Pre-Design Report will be reviewed by the DOE, EPA, Ecology, and the CENPW. This review will include a telephone conference with the review parties to discuss comments.

1.1.5.9 Response to Comments (EM-1, EM-2, EM-3 Monitoring Wells). Comments to the IU-1 Pre-Design Report will be addressed in writing and returned to the reviewers.

1.1.5.10 Review Pre-Design Report (Soil Removal Actions at EM-1, EM-2, and EM-3). The Pre-Design Report will be reviewed by the DOE, EPA, Ecology, and the CENPW. The review will include a one-day meeting to discuss comments attended by two to three professionals representing the remedial design contractor.

1.1.5.11. Response to Comments (Soil Removal Actions at EM-1, EM-2, and EM-3). Comments to the IU-1 Pre-Design Reoort will be addressed in writing and returned to the reviewers.

1.1.5.12 Review Pre-Design Report (UST Sites, EM-2, EM-3). The Pre-Design Report will be reviewed by the DOE, EPA, Ecology, and the CENPW. This review will include a teleconference to discuss comments.

1.1.5.13. Response to Comments (UST Sites, EM-2, EM-3). The Pre-Design Report will be reviewed by the DOE, Ecology, and the USACE. This review will include a teleconference to discuss comments.

1.1.5.14 Review Pre-Design Report (Landfill Cap, HRL). The Pre-Design Report will be reviewed by the DOE, EPA, Ecology, and the CENPW. The review will include a one-day meeting to discuss comments attended by two to three professionals representing the remedial design contractor.

1.1.5.15. Response to Comments (Landfill Cap, HRL). The Pre-Design Report will be reviewed by the DOE, Ecology, and the USACE. The review will include a one-day meeting to discuss comments attended by two to three Montgomery professionals.

1.1.6 Remedial Design Report-100 Percent

This task involves incorporation of comments on the 30% Design Report received from DOE, EPA, Ecology, and the CENPW. Final, constructable, design calculations and detailed construction drawings and specifications will be included.

1.1.6.1 Prepare 100% Remedial Design Report 1100 IU-1 Area. (This element will not be used.)

1.1.6.2 Prepare 100% Remedial Design Report EM-1, EM-2, EM-3 Monitoring Wells. The 100% effort will include plans and specifications and a cost estimate for the remedial action at the EM-1, EM-2, and EM-3 areas.

1.1.6.2.1 100% Design Documents (Plans and Specifications). The 100% design documents will be prepared for bidding. This will include drawings where appropriate, and written specifications as needed for remedial action.

1.1.6.2.2 100% Cost estimate. The 100% complete cost estimate will be the engineer's estimate for the individual bid packages that are competitively bid.

1.1.6.3 Prepare 100% Remedial Design Report Soil Removal Actions at EM-1, EM-2, And EM-3. The 100% effort will include plans and specifications and a cost estimate for the remedial action at the soil removal areas.

1.1.6.3.1 100% Design Documents (Plans and Specifications). The 100% design documents will be prepared for bidding. This will include drawings where appropriate, and written specifications as needed for remedial action.

1.1.6.3.2 100% Cost estimate. The 100% complete cost estimate will be the engineer's estimate for the individual bid packages that are competitively bid.

1.1.6.4 Prepare 100% Remedial Design Report UST Sites, EM-1, EM-2, EM-3. The 100% effort will include plans and specifications and a cost estimate for the remedial action at the UST sites.

1.1.6.4.1 100% Design Documents (Plans and Specifications). The 100% design documents will be prepared for bidding. This will include drawings where appropriate, and written specifications as needed for remedial action.

1.1.6.4.2 100% Cost estimate. The 100% complete cost estimate will be the engineer's estimate for the individual bid packages that are competitively bid.

1.1.6.5 Prepare 100 Percent Remedial Design Report Landfill Cap, HRL. The 100% effort will include plans and specifications and a cost estimate for the remedial action at the HRL.

1.1.6.5.1 100 % Design Documents (Plans and Specifications). The 100 % design documents will be prepared for bidding. This will include drawings where appropriate, and written specifications as needed for remedial action.

1.1.6.5.2 100 % Cost Estimate. The 100 % complete cost estimate will be the engineers estimate for the individual bid packages that are competitively bid.

1.1.6.6 Review of 100 Percent Remedial Design Report 1100 IU-1 Area. (This element will not be used.)

1.1.6.7 Review of 100 Percent Remedial Design Report EM-1, EM-2, EM-3 Monitoring Wells. The 100% Design Report for the EM-1, EM-2, and EM-3 monitoring wells will be reviewed by the DOE, EPA, Ecology, and the CENPW. Review will include a conference call to review changes prior to final production.

1.1.6.8 Review of 100 Percent Remedial Design Report Soil Removal Actions at EM-1. The 100% Design Report for the Soil Removal Actions at EM-1 will be reviewed by the DOE, EPA, Ecology, and the CENPW. Review will include a conference call to review changes prior to final production.

1.1.6.9 Review of 100 Percent Remedial Design Report UST Sites, EM-1, EM-2, EM-3. The 100% Design Report for the UST Sites at EM-1, EM-2, and EM-3 will be reviewed by the DOE, EPA, Ecology, and the CENPW. Review will include a conference call to review changes prior to final production.

1.1.6.10 Review of 100 Percent Remedial Design Report Landfill Cap, HRL. The 100% Design Report for the HRL Landfill Cap will be reviewed by the DOE, EPA, Ecology, and the CENPW. Review will include a conference call to review changes prior to final production.

1.1.6.11 Prepare Final 100 Percent Remedial Design Report 1100 IU-1 Area. (This element will not be used.)

1.1.6.12 Prepare Final 100 Percent Remedial Design Report EM-1, EM-2, EM-3 Monitoring Wells. Comments from the 100 percent review will be incorporated into the final report and written responses to review comments will be prepared for the design documents and the cost estimate.

1.1.6.13 Prepare Final 100 Percent Remedial Design Report Soil Removal Actions at EM-1, EM-2, EM-3. Comments from the 100 percent review will be incorporated into the final report and written responses to review comments will be prepared for the design documents and the cost estimate.

1.1.6.14 Prepare Final 100 Percent Remedial Design Report UST Sites, EM-2, EM-3. Comments from the 100 percent review will be incorporated into the final report and written responses to review comments will be prepared for the design documents and the cost estimate.

1.1.6.15 Prepare Final 100 Percent Remedial Design Report Landfill Cap, HRL. Comments from the 100 percent review will be incorporated into the final report and written responses to review comments will be prepared for the design documents and the cost estimate.

1.2 REMEDIAL ACTION

The Remedial Action will require project plans and documents to guide the contractor and provide standards for quality assurance and safety. Additional scheduling tasks will also be required prior to the commencement of the Remedial Action.

1.2.1 Project and Technical Management

Project management tasks by CENPW and the remedial action contractor will be conducted under this task. CENPW will prepare status reports, attend meetings, track budgets, and oversee the remedial action contractor. The remedial action contractor will conduct general management activities (i.e., monthly reports, meetings, coordination resource allocation, scheduling, etc.) required for the successful execution of the project. All quality assurance (QA) activities will be performed under this element, including internal audits, surveillances, participation in and external audits of the remedial action contractor, planning/procedures updates, document distribution, preparation of information/records packages, and other QA activities.

1.2.2 Remedial Action Work Plan Outline

The Remedial Action Work Plan outline will include a Scope of Work and conceptual schedule for implementation of all remedial action tasks at each operable unit. The Contractor will be required to complete each work plan prior to commencement of remedial action alternatives. A description of the Remedial Action Team, how the RA contractor will conduct the work, and an outline of how the contractor must comply with regulatory guidance will be included in each document.

1.2.2.1 Prepare Draft Remedial Action Work Plan. This task includes the preparation of the Draft Remedial Action Work Plan. Internal report review and documentation will also be included as QA/QC activities.

1.2.3 Complete NEPA Compliance Activities

This task includes the completion of the flora and fauna surveys and cultural resource surveys.

1.2.4 Obtain Construction Excavation Permits

1.2.4.1 IU-1 Site. This task must be performed prior to any excavation or UST removal at the IU-1 site. Permits may be required for test pits and exploratory work done during the additional field investigation work. The USACE will be responsible for securing the permits. The obtaining of permits must be scheduled such that data collection activities are not delayed.

1.2.4.2 Other Sites. This task must be performed prior to any excavation or UST removal at all remaining sites. Permits may be required for test pits and exploratory work done during the additional field investigation work. The USACE will be responsible for securing the permits. The obtaining of permits must be scheduled such that data collection activities are not delayed. This activity will take place independently and at a later time than the IU-1 site.

1.2.5 Prepare Off-Site Transport Manifests

This task involves the preparation of transportation manifests so that excavated material classified as a hazardous or dangerous waste or as a PCB waste can be treated off site. Each truck must have a transportation manifest completed and signed. The preparation of manifests must be scheduled such that remediation activities are not delayed.

1.2.6 Procurement Activities Technical Support

1.2.6.1 IU-1 Site. This task will include support from the A-E during the bidding/procurement phase of the project for the IU-1 site. The A-E will respond to questions and issues from potential contractors prior to award of the contract. The A-E will also review and compare the received bids for compliance with the contract requirements and make a recommendation for selection.

1.2.6.2 Other Sites. This task will include support from the A-E during the bidding/procurement phase of the project for the remaining sites. The A-E will respond to questions and issues from potential contractors prior to award of the contract. The A-E will also review and compare the received bids for compliance with the contract requirements and make a recommendation for selection.

1.2.7 Remedial Action Technical Support

1.2.7.1 IU-1 Site. The A-E will support the remedial action with technical or management assistance daily during remediation of IU-1 sites. This will include field support to guide the contractor during excavation, characterization and cleanup, and activity tracking; plus office support to evaluate contractor submittals, generate site closure plans, solve design problems associated with changes, and review contractor pay requests.

1.2.7.2 Other Sites. The A-E will support the remedial action with technical or management assistance daily during remediation ativities at all other sites. This will include field support to guide the contractor during excavation, characterization and cleanup, and activity tracking; plus office support to evaluate contractor submittals, generate site closure plans, solve design problems associated with changes, and review contractor pay requests.

5.0 ALTERNATIVE REMEDIAL TECHNOLOGIES

1.0 OFF-SITE LANDFILLING

Landfilling of materials is the currently suggested remedial alternative for most of the 1100 Area sites. If this remedial option is exercised, the contaminated materials will be characterized, excavated, containerized, and transported to the receiving landfill facility. Most, if not all, of the contaminated materials will require landfilling in a RCRA-permitted Subtitle C hazardous waste landfill. The identified potential landfill is in Oregon.

Costs involved with landfilling include excavation of the material, transportation to the landfill in Oregon, plus the cost for disposal. In addition, clean fill material must be obtained, transported, and placed. If the materials removed for remediation require pretreatment to meet land disposal restrictions, cost per ton will be significantly higher.

Advantages of landfilling include fast clean up of the site. Cleanup times are limited by the time required to characterize the site and perform the excavation. Disadvantages of landfilling include the costs required. Compared to other alternatives that will be described, landfilling may prove to be the most costly alternative depending on site conditions. With landfilling, the generator of the waste retains permanent liability for disposed materials. Transportation costs can be substantial and clean backfill material must be obtained and transported to site to replace the landfilled material.

1.1 THERMAL DESORPTION

Thermal desorption is an on-site process to thermally treat petroleum and solvent contaminated soils. Soils are excavated and placed directly into the on site thermal desorption unit. During the process, soils are heated and agitated in a rotary kiln to cause volatilization and desorption of contaminants from the soil. The off gases are treated with a bag filter and catalytic oxidation to destroy contaminants. The treated soils are reused to backfill the original excavation.

Costs associated with thermal desorption include excavation of soils, on-site treatment of the material, off-gas treatment, and mobilization/demobilization of the treatment unit. There are no costs associated with transportation of soils or purchase of backfill material since treatment is performed on-site and treated soils are reused as backfill.

Advantages associated with thermal desorption include the fact that it may be significantly less expensive than landfilling. After site closure, no liability is retained by site owner. Site clean up times are about the same as for landfilling. The primary disadvantage of thermal desorption is that, like landfilling, excavation and backfilling are still required.

1.2 SOIL VAPOR EXTRACTION

Soil vapor extraction (SVE) utilizes injection of air and/or extraction of air from soil to cause volatilization of contaminants. Off gases are collected by a vacuum extraction system and treated to destroy contaminants. SVE is an in-situ process that does not require any excavation beyond installation of the system. SVE can be used to treat VOC contaminated soils.

Advantages of SVE include the fact that it is an in-situ process that requires no excavation. Systems are typically easy to design and install. SVE is significantly less expensive than landfilling and is also less expensive than thermal desorption due to lack of excavation costs. After site closure, no liability is retained by site owner. A primary disadvantage of SVE is that cleanup times are significantly longer (potentially years). Off gas treatment adds to cost of this technology. SVE is readily applicable only to sites contaminated with highly volatile, high vapor pressure compounds (i.e., certain types of solvents and light hydrocarbons such as gasoline).

1.3 BIOVENTING

Bioventing is an in-situ process that utilizes injection of air and/or extraction of air from soil to enhance biodegradation of non-chlorinated hydrocarbons. Since hydrocarbons are mineralized by the process, off-gases typically do not require treatment. Bioventing requires much lower air flow rates than SVE. Bioventing is most readily applied to sites contaminated with non-chlorinated, medium to heavy hydrocarbons.

Advantages of bioventing include that it is an in-situ process that requires no excavation. Systems are typically easy to design and install. Bioventing is potentially the least expensive of the remedial methods discussed. Off-gases require no treatment and after site closure, no liability is retained by site owner. The primary disadvantage of bioventing is that of all the remediation alternatives discussed, cleanup times are longest (several years).

Appendix A

DOE/RL-94-08 Rev. 0

REMEDIAL DESIGN FIELD SAMPLING PLAN FOR THE 1100 AREA HANFORD SITE

June 9, 1994

Work Performed Under Master Interagency Agreement
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Prepared for
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CONTENTS

FIGURES:

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2.0 SAMPLING PROGRAM OBJECTIVES

This section discusses the objectives of the field sampling program. This section is broken down into EM-1 soil, EM-1 groundwater, and OUs EM-2, EM-3, and IU-1.

2.1 EM-1 SOIL

The contaminants and concentrations at most of the subsites within EM-1 are already known. In addition, the extent of contamination has been partially defined. The only additional information that is required for proper remediation is the limits of the areas contaminated above cleanup goals. Thus, at the Discolored Soil Site, the sampling objective is to determine the limits of soil contaminated with bis(2-ethylhexyl)phthalate (BEHP) above 71 mg/kg; at the Ephemeral Pool Site, the sampling objective is to determine the limits of soil contaminated with polychlorinated biphenyls (PCBs) above 1 mg/kg; and at the Horn Rapids Landfill, the sampling objective is to determine the limits of soil contaminated with PCBs above 5 mg/kg. These limits should be defined cost effectively; i.e., the optimum situation would be where the amount of money saved by avoiding overexcavation would be balanced by the cost of additional characterization. Sample analyses (including field screening methods) used during the remediation will approximate the excavation limits, and confirmational samples analyzed by an off-site laboratory will verify that all soil contaminated above the cleanup goals has been excavated.

The receiving facility (i.e., landfill or incinerator) requires a representative 1-quart sample of soil from each subsite to evaluate the wastestream. Because these samples are required in advance of transporting the soil to the receiving facility, they will be collected at least three weeks prior to the start of remediation.

An exception is Site 600-2, which is an area which may have been used for disposal of military debris. The objectives of the field sampling program are to positively determine the location and areal extent of this site in order to develop an appropriate investigation scheme.

2.2 EM-1 GROUNDWATER

Six groundwater wells will be installed downgradient of the known extent of trichloroethene (TCE) contamination to verify modeled predictions of TCE attenuation. The objectives of the sampling program are:

- Verify that the groundwater near the George Washington Way Diagonal is currently free of TCE contamination above 5 µg/L
- Assuming that expectations are met concerning the first objective, sample frequently enough so that a timely evaluation of the need for active remedial measures can be made if TCE is attenuated to a lesser extent than predicted.

2.3 EM-2, EM-3, AND IU-1

EM-2, EM-3, and IU-1 consist of a large number of uncharacterized Waste Management Units (WMUs). The types and locations of contaminants can be speculated upon at some WMUs; in other cases, there is no information regarding potential contamination whatsoever. The objectives for sampling the WMUs in advance of remediation are as follows:

- Determine the types of contaminants present at each WMU
- Determine which sites require no remediation
- For sites that require remediation, identify which contaminants are present at concentrations that require remediation
- Where relatively little additional effort is necessary, determine the approximate extent of remediation that will be required.

1.0 PROJECT BACKGROUND

As an appendix to the *Remediation Design and Remedial Action Plan for the 1100 Area*, this Field Sampling Plan (FSP) has been written to describe the sampling necessary to carry out the remediation of the 1100 Area. There will be three different phases of sampling:

- Investigatory sampling to determine whether remediation is necessary at a site. This will be carried out only within Operable Units EM-2, EM-3, and IU-1. This sampling will identify the contaminants present, their concentrations, and to a limited degree, the area of contamination.
- Sampling during remediation to determine the necessary extent of an excavation.
- Sampling after the completion of an excavation to confirm that the excavation removed all soil containing contaminants above action levels.

Site descriptions are provided in Section 1.0 of the Remediation Design and Remedial Action Plan. Section 2.0 of this FSP describes the sampling program objectives. Section 3.0 describes the overall sampling program and indicates the sampling methods that will be used, the number of samples that will be collected, their locations, and the analytes. Section 4.0 describes how samples will be designated. Section 5.0 describes how samples will be collected. Section 6.0 describes sample handling and analytical procedures and reporting requirements.

2.3.1 Types of Contaminants Present

The types of contaminants present at each WMU will be determined through the use of geophysical surveys and/or soil gas sampling and/or soil sampling. Geophysical surveys do not determine the types of contaminants present, but identify the locations of possible releases so that follow-up soil sampling can be performed to identify the contaminants. Geophysical surveys will be used to demarcate the extent of landfills, to determine whether leachate is leaking from the bottom of landfills, and to locate large buried metal objects. The objectives of the geophysical surveys are to 1) be sensitive enough to identify anomalies including drums and USTs (i.e., avoid false negatives); 2) within the constraints of the first objective, minimize the number of anomalies identified that do not correspond to probable sources of contamination (i.e., false positives); 3) perform measurements with a close enough spacing so that likely sources of contamination will not be missed; and 4) identify the location of each anomaly to within a 10-foot radius so that follow-up sampling will collect either potentially contaminated soil or be close enough to the release so that a negative result will be adequate to indicate that any release is too small to warrant remediation.

For soil gas surveys, the objectives are to identify the principal volatile organic compounds (VOCs) present within a WMU, the location of the highest concentrations of VOCs, and if applicable, the location of the highest concentration of benzene.

Soil sampling addresses whether a WMU requires remediation, determines which contaminants require remediation, and determines the approximate extent of remediation. Soil sample analyses will generally require methods that provide positive identification of contaminants. If the nature of potential contaminants is known prior to sampling (i.e., when investigating the soil around a JP-4 tank), then this objective does not apply. Analytical methods that only rule out the presence of contamination can be used if methods that positively identify the contaminants are used as a follow-up measure.

2.3.2 Cleanup Levels

The detection limits of the analyses must be below cleanup levels as specified in the Record of Decision (ROD), which are repeated here in Table 2-1. For contaminants not listed in the ROD, the cleanup levels can either be looked up under the Washington Department of Ecology Model Toxics Control Act (MTCA) Method A (Table 2 in MTCA), or can be calculated. The cleanup level should also be calculated if the concentration listed by MTCA Method A is based on protection of groundwater. Calculated cleanup levels are those that are estimated to result in no acute or chronic toxic effects to human health via direct ingestion of contaminated soil. They are calculated assuming that a 16-kg child ingests 200 milligrams of soil per day, every day (Washington Administrative Code (WAC) 173-340-740(3)(iii)):

$$\text{Soil Cleanup Level (mg/kg)} = \frac{\text{RFD} \times \text{ABW} \times 10^6 \text{ mg/kg}}{\text{SIR}} \qquad \text{Equation 1}$$

where:
RFD = Oral Reference Dose (mg/kg-day)
ABW = Average Body Weight (kg)
SIR = Soil Ingestion Rate (mg/day)

The reference dose will be obtained from the Integrated Risk Information System (IRIS) database when available. When a reference dose is not available on IRIS, it will be obtained from the 1993 *Health Effects Assessment Summary Tables* or the most recent version.

Table 2-1. Soil Cleanup Goals from Record of Decision for EM-1, EM-2, and IU-1 OUs.

Hazardous Substance	Cleanup Goal (mg/kg)
Acetone	8,000
Aniline	175
Benzene	34.5
Carbon Tetrachloride	5.0
Chromium	1,600
Ethylbenzene	20
Lead	250
PAHs (carcinogenic)[(a)]	1.0
PCB Mixtures	1.0
Tetrachloroethylene	18[(b)]
Toluene	40
TPH (gasoline)	100
TPH (diesel)	200
1,1,1-Trichloroethane	20
Trichloroethylene	91[(b)]
Xylenes	20

(a) Includes benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and ideno (1,2,3-cd)pyrene.

(b) Calculated from Equation 3 and an oral slope factor of 0.055 $(mg/kg/day)^{-1}$ for tetrachloroethylene and 0.011 $(mg/kg/day)^{-1}$ for trichloroethylene. These slope factors are taken from EPA's Environmental Criteria and Assessment Office (ECAO), as cited by EPA Region IX in *Region IX Preliminary Remediation Goals (PRGs) Third Quarter, 1993.*

PAHs Polyaromatic hydrocarbons
PCBs Polychlorinated biphenyls
TPH Total petroleum hydrocarbons

When multiple substances with similar toxicological effects are present, the sum of the hazard quotients for all of these substances must be less than 1. The hazard quotient is the ratio of the chronic daily intake to the reference dose. The chronic daily intake is calculated by rearranging Equation 1 and substituting the actual contaminant concentration for the cleanup level:

$$\text{Chronic Daily Intake (mg/kg/day)} = \frac{C \times SIR}{ABW \times 10^{6}\ \text{mg/kg}} \qquad \text{Equation 2}$$

where: C = Contaminant Concentration (mg/kg)

For contaminants that are carcinogens, a second cleanup level will be calculated such that the cancer risk does not exceed 1 in 1,000,000. The cleanup level will be calculated using the following equation:

$$\text{Soil Cleanup Level (mg/kg)} = \frac{10^{-6} \times ABW \times LIFE \times 10^{6}\ \text{mg/kg}}{SF \times SIR \times DUR} \qquad \text{Equation 3}$$

where:
ABW = Average Body Weight (kg)
LIFE = Lifetime (years)
SF = Oral Slope Factor $(\text{mg/kg-day})^{-1}$
SIR = Soil Ingestion Rate (mg/day)
DUR = Duration of Exposure (years)

For this scenario, the child is assumed to be exposed for six years and to have a lifetime of 75 years (WAC 173-342-740(3)(iii)). The other exposure assumptions are the same as for Equation 1. The slope factor will be obtained from IRIS if available or else from the most recent version of the HEAST tables.

When multiple carcinogens are present, the sum of the cancer risks for all of the carcinogens must be less than 1 in 100,000 (WAC 173-340-708(6)(d)). The cancer risk for an individual contaminant is calculated as the product of the lifetime average intake and the slope factor. The lifetime average intake is calculated by rearranging Equation 3 and substituting the actual contaminant concentration for the cleanup level:

$$\text{Lifetime Average Intake (mg/kg/day)} = \frac{C \times SIR \times DUR}{ABW \times LIFE \times 10^{6}\ \text{mg/kg}} \qquad \text{Equation 4}$$

2.3.3 Determining the Extent of Remediation

The extent of remediation can be determined either in advance of or during remediation. The extent of remediation will not be determined during pre-remedial sampling unless:

- The concentrations of contaminants can be determined in the field
- The cleanup levels of contaminants where concentrations can be determined are listed on Table 2-1.

If these two criteria are met, the objective during pre-remedial sampling will be to determine the depth of contamination that exceeds cleanup levels, and to determine if the total volume of soil that requires excavation exceeds 40 cubic yards. If the volume of soil exceeds 40 cubic yards, or if the contamination is excessively deep such that its removal creates logistical problems, the appropriateness of landfilling all contaminated soil will be reconsidered.

The volume of 40 cubic yards is based on the fact that most sites are expected to have less contaminated soil than this volume, and therefore, the presence of a larger volume is indicative that the site is substantially different from available descriptions. Furthermore, other remedial alternatives that require greater planning than landfilling will become more cost effective as the scale of remediation increases. For the drain fields and landfills, the volume of soil applies to each discrete area within the WMU that requires remediation. For most sites, the extent of excavation will be determined during remediation.

2.3.4 Sampling Objectives During Remediation

The sampling objectives during remediation are as follows:

- Cost effectively determine the limits of soil contamination above cleanup goals
- Verify that the remediation successfully meets the cleanup goals.

3.0 SAMPLING PROGRAM

This section discusses the activities required to meet the site objectives detailed in Section 2.0. Included in this section are discussions of sampling activities and locations. For clarity, this section is divided into two subsections detailing the activities prior to remediation and during remediation. Since these activities will vary between sites, the sections are further divided into discussions directly applicable to underground storage tank (UST) and aboveground tank (AST) sites, transformer and drain concrete pads, groundwater, septic drain fields, landfills, surface spills, and miscellaneous sites. Table 3-1 lists the sites that are grouped under these divisions and outlines the sampling program both prior to and during remediation. Tables 3-2 and 3-3 summarize the soil gas and soil sampling, respectively, to be performed prior to remediation only. Figures 3-1 through 3-5 are included to graphically illustrate pre-remediation and remediation activities and the decision process associated with them. These figures should be utilized in conjunction with the following sections.

3.1 PRE-REMEDIATION ACTIVITIES

3.1.1 Underground Storage Tanks and Aboveground Storage Tanks

Figure 3-1 illustrates the activities discussed in the following section.

3.1.1.1 Geophysical Survey. Since the existence and exact location of USTs and ancillary piping are frequently unknown, a geophysical survey will be conducted at all UST sites prior to sampling activities. An electromagnetic (EM) survey will determine the approximate location of the tanks and piping, while ground-penetrating radar (GPR) will be used to identify the precise location and orientation of the buried objects. GPR will also be used at the sites where no anomalies are identified in the EM survey in an effort to determine the location of any backfill. Using a permanent landmark adjacent to the site as an origin, a grid will be staked out over the suspected UST area. The geophysical survey will be conducted as detailed in Section 5.1. Results of the geophysical survey will be used to determine the position of the USTs and any ancillary piping. Geophysical surveys will not be conducted at AST sites unless they are necessary to locate ancillary piping.

3.1.1.2 Soil Gas Survey. At AST sites and at UST sites where the geophysical survey has determined the tanks are no longer present, soil gas surveys will be conducted to determine if a leak or spill has occurred (i.e., if volatile contaminants are present). A minimum of four samples will be collected. Two samples will be placed at the estimated position of the ends of the tank, and the remaining two probes will be placed to form a square centered on the middle of the tank. In addition, measurements will be taken every 10 feet along piping associated with the tank. An exception is that soil gas measurements will not be collected at sites associated with the Missile Control Center on top of Rattlesnake Mountain, as the presence of basalt at the ground surface makes these measurements impractical. Probes will be placed to half the total depth of the UST, up to a maximum depth of 6 feet. Probes will also be placed 6 feet below ground surface at AST sites. Soil gas will be collected from each probe for on-site analysis. Analytes at fuel tank sites will include benzene, toluene, ethylbenzene, and xylenes (BTEX). Analytes at solvent tank sites will consist of carbon tetrachloride, trichloroethene (TCE), perchloroethene (PCE), 1,1,1-trichloroethane (TCA), 1,1-dichloroethene (1,1-DCE), and 1,2-dichloroethene (1,2-DCE). Soil gas results will determine if volatile organic compounds (VOCs) are present. The specific soil gas analytes for each WMU are listed in both Tables 3-1 and 3-2. Section 5.2 details the soil gas survey procedures.

If tank locations are not identified by the geophysical or soil gas surveys, additional measures may be used to confirm that the proper area has been investigated if the tank location is at all uncertain. These measures can include additional soil gas samples and/or lithological sampling.

3.1.1.3 Soil Sampling. At UST or AST sites where results of the soil gas survey indicate the presence of contamination, soil will be sampled to investigate the extent of soil contamination. Because existing tanks will be removed during remediation activities, pre-remediation soil sampling will not be conducted at UST sites where the tanks are still in place. Soil borings will be drilled and/or test pits will be excavated at locations where high soil gas concentrations were

Table 3-1. Site Divisions and Analytes.

	Possible Contaminants	Soil Gas Analytes	Field Screening Analytes	Soil Sampling Analytes (analyses by off-site and/or on-site laboratory)
Underground Storage Tanks and Above Ground Storage Tank Sites				
EM-3				
1218 Service Station	Gasoline	BTEX	TPH, VOCs	TPH, VOCs
1262 Solvent Tanks	Chlorinated Solvents	Carbon Tetrachloride, TCE, PCE, TCA, 1,1-DCE, 1,2-DCE	VOCs	VOCs
JA Jones Oil Storage Tanks	Unknown Hydrocarbons	BTEX	TPH, VOCs	VOCs, TPH
IU-1				
H-52-C Surface Gas Tank Area	Gasoline, Chlorinated Solvents, and Metals		TPH, VOCs	TPH, VOCs, Metals[(a)]
Building 6652-C Abandoned USTs	Fuel Oil		TPH, VOCs	TPH, VOCs
Pumphouse Latrine 1500 Gallon Fuel Oil Storage Tank	Fuel Oil		TPH, VOCs	TPH, VOCs
Pumphouse Latrine 275 Gallon Fuel Oil Storage Tank	Fuel Oil		TPH, VOCs	TPH, VOCs
Abandoned Underground Storage Tanks	Fuel Oil	BTEX	TPH, VOCs	TPH, VOCs
H-52-L Surface Gas Tank Storage Area	Gasoline, chlorinated solvents, and metals	Benzene, Toluene, Carbon Tetrachloride	TPH, VOCs	TPH, VOCs, Metals[(a)]
Concrete Pads				
EM-3				
1262 Transformer Pad	PCBs		PCBs	PCBs
JA Jones Steam Plant Drain Pad	Unknown		VOCs	VOCs, SVOCs, Metals[(a)]
IU-1				
Radar Berm and Pads	Hydraulic Fluid		TPH	TPH
Acid Neutralization Pit	JP-4 and Metals		TPH	TPH, Metals[(a)]
Missile Refueling JP-4 Fueling Area	JP-4		TPH	TPH
JP-4 Fuel Pad	JP-4		TPH	TPH
Drain Fields				
EM-2				
Neptune's Potato and Separator Tank	Unknown, but could include chlorinated and nonchlorinated solvents	Benzene, Toluene, Carbon Tetrachloride, TCE, PCE, TCA	VOCs	VOCs
IU-1				
6652-C SSL Active Septic System	Chlorinated and nonchlorinated solvents		VOCs	VOCs
6652-C SSL Inactive Septic System	Chlorinated and nonchlorinated solvents		VOCs	VOCs
6652 ALE Field Storage Building Septic System	Chlorinated and nonchlorinated solvents	Benzene, Toluene, Carbon Tetrachloride, TCE, PCE, TCA	VOCs	VOCs
6652-I ALE Headquarters Septic System	Chlorinated and nonchlorinated solvents	Benzene, Toluene, Carbon Tetrachloride, TCE, PCE, TCA	VOCs	VOCs
Missile Assembly and Test Building Inactive Septic System	Chlorinated and nonchlorinated solvents	Benzene, Toluene, Carbon Tetrachloride, TCE, PCE, TCA	VOCs	VOCs
Missile Bunker Drainfield	Chlorinated and nonchlorinated solvents	Benzene, Toluene, Carbon Tetrachloride, TCE, PCE, TCA	VOCs	VOCs

Table 3-1. Site Divisions and Analytes. (Cont)

	Possible Contaminants	Soil Gas Analytes	Field Screening Analytes	Soil Sampling Analytes (analyses by off-site and/or on-site laboratory)
Landfills				
IU-1				
Control Center Disposal Pits	Unknown- Landfill areas could potentially contain chlorinated and Nonchlorinated	Benzene, Toluene, Carbon Tetrachloride, TCE, PCE, TCA	VOCs, PCBs	VOCs, SVOCs, Metals, Pesticides/PCBs[a]
Missile Bunker Landfill	solvents, waste oils, missile fuel, acids, and paint wastes.	Benzene, Toluene, Carbon Tetrachloride, TCE, PCE, TCA		VOCs, SVOCs, Metals, Pesticides/PCBs[a]
Horseshoe Site		Benzene, Toluene, Carbon Tetrachloride, TCE, PCE, TCA		VOCs, SVOCs, Metals, Pesticides/PCBs[a]
H-52-L NIKE Base Landfill		Benzene, Toluene, Carbon Tetrachloride, TCE, PCE, TCA		VOCs, SVOCs, Metals, Pesticides/PCBs[a]
Spill and Surface Disposal Areas				
EM-2				
Tar Flow Area	Unknown		PCBs, VOCs	VOCs, SVOCs, PCBs, Metals[a]
Stained Sands Area	Unknown		PCBs, VOCs	VOCs, SVOCs, PCBs, Metals[a]
EM-3				
1240 French Drain	PCBs		PCBs	PCBs
1240 Suspect Spill Area	Unknown		PCBs, VOCs	VOCs, SVOCs, PCBs, Metals[a]
1226 Suspect Waste Oil Disposal Area	Waste Oil and Metals		TPH, VOCs	TPH, VOCs, Metals
1212/1217 Suspect Battery Acid Disposal Area	Metals, VOCs		VOCs	VOCs, Metals
IU-1				
Pumphouse Disposal Slope	Unknown		PCBs, VOCs	VOCs, SVOCs, PCBs, Metals[a]
Missile Refueling Area Berm	Pesticides and Herbicides			Pesticides and Herbicides
Missile Maintenance and Assembly Area Acid Storage Shed	Unknown		PCBs, VOCs	VOCs, SVOCs, PCBs, Metals[a]
Missile Bunker Discharge Ditch	Unknown		PCBs, VOCs	VOCs, SVOCs, PCBs, Metals[a]
Main Entrance Stained Soil	Unknown		PCBs, VOCs	VOCs, SVOCs, PCBs, Metals[a]
Flammable Storage Block Shed/Missile Maintenance and Assembly Area Paint Shed	Unknown		PCBs, VOCs	VOCs, SVOCs, PCBs, Metals[a]
Missile Maintenance and Assembly Area Dry Well Drum	Chlorinated and nonchlorinated solvents		VOCs	VOCs

Table 3-1. Site Divisions and Analytes. (Cont)

	Possible Contaminants	Soil Gas Analytes	Field Screening Analytes	Soil Sampling Analytes (analyses by off-site and/or on-site laboratory)
Miscellaneous Sites				
EM-1				
Discolored Soil Site	Bis(2-ethylhexyl)phthalate			Phthalates
Ephemeral Pool	PCBs		PCBs	PCBs
Horn Rapids Landfill	PCBs		PCBs	PCBs
Site 600-2	Unknown	TBD	TBD	TBD
IU-1				
Mound Site Northwest of Building 6652-G	Unknown		PCBs, VOCs	VOCs, SVOCs, PCBs, Metals[(a)]
H-52-L Missile Bunker Sump	Hydraulic fluid, JP-4, missile fuel		TPH, VOCs	TPH, VOCs, SVOCs, Asbestos, Metals[(a)]
Generator Building	PCBs, hydraulic fluid, waste oils		PCBs, TPH	PCBs, TPH
Elevator Doors	PCBs		PCBs	PCBs

(a) Metals include antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc.

BTEX Benzene, toluene, ethylbenzene, xylene
DCE 1,1-Dichloroethene
PCBs Polychlorinated biphenyls
PCE Perchloroethene
SVOCs Semi-volatile organic compounds
TBD To be determined
TCA 1,1,1-Trichloroethane
TCE Trichloroethene
TPH Total petroleum hydrocarbons
VOCs Volatile organic compounds

Table 3-2. Soil Gas Sampling Summary.

Site	Site Type	Soil Gas Samples	Field Duplicate Samples(a)	Analytes
EM-2				
Neptune's Potato and Separator Tank	Drain Field	26 samples spaced every 100 feet along the distribution trench.	3	Benzene, Toluene, CCl4, TCE, PCE, TCA
EM-3				
1218 Service Station	UST/AST	Dependent upon geophysical survey results.	TBD	BTEX
1262 Solvent Tanks	UST/AST	Dependent upon geophysical survey results.	TBD	CCl4, TCE, PCE, TCA, 1,1-DCE, 1,2-DCE
JA Jones Oil Storage Tanks	UST/AST	Dependent upon geophysical survey results.	TBD	BTEX
IU-1				
Missile Bunker Landfill	Landfill	On a grid, with locations spaced at 50 foot intervals. Estimated 20 samples.	2	Benzene, Toluene, CCl4, TCE, PCE, TCA
Horseshoe Site	Landfill	On a grid with locations spaced at 50 foot intervals. Estimated 9 samples.	1	Benzene, Toluene, CCl4, TCE, PCE, TCA
H-52-L NIKE Base Landfill	Landfill	On a grid with locations spaced at 50 foot intervals. Estimated 25 samples.	3	Benzene, Toluene, CCl4, TCE, PCE, TCA
Abandoned Underground Storage Tanks	UST/AST	Dependent upon geophysical survey results	TBD	BTEX
H-52-L Surface Gas Tank Storage Area	UST/AST	Four samples, with two samples at the projected ends of the tank, and the other two samples even with the center of the tank so that the four samples form a square.	0	Benzene, Toluene, CCl4, TCE, PCE, TCA
6652 ALE Field Storage Building Septic System	Drain Field	Four soil gas samples will be collected along one line in the center of the septic field. In addition, one sample will be collected at each end of the septic tank.	1	Benzene, Toluene, CCl4, TCE, PCE, TCA

Table 3-2. Soil Gas Sampling Summary. (Cont)

Site	Site Type	Soil Gas Samples	Field Duplicate Samples(a)	Analytes
6652-I ALE Headquarters Septic System	Drain Field	Three soil gas samples will be collected along one line in the 15 x 150 foot area; and two samples will be collected along two lines in each of the two 70 x 100 foot areas. One sample will be collected at each end of the septic tank.	1	Benzene, Toluene, CCl4, TCE, PCE, TCA
Missile Assembly and Test Building Inactive Septic System	Drain Field	One soil gas sample will be collected at each end of the tank, and two samples (spaced 50 feet apart) will be collected in the center of the septic field.	0	Benzene, Toluene, CCl4, TCE, PCE, TCA
Missile Bunker Drainfield	Drain Field	Two soil gas samples will be collected in the center of the septic field approximately 15 feet from each end of the field.	0	Benzene, Toluene, CCl4, TCE, PCE, TCA

(a) In addition, one equipment blank and one ambient air blank will be collected each day. See Section 5.2 for procedures.

BTEX Benzene, toluene, ethylbenzene, and xylenes
CCl4 Carbon tetrachloride
1,1-DCE 1,1-Dichloroethylene
1,2-DCE 1,2-Dichloroethylene
PCE Tetrachloroethylene
TBD To be determined based on geophysical survey results. Field duplicates will be collected at a rate of ten percent of the total number of soil gas samples.
TCA 1,1,1-Trichloroethane
TCE Trichloroethylene
UST/AST Underground storage tank/aboveground storage tank

TABLE 3-3. Soil Sampling Summary for Pre-Remedial Sampling.

Site(a)	Site type	Soil Samples	Blind Replicates(b)	Matrix Spike/ Matrix Spike Replicates	Analytes	Analytical Method(c)
EM-1						
Discolored Soil Site	Miscellaneous	One composite sample for landfill characterization from subsamples at 20-foot intervals from 6 inches bgs. Subsamples collected with a trowel.	0	0	None	None
Ephemeral Pool	Miscellaneous	One composite sample for landfill characterization from subsamples at 20-foot intervals from 6 inches bgs. Subsamples collected with a trowel.	0	0	None	None
Horn Rapids Landfill	Miscellaneous	One composite sample for landfill characterization from subsamples at 20-foot intervals from 6inches to two feet bgs. Subsamples collected with a trowel.	0	0	None	None
EM-2						
Tar Flow Area	SSDA	Perform borings at six locations: 3 in the east "lobe", 2 in the center "lobe", and one in the west "lobe". Collect samples at the surface and 3 feet bgs from each boring. Borings will be performed using a hand auger.	0	1	SVOCs, Metals VOCs, PCBs	Off-Site Lab Field Screen
Stained Sands Area	SSDA	Collect a sample at the surface and at 3 feet from one boring in the center of this area. Boring will be hand augered.	1	0	SVOCs, Metals VOCs, PCBs	Off-Site Lab Field Screen
Neptune's Potato and Separator Tank	Drain Field	Dependent upon soil gas results	TBD	TBD	VOCs	Field Screen
EM-3						
1240 French Drain Area	SSDA	Collect a surface sample and a sample 5 feet bgs from the drain. Samples will be collected with a hand auger.	0	0	PCBs	Field Screen

(a) Sites requiring remediation will also require a composite sample to be sent to the landfill facility at least three weeks prior to the start of remediation.

(b) In addition to the specified QA/QC samples, one source water blank will be required for each supply of source water; one trip blank will be required per cooler containing samples for VOC analysis, and one equipment blank will be required for every 20 samples.

(c) Field screening for TPH will be performed to determine if levels exceed cleanup standards. If so, a sample will be submitted to a laboratory to obtain positive identification concerning the type of fuel.

bgs Below ground surface
PCBs Polychlorinated biphenyls
SSDA Surface spill and disposal area
SVOCs Semivolatile organic compounds
TBD To be determined
TPH Total petroleum hydrocarbons
UST/AST Underground storage tank/aboveground storage tank
VOCs Volatile organic compounds

TABLE 3-3. Soil Sampling Summary for Pre-Remedial Sampling. (Cont)

Site(a)	Site type	Soil Samples	Blind Replicates(b)	Matrix Spike/ Matrix Spike Replicates	Analytes	Analytical Method(c)
1240 Suspect Spill Area	SSDA	In each of two areas where staining is present, collect a sample at the surface and at 3 feet bgs, for a total of four samples. Samples will be collected with a hand auger or backhoe.	0	0	SVOCs, Metals	Off-Site Lab
					VOCs, PCBs	Field Screen
1226 Suspect Waste Oil Disposal Area	SSDA	Two borings each in area of stained soil and area where waste oil drums are stored. Samples collected immediately below the asphalt and 3 feet below the asphalt. Samples will be collected with a hand auger.	1	0	TPH, Metals	Off-Site Lab
					VOCs, TPH	Field Screen
1212/1217 Suspect Battery Acid Disposal Area	SSDA	Divide the site into two 20-foot x 30-foot sections, and collect composite samples from the surface and at 3 feet from each section. Each composite will be made up of four subsamples evenly spaced throughout the section.	1	0	Metals	Off-Site Lab
					VOCs	Field Screen
1218 Service Station	UST/AST	Dependent upon geophysical or soil gas survey results.	TBD	TBD	TPH, VOCs	Field Screen
					TPH	Off-Site Lab
1262 Solvent Tanks	UST/AST	Dependent upon geophysical or soil gas survey results.	TBD	TBD	VOCs	Field Screen
JA Jones Oil Storage Tanks	UST/AST	Dependent upon geophysical or soil gas survey results.	TBD	TBD	TPH, VOCs	Field Screen
					TPH	Off-Site Lab
1262 Transformer Pad	Concrete Pads	Collect two samples 1 foot below the asphalt with a hand auger and two wipe samples of the asphalt.	0	0	PCBs	Field Screen

(a) Sites requiring remediation will also require a composite sample to be sent to the landfill facility at least three weeks prior to the start of remediation.

(b) In addition to the specified QA/QC samples, one source water blank will be required for each supply of source water; one trip blank will be required per cooler containing samples for VOC analysis, and one equipment blank will be required for every 20 samples.

(c) Field screening for TPH will be performed to determine if levels exceed cleanup standards. If so, a sample will be submitted to a laboratory to obtain positive identification concerning the type of fuel.

bgs Below ground surface
PCBs Polychlorinated biphenyls
SSDA Surface spill and disposal area
SVOCs Semivolatile organic compounds
TBD To be determined
TPH Total petroleum hydrocarbons
UST/AST Underground storage tank/aboveground storage tank
VOCs Volatile organic compounds

TABLE 3-3. Soil Sampling Summary for Pre-Remedial Sampling. (Cont)

Site[a]	Site type	Soil Samples	Blind Replicates[b]	Matrix Spike/ Matrix Spike Replicates	Analytes	Analytical Method[c]
JA Jones Steam Plant Drain Pad	Concrete Pads	Collect a surface sample and a sample at 3 feet below the drain.	0	1	SVOCs, Metals VOCs	Off-Site Lab Field Screen
IU-1						
Control Center Disposal Pits	Landfill	Collect one sample at each of the five pits 1 foot below the base of each pit. Samples will be collected with a hand auger or backhoe.	1	0	SVOCs, Metals VOCs, PCBs	Off-Site Lab Field Screen
Missile Bunker Landfill	Landfill	Dependent upon soil gas and geophysical survey results.	TBD	TBD	VOCs, SVOCs, Metals, PCBs	Off-Site Lab
Horseshoe Site	Landfill	Dependent upon soil gas and geophysical survey results.	TBD	TBD	VOCs, SVOCs, Metals, PCBs	Off-Site Lab
H-52-L NIKE Base Landfill	Landfill	Dependent upon soil gas and geophysical survey results.	TBD	TBD	VOCs, SVOCs, Metals, PCBs	Off-Site Lab
Pumphouse Disposal Slope	SSDA	Collect a composite sample from three surface locations on the slope. Samples will be collected with a trowel.	0	0	SVOCs, Metals VOCs, PCBs	Off-Site Lab Field Screen
Missile Refueling Area Berm	SSDA	Collect one composite sample from each berm. Six subsamples will be used to make up each composite sample, with two subsamples from the top and each side. The subsamples will be collected from the surface with a trowel.	1	1	Pesticides, Herbicides	Off-Site Lab

(a) Sites requiring remediation will also require a composite sample to be sent to the landfill facility at least three weeks prior to the start of remediation.

(b) In addition to the specified QA/QC samples, one source water blank will be required for each supply of source water; one trip blank will be required per cooler containing samples for VOC analysis, and one equipment blank will be required for every 20 samples.

(c) Field screening for TPH will be performed to determine if levels exceed cleanup standards. If so, a sample will be submitted to a laboratory to obtain positive identification concerning the type of fuel.

bgs Below ground surface
PCBs Polychlorinated biphenyls
SSDA Surface spill and disposal area
SVOCs Semivolatile organic compounds
TBD To be determined
TPH Total petroleum hydrocarbons
UST/AST Underground storage tank/aboveground storage tank
VOCs Volatile organic compounds

TABLE 3-3. Soil Sampling Summary for Pre-Remedial Sampling. (Cont)

Site[(a)]	Site type	Soil Samples	Blind Replicates[(b)]	Matrix Spike/ Matrix Spike Replicates	Analytes	Analytical Method[(c)]
Missile Maintenance and Assembly Area Acid Storage Shed	SSDA	One surface sample will be collected from the area by the shed with a trowel.	0	0	SVOCs, Metals VOCs, PCBs	Off-Site Lab Field Screen
Missile Bunker Discharge Ditch	SSDA	At each of three locations where a discharge pipe is present, samples will be collected at the surface and at 5 feet bgs using a hand auger.	1	0	SVOCs, Metals VOCs, PCBs	Off-Site Lab Field Screen
Main Entrance Stained Soil	SSDA	One sample will be collected at the surface using a trowel.	0	0	SVOCs, Metals VOCs, PCBs	Off-Site Lab Field Screen
Flammable Storage Block Shed/Missile Maintenance and Assembly Area Paint Shed	SSDA	Two samples will be collected at each of two borings. One boring will be around the rack and one boring will be from an area of stained soil. Samples will be collected at the surface and 3 feet bgs using a hand auger.	1	0	SVOCs, Metals VOCs, PCBs	Off-Site Lab Field Screen
Missile Maintenance and Assembly Area Dry Well Drum	SSDA	Collect one surface sample and a sample at 3 feet from a hand auger boring beside the drum.	1	0	VOCs	Field Screen
H-52-C Surface Gas Tank Area	UST/AST	Sample at each of the two locations where a tank was stored, and collect a surface sample and a sample at 3 feet. Sampling will be with a hand auger or backhoe.	0	1	TPH, Metals VOCs, TPH	Off-Site Lab Field Screen

(a) Sites requiring remediation will also require a composite sample to be sent to the landfill facility at least three weeks prior to the start of remediation.

(b) In addition to the specified QA/QC samples, one source water blank will be required for each supply of source water; one trip blank will be required per cooler containing samples for VOC analysis, and one equipment blank will be required for every 20 samples.

(c) Field screening for TPH will be performed to determine if levels exceed cleanup standards. If so, a sample will be submitted to a laboratory to obtain positive identification concerning the type of fuel.

bgs Below ground surface
PCBs Polychlorinated biphenyls
SSDA Surface spill and disposal area
SVOCs Semivolatile organic compounds
TBD To be determined
TPH Total petroleum hydrocarbons
UST/AST Underground storage tank/aboveground storage tank
VOCs Volatile organic compounds

TABLE 3-3. Soil Sampling Summary for Pre-Remedial Sampling. (Cont)

Site(a)	Site type	Soil Samples	Blind Replicates(b)	Matrix Spike/ Matrix Spike Replicates	Analytes	Analytical Method(c)
Building 6652-C Abandoned USTs	UST/AST	Dependent upon geophysical survey results	TBD	TBD	TPH, VOCs	Field Screen
					TPH	Off-Site Lab
Pumphouse Latrine 1500-Gallon Fuel Oil Storage Tank	UST/AST	Collect samples at the surface and 3 feet bgs from beneath the area where the tank was stored. Samples will be collected with a backhoe.	1	0	TPH, VOCs	Field Screen
					TPH	Off-Site Lab
Pumphouse Latrine 275-Gallon Fuel Oil Storage Tank	UST/AST	Collect samples at the surface and 3 feet bgs from beneath the area where the tank was stored. Samples will be collected with a backhoe.	0	0	TPH, VOCs	Field Screen
					TPH	Off-Site Lab
Abandoned Underground Storage Tanks	UST/AST	Dependent upon geophysical or soil gas survey results	TBD	TBD	TPH, VOCs	Field Screen
					TPH	Off-Site Lab
H-52-L Surface Gas Tank Storage Area	UST/AST	Dependent upon soil gas survey results	TBD	TBD	TPH, Metals	Off-Site Lab
					VOCs, TPH	Field Screen
Radar Berm and Pads	Concrete Pads	Sample at four locations in each of two areas identified as a pad. At each of the total of eight locations, collect a surface sample and a sample at 3 feet. Samples will be collected with a hand auger or backhoe.	1	0	TPH	Field Screen

(a) Sites requiring remediation will also require a composite sample to be sent to the landfill facility at least three weeks prior to the start of remediation.

(b) In addition to the specified QA/QC samples, one source water blank will be required for each supply of source water; one trip blank will be required per cooler containing samples for VOC analysis, and one equipment blank will be required for every 20 samples.

(c) Field screening for TPH will be performed to determine if levels exceed cleanup standards. If so, a sample will be submitted to a laboratory to obtain positive identification concerning the type of fuel.

bgs Below ground surface
PCBs Polychlorinated biphenyls
SSDA Surface spill and disposal area
SVOCs Semivolatile organic compounds
TBD To be determined
TPH Total petroleum hydrocarbons
UST/AST Underground storage tank/aboveground storage tank
VOCs Volatile organic compounds

TABLE 3-3. Soil Sampling Summary for Pre-Remedial Sampling. (Cont)

Site[a]	Site type	Soil Samples	Blind Replicates[b]	Matrix Spike/ Matrix Spike Replicates	Analytes	Analytical Method[c]
Acid Neutralization Pit	Concrete Pads	One surface sample and one sample at a depth of 3 feet will be collected from each of two borings. Borings will be made with a hand auger.	0	1	TPH, Metals TPH	Off-Site Lab Field Screen
Missile Refueling JP-4 Fueling Area	Concrete Pads	Sampling from acid neutralization pit will apply to this area.	0	0	TPH	Field Screen, Off-Site Lab
JP-4 Fuel Pad	Concrete Pads	Collect two surface samples with a trowel from around the pad.	0	0	TPH	Field Screen, Off-Site Lab
6652-C SSL Active Septic System	Drain Field	Collect four samples using a backhoe, with two samples beneath the septic tank (one at the base and one 5 feet beneath the base of the tank), and two samples at the end of the septic line (one at the base of the line and one 5 feet beneath the base).	0	0	VOCs	Field Screen
6652-C SSL Inactive Septic System	Drain Field	Collect one sample beneath the septic tank and three samples in the drainfield at a depth of 3 feet. Samples will be collected with a backhoe.	0	0	VOCs	Field Screen
6652 ALE Field Storage Building Septic System	Drain Field	Dependent upon the results of the soil gas survey.	TBD	TBD	VOCs	Field Screen
6652-I ALE headquarters Septic System	Drain Field	Dependent upon the results of the soil gas survey.	TBD	TBD	VOCs	Field Screen
Missile Assembly and Test Building Inactive Septic System	Drain Field	Dependent upon the results of the soil gas survey.	TBD	TBD	VOCs	Field Screen

(a) Sites requiring remediation will also require a composite sample to be sent to the landfill facility at least three weeks prior to the start of remediation.

(b) In addition to the specified QA/QC samples, one source water blank will be required for each supply of source water; one trip blank will be required per cooler containing samples for VOC analysis, and one equipment blank will be required for every 20 samples.

(c) Field screening for TPH will be performed to determine if levels exceed cleanup standards. If so, a sample will be submitted to a laboratory to obtain positive identification concerning the type of fuel.

bgs Below ground surface
PCBs Polychlorinated biphenyls
SSDA Surface spill and disposal area
SVOCs Semivolatile organic compounds
TBD To be determined
TPH Total petroleum hydrocarbons
UST/AST Underground storage tank/aboveground storage tank
VOCs Volatile organic compounds

TABLE 3-3. Soil Sampling Summary for Pre-Remedial Sampling. (Cont)

Site[(a)]	Site type	Soil Samples	Blind Replicates[(b)]	Matrix Spike/ Matrix Spike Replicates	Analytes	Analytical Method[(c)]
Missile Bunker Drainfield	Drain Field	Dependent upon the results of the soil gas survey.	TBD	TBD	VOCs	Field Screen
Mound Site Northwest of Building 6652-G	Miscellaneous	Samples will be collected at geophysical anomalies. In addition, two borings each will be located on the west side and on top of the mound. Samples will be collected at depths of 2 and 5 feet bgs from each boring using a hand auger.	0	1	SVOCs, Metals VOCs, PCBs	Off-Site Lab Field Screen
H-52-L Missile Bunker Sump	Miscellaneous	Collect two samples (one at the surface and one 3 feet bgs) at each of two locations	1	0	SVOCs, Asbestos, Metals VOCs	Off-Site Lab Field Screen
Generator Building	Miscellaneous	One surface sample will be collected with a trowel at each of three transformer pads.	0	0	PCBs, TPH TPH	Field Screen Off-Site Lab
Elevator Doors	Miscellaneous	Collect one wipe sample from each of the two doors.	0	0	PCBs	Field Screen

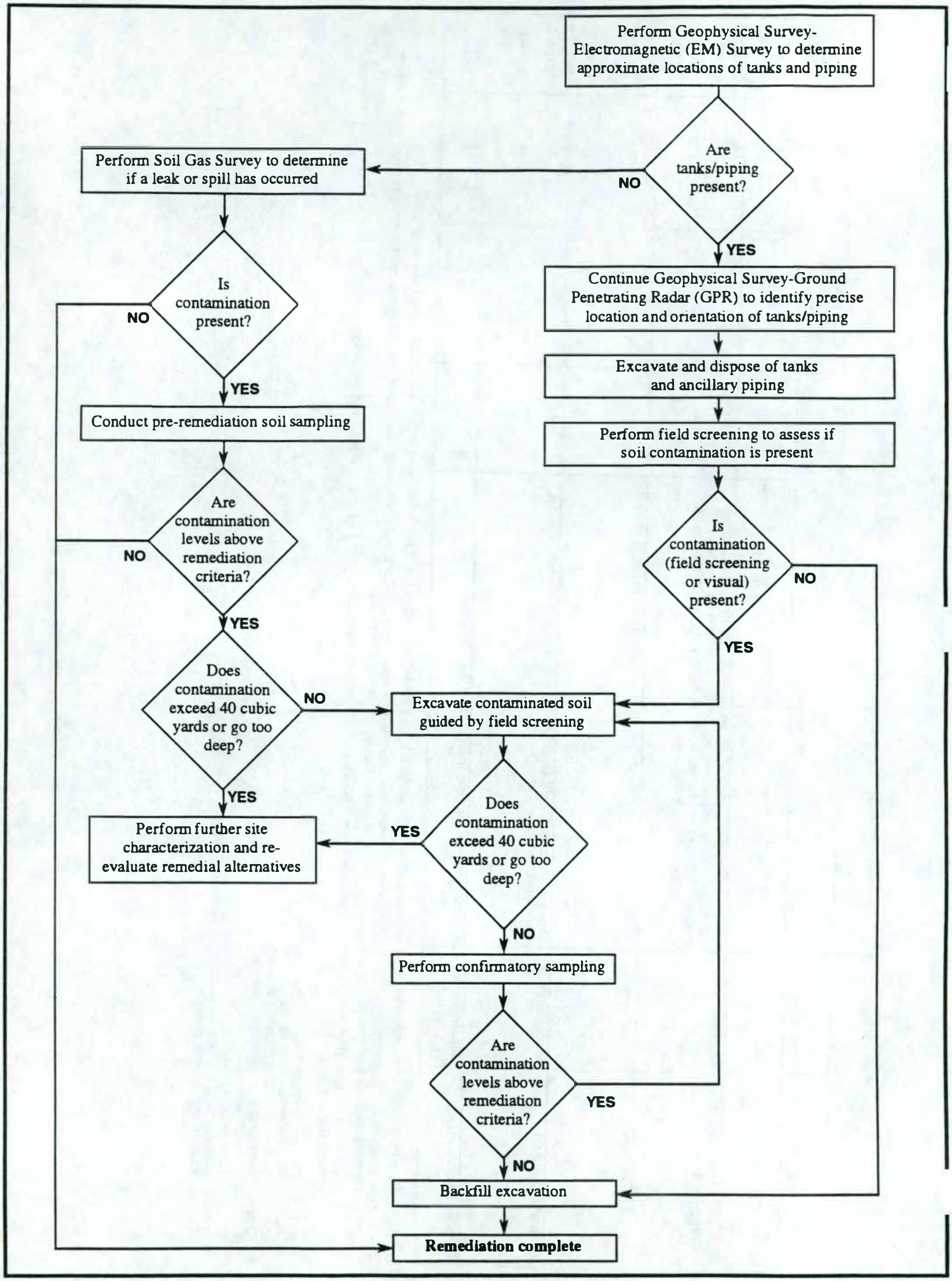
(a) Sites requiring remediation will also require a composite sample to be sent to the landfill facility at least three weeks prior to the start of remediation.

(b) In addition to the specified QA/QC samples, one source water blank will be required for each supply of source water; one trip blank will be required per cooler containing samples for VOC analysis, and one equipment blank will be required for every 20 samples.

(c) Field screening for TPH will be performed to determine if levels exceed cleanup standards. If so, a sample will be submitted to a laboratory to obtain positive identification concerning the type of fuel.

bgs Below ground surface
PCBs Polychlorinated biphenyls
SSDA Surface spill and disposal area
SVOCs Semivolatile organic compounds
TBD To be determined
TPH Total petroleum hydrocarbons
UST/AST Underground storage tank/aboveground storage tank
VOCs Volatile organic compounds

Figure 3-1. Hanford 1100 Area UST and AST Sites Schematic of Sampling/Remediation Program.



detected. Where soil gas measurements are not collected (i.e., at the Missile Control Center), soil borings will be placed in the same configuration specified for soil gas measurements. In the event refusal is encountered during drilling, the borehole will be abandoned and other attempts will be made within a 5-foot radius of the original borehole. The position of each borehole will be staked, and described in detail in the field logbook. Samples will be collected continuously during drilling, following procedures outlined in Section 5.3. Soil samples will be logged to assess soil characteristics and the presence of visible contamination.

Samples from fuel tank sites will be screened using a headspace analysis as detailed in Section 5.3.6 for the presence of total VOCs. Two sample intervals from each boring with the highest headspace levels and/or stained soil will be submitted for field screening for TPH and VOCs, as detailed in Section 5.5. As an alternative, the headspace measurements can be eliminated and all samples field screened. Samples from fuel tank sites that register concentrations greater than 100 parts per million (ppm) of TPH through field screening will be submitted to an off-site laboratory for analysis of TPH by the appropriate Washington State Department of Ecology method (WTPH-G for gasoline tank sites, WTPH-D for diesel, and WTPH-418.1 for fuel oil, JP-3, JP-4, and hydraulic fluid sites). The soil sampling with analysis of VOCs by an analytical laboratory, as specified in Table 3-1, refers only to sampling during remediation.

Soil borings and/or test pits will be completed to the depth where contamination is no longer detected by headspace analysis or to 5 feet below the bottom of the tank, whichever is deeper. Laterally, soil borings will be completed until contamination is no longer detected by field screening or the volume of contaminated soil exceeds 40 cubic yards, whichever is less. Soil from each boring at a site that will require remediation (as indicated by field screening) will also be composited and submitted to the receiving facility at least three weeks prior to the commencement of remedial activities. Two borings (one from each end of the tank) will be drilled for this purpose at UST sites where the tanks are still in place (and where no pre-remedial investigation will be undertaken).

3.1.2 Concrete Pads

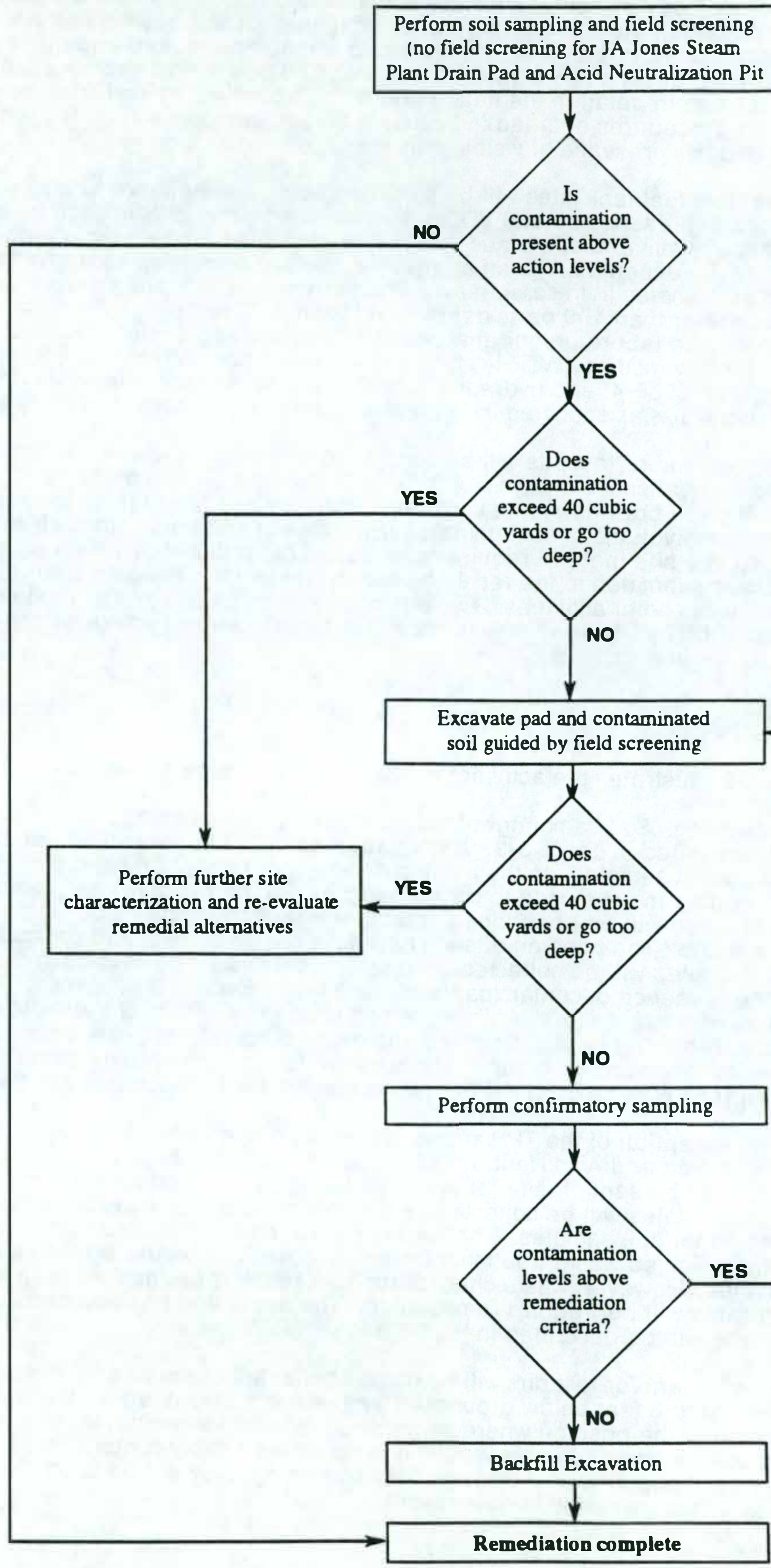
Figure 3-2 illustrates the activities discussed in the following section.

3.1.2.1 Soil Sampling. Soil sampling will be conducted at all pad sites. The location and depth of each sample is specified in Table 3-3. A stainless steel hand auger will be used to advance boreholes and collect samples. In the event a hand auger cannot be used due to subsurface conditions, a backhoe may be used to collect samples. In the event refusal is encountered during sampling, the location will be abandoned and other attempts will be made within a 5-foot radius of the original borehole. The position of each borehole will be staked, and described in detail in the field logbook. Samples will be collected continuously as described in Section 5.3 and will be field screened for the presence of contaminants, as detailed in Section 5.5. Field screening will focus on contaminants consistent with the history of pad usage (i.e., PCBs at transformer pad sites and TPH and VOCs at refueling pads). Samples with over 100 ppm TPH by field screening will be submitted to an off-site laboratory for analysis by the appropriate Washington State Department of Ecology Method (see Section 3.1.1). Potential contaminants for each pad are listed in Table 3-1.

With the exception of the TPH analyses just referenced and samples from the JA Jones Steam Plant Drain Pad and Acid Neutralization Pit, only samples necessary for waste characterization will be sent off-site for analysis during pre-remedial sampling. Waste characterization samples will be collected as a composite from areas representative of the locations selected for soil samples. The waste characterization sample from a site will be submitted to the selected waste treatment facility at least three weeks prior to commencement of remedial activities. However, waste characterization samples are not required at sites that field screening indicates will not require remediation. The depth and position of soil making up the composite sample will be described in the field logbook.

Soil borings and/or test pits will be completed to the depth where contamination is no longer detected or to 5 feet below ground surface, whichever is deeper. Laterally, soil borings will be completed to the position where contamination is no longer detected or the volume of contaminated soil exceeds 40 cubic yards. If samples are visibly contaminated but do not register detectable levels of contaminants through field screening, they will be submitted to the laboratory to document that contamination is not present.

Figure 3-2. Hanford 1100 Area Concrete Pads Schematic of Sampling/Remediation Program.



3.1.2.2 JA Jones Steam Plant Drain Pad and Acid Neutralization Pit. Field screening will be conducted for VOCs at the JA Jones Steam Plant Drain Pad. Field screening for TPH and VOCs will be conducted at the Acid Neutralization Pit. Soil samples will be collected as described in Table 3-3 and submitted to a laboratory for analysis. At the JA Jones Steam Plant Drain Pad, samples will be analyzed for semi-volatile organic compounds (SVOCs) by EPA Method 8270, and metals by EPA Method 6010. The samples will be from locations where VOCs were detected above cleanup levels during field screening, not at the perimeter where VOCs were below cleanup levels. Samples from the Acid Neutralization Pit will be analyzed for metals by EPA Method 6010 and TPH by Washington State Department of Ecology WTPH-D method. Analytical results will be used to characterize site contaminants and the need for remediation.

3.1.3 Groundwater

3.1.3.1 No pre-remediation activities are necessary for groundwater.

3.1.4 Drain Fields

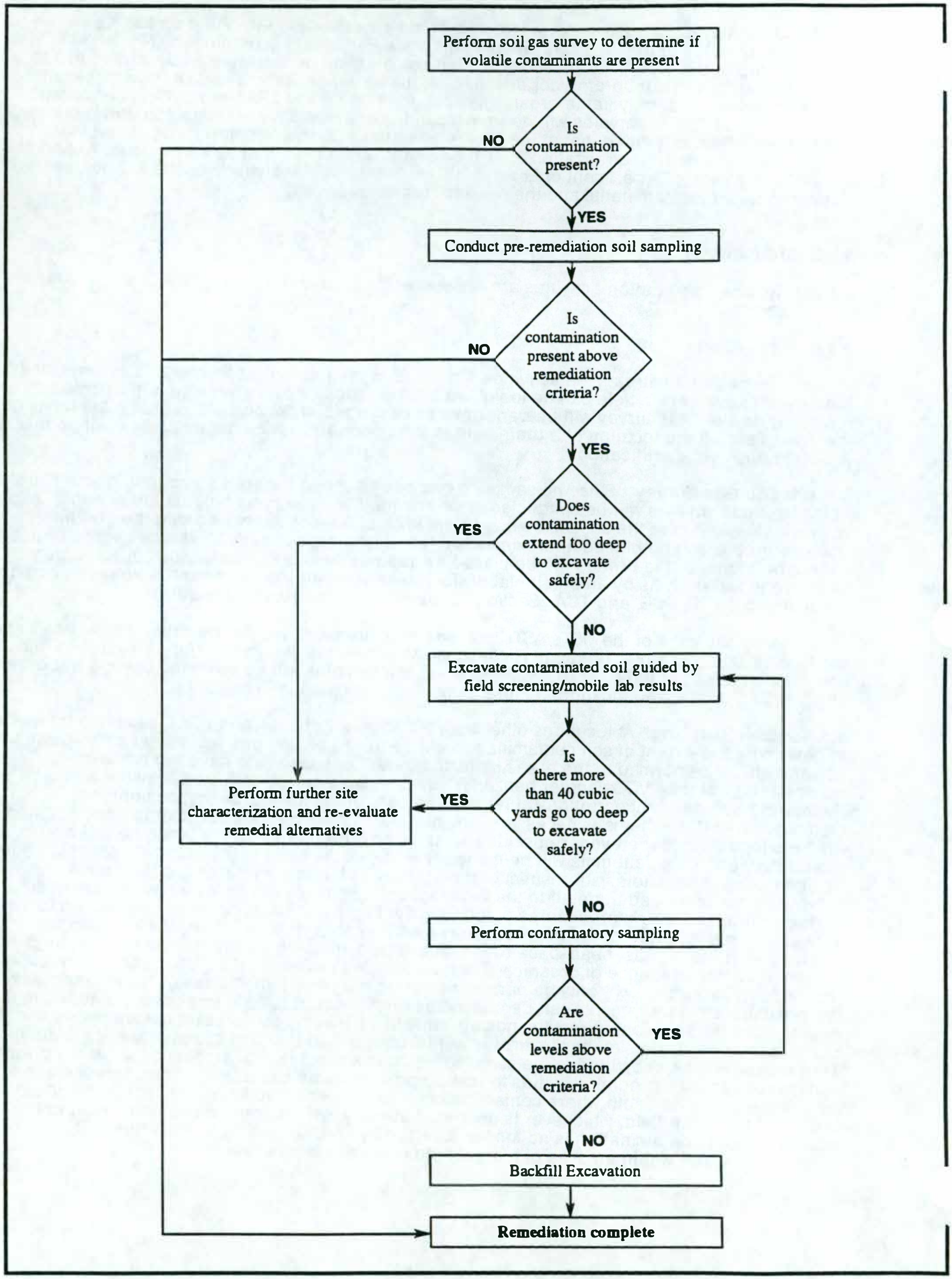
Figure 3-3 illustrates the activities discussed in the following section. It is assumed that the extent of each drain field can be identified by inspection. If this assumption is incorrect, a resistivity and/or GPR survey will be performed as described in Section 5.1 to define the limits of the drain field. If the location of a drain field is still uncertain, additional measures will be taken to obtain positive identification.

3.1.4.1 Soil Gas Survey. Since no sampling has been done in the soils surrounding septic drain fields, soil gas surveys will be conducted to determine if volatile contaminants are present. A grid will be staked out over the suspected drain field area at 50-foot intervals along the grid lines. Soil gas probes will be placed approximately 6 feet below ground surface. In the event this depth cannot be attained, the probes will be placed as deep as possible. Gas will be collected from each probe for analysis by an on-site laboratory. Analytes will include benzene, toluene, carbon tetrachloride, TCE, PCE, and TCA. Section 5.2 details soil gas survey procedures.

As in the case of the USTs/ASTs, soil gas measurements will not be collected at sites within the Missile Control Center on top of Rattlesnake Mountain (as shown in Figure 1-5) due to the presence of basalt at the surface. At these sites, soil samples will be collected using a backhoe. The number, depth, and location of these samples is indicated in Table 3-3.

3.1.4.2 Soil Sampling. At locations other than the Missile Control Center, soil sampling conducted to determine the extent of soil contamination will be based on soil gas results. At a minimum, soil borings will be performed in the areas indicated by soil gas results to have the highest concentration of total VOCs and/or benzene. Samples also will be collected from the areas registering soil gas concentrations at least 10 percent of the highest concentrations. If modification of this scheme is necessary, any deviations shall be fully documented and justified in the field logbook. In the event refusal is encountered during drilling, the borehole will be abandoned and other attempts will be made within a 5-foot radius of the original borehole. The position of each borehole with respect to the permanent landmark referenced for the soil gas survey will be described in detail in the field logbook. Samples will be collected continuously during drilling, following procedures outlined in Section 5.3. Soil samples will be logged to assess soil characteristics and the presence of visible contamination. Samples from the two intervals with the highest headspace readings and/or containing visibly stained soil will be field screened for the presence of organic vapors, as detailed in Section 5.5 (laboratory analyses, as indicated in Table 3-1, will only be performed during the remediation phase). As an alternative, the headspace measurements can be eliminated and all samples field screened. In addition, if one or more field screening results indicates that there may be soil present contaminated above cleanup levels, portions of these samples will be composited into one sample for each drain field. This sample will be submitted to the selected waste treatment facility at least three weeks prior to commencement of remedial activities for the purpose of waste characterization. Soil borings will be completed to the depth where contamination is no longer detected or to 5 feet below the bottom of the drain field, whichever is deeper. Laterally, soil borings will be completed to the position where contamination is no longer detected by field screening or the volume of contaminated soil within an area of a drain field exceeds 40 cubic yards.

Figure 3-3. Hanford 1100 Area Drain Field Schematic of Sampling/Remediation Program.



3.1.5 Landfills

Figure 3-4 illustrates the activities discussed in the following section.

3.1.5.1 Geophysical Survey. Due to their heterogeneous nature, landfills will be investigated with several geophysical methods. A resistivity survey will be conducted to map increases in dissolved solids in either a shallow perched aquifer or the unsaturated zone that could be indicative of a contaminant release from the landfill. An EM survey will be conducted to determine anomalous areas within the landfill that could be indicative of buried metallic materials (i.e., buried drums). A GPR survey will be conducted in areas determined by the EM survey to contain anomalous readings. The GPR survey will be used to provide better definition of subsurface conditions in these areas and to define locations of any buried materials. A grid will be staked out over the landfill area for the EM survey, and will cover a wide area to provide general information on subsurface conditions. Grids for the GPR survey will be closely spaced over areas indicated by the EM survey to contain anomalies. Geophysical surveys will be conducted as detailed in Section 5.1.

3.1.5.2 Soil Gas Survey. Since no sampling has been done in the landfill areas, soil gas surveys will be conducted to determine if volatile contaminants are present. Using a permanent landmark adjacent to the site as an origin, a grid with 50-foot spacing between lines will be staked out over the landfill area. Soil gas probes will be placed at 50-foot intervals along the grid lines. Probes will be placed approximately 6 feet below ground surface. In the event this depth cannot be attained, the probes will be placed as deep as possible. Soil gas will be collected from each probe for analysis by an on-site laboratory. Analytes will include benzene, toluene, carbon tetrachloride, TCE, PCE, and TCA. Section 5.2 details soil gas survey procedures.

3.1.5.3 Soil Sampling. Using soil gas and geophysical results as a basis for establishing sampling locations, soil sampling will be conducted to determine the extent of soil contamination. Test pits will be completed through areas indicated by geophysical survey results to contain anomalies. Soil borings or test pits will be performed in the areas indicated by soil gas results to be the most contaminated. In the event refusal is encountered during drilling, the borehole will be abandoned and other attempts will be made within a 5-foot radius of the original borehole. The position of each borehole and test pit will be described in detail in the field logbook and will be staked. Soil samples will be logged to assess soil characteristics and the presence of visible contamination. Samples will be analyzed with a headspace analysis, as detailed in Section 5.3.6. Sample intervals with visible contamination and/or registering one of the two highest levels of contamination as indicated by headspace analyses will be submitted to the laboratory for analysis of VOCs by EPA Method 8240, SVOCs by EPA Method 8270, metals by EPA Method 6010, and pesticides/PCBs by EPA Method 8080. As an alternative, field screening for VOCs may replace the headspace analyses. In addition, portions of these samples will be composited into one sample from each landfill. This sample will be submitted to the selected waste treatment facility at least three weeks prior to commencement of remedial activities for the purpose of waste characterization. Soil borings and test pits will be completed to the depth where contamination is no longer detected or through the anomalous area. Because samples will be analyzed by an off-site laboratory, the lateral extent of contamination will not be determined during pre-remedial sampling.

3.1.6 Spills and Surface Disposal Areas

Figure 3-5 illustrates the activities discussed in the following section.

3.1.6.1 Soil Sampling. Soil sampling will be conducted at spill and surface disposal areas to assess the extent of contamination. The number and location of samples is described in Table 3-3. The location of individual samples may be adjusted to include areas of likely contamination, such as areas of visible staining and drainage areas. In the event refusal is encountered during drilling, the borehole will be abandoned and other attempts will be made within a 5-foot radius of the original borehole. The position of each borehole will be staked, and described in detail in the field logbook. Soil samples will be logged to assess soil characteristics and the presence of visible contamination. A stainless steel hand auger will be used to advance boreholes and collect samples. In the event a hand auger cannot be used due to subsurface conditions, an excavator may be used to reach the desired depth. Soil samples will be logged to assess soil characteristics and presence of visible contamination.

Figure 3-4. Hanford 1100 Area Landfills Schematic of Sampling/Remediation Program.

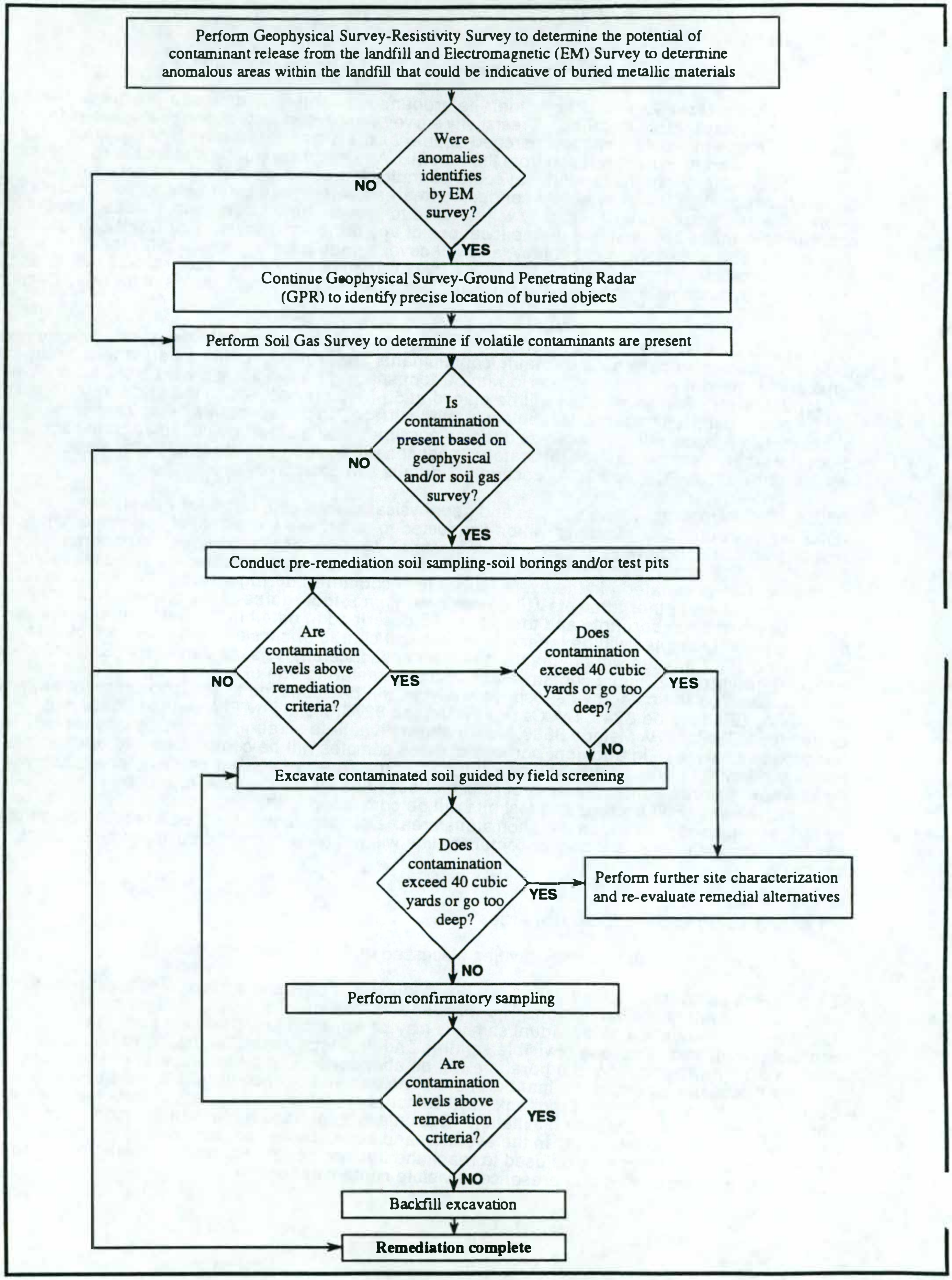
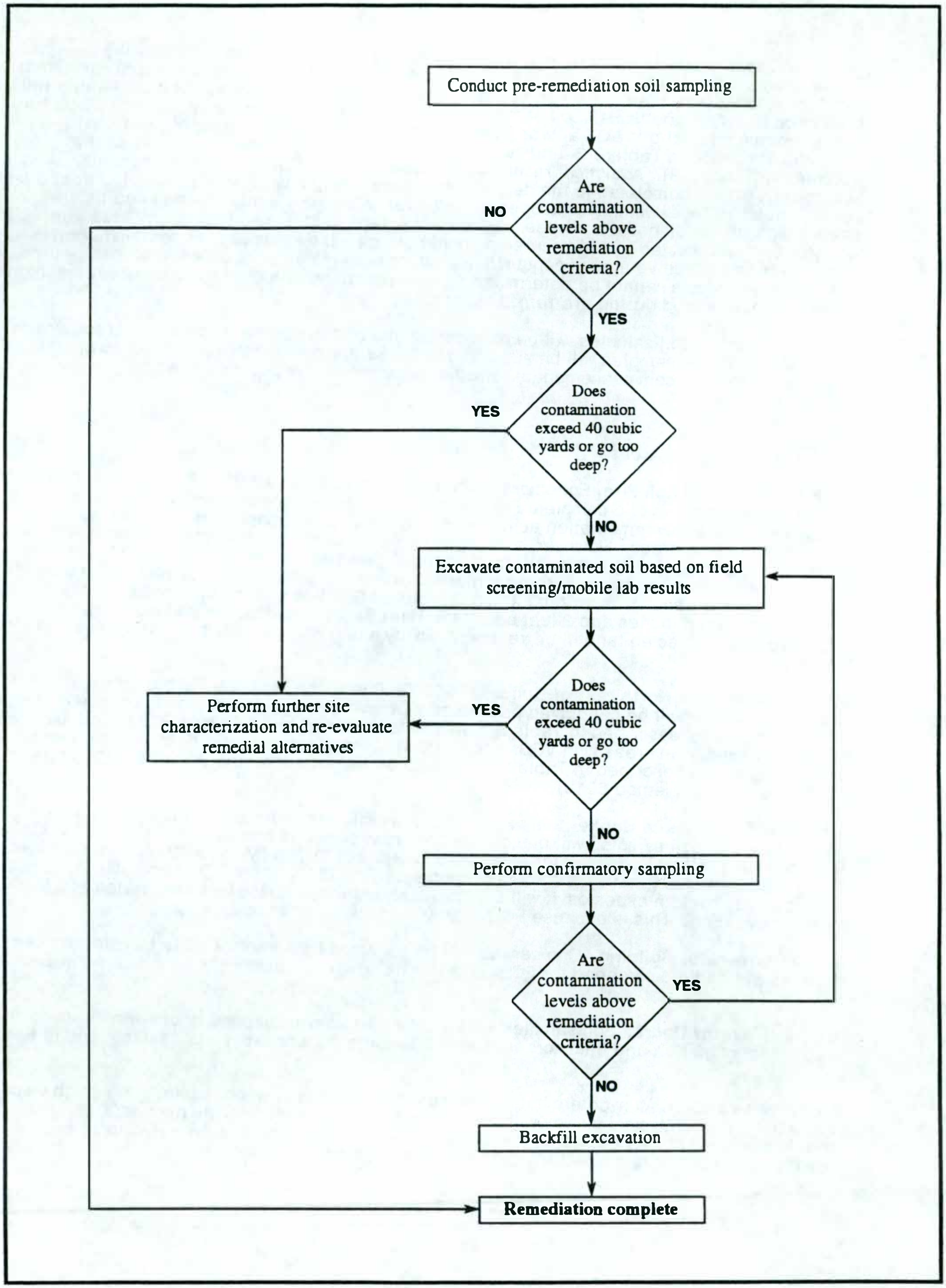


Figure 3-5. Hanford 1100 Area Spills and Surface Disposal Areas Schematic of Sampling/Remediation Program.



In areas where contaminants are known, samples will be field screened for the presence of contaminants, as detailed in Section 5.5. Field screening will focus on contaminants consistent with the history of the area. In areas where the contaminants are unknown, field screening will be performed for VOCs and PCBs. Soil samples will be collected as described in Section 3.1.6.1 from areas contaminated above VOC and/or PCB cleanup levels (if they are present), or from the locations described in Table 3-3, and submitted to a laboratory for analysis (analytes are specified in Table 3-3). Analytical results will be used to characterize site contaminants. Most soil borings will be completed to the depth where contamination is no longer detected or to 3 feet below ground surface, whichever is deeper. However, where large quantities of liquids are associated with the disposal activities, borings will extend to at least 5 feet. For WMUs where all analytes can be detected by field screening, soil borings will be placed until contamination is no longer detected or the volume of contaminated material within an area exceeds 40 cubic yards. If one or more analytes cannot be determined by field screening, the lateral extent of contamination will not be determined during pre-remedial sampling.

Portions of soil samples will be composited into one sample for each site that requires remediation. These samples will be submitted to the selected waste treatment facility at least three weeks prior to commencement of remedial activities for the purpose of waste characterization.

3.1.7 Miscellaneous Areas

3.1.7.1 Discolored Soil Site, Ephemeral Pool, and Horn Rapids Landfill. These sites, located in EM-1, were the subject of a complete RI/FS in 1993. Therefore, these sites are sufficiently characterized to allow remediation activities to begin. No pre-remediation activities will be conducted in these areas. However, at least three weeks prior to remediation, samples will be collected for landfill or incinerator characterization. Samples will be collected at 20-foot intervals and composited into one sample from each area. These samples will be collected from a depth of 6 inches below ground surface (bgs) at the Discolored Soil Site and the Ephemeral Pool and at a depth of between 6 inches and 2 feet bgs at the Horn Rapids Landfill. This sample will be submitted to the selected landfill or treatment facility along with all analytical data generated for the area.

3.1.7.2 Mound Site Northwest of Building 6652-G. Due to the potential for buried objects in this site, an EM survey will be conducted prior to other activities. After the survey is complete, the site will be sampled as described in Table 3-3, and field screened for VOCs and PCBs. Soil samples will be collected from areas with VOCs and/or PCBs above cleanup levels (if they are present) or from the locations described in Table 3-3, and will be submitted for analysis of SVOCs (Method 8270) and metals (Method 6010).

3.1.7.3 H-52-L Missile Bunker Sump. An EM survey will be conducted in this area to detect buried objects. Soil samples will be collected in areas of debris and field screened for VOCs and TPH. Samples will be submitted for laboratory analysis of SVOCs (Method 8270), metals (Method 6010), and asbestos (phase contract light microscopy (PCLM)). If the PCLM analysis indicates that a sample may contain asbestos, it will then be analyzed for asbestos by transmission electron microscopy (TEM). This is because PCLM can yield false positive results.

3.1.7.4 Generator Building. One sample will be collected from each of three transformer pads. Samples will be field screened for PCBs and TPH using immunoassay kits as indicated in Section 5.5.

3.1.7.5 Elevator Doors. Soil samples will be collected from around the doors and in areas of visible contamination and field screened for PCBs using immunoassay kits as described in Section 5.5.

3.1.7.6 Site 600-2. After determining the location of this site, it will be given a thorough visual inspection. A geophysical survey will then be performed with the specific method(s) dependent on what is observed during the visual inspection. After the geophysical survey is completed, the need for additional site characterization will be evaluated.

3.2 REMEDIATION ACTIVITIES

The following sections discuss remediation activities at sites where contaminants are detected above cleanup levels during the pre-remedial sampling, UST sites where tanks need to be removed, and EM-1 sites. Sites outside of EM-1 and where no USTs are present will not be remediated if contaminants are not detected above cleanup levels during the pre-remedial sampling.

3.2.1 Underground Storage Tanks and Aboveground Storage Tanks

During remediation, the following actions will be implemented: all in-place USTs and ancillary piping will be excavated and disposed, any out of service ASTs will be demolished and disposed, and sites found to be contaminated during pre-remedial activities will be excavated.

During excavation of USTs and contaminated sites, all visibly contaminated soil, soil with headspace readings that are indicative of contamination above cleanup levels, and soil determined to be contaminated during pre-remedial sampling will be removed. Excavated materials will be stockpiled prior to treatment or disposal in lined containers or stockpiled on liners that are shaped to prevent runoff. After the initial removal, field screening for TPH will be performed if appropriate. Excavation will continue until the excavation is free of visible contamination and field screening and headspace results indicate no contaminants are present above cleanup levels. At this point, confirmation samples will be collected from each side and the bottom of the excavation. At a minimum, at least one sample will be collected from each wall and the base of the excavation. These samples will be collected from the area of each wall and the base that was adjacent to areas of contamination within the excavation. Confirmation samples also will be collected from the bottom of any trenches that held ancillary piping. Confirmation samples will be analyzed by the mobile laboratory by Method 8010 (if chlorinated solvents are present above action levels) and/or Method 8020 (if petroleum-based solvents are present above action levels) and/or the appropriate WTPH method (if TPH levels are above action levels). Ten percent of the samples will be sent to an off-site laboratory as a QA/QC check on the mobile laboratory results.

If contamination above cleanup levels is determined to exceed 40 cubic yards of soil or reaches a depth below ground surface that cannot safely be excavated, excavation will cease. In this event, the site will require further characterization and re-evaluation of remedial alternatives.

In the event confirmation sampling reveals a wall or the base of the excavation to be contaminated over cleanup levels, the wall or base will be further excavated. After overexcavation, confirmation sampling will be performed. This process will continue until the excavation is determined to be free of contaminants over cleanup levels or until the conditions in the previous paragraph are met.

Excavations that are shown to be free of contaminants over the cleanup levels listed in Table 2-1 will be backfilled. Backfill material will consist of treated soil from the excavation and/or clean fill material.

Contaminated soil will be disposed of off-site in a RCRA-permitted Subtitle C hazardous waste landfill. When contaminated soils are landfilled, an equal volume of clean fill material will be obtained to replace the landfilled material. A representative sample of clean fill material will be analyzed for the presence of VOCs, SVOCs, pesticides/PCBs, and metals. The material will not contain any hazardous constituents at concentrations over cleanup levels defined by the State of Washington Model Toxics Control Act (MTCA).

3.2.2 Concrete Pads

If the results of soil sampling (as described in Section 3.1.2) indicate that contaminants are present above cleanup levels, the pad and surrounding contaminated soil will be excavated. Excavated materials will be stockpiled prior to treatment or disposal in lined containers or stockpiled on liners that are shaped to prevent runoff. After all visually contaminated soil and soil determined to be contaminated above cleanup levels by pre-remedial sampling is removed, field screening will be conducted on the subsequently excavated soil. Field screening will be for PCBs or TPH (as is appropriate). At the Acid Drainage Pit, field screening may be conducted for TPH, and metals can be analyzed by a mobile laboratory depending on whether these compounds were detected above cleanup levels in the pre-remedial sampling. Analyses and field screening of samples from the JA Jones Steam Plant Drain Pad will be dependent on what was detected during the pre-remedial sampling. Excavation will continue until field screening indicates no contaminants are present above cleanup levels. At this point, confirmation samples will be collected from each side and the bottom of the excavation. At a minimum, one sample will be collected from each wall and the base of the excavation. These samples will be collected from the area of the wall and base that was adjacent to contaminated areas in the excavation. Confirmation samples will be analyzed by the mobile laboratory if possible, or sent to an off-site laboratory for analyses on a 24-hour turnaround to certify that the excavations are free of contaminants above cleanup levels (a two-week turnaround is acceptable at IU-1 sites). Ten percent of samples analyzed by the mobile laboratory will also be analyzed by an off-site laboratory. Analyses of confirmation samples will consist of contaminants determined to be present above cleanup levels during pre-remedial activities.

If contamination above cleanup levels is determined to exceed 40 cubic yards of soil or reaches a depth below ground surface that cannot safely be excavated, excavation will cease. In this event, the site will require further characterization and re-evaluation of remedial alternatives.

In the event confirmation sampling reveals a wall or the base of the excavation to be contaminated over cleanup levels, the wall or base will be further excavated. After overexcavation, confirmation sampling will be performed. This process will continue until the excavation is determined to be free of contaminants over cleanup levels or until the conditions established in the previous paragraph are met.

Excavations determined by confirmation sampling to be free of contaminants at concentrations over cleanup levels will be backfilled. Backfill material will consist of treated soil from the excavation and/or clean fill material.

Contaminated soil will be disposed off site in a RCRA-permitted Subtitle C hazardous waste landfill. TSCA regulated PCB-contaminated soil will be disposed off site in a TSCA-approved landfill. An equal volume of clean fill material will be obtained to replace the landfilled material. The clean fill material will be analyzed for the presence of VOCs, SVOCs, pesticides/PCBs, and metals. The clean fill material will not contain any hazardous constituents at concentrations over those defined by MTCA.

3.2.3 Groundwater

The location and construction of the monitoring wells near the George Washington Way Diagonal will be specified in the remedial design. Groundwater samples will be collected quarterly during the first year. The monitoring frequency during later years will be specified in the remedial design. Samples will be analyzed for VOCs by Method 8240. No remediation activities will be conducted at this time. Groundwater sampling procedures are described in Section 5.4.

3.2.4 Drain Fields

If the results of field screening and sampling (as described in Section 3.1.4) indicate that contaminants are present above cleanup levels, the drain field and surrounding contaminated soil will be excavated. Excavated materials will be stockpiled prior to treatment or disposal in lined containers or stockpiled on liners that are shaped to prevent runoff. During excavation, samples will be collected and headspace analyses performed for the presence of VOCs. At the point when all soil determined to be contaminated above cleanup levels by pre-remedial sampling, all visibly contaminated soil, and soil where VOCs are likely to be present above cleanup levels (as determined by headspace analyses) has been removed, confirmation samples will be collected for analysis in a mobile laboratory by Method 8010 (if chlorinated solvents are present above action levels) and/or Method 8020 (if petroleum-based solvents are present above action levels). Confirmation samples will be collected from each side and the bottom of the excavation. At a minimum, one sample will be collected from each wall and the base of the excavation. These samples will be collected from the area of the wall and base that was adjacent to contaminated areas in the excavation. Ten percent of confirmation samples will also be sent to an off-site laboratory for analysis.

If contamination above cleanup levels is determined to exceed 40 cubic yards of soil in a given section of a drain field, or reaches a depth below ground surface that cannot safely be excavated, excavation will cease. In this event, the site will require further characterization and re-evaluation of remedial alternatives.

In the event confirmation sampling reveals a wall or the base of the excavation to be contaminated over cleanup levels, the wall or base will be further excavated. After overexcavation, confirmation sampling will be performed. This process will continue until the excavation is determined to be free of contaminants over cleanup levels or until the conditions established in the previous paragraph are met.

Excavations determined by confirmation sampling to be free of contaminants at concentrations over cleanup levels defined in Table 2-1 will be backfilled. Backfill material will consist of treated soil from the excavation and/or clean fill material.

Contaminated soil will be disposed of in a Subtitle C hazardous waste landfill. For contaminated soils that are landfilled, an equal volume of clean fill material will be obtained to replace the landfilled material. In this case, the clean fill material will be analyzed for the presence of VOCs, SVOCs, pesticides/PCBs, and metals. The clean fill material will not contain any hazardous constituents at concentrations over the levels set by MTCA.

3.2.5 Landfills

If the results of field screening and sampling (as described in Section 3.1.5) indicate contaminants are present above cleanup levels, the contaminated soil will be excavated. Excavated materials will be stockpiled prior to treatment or disposal in lined containers or stockpiled on liners that are shaped to prevent runoff. During excavation, samples will be collected and subjected to headspace analysis if VOCs are known to be a contaminant. When no VOCs are detected by the headspace analysis at levels likely to be above cleanup levels, field screening appropriate to the contaminants detected by pre-remedial samples will be performed. If the field screening indicates contamination is below cleanup levels, confirmation samples will be collected from each side and the bottom of the excavation. At a minimum, one sample will be collected from each wall and the base of the excavation. These samples will be collected from the area of the walls and base that was adjacent to contaminated areas in the excavation. Samples will not include debris, so that samples will be representative of the landfill proper. Confirmation samples will be analyzed by a mobile laboratory if possible, or sent to an off-site laboratory to certify that the excavations are free of contaminants above cleanup levels with a two-week turnaround time. These analyses will consist of analytes detected above cleanup levels during pre-remedial sampling.

If contamination is determined to reach a depth below ground surface that cannot safely be excavated or if a given section of the landfill contains over 40 cubic yards of material above cleanup levels, excavation will cease. In this event, the site will require further characterization and re-evaluation of remedial alternatives.

In the event confirmation sampling reveals a wall or the base of the excavation to be contaminated over cleanup levels, the wall or base will be further excavated. After overexcavation, confirmation sampling will be performed. This process will continue until the excavation is determined to be free of contaminants over cleanup levels or until the conditions established in the previous paragraph are met.

Excavations determined by confirmation sampling to be free of contaminants at concentrations over cleanup levels will be backfilled. Backfill material will consist of treated soil from the excavation and/or clean fill material.

Contaminated soil will be disposed of in a Subtitle C hazardous waste landfill. When contaminated soils are landfilled, an equal volume of clean fill material will be obtained to replace the landfilled material. In this case, the clean fill material will be analyzed for the presence of VOCs, SVOCs, pesticides/PCBs, and metals. The clean fill material will not contain any hazardous constituents at concentrations over those defined by MTCA.

3.2.6 Spills and Surface Disposal Areas

If the results of field screening and sampling (as described in Section 3.1.6) indicate that contaminants are present above cleanup levels, the contaminated soil will be excavated. Excavated materials will be stockpiled prior to treatment or disposal in lined containers or stockpiled on liners that are shaped to prevent runoff. Initially, all soil determined by pre-remedial sampling to be contaminated above cleanup levels and all visibly contaminated soil will be removed. Headspace analyses and field screening will be conducted to guide additional removal. Field screening will be appropriate for analytes detected above cleanup levels during pre-remedial sampling. Excavation will continue until field screening results indicate contaminants are not present above action levels. At this point, confirmation samples will be collected from each side and the bottom of the excavation. At a minimum, one sample from each wall and the base of the excavation will be collected. These samples will be collected from the area of the wall and the base that was adjacent to contaminated areas within the excavation. Confirmation samples will be analyzed by a mobile laboratory if possible, or sent to an off-site laboratory to certify that the excavations are free of contaminants above cleanup levels. Analyses will be performed within 24 hours of the laboratory receiving the sample (two weeks is acceptable for IU-1 sites). These analyses will consist of analytes detected above cleanup levels during pre-remedial sampling.

If contamination above cleanup levels is determined to exceed 40 cubic yards of soil or reaches a depth below ground surface that cannot safely be excavated, excavation will cease. In this event, the site will require further characterization and re-evaluation of remedial alternatives.

In the event confirmation sampling reveals a wall or the base of the excavation to be contaminated over cleanup levels, the wall or base will be further excavated. After overexcavation, confirmation sampling will be performed. This process will continue until the excavation is determined to be free of contaminants over cleanup levels or until the conditions established in the previous paragraph are met.

Excavations determined by confirmation sampling to be free of contaminants at concentrations over cleanup levels will be backfilled. Backfill material will consist of treated soil from the excavation and/or clean fill material.

Contaminated soil will be disposed of in a Subtitle C hazardous waste landfill. TSCA regulated PCB-contaminated soil will be disposed of off site in a TSCA-approved landfill. When contaminated soils are landfilled, an equal volume of clean fill material will be obtained to replace the landfilled material. In this case, the clean fill material will be analyzed for the presence of VOCs, SVOCs, pesticides/PCBs, and metals. The clean fill material will not contain any hazardous constituents at concentrations over MTCA levels.

3.2.7 Miscellaneous Areas

3.2.7.1 Discolored Soil Site and Ephemeral Pool. These sites will be remediated as detailed in Section 3.2.6. Since field screening methods are not available for bis(2-ethylhexyl)phthalate (BEHP), excavation will continue until all visually contaminated soil is removed. Confirmation samples will be collected (one from each excavation wall and one from the base) for off-site analysis by EPA Method 8060 on the shortest turnaround time possible. If BEHP is detected over the cleanup level, the contaminated wall or base will be overexcavated and re-sampled. Field screening for PCBs will be conducted during excavation of the Ephemeral Pool with a detection limit of 1 mg/kg. Confirmation samples will be collected form each end of the excavation and every 50 yards from each side and the bottom of the excavation. Confirmation samples will be analyzed by Method 8080 by an on-site laboratory with a 24-hour turnaround time.

3.2.7.2 Horn Rapids Landfill. The PCB-contaminated landfill cell will be excavated, following the steps detailed in Section 3.2.6. Field screening for PCBs will be conducted to guide excavation. When field screening indicates the concentration of PCBs in the soil is 5 mg/kg or less, excavation will stop and confirmation samples will be collected for analysis by an on-site laboratory using Method 8080 with a 24-hour turnaround time. After remediation of the PCB-contaminated soil is complete, the landfill will be capped.

3.2.7.3 Mound Site Northwest of Building 6652-G. This site will be remediated as described in Section 3.2.6, using analyses consistent with the results of the pre-remedial activities.

3.2.7.4 H-52-L Missile Bunker Sump. Remediation methods will be determined by results of pre-remedial activities. The building will eventually be demolished. Any contamination will be excavated and disposed of accordingly. Field screening will be performed for PCBs and/or TPH. Confirmation samples will be collected and analyzed for WTPH-418.1 depending on which analytes were above cleanup levels in pre-remedial sampling.

3.2.7.5 Generator Building. Remediation methods will be determined by results of pre-remedial activities. The building will eventually be demolished. Any contamination will be excavated and disposed of accordingly. TSCA regulated PCB-contaminated soil will be disposed of off site in a TSCA-approved landfill. Confirmation samples will be collected if necessary.

3.2.7.6 Elevator Doors. If results of pre-remedial sampling indicate the presence of PCBs over cleanup levels, the PCB contaminated materials will be excavated and disposed in a TSCA-approved landfill. Confirmation samples will be collected if necessary.

3.2.7.7 Site 600-2. Remediation sampling will be evaluated after the visual inspection and geophysical survey have been completed.

4.0 SAMPLE DESIGNATION PROCEDURES

4.1 GEOPHYSICAL SURVEY

As described in Section 3.0, geophysical surveys will be performed based upon a grid system. Although no actual samples will be collected during a geophysical survey, data collected will be logged electronically in a data collector/recorder or in a field logbook. A description of the location of the survey point will be noted along with the results of each geophysical survey.

4.2 SOIL GAS SURVEY

Soil gas surveys will be performed as described in Section 3.0. Each sample will be clearly labeled with a unique designation as described herein. All soil samples shall be labeled with the operable unit of origin (i.e., EM1, EM2, EM3, or IU1), followed by a site designation number. Operable unit and site designation numbers are listed in Table 4-1. Following the operable unit and site designation number, the sample designation shall contain an 'SG' designation to indicate the sample is a soil gas sample. Each sample will be assigned a sample number, and this number will be followed by the depth measured with respect to ground surface. The position of the sample shall be referenced to a permanent landmark. The landmark and the position of the sample with respect to the landmark will be recorded in the field logbook. The location of sample will also be staked, with the sample number recorded on the stake.

As an example, the sample designation for the second soil gas survey sample collected from Building 6652-C Abandoned USTs in Operable Unit 1100-IU-1, with the samples at a depth of 3 feet below ground surface would be as follows:

IU1-06-SG-2-3

4.3 SOIL SAMPLES

Each soil sample will be clearly labeled with a unique designation as described in this section. Two types of soil samples will be collected during remedial activities: pre-remedial samples and confirmatory samples. All soil samples shall be labeled with the operable unit of origin (i.e., EM1, EM2, EM3, or IU1), followed by a site designation number, as listed in Table 4-1. Following the operable unit and site designation number, the sample designation shall indicate if the sample is pre-remedial (P) or confirmatory (C). Also included in the sample designation shall be the boring number and depth of sample collection. The location of each sample will be recorded in the log book. For pre-remedial samples, the location shall be referenced to a permanent landmark adjacent to the site as an origin. For confirmatory samples, the location of sample collection shall be referenced to the most northern and western corner of the excavation. The location of pre-remedial samples will be staked. The northwest corner of each excavation will also be staked. Stakes will be marked with the sample number for pre-remedial samples.

As an example, the sample designation assigned to the first pre-remedial soil sample collected from the 1240 French Drain in Operable Unit 1100-EM-3, three feet below ground surface would be as follows:

EM3-02-P-1-3

4.4 GROUNDWATER SAMPLES

Each groundwater sample collected in association with the remediation of the 1100 Area at Hanford shall be labeled with the well number. For example, a groundwater sample collected from monitoring well MW-5 would have a sample designation of MW-5. The date will be noted separately on the chain-of-custody form.

TABLE 4-1. Sample Designation Summary.

Site Designation	Sample Designation
Operable Unit 1100-EM-1	
Discolored Soil Site	EM1/01
Ephemeral Pool	EM1/02
Horn Rapids Landfill	EM1/03
Site 600-2	EM1/04
Operable Unit 1100-EM-2	
Tar Flow Area	EM2/01
Stained Sands Area	EM2/02
Neptune's Potato and Separator Tank	EM2/03
Operable Unit 1100-EM-3	
1240 Suspect Spill Area	EM3/01
1240 French Drain	EM3/02
1226 Suspect Waste Oil Disposal Area	EM3/03
1212/1217 Suspect Battery Acid Disposal Area	EM3/04
1218 Service Station	EM3/05
1262 Solvent Tanks	EM3/06
1262 Transformer Pad	EM3/07
JA Jones Oil Storage Tanks	EM3/08
JA Jones Steam Plant Drain Pad	EM3/09
Operable Unit 1100-IU-1	
6652-C SSL Active Septic System	IU1/01
6652-C SSL Inactive Septic System	IU1/02
Radar Berm and Pads	IU1/03
H-52-C Surface Gas Tank Area	IU1/04
Control Center Disposal Pits	IU1/05
Building 6652-C Abandoned USTs	IU1/06
Pumphouse Disposal Slope	IU1/07
Pumphouse Latrine 1500 Gallon Fuel Oil Storage Tank	IU1/08
Pumphouse Latrine 275 Gallon Fuel Oil Storage Tank	IU1/09
665 ALE Field Storage Building Septic System	IU1/10
Mound Site Northwest of Building 6652-G	IU1/11
6652-I ALE Headquarters Septic System	IU1/12
Abandoned Underground Storage Tanks	IU1/13
H-52-L Missile Bunker Sump	IU1/14
Missile Bunker Landfill	IU1/15
Missile Refueling Area Berm	IU1/16
Acid Neutralization Pit	IU1/17
Missile Refueling JP-4 Fueling Area	IU1/18
Missile Assembly and Test Building Inactive Septic System	IU1/19
Missile Maintenance and Assembly Area Acid Storage Shed	IU1/20
JP-4 Fuel Pad	IU1/21
Missile Bunker Drainfield	IU1/22
Missile Bunker Discharge Ditch	IU1/23
Main Entrance Stained Soil	IU1/24
H-52-L Surface Gas Tank Storage Area	IU1/25
Generator Building	IU1/26
Horseshoe Site	IU1/27
Elevator Doors	IU1/28
Flammable Storage Block Shed	IU1/29
Missile Maintenance and Assembly Area Dry Well Drum	IU1/30
H-52-L NIKE Base Landfill	IU1/31

4.5 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) SAMPLES

4.5.0.1 Trip Blanks. Trip blanks will be designated "TB" followed by the operable unit number and the date. A trip blank for a cooler from Operable Unit 1100-EM-3 being shipped on January 9, 1994 would have a sample designation as follows:

TB-EM3-01-09-94

In the event that a cooler contains samples from two operable units, the sample designation shall indicate such. For example, a trip blank for a cooler from Operable Units 1100-EM-2 and 1100-EM-3 being shipped on March 8, 1994 would have a sample designation as follows:

TB-EM2,3-03-08-94

4.5.0.2 Equipment Blanks. Equipment blanks will be designated the same sample identification as the sample collected immediately before the equipment blank preceded by the designation 'EB' for equipment blank. For an equipment blank collected immediately after the soil sample illustrated in Section 4.3, the sample designation would be:

EB-EM3-02-P-1-3

4.5.0.3 Blind Duplicate and Replicate Samples. Analyses by an off-site laboratory of blind duplicate and replicate samples for groundwater and soil will be labeled in the same manner as environmental samples, but with a fictitious identification. The laboratory should not be able to identify the sample as a blind duplicate. The proper sample identification will be indicated in the field log book.

4.5.0.4 Field Duplicate Samples. To check the reproducibility of measurements, duplicate samples (or measurements) will be taken for soil gas and field screening samples, and for samples analyzed by a mobile laboratory. These samples will be labeled identically to the primary environmental sample followed by a "D". For example, a duplicate of the soil gas sample described in Section 4.2 would be designated:

IUI-06-SG-2-3D

4.5.0.5 Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples. MS/MSD samples will be labeled identically to the environmental sample followed by "MS" or "MSD". For the groundwater sample described in Section 4.4, the designations would be MW-5MS and MW-5MSD.

4.6 HEIS NUMBER

In addition to the sample designations described above, each sample must be clearly labeled with a Hanford Environmental Information System (HEIS) number. One week prior to each sample round, the contractor shall contact one of the following people to obtain HEIS numbers for each sample to be collected:

Roger D. Price
Westinghouse Environmental Data Management Group
(509) 372-2637

Briana M Colley
Hanford Analytical Services Management Group
(509) 372-2775

Extra numbers should be obtained to allow for unplanned samples to be collected in the field.

5.0 SAMPLING EQUIPMENT AND PROCEDURES

5.1 GEOPHYSICAL SURVEY

Geophysical survey procedures are generally described in the following paragraphs. Specific references are provided in Section 4.0 of the Quality Assurance Project Plan (QAPjP), which is Appendix B of this document. In addition to the listed procedures, an explosive ordnance technician will clear all landfills for explosive ordnance.

5.1.1 Electromagnetic Survey

5.1.1.1 Introduction. Electromagnetic (EM) surveys will be conducted in areas suspected of containing buried metallic wastes (i.e., buried drums or underground storage tanks). An EM survey typically utilizes an electromagnetic field generated at the ground surface. This electromagnetic field induces secondary electromagnetic fields in the earth, which are measured at the surface. Fluctuations in the secondary electromagnetic fields are indicative of differing materials under the surface. In this way, areas containing buried metallic objects may be located by anomalous readings. EM surveys can typically scan to a depth of 10 to 20 feet.

5.1.1.2 Procedures. General procedures for performing an EM survey will be in accordance with the procedures cited in Section 4.0 of the QAPjP. Specific instrument calibration and operation procedures will be in accordance with the manufacturer's instructions. Readings will be taken at evenly spaced intervals along grid lines placed over the area under investigation. Data collected from readings will be graphed to allow interpretation of areas displaying anomalous readings that may be indicative of buried metallic objects.

5.1.2 Ground Penetrating Radar

5.1.2.1 Introduction. GPR is a method that provides a continuous, high resolution cross-section depicting variations in the electrical properties of the shallow subsurface. This method is particularly sensitive to variations in electrical conductivity and electrical permitivity (the ability of a material to hold a charge when an electrical field is applied). The system operates by continuously radiating an electromagnetic pulse into the ground from a transducer (antenna) as it is moved along a traverse. Since most of the earth materials are transparent to electromagnetic energy, only a portion of the radar signal is reflected back to the surface. When the signal encounters a metal object, however, all of the incident energy is reflected. The reflected signals are received by the same transducer and are printed in cross-section form on a graphical recorder. The resulting records can provide information regarding stratification, the thickness and extent of fill material, the location of buried objects, changes in material conditions such as saturation, and changes in subsurface chemistry where this is reflected by varying electrical properties.

5.1.2.2 Procedures. General procedures for performing a GPR surveys will be in accordance with the procedures cited in Section 4.0 of the QAPjP. Specific instrument calibration and operation procedures will be in accordance with the manufacturer's instructions. Equipment calibration will be conducted at regular intervals according to the manufacturer's instructions. The GPR locations will be in areas where EM anomalies were detected, and (if necessary), to define the boundaries of drain fields. When used in conjunction with an EM survey, the survey locations will focus on the location and orientation of the EM anomaly. The location of features causing the EM anomaly will then be determined.

5.1.3 Resistivity Survey

5.1.3.1 Introduction. A resistivity survey will be utilized to determine if there has been a release from the landfills at IU-1, and (if necessary), to define the boundaries of drain fields. Resistivity surveys define electrical resistivity of materials in the subsurface and are sensitive to the conductivity of soil and groundwater in subsurface pore spaces. The conductivity is influenced by the concentration of dissolved solids (higher conductivity is indicative of higher dissolved solids concentrations). Since landfill leachate frequently contain high dissolved solids, a release from a landfill can be approximately mapped through a resistivity survey.

Typically, resistivity surveys contain two components. A frequency domain electromagnetic conductivity survey (FDEM) is first conducted to delineate the lateral extent of the dissolved solids plume. A time domain electromagnetic survey (TDEM) is then conducted at discrete locations within the lateral area of the plume to determine the depth to the plume. Both components of the survey utilize a primary magnetic field to induce electrical currents in the subsurface. These electrical currents generate a secondary magnetic field, which is measured at the surface. The intensity of currents and their associated secondary magnetic fields are a function of the conductivity of the materials in the subsurface.

5.1.3.2 Procedures. Surveys may be conducted by equipment on the ground surface or with probes installed to a predetermined depth. The general procedures for the resistivity survey will be in accordance with the methods cited in Section 4.0 of the QAPjP developed by CENPW for the Hanford Site. Specific instrument calibration and operation procedures will be in accordance with the manufacturer's instructions. Readings will be taken at evenly spaced intervals along grid lines placed over the area under investigation. For landfills, background readings will also be collected in areas known to be uncontaminated. Data collected from readings in landfill areas will be compared to background readings to allow interpretation of areas displaying anomalous readings that may be indicative of higher than background dissolved solids content. A sharp change in resistivity may indicate the boundary of drain fields.

5.2 SOIL GAS SURVEYS

5.2.0.1 Introduction. Soil gas surveys collect soil pore air from the unsaturated zone and analyze it for selected volatile organic compounds. An explosive ordnance technician will clear all landfill sampling locations for explosive ordnance prior to sampling.

5.2.0.2 Sample Collection Procedures. Samples will be collected in accordance with the soil gas procedures detailed in Section 4.0 of the QAPjP.

5.2.0.3. Equipment Decontamination. Equipment decontamination shall follow procedures detailed in the soil gas survey procedure.

5.2.0.4 Sample Analysis. Sample analysis will be performed by a portable gas chromatograph (GC) with a flame ionization detector and either a Hall electrolytic conductivity detector or an electron capture detector. This instrument will be operated in a mobile trailer with a controlled temperature environment. A photoionization detector will not be used unless it is equipped with a lamp capable of ionizing 1,1,1-trichloroethane. The carrier gas in the GC will either be helium or nitrogen, and it will flow at a rate appropriate to the column composition and temperature.

5.2.0.5 QA/QC Procedures. Minimum laboratory QA/QC procedures to be implemented will include analyzing syringe blanks, running duplicate analyses on selected samples, and calibrating the instrument response with known standards. Syringes will be cleaned after each use. Syringe blanks will consist of ambient air or nitrogen that has been drawn into a decontaminated syringe and then injected into the gas chromatograph and analyzed. The detection of contaminants (beyond what is present in ambient air) will require that the syringe be cleaned and another syringe blank be analyzed. Syringe blanks will be analyzed until the results indicate that the syringe is free of contamination. Syringe blanks will be analyzed for at least 20 percent of the samples.

Duplicate analyses will be run on at least 10 percent of the samples. Precision must be better than 35 percent as calculated using the following formula:

$$\text{Precision} = \frac{|A-B|}{[A+B]/2} \times 100 \qquad \text{Equation 5}$$

where A and B are the two measurement results. Duplicate samples with poor precision will require troubleshooting the analytical system and/or reanalyzing the samples.

Instrument calibration will be performed at the beginning of each day. Calibration may involve the direct use of gas standards or the gas standards may be prepared daily from liquid or aqueous standards. The gas standards will be analyzed at least three times at the beginning of each day to determine the mean response factor of the analytical system. If the response factor varies by greater than ± 25 percent, then appropriate measures will be taken to correct the circumstances causing the variability. Continuing calibration checks will be performed at a minimum of after every tenth sample and whenever the analyst is suspicious that the detector response has changed. If the response factor has changed more than 25 percent, a new response factor will be calculated based on the results of two additional standard injections.

Minimum field QA/QC samples will include ambient air and equipment blanks, and field duplicate samples. Ambient air samples will be collected by allowing ambient air to enter (or in the case of the gas syringe or three layer carbon sorption tube, drawing air into) the sample collection media. An equipment blank will be collected by passing ambient air or nitrogen through the sampling equipment and then collecting the air into the appropriate sample container. One equipment and one ambient air blank will be collected per day.

Field duplicate samples will constitute two samples collected sequentially while the soil gas probe remains in one location. One field duplicate will be collected for every ten environmental samples.

5.3 SOIL SAMPLING

Soil sampling procedures are described in the following paragraphs for pre-remedial sampling (including both borings and test pits) and confirmational sampling. Also described are sample labeling, QA/QC, and headspace analysis procedures. An explosive ordnance technician will clear all sampling locations for explosive ordnance prior to sampling.

5.3.1 Pre-Remedial Soil Boring Equipment

Depending on the anticipated depth of contamination at a site, soil borings will be performed with a stainless steel hand auger, an excavator (i.e., backhoe or equivalent), or a drill rig equipped with a hollow stem auger. In areas where contamination is expected to be confined to the upper 5 to 10 feet of soil (depending on soil conditions), a stainless steel hand auger will be used to advance boreholes and collect samples. In the event a hand auger cannot be used due to subsurface conditions, an excavator may be used to advance boreholes. An excavator may also be used for boreholes up to the maximum depth that can be safely reached by the excavator arm. In the areas where contamination is expected to extend beyond a depth of 10 feet, a drill rig with a hollow stem auger may be used to advance boreholes in lieu of a hand auger or excavator.

5.3.1.1 Pre-Remedial Soil Sampling Procedures. Samples will be collected in accordance with procedures detailed in Section 4.0 of the QAPjP.

5.3.1.2 Equipment Decontamination. Equipment decontamination shall follow procedures detailed in Section 4.0 of the QAPjP. In addition, excavators will be decontaminated as follows. Any large soil deposits will be scraped off with a shovel. The excavator will then be decontaminated with a high pressure steam cleaner. Only the portions of the excavator contacting the soil will require decontamination. All decontamination procedures will be conducted over a temporary decontamination pad which will be shaped to contain all fluids generated during the process.

5.3.1.3 Disposal of Drill Cuttings, Soil from Test Pits, and Decontamination Fluids. Drill cuttings will be containerized in lined containers or drums. Samples collected from boreholes will be used to characterize the drill cuttings for disposal. If analytical data from these samples indicates the soil is not contaminated at concentrations above MTCA levels, then the cuttings will be disposed of on-site. In the event the soil is found to be contaminated over MTCA levels, then the Contracting Officer will be contacted for direction on disposal. Soil from the test pits will be used for backfill in a manner such that the soil is buried in approximately the same order as before it was excavated. Decontamination fluids will be sampled and analyzed for the constituents of concern for the site where the fluids were generated. If analytical data from these samples indicates the fluids are not contaminated at concentrations above MTCA levels, then the fluids will be disposed of on-site. In the event the fluids are found to be contaminated over MTCA levels, then the Contracting Officer will be contacted for direction on disposal.

5.3.2 Pre-Remedial Test Pit Sampling Equipment

To avoid placing personnel in an excavation, samples shall be collected from ground surface using the excavator bucket whenever possible. If possible, a core sampler (i.e., a split spoon sampler or equivalent) will be attached to the excavator bucket for use in collecting samples for VOC analysis. Samples for other analyses shall be collected directly with the excavator bucket. In the event samples cannot be collected with the excavator, samples shall be collected with a stainless steel hand auger or hand trowel. All measures will be taken to ensure the safety of personnel who enter an excavation. Under no circumstances will personnel enter an unshored, vertical-walled excavation greater than 4 feet deep.

5.3.2.1 Pre-Excavation Test Pit Sampling Procedures. Samples will be collected in accordance with surface sampling procedures detailed in Section 4.0 of the QAPjP.

5.3.2.2 Equipment Decontamination. Equipment decontamination shall follow procedures detailed in the applicable sampling procedures, except that excavation equipment will be decontaminated as described in Section 5.3.1.2.

5.3.3 Confirmational Sampling Equipment

In excavations of 4 feet or less in depth, or in deeper excavations with tapered sides, confirmatory samples will be collected with a stainless steel hand trowel or a stainless steel hand auger. Samples for VOC analysis will be collected with a hand driven core sampler (i.e., a split spoon sampler or equivalent). Vertical wall excavations greater than four feet in depth will require differing sample collection methods. To avoid placing personnel in these excavations, samples shall be collected from ground surface using the excavator bucket whenever feasible. If possible, the Contractor shall attach a core sampler to the excavator bucket for use in collecting samples for VOC analysis. Samples for other analyses shall be collected directly with the excavator bucket unless this approach is not feasible. In the event samples cannot be collected with the excavator, samples shall be collected with a stainless steel hand auger or hand trowel. All measures will be taken to ensure the safety of personnel who enter the excavation. Under no circumstances will personnel enter an unshored, vertical-walled excavation greater than four feet deep.

5.3.3.1 Confirmation Sampling Procedures. Samples will be collected in accordance with surface sampling procedures detailed in Section 4.0 of the QAPjP.

5.3.3.2 Equipment Decontamination. Equipment decontamination shall follow procedures detailed in the applicable sampling procedures, except that excavation equipment will be decontaminated as described in Section 5.3.1.2.

5.3.4 Sample Labeling

A complete set of sample labels will be marked with a waterproof ink marking pen and placed on each sample container prior to the collection of individual soil samples. Information on each sample label will include the sample designation, the date of sampling, project name, the HEIS number, the sampler's signature, and the parameters to be analyzed. The time of sampling will be filled in after sample collection.

5.3.5 Soil QA/QC Samples and Procedures

The following QA/QC samples will be collected during the soil sampling activities for laboratory analyses:

- Matrix spike/matrix spike replicate (MS/MSR)
- Blind replicate (BR)
- Split sample (for confirmation sampling only)
- Trip blank
- Source water blank
- Equipment rinsate blank.

The MS/MSR, BR, and split samples for all analyses except VOCs will be collected from the same material, using the same sampling procedures, and will be sent to the same laboratory as the original soil samples. QA/QC samples for VOC analysis will be collected from the same core sampler as regular VOC samples. Since core samplers typically contain four sleeves, an equal number of sleeves shall be collected from the core sampler for QA/QC samples as were collected for regular samples. BR samples will be collected at the rate of ten percent of all samples for each analyte class, while MS/MSR samples will be collected at the rate of five percent for each analyte class. Split samples will be collected at a rate of 10 percent for all confirmation samples.

Other QA/QC samples to be collected during the soil sampling program include trip blanks, source water blanks, and equipment rinsate blank samples. Source water is water brought on site for decontamination purposes. Source water blanks consist of source water poured directly into a sample container in the field, and are collected each time a new supply of source water is used. One trip blank will be included in each cooler containing VOC samples to be sent to the laboratory. Trip blanks are provided by the laboratory. One equipment rinsate blank will be collected for each 20 samples. Equipment blanks are collected after routine decontamination procedures have been performed by pouring distilled water over the sampling equipment and collecting it in appropriate water sampling containers. Analyses are the same as for normal analyses except that no VOC analyses are required due to the use of brass or aluminum sleeves. All QC samples will be preserved, handled, and transported in an identical manner as the soil samples, with the exception that equipment blanks, trip blanks, and source water blanks will be treated as water samples.

5.3.6 Headspace Analyses

At sites where VOCs are a concern, soil samples will be subject to headspace analysis with an organic vapor detector to determine which samples to field screen or submit for laboratory analysis. Organic vapor detectors may be photo- or flame-ionization detectors (PIDs of FIDs). Calibration procedures shall be in accordance with manufacturer's recommendations. Headspace screening is accomplished by filling a container (i.e., a jar or ziplock bag) about half full of soil. The container is closed and allowed to sit or is heated at a constant temperature for five minutes. Following this period, the PID or FID probe is inserted into the container and a reading is taken. The samples with the highest levels of VOCs will be submitted for further characterization.

5.4 GROUNDWATER SAMPLING

5.4.1 Groundwater Sampling Equipment

Monitoring wells will be sampled using dedicated stainless steel bladder pumps equipped with Teflon-lined polyethylene tubing. An electronic water level indicator will be used to measure the depth to ground water.

5.4.1.1 Sampling Procedures. Pre-sampling procedures, well evacuation, and sample collection shall follow the procedures detailed in Section 4.0 of the QAPjP. Purge water will be collected in containers (i.e., drums or tanks) at each well site. These containers will be labeled for the associated well. After receipt of analytical data stating that the groundwater at the well location (and therefore the purge water) is free of VOC contamination at concentrations greater than MTCA levels, the purge water will be discharged to the ground. In the event the groundwater is found to be contaminated, the Contracting Officer will be contacted for direction prior to discharge of the purge water.

5.4.1.2 Sample Labels. Sample container labels will be prepared using waterproof ink marking pens prior to sampling each well. The containers will be labeled with the date, well designation, project name, the HEIS number, collector's name and analysis type. After each sample is collected, the time of collection will also be written on the label. Clean sample containers will be stored in a cool environment, such as an ice chest, until immediately before sampling. This practice will minimize the potential for heat stored in sample bottles to warm the groundwater and promote analyte volatilization or biodegradation in the field.

5.4.1.3 Equipment Decontamination. Equipment decontamination shall follow procedures detailed in Section 4.0 of the QAPjP. Decontamination will only be required for the water level indicator due to the use of dedicated bladder pumps for sampling.

5.4.2 QA/QC Samples and Procedures

Quality Assurance/Quality Control (QA/QC) requirements for ground water are presented below. QA/QC samples including one blind duplicate and one matrix spike/matrix spike duplicate (MS/MSD) will be analyzed for each sampling round. These numbers meet EPA recommendations for 10 percent blind duplicates and five percent MS/MSDs. One VOC trip blank, prepared by the laboratory, will be included in each cooler containing VOC samples to be sent to the laboratory. However, they will only be analyzed if VOCs are detected in one of the samples in the cooler. Because dedicated bladder pumps will be used to collect the samples, equipment blank samples and source water blanks will not be necessary. All QA/QC samples will be preserved, handled, and transported identically to the primary field samples.

The blind duplicate sample consists of a sample collected at the same location and time as the original sample. Thus, four 40 ml vials will be collected for VOC analysis. The vials will be filled sequentially. Two of the containers will be labeled with the correct sample identification (the original sample name) and the other two containers will be labeled with a fictitious sample identification (the blind duplicate sample name). The samples will be sent to the same laboratory for analysis. MS/MSD samples will be collected in the same manner, except that only three bottles (the sample, the matrix spike, and the matrix spike duplicate) will be filled.

5.5 FIELD SCREENING

In order to expedite remediation of the Hanford 1100 Area, various field screening methods will be employed for preliminary determination of the presence and extent of contamination. Followed by confirmatory sampling, field screening will also be used as an indicator of when an area has been excavated to below remediation criteria. Various field screening techniques have been identified which may be applicable to contaminants of concern at the 1100 Area. Each of these methods is discussed below. The applicability of field screening to each site is summarized in Table 5-1.

5.5.1 Immunoassay Tests

Immunoassay is a technique for detecting and measuring a target compound or group of compounds using an antibody which binds only to that substance or group of substances. Based on the antibody's affinity for the analyte, immunoassay tests may be capable of detection to very low levels. Samples generally require little or no sample preparation since the antibodies are chemical-specific. Immunoassay tests are generally qualitative (i.e., they can indicate the absence or presence of a contaminant at a given level) or semi-qualitative (i.e., they can indicate the absence or presence of a contaminant within certain concentration limits). For contaminants of concern within the Hanford 1100 Area, immunoassay test kits are available for PCBs and petroleum hydrocarbons. Immunoassay test kits are available from EnSys Inc. and Millipore Corporation; they will be used to evaluate the presence of contamination, and, if contamination is found, to delineate the area of contamination above remediation criteria. Test procedures shall be as provided by the manufacturer, as noted in Section 4.0 of the QAPjP.

5.5.2 VOC Screening

VOC screening will be performed during pre-remedial sampling using the methods defined in Section 4.0 of the QAPjP. Samples will be prepared using a purge and trap scheme, and analyzed with a flame ionization detector and/or an electron capture detector.

TABLE 5-1. Field Screening Applications.

PCBs Immunoassay	Petroleum Hydrocarbons Immunoassay	Volatile Organic Compounds
EM-1 Ephemeral Pool Horn Rapids Landfill[(a)]	**EM-1**	**EM-1**
EM-2 Tar Flow Area Stained Sands Area	**EM-2**	**EM-2** Neptune's Potato and Separator Tank Tar Flow Area Stained Sands Area
EM-3 1262 Transformer Pad 1240 French Drain 1240 Suspect Spill Area	**EM-3** 1218 Service Station JA Jones Oil Storage Tanks 1226 Suspect Waste Oil Disposal Area	**EM-3** 1262 Solvent Tanks JA Jones Oil Storage Tanks Building 6652-C Abandoned USTs Pumphouse Latrine 1500 Gal Fuel Oil Storage Tank Pumphouse Latrine 275 Gal Fuel Oil Storage Tank Abandoned Underground Storage Tanks 1240 Suspect Spill Area 1226 Suspect Waste Oil Disposal Area 1212/1217 Suspect Battery Acid Disposal Area JA Jones Steam Plant Drain Pad
IU-1 Generator Building Elevator Doors Pumphouse Disposal Slope Missile Refueling Area Berm Main Entrance Stained Soil Flammable Bock Storage Shed/Missile Maintenance and Assembly Area Paint Shed Mound Site Northwest of Building 6652-G Control Center Disposal Pits Missile Maintenance and Assembly Area Acid Storage Shed	**IU-1** H-52-C Surface Gas Tank Area Building 6652-C Abandoned USTs Pumphouse Latrine 1500 Gal Fuel Oil Storage Tank Pumphouse Latrine 275 Gal Fuel Oil Storage Tank Abandoned USTs H-52-L Surface Gas Tank Storage Area Radar Berm and Pads Acid Neutralization Pit Missile Refueling JP-4 Fueling Area JP-4 Fuel Pad Control Center Disposal Pits Missile Bunker Landfill Horseshoe Site H-52-L NIKE Base Landfill Generator Building	**IU-1** H-52-C Surface Gas Tank Area H-52-L Surface Gas Tank Storage Area 6652-C SSL Active Septic System 6652-C Inactive Septic System 6652 ALE Field Storage Building Septic System 6652-I ALE Headquarters Septic System Missile Assembly and Test Building Inactive Septic System Missile Bunker Drainfield Missile Maintenance and Assembly Area Dry Well Drum Control Center Disposal Pits Pumphouse Disposal Slope Missile Maintenance and Assembly Area Acid Storage Shed Missile Bunker Discharge Ditch Main Entrance Stained Soil Flammable Block Storage Shed/Missile Maintenance and Assembly Area Paint Shed Mound Site Northwest of Building 6652-G H-52-2 Missile Bunker Sump

(a) Detection limit of 5 mg/kg. All other PCB field screens will have a detection limit of 1 mg/kg or lower.

6.0 SAMPLE HANDLING AND ANALYSIS

6.1 SAMPLE CONTAINERS

As previously discussed, several different types of samples will be collected during the course of the project. Based on the type of sample to be collected, containers will vary. Table 6-1 is a summary of suggested sample containers, required sample preservation methods, and allowable holding times for the various analyses which may be performed during the course of the remedial action for the Hanford 1100 Area. The selected laboratory will provide sample containers consistent with their current Agreement of Services with CENPW, and the suggested requirements in Table 6-1. The Contractor will contact the laboratory to confirm container requirements prior to collection of samples.

6.2 SAMPLE HANDLING AND SHIPPING

6.2.1 Sample Handling

The samples will be kept cool during collection and shipment with regular ice contained in a plastic bag or with frozen "blue ice." The blue ice will be changed immediately before shipment to help assure that the samples remain cool. The samples will be stored in an appropriately sized, durable ice chest. Packing materials, such as bubble packaging, should line the bottom, sides, and top of the ice chest. Samples should be placed upright and kept separated with the intervening voids filled with the packing material more than halfway to the top of the containers. The ice should be placed above and about the top of the containers. The laboratory will measure the temperatures inside the cooler upon receipt to ensure that the samples remained cold during transport to the laboratory. The chain-of-custody record should be sealed in a "Ziplock" plastic bag and affixed to the inside of the top lid of the cooler. The remaining space should be filled with packing material. The cooler should be secured by completely wrapping with strapping tape around both ends. If the cooler has a drain, it should be taped shut. Custody seals should be affixed across the seal between the lid and body of the cooler so that any tampering with the samples during shipment can be detected.

Samples awaiting on-site analysis during the soil gas program or by a mobile laboratory will be stored in a cooler or refrigerator at 4°C. Samples will be stored in a manner that protects them from light.

6.2.2 Chain-of-Custody

All samples will remain in the custody of the sampling personnel during each sampling day. At the end of each sampling day and prior to the transfer of the samples, chain-of-custody entries will be made for all samples using chain-of-custody records as shown in Figure 6-1. Information to be included on this form will consist of time and date sampled, sample number, HEIS number, type of sample, sampler's name, preservatives used, and any special instructions. A chain-of-custody form will be completed for each cooler. All information on the chain-of-custody record and the sample container labels will be checked against the sampling log entries; samples will be recounted before transferring custody. A copy of the chain-of-custody form will be retained by the sampler prior to shipment (forms with multiple carbon copies are recommended), and the original chain-of-custody form will accompany the sample to the laboratory. Upon transfer of custody, the chain-of-custody records will be signed by a member of the field team, sealed in plastic, and taped to the inside lid of each respective cooler. A signed, dated custody seal will be placed over the lid opening of each sample cooler to indicate if the cooler is opened during shipment. Chain-of-custody forms are not required for any on-site measurements such as soil gas or field screening analyses.

According to EPA's National Enforcement Investigations Center (NEIC), a sample is in a person's *custody* if:

TABLE 6-1. Sample Containers.

Analyte	Method	Container[a, b]	Preservative	Holding Time[c]
Soil Samples				
Metals	6010	Two 8 oz glass bottles with Teflon lined cap	4°C	180 Days
Metals	7000 Series	4 oz glass bottle	4°C	180 Days
TPH - Gas	WTPH-G	4 oz amber glass bottle with Teflon septum	4°C	14 Days
TPH - Diesel	WTPH-D	4 oz amber glass bottle with Teflon septum	4°C	14/40 Days
TPH - Other	WTPH-418.1	4 oz amber glass bottle with Teflon septum	4°C	28 Days
Halogenated Volatile Organic	8010	4 oz amber glass bottle with Teflon septum	4°C	14 Days
Aromatic Volatile Organics	8020	4 oz amber glass bottle with Teflon septum	4°C	14 Days
Phthalate Esters	8060	4 oz amber glass bottle with Teflon lined cap	4°C	14/40 Days
PCBs and Pesticides	8080	4 oz amber glass bottle with Teflon lined cap	4°C	14/40 Days
Herbicides	8150	4 oz amber glass bottle with Teflon lined cap	4°C	14/40 Days
VOCs	8240	Teflon-lined brass or aluminum sleeve	4°C	14 Days
SVOCs	8270	Two 4 oz amber glass bottled with Teflon lined cap	4°C	14/40 Days
Polyaromatic Hydrocarbons	8310	4 oz amber glass bottle with Teflon lined cap	4°C	14 Days
Groundwater and Equipment Blank Sample				
Metals	6010	500 ml polyethylene bottles	HNO_3, 4°C	180 Days
Metals	7000 Series	500 ml polyethylene bottle	HNO_3, 4°C	180 Days[d]
TPH - Gas	WTPH-G	Two 40 ml vials with Teflon cap	HCl, 4°C	14 Days
TPH - Diesel	WTPH-D	One liter glass bottle with Teflon lined cap	4°C	14/40 Days
TPH-Other	WTPH-418.1	One liter glass bottle with Teflon lined cap	H_2SO_4, 4°C	28 Days
Halogenated Volatile Organic	8010	Two 40 ml amber glass vials with Teflon septum	4°C	14 Days

TABLE 6-1. Sample Containers. (Cont)

Analyte	Method	Container[a, b]	Preservative	Holding Time[c]
Aromatic Volatile Organics	8020	Two 40 ml amber glass vials with Teflon septum	HCl, 4°C	14 Days
Phthalate Esters	8060	1 liter amber glass bottle with Teflon lined cap	$Na_2S_2O_3$, 4°C	7/40 Days
PCBs and Pesticides	8080	1 liter amber glass bottle with Teflon lined cap	$Na_2S_2O_3$, 4°C	7/40 Days
Herbicides	8150	1 liter amber glass bottle with Teflon lined cap	$Na_2S_2O_3$, 4°C	7/40 Days
VOCs	8240	Two 40 ml glass amber glass vials with Teflon septum	HCl, 4°C	14 days
SVOCs	8270	1 liter glass bottle with Teflon lined cap	$Na_2S_2O_3$, 4°C	7/40 Days
Polyaromatic Hydrocarbons	8310	1 liter amber glass bottle with Teflon lined cap	$Na_2S_2O_3$, 4°C	7/40 Days

a A brass or aluminum sleeve can be used as an alternative to glass jars for soil samples; contact the laboratory to determine the number of sleeves required.

b Analytes using identical containers and preservatives may use the same container. Contact the laboratory for details.

c Where two numbers are given, the first is the number of days to extraction and the second is the number of days from extraction to analysis.

d Holding time for mercury is 28 days.

CHAIN OF CUSTODY RECORD/LAB WORK REQUEST

Chain of Custody Number ______
Cooler Number ______
Lot Control ID ______
Page ______ of ______
Air Bill No. ______

LABORATORY ______

Company ______
Phone ______ FAX ______
Contact ______
Project ______
Project Number ______
Date Due ______
Samplers Signature ______

Lab ID No. (Lab Only)	HEIS Number	Sample ID	Depth Interval (ft)	Date Collected	Time Collected	Matrix[1]	Sampling Technique[2]	Number of Containers (Total)	ANALYSES REQUESTED: VOC (SW 8240) (SW 8260)	BNAE (SW 8270 + SIM) (SW 8270)	Hex Chrome (SW 7196)	Cl, Fl, SO_4, Nitrate, CO_3/HCO_3, TDS	Ca, Fe, Mg, Mn, K, Na	As, Ca, Fe, Mg, Mn, K, Na	As, Cr, Ca, Fe, Mg, Mn, K, Na						

[1] **Matrix:**
SO- Soil
SE - Sediment
WS - Surface Water
WG - Ground Water
LF - Product
AA - Air
SW - Wipe
DC - Drum Solids
LD- Drum Liquids
EP/TCLP Leachate

[2] **Sampling Technique:**
Composite=C
Grab=G

SPECIAL INSTRUCTIONS (i.e. metals list...):

Relinquished by	Received by	Date	Time	Relinquished by	Received by	Date	Time

LABORATORY USE ONLY

SAMPLES WERE:

1 Shipped or hand delivered
Notes:

2 Ambient or Chilled
Notes:

3 Temperature ______

4 Received Broken/Leaking (Improperly Sealed)
Y N
Notes:

5 Properly Preserved
Y N
Notes:

6 Received Within Holding Times
Y N
Notes:

COC Tape Was:

1 Present on Outer Package
Y N NA

2 Unbroken on Outer Package
Y N NA

3 Present on Sample
Y N NA

4 Unbroken on Sample
Y N NA
Notes:

Discrepancies Between Sample Labels and COC Record?
Y N
Notes:

Figure 6-1. Chain of Custody Record Form.

- The sample is in the person's actual possession, or
- The sample is in a person's view, after being in their actual physical possession, or
- The sample was in their actual physical possession and then they locked it up to prevent tampering, or
- The sample is in a designated and identified secure area.

The laboratory, upon receipt of the samples, will be responsible for all chain-of-custody following their approved QAPP.

6.2.3 Shipping Instructions

All samples should be shipped overnight through a reliable commercial carrier, such as Federal Express, Emery, Purolator, or equivalent. The sampler will call the laboratory to alert them when the samples will arrive on the following day.

6.2.3.1 Off-Site Property Control. Prior to shipping any soil or water samples from the Hanford site, an Off-Site Property Control Form (Figure 6-2) must be completed by the contractor. This form must be presented to:

Candace L. Gifford
Westinghouse Hanford Company
Room 396R, Building 1163
Stevens Drive
Richland, WA
(509) 376-1028

Ms. Gifford will assign an off-site property number and retain the original copy of this form. A copy will be supplied to the COE site representative the following workday. THIS MUST BE COMPLETED BEFORE ANY SAMPLES LEAVE THE HANFORD SITE. Samples have been certified clear of radiation contamination; therefore, radiation screening of samples is not required.

6.3 DOCUMENTATION

In order to document activities during the remedial action at the Hanford 1100 Area, several different types of reports and logging activities must be performed. Each of these documentation activities is described below.

6.3.1 Field Logbook

A hardbound field logbook with weather-resistant pages will be used as a diary by the sampling personnel to account for all time spent in the field each day as well at to record important sampling data. Entries in the logbook will include:

- date and time of sampling;
- sampling personnel;
- sampling locations;
- sampling procedures;
- sample designations and analyses for all samples collected;
- field screening results;
- decontamination procedures;
- sampling, handling, and shipping procedures;

Figure 6-2. Off-Site Property Control Form

Contractor	**OFF-SITE PROPERTY CONTROL**	CONTROL NUMBER *(To be obtained from PROPERTY MANAGEMENT)*

PART I—TO BE COMPLETED BY ORIGINATOR

Department	Section	Unit

The following items are to be shipped from ☐ Contractor ☐ Vendor

Routing ☐ Contractor ☐ Vendor

	Off-site Custodian
	Full Title

Quantity	Description *(Include Serial and any Government Tag Numbers)*	Original Cost

☐ Classified ☐ Unclassified ☐ Shipped Under DOE Contract ☐ Shipped Under Contractor's Use Permit Contract

____ for the Off-Site Use of this Property

CERTIFIED FREE OF CONTAMINATION PER TELEPHONE CONVERSATION WITH (MANAGER, ENVIRONMENTAL HEALTH AND SAFETY) ON , 199 .

CERTIFICATION OF THE RADIATION MONITORING RELEASE MUST BE SECURED THE SAME DAY THAT MATERIAL IS DELIVERED TO SHIPPING.

RM Clearance for Public Release		RM Survey No.	Date
Location of Property (*Area & Bldg.*)	Contact		Phone
Date Ready for Shipment	Cost Code to be Charged		Approximate Date This Property will be Returned
Originated By	Date	Authorized By	Date
Signature and Name of Property Control	Custodian Date	Property Management Approval	Date

PART II—TO BE COMPLETED BY SHIPPING

Signature of Recipient	Return Order No.	Date Issued	Purchase Order No.	Date Issued

DISTRIBUTION

By Originator	Shipping Operation—Sign all Copies and Forward to:
White, Green, Yellow, Pink—Property Management Goldenrod—Retain	White—Property Management Yellow—Retain Green—Property Control Custodian (Issuing Office) Ping—Originator

54-3000-479 (09/89)

- instrument calibration procedures;
- any problems or corrective actions taken during each day's activities;
- a brief description of the weather conditions.

Any deviation from the sampling procedures described in previous sections will be described in detail and justified in the field logbook.

6.3.2 Field Sampling Notebook

A three-ring bound field notebook will be maintained during the remedial action. The field notebook will be used to store copies of all chain-of-custody forms and sampling forms used for field screening methods, and soil gas sampling. Sampling forms may also be used for soil and groundwater sampling. All other procedural documentation shall be as specified in individual procedures.

6.3.3 Remediation Documentation

Depending on the results of site characterization activities, different remedial approaches to the sites may be taken. Based on the remedial approach to be taken, different types of documentation will be required. Each of these types of documentation is described below.

6.3.3.1 Pre-Remedial Sampling Report. After the completion of the pre-remedial sampling, a brief (approximately one page) summary will be written for each WMU containing the findings of the investigation and recommendations for remediation. All geophysical and laboratory analysis reports will be included, as well as a summary of field screening results. This report will be provided to DOE, USACE - Walla Walla District, EPA, and Ecology after completion of internal technical reviews as required in the approved Contractor's Quality Control Program (CQCP).

6.3.3.2 Remediation Form. For sites at which the remediation activities are very straightforward (i.e., excavation of contaminated materials for off-site landfilling or other treatment), documentation of site remediation activities will be achieved by completion of a form. Information to be contained of the form will include operable unit, site identification, results of characterization activities, volume of contaminated material, remediation activities performed, and results of confirmatory sampling. Figure 6-3 presents a proposed format for the Remediation Form. Upon completion of remediation activities for all sites, a copy of all Remediation Forms will be provided to DOE, USACE - Walla Walla District, EPA, and Ecology at the completion of internal technical reviews.

6.3.3.3 Field Investigation Report. Some sites will require greater documentation of activities due to results obtained during characterization activities. Such sites would include landfills where the selected remedial alternative involves capping; sites where the selected remedial alternative is other than landfilling; or sites that are determined to require further evaluation (beyond the scope of characterization provided within this document) prior to selection/performance of a remedial alternative. In such situations, the Contractor shall prepare a draft Field Investigation Report. As applicable, this report will summarize findings during the remediation; additional suggested characterization activities; a description of the selected remedial alternative and a discussion of its effectiveness; and a proposed design for the selected remedial action (essentially, a 95% design of the remediation alternative). Draft Field Investigation Reports will be provided to DOE, USACE - Walla Walla District, EPA, and Ecology for review and approval as they are developed (after completion of internal reviews). Following a one month review period, a final Field Investigation Report shall be prepared which incorporates all external comments received. Remediation of the site shall be performed in accordance with the final approved Field Investigation Report. Following completion of remedial activities at the site, a remediation form shall be submitted to document adequate cleanup.

Figure 6-3. Site Remediation Form

Operable Unit: ____________________ **Site:** ____________________

Characterization Sampling:

Type of Sample	Sample ID	Analyte	Result	Cleanup Level

Volume of contaminated material: ______

Remedial activities performed: ____________________

Confirmation Sampling:

Sample ID	Analyte	Result	Cleanup Level

Location of sample collection:

X = Characterization sample location
O = Confirmation sample location

Appendix B

QUALITY ASSURANCE PROJECT PLAN FOR FIELD INVESTIGATIONS SUPPORTING REMEDIAL DESIGN/REMEDIAL ACTION ACTIVITIES IN THE 1100 AREA

June 9, 1994

Work Performed Under Master Interagency Agreement
No. DE-AI06-90RL12074
Task Order DE-AT06-93RL12107

Prepared for
U.S Department of Energy
Operations Office, Richland

Prepared by
DEPARTMENT OF THE ARMY
Walla Walla District, Corps of Engineers
Walla Walla, Washington 99362-9265

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1.0 PROJECT DESCRIPTION

1.1 PROJECT OBJECTIVE

The general objectives of the environmental investigations supporting Remedial Design (RD) and Remedial Action (RA) activities conducted on behalf of the U.S Department of Energy - Operations Office, Richland (DOE-RL) by the Walla Walla District, U.S. Army Corps of Engineers (CENPW) in the 1100 Aggregate Area of the Hanford Site are 1) to obtain additional characterization information from the surface and subsurface in order to refine the scope of cleanup operations, and 2) to obtain and validate analytical data as necessary to confirm the adequacy of the cleanup operations associated with the selected RA. These objectives are further defined in Section 1.1 of the main text of the Work Plan.

1.2 BACKGROUND INFORMATION

The 1100 Aggregate Area Operable Units [Operable Units (OUs) 1100-EM-1, 1100-EM-2, 1100-EM-3, and 1100-IU-1] are located near the southern boundary of the Hanford Site, as shown in Figure 1-1 of the Field Sampling Plan (FSP; see Appendix A). Background information regarding the history and present use of these units is provided in Section 1.2 of the Work Plan (DOE 1993a). Brief descriptions of the individual sites to be investigated within each OU are presented in Section 1.3 of the FSP.

1.3 QUALITY ASSURANCE PROJECT PLAN SCOPE AND RELATIONSHIP TO CENPW QUALITY ASSURANCE PROGRAM

This quality assurance (QA) project plan (QAPjP) applies specifically to the field investigations and laboratory analyses performed in support of Remedial Design/Remedial Action (RD/RA) activities in the 1100 Area; it is prepared in compliance with the requirements of CEQAPP 1.1, the U.S. Army Corps of Engineers Quality Assurance Program Plan, Appendix A, Chapter 4.0 (CENPW, 1993a), and, in conjunction with the FSP, provides or references the procedural resources necessary to accomplish all field and laboratory activities. The scope of this QAPjP does not include design engineering activities, which shall be managed in compliance with Section 10.0 of CEQAPP 1.1, or if subcontracted, with corresponding sections of the CENPW-approved Contractor Quality Control Plan (CQCP).

The Work Plan, QAPjP, FSP, Site Health and Safety Plan (SHSP), and all supporting procedures cited therein are subject to review and approval by the CENPW in compliance with Section 5.2 of CEQAPP 1.1. External review and approval of the Work Plan its appendices and its supporting procedures by DOE-RL, U.S. Environmental Protection Agency (EPA) Region 10, and the Washington State Department of Ecology (Ecology) is required prior to implementation.

All changes to these documents shall be considered to be major, and, pursuant to the requirements of Section 5.4 of CEQAPP 1.1, shall require review and approval by the same organizations that participated in the review and approval of the original versions. Distribution of these documents and all subsequent revisions shall be controlled in compliance with Section 5.2 of CEQAPP 1.1.

1.4 PROJECT ACTIVITIES

The specific field investigations required at the various sites within the 1100 Aggregate Area OUs are described in Section 3.0 of the FSP, and include groundwater sampling in existing wells, geophysical surveys, soil gas surveys, field screening, surface and subsurface soil sampling, and associated sample analyses in mobile and permanent off-site laboratory locations. Procedures directly applicable to these tasks are further discussed in Section 5.0 of the FSP, and are summarized in Section 4.0 of this QAPjP.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The organizational structure of the RD/RA Team is shown in Figure 7 of the Work Plan. Section 2.2.4 of CEQAPP 1.1 (CENPW 1993a) describes the specific responsibilities of the CENPW Project Manager, Special Assistant for Quality Assessment, Environmental Engineering Branch Chief, Safety Technical Manager, Technical Manager, and Laboratory Technical Manager. The overall functional responsibilities of CENPW personnel relative to this investigation are further described in Section 1.4.2 of the Work Plan. The general responsibilities of the remedial action contractor are stated in Section 1.4.3 of the Work Plan, and include responsibilities for the RD and RA phases of the project, including provision of all field sampling and mobile analytical laboratory support. The remedial action contractor and offsite analytical laboratory and data validation support will be selected and managed by CENPW through the procurement and service acceptance processes described in Section 4.0 of CEQAPP 1.1. All work shall comply with CENPW-approved QA plans and/or procedures. The remedial action contractor shall submit a CQCP for CENPW review and approval that meets the requirements of DOE order 5700.6C, Quality Assurance, (DOE 1991b), and DOE/RL-90-28, Environmental Restoration Program Quality Assurance Systems Requirements (DOE 1992). The remedial action contractor shall also submit a laboratory QA plan that addresses the technical operations of mobile field laboratory activities. Applicable quality requirements shall be invoked as part of procurement documentation or internal work instructions, in compliance with the requirements of the contractor's approved CQCP.

3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENTS

The Data Quality Objectives (DQOs) for RD/RA activities in the 1100 Aggregate Area have been determined on the basis of recommendations provided in the two relevant guidance documents cited in the Hanford Federal Facility Agreement and Consent Order (HFFACO; Ecology et. al. 1993). The documents are EPA/540/G-87/003, Data Quality Objectives for Remedial Response Activities (EPA 1987), and WHC-SD-EN-AP-023, A Proposed Data Quality Strategy for the Hanford Site (McCain and Johnson 1990). The DQOs are driven by the data needs described in Section 2.0 of the FSP, which are briefly restated as follows:

1) in OU 1100-EM-1, to ensure that all soil contaminated with bis(2-ethylhexyl) phthalate (BEHP) and polychlorinated biphenyls (PCBs) above specified action levels has been properly excavated;

2) to ensure that trichloroethylene (TCE) concentrations in groundwater near the George Washington Way Diagonal remain below specified action levels; and

3) to characterize the nature and extent of contamination at OUs 1100-EM-2, EM-3, and IU-1, in support of RD activities, and to subsequently confirm that the remediation goals of the selected RA.

In response to these data needs, analytical methods have been selected that are consistent with those used during previous phases of the investigation at 1100-EM-1. All analytical parameters that have been identified for this investigation are listed in Table 3-1, cross-referenced to the selected EPA, Ecology and other reference methods, and maximum detection or quantitation limits. Maximum acceptable ranges for precision and accuracy, in both soil and water matrices shall be as defined in the governing reference method. All methods for mobile and off-site laboratory analysis [except for total petroleum hydrocarbons (TPHs) and asbestos] have been selected from SW-846, Test Methods For Evaluating Solid Waste (EPA 1986). TPHs shall be analyzed using appropriate methods from Guidance for Remediation of Releases from Underground Storage Tanks, Appendix L, "Total Petroleum Hydrocarbon Analytical Methods" (Ecology 1992). Asbestos shall be analyzed using ASTM E-883 and/or ASTM E-521 Methods (ASTM 1993). Field screening for TPHs and PCBs shall be performed using commercial (EnSys, Millipore, or CENPW-approved equivalent) immunoassay test kits. Field screening for volatile organic compounds (VOCs) shall be performed using headspace sampling methods in

<u>TABLE 3-1</u>

Site Locations and Matrix, Analytical Parameters, Methods, and Detection/Quantitation Goals
for RD/RA Investigations in the 1100 Aggregate Area

Site Location and Matrix	Analytical Parameters	Analytical Method	Detection/ Quantitation Goals[a]
1100 EM-1 soil	Bis(2-ethylhexyl)phthalate	8060[b]	13 mg/kg[c]
	Aroclor-1016	8080[b]	33 μg/kg[d]
	Aroclor-1221	8080[b]	33 μg/kg[d]
	Aroclor-1232	8080[b]	67 μg/kg[d]
	Aroclor-1242	8080[b]	44 μg/kg
	Aroclor-1248	8080[b]	33 μg/kg[d]
	Aroclor-1254	8080[b]	33 μg/kg[d]
	Aroclor-1260	8080[b]	33 μg/kg[d]
1100 EM-1 groundwater	Trichloroethene	8240[b]	0.12 μg/L
1100-EM-2, EM-3, IU-1 soil	Aluminum	6010[b]	9 mg/kg
	Antimony	6010[b]	6.4 mg/kg
	Arsenic	7060[b]	10.6 mg/kg
	Barium	6010[b]	0.4 mg/kg
	Beryllium	6010[b]	.06 mg/kg
	Boron	6010[b]	1.0 mg/kg
	Cadmium	6010[b]	0.8 mg/kg
	Calcium	6010[b]	2.0 mg/kg
	Chromium	6010[b]	1.4 mg/kg
	Cobalt	6010[b]	2.0 mg/kg
	Copper	6010[b]	30 mg/kg
	Iron	6010[b]	35 mg/kg
	Lead	7421[b]	5 mg/kg
	Magnesium	6010[b]	150 mg/kg
	Manganese	6010[b]	10 mg/kg
	Molybdenum	6010[b]	40 mg/kg
	Nickel	6010[b]	75 mg/kg
	Potassium	6010[b]	1,000 mg/kg[d]
	Selenium	6010[b]	375 mg/kg
	Silicon	6010[b]	290 mg/kg
	Silver	6010[b]	35 mg/kg

TABLE 3-1

Site Locations and Matrix, Analytical Parameters, Methods, and Detection/Quantitation Goals for RD/RA Investigations in the 1100 Aggregate Area

1100-EM-2, EM-3, IU-1 soil (Cont.)	Sodium	6010[b]	145 mg/kg
	Thallium	6010[b]	200 mg/kg
	Vanadium	6010[b]	40 mg/kg
	Zinc	6010[b]	10 mg/kg
	Acetone	8240[b]	100 μg/kg[d]
	Bromodichloromethane	8240[b]	5 μg/kg
	2-Butanone	8240[b]	100 μg/kg
	Bromoform	8240[b]	5 μg/kg
	Bromomethane	8240[b]	10 μg/kg[d]
	Carbon Disulfide	8240[b]	5 μg/kg
	Carbon tetrachloride	8240[b]	5 μg/kg
	Chlorobenzene	8240[b]	5 μg/kg
	Chloroethane	8240[b]	10 μg/kg
	Chloroform	8240[b]	5 μg/kg
	2-Chloroethyl vinyl ether	8240[b]	10 μg/kg
	Chloromethane	8240[b]	10 μg/kg
	Dibromochloromethane	8240[b]	5 μg/kg
	1,1-Dichloroethane	8240[b]	5 μg/kg
	1,2-Dichloroethane	8240[b]	5 μg/kg
	1,1-Dichloroethene	8240[b]	5 μg/kg
	trans-1,2-Dichloroethene	8240[b]	5 μg/kg
	1,2-Dichloropropane	8240[b]	5 μg/kg
	Cis-1,3-Dichloropropylene	8240[b]	5 μg/kg
	trans-1,3-Dichloropropylene	8240[b]	5 μg/kg
	2-Hexanone	8240[b]	50 μg/kg
	Methylene Chloride	8240[b]	10 μg/kg
	4-Methyl-2-Pentanone	8240[b]	50 μg/kg
	1,1,2,2-Tetrachloroethane	8240[b]	5 μg/kg
	Tetrachloroethylene	8240[b]	5 μg/kg
	1,1,1-Trichloroethane	8240[b]	5 μg/kg

Site Locations and Matrix, Analytical Parameters, Methods, and Detection/Quantitation Goals for RD/RA Investigations in the 1100 Aggregate Area

1100-EM-2, EM-3, IU-1 soil (Cont.)	1,1,2-Trichloroethane	8240[b]	5 μg/kg
	Trichloroethylene	8240[b]	5 μg/kg
	Vinyl Acetate	8240[b]	50 μg/kg
	Vinyl chloride	8240[b]	10 μg/kg
	Benzene	8240[b]	5 μg/kg
	Ethyl benzene	8240[b]	5 μg/kg
	Toluene	8240[b]	5 μg/kg
	Styrene	8240[b]	5 μg/kg
	Xylenes	8240[b]	5 μg/kg
	Aldrin	8080[b]	2.7 μg/kg
	α-BHC	8080[b]	2.0 μg/kg
	β-BHC	8080[b]	4.0 μg/kg
	δ-BHC	8080[b]	6.0 μg/kg
	γ-BHC (Lindane)	8080[b]	2.7 μg/kg
	Chlordane (technical)	8080[b]	9.4 μg/kg
	4,4'-DDD	8080[b]	7.4 μg/kg
	4,4'-DDE	8080[b]	2.7 μg/kg
	4,4'-DDT	8080[b]	8.0 μg/kg
	Dieldrin	8080[b]	1.3 μg/kg
	Endosulfan I	8080[b]	9.4 μg/kg
	Endosulfan II	8080[b]	2.7 μg/kg
	Endosulfan sulfate	8080[b]	44 μg/kg
	Endrin	8080[b]	4.0 μg/kg
	Endrin aldehyde	8080[b]	15 μg/kg
	Heptachlor	8080[b]	20 μg/kg
	Heptachlor epoxide	8080[b]	56 μg/kg
	Methoxychlor	8080[b]	120 μg/kg
	Toxaphene	8080[b]	160 μg/kg
	Aroclor-1016	8080[b]	33 μg/kg[d]
	Aroclor-1221	8080[b]	33 μg/kg[d]

<u>TABLE 3-1</u>

Site Locations and Matrix, Analytical Parameters, Methods, and Detection/Quantitation Goals
for RD/RA Investigations in the 1100 Aggregate Area

1100-EM-2, EM-3, IU-1 soil (Cont.)	Aroclor-1232	8080[b]	67 µg/kg[d]
	Aroclor-1242	8080[b]	44 µg/kg[d]
	Aroclor-1248	8080[b]	33 µg/kg[d]
	Aroclor-1254	8080[b]	33 µg/kg[d]
	Aroclor-1260	8080[b]	33 µg/kg[d]
	2,4-D	8150[e]	240 µg/kg
	2,4,5-T	8150[e]	40 µg/kg
	2,4,5-TP (Silvex)	8150[e]	34 µg/kg
	Phenol	8270[e]	660 µg/kg
	bis(2-chloroethyl)ether	8270[e]	660 µg/kg
	2-Chlorophenol	8270[e]	660 µg/kg
	1,3-Dichlorobenzene	8270[e]	660 µg/kg
	1,4-Dichlorobenzene	8270[e]	660 µg/kg
	Benzyl alcohol	8270[e]	1300 µg/kg
	1,2-Dichlorobenzene	8270[e]	660 µg/kg
	2-Methylphenol	8270[e]	660 µg/kg
	Bis(2-chloroisopropyl)ether	8270[e]	660 µg/kg
	4-Methylphenol	8270[e]	660 µg/kg
	N-nitroso-di-n-propylamine	8270[e]	660 µg/kg
	Hexachloroethane	8270[e]	660 µg/kg
	Nitrobenzene	8270[e]	660 µg/kg
	Isophorone	8270[e]	660 µg/kg
	2-Nitrophenol	8270[e]	660 µg/kg
	2,4-Dimethylphenol	8270[e]	660 µg/kg
	Benzoic acid	8270[e]	3300 µg/kg
	Bis(2-chloroethoxy)methane	8270[e]	660 µg/kg
	2,4-Dichlorophenol	8270[e]	660 µg/kg
	1,2,4-Trichlorobenzene	8270[e]	660 µg/kg
	Naphthalene	8270[e]	660 µg/kg
	4-Chloroaniline	8270[e]	1300 µg/kg
	Hexachlorobutadiene	8270[e]	660 µg/kg
	4-Chloro-3-methylphenol	8270[e]	1300 µg/kg
	2-Methylnaphthalene	8270[e]	660 µg/kg

Site Locations and Matrix, Analytical Parameters, Methods, and Detection/Quantitation Goals
for RD/RA Investigations in the 1100 Aggregate Area

1100-EM-2, EM-3, IU-1 soil (Cont.)	Hexachlorocyclopentadiene	8270[a]	660 μg/kg
	2,4,6-Trichlorophenol	8270[a]	660 μg/kg
	2,4,5-Trichlorophenol	8270[a]	660 μg/kg
	2-Chloronaphthalene	8270[a]	660 μg/kg
	2-Nitroaniline	8270[a]	3300 μg/kg
	Dimethylphthalate	8270[a]	660 μg/kg
	Acenaphthylene	8270[a]	660 μg/kg
	2,6-Dinitrotoluene	8270[a]	660 μg/kg
	3-Nitroaniline	8270[a]	3300 μg/kg
	Acenaphthene	8270[a]	660 μg/kg
	2,4-Dinitrophenol	8270[a]	3300 μg/kg
	4-Nitrophenol	8270[a]	3300 μg/kg
	Dibenzofuran	8270[a]	660 μg/kg
	2,4-Dinitrotoluene	8270[a]	660 μg/kg
	4-Nitrophenol	8270[a]	3300 μg/kg
	Dibenzofuran	8270[a]	660 μg/kg
	2,4-Dinitrotoluene	8270[a]	660 μg/kg
	Diethylphthalate	8270[a]	660 μg/kg
	4-Chlorophenyl-phenyl ether	8270[a]	660 μg/kg
	Fluorene	8270[a]	660 μg/kg
	4-Nitroaniline	8270[a]	3300 μg/kg
	4,6-Dinitro-2-methylphenol	8270[a]	3300 μg/kg
	N-Nitrosodiphenylamine	8270[a]	660 μg/kg
	4-Bromophenyl-phenyl ether	8270[a]	660 μg/kg
	Hexachlorobenzene	8270[a]	660 μg/kg
	Pentachlorophenol	8270[a]	3300 μg/kg
	Phenanthrene	8270[a]	660 μg/kg
	Anthracene	8270[a]	660 μg/kg
	Di-n-butylphthlate	8270[a]	660 μg/kg
	Fluoranthene	8270[a]	660 μg/kg

TABLE 3-1

Site Locations and Matrix, Analytical Parameters, Methods, and Detection/Quantitation Goals
for RD/RA Investigations in the 1100 Aggregate Area

1100-EM-2, EM-3, IU-1 soil (Cont.)	Pyrene	8270[e]	660 μg/kg
	Butylbenzylphthalate	8270[e]	660 μg/kg
	3,3'-Dichlorobenzidine	8270[e]	1300 μg/kg
	Benzo(a)anthracene	8270[e]	660 μg/kg
	Chrysene	8270[e]	660 μg/kg
	Bis(2-ethyhexyl)phthalate	8270[e]	660 μg/kg
	Di-n-octylphthalate	8270[e]	660 μg/kg
	Benzo(b)fluoranthene	8270[e]	660 μg/kg
	Benzo(k)fluoranthene	8270[e]	660 μg/kg
	Benzo(a)pyrene	8270[e]	660 μg/kg
	Indeno(1,2,3-cd)pyrene	8270[e]	660 μg/kg
	Dibenz(a,h)anthracene	8270[e]	660 μg/kg
	Benzo(g,h,i)perylene	8270[e]	660 μg/kg
	TPH (gasoline)	WTPH-G[e]	10 mg/kg
	TPH (diesel)	WTPH-D[e]	20 mg/kg
	TPH (oils)	WTPH-418.1[e]	20 mg/kg
	Asbestos	ASTM E-883 or ASTM E-521[f]	[f]
	Explosives	8330[j]	0.25-1.0 ppm
Field Screening	TPHs	[g]	[g]
	VOCs	[h]	[h]
	PCBs	[g]	[g]
Soil Gas	BTEX[j]	[i]	[i]
	Chlorinated Solvents[j]	[i]	[i]

[a]Detection limits for soil will vary based on the laboratory sample preparation method, dilution factors and soil moisture content. In all cases the limits specified are well below the action levels defined in Section 2.0 of the FSP. Detection limits may be adjusted for matrix type where permitted by the governing reference method.

[b]From SW-846 Test Methods for Evaluating Solid Waste (EPA 1986).

[c]Detection limit established at a maximum 0.5 times the action level defined in Section 2.0 of the FSP.

[d]Value unspecified in reference method; values cited have been derived from contract required detection limits (CRQLs) from the current EPA Contract Laboratory Program (CLP) Statement of Work (SOW; EPA 1990).

[e]From Guidance for Remediation of Releases from Underground Storage Tanks, Appendix L, "Total Petroleum Hydrocarbon Analytical Methods" (Ecology 1992).

[f]Methods are from 1993 Annual Book of ASTM Standards, Vols. 03.01 and 12.02 (ASTM 1993). Detection limits and method precision and accuracy requirements shall be as stated therein.

[g]Commercial immunoassay or chemical test kit methods shall be used (EnSys, Millipore, or CEPNW-approved equivalent). Detection limits and method precision and accuracy shall be as stated in the test kit documentation provided by the manufacturer.

[h]VOC screening shall be performed in compliance by sample headspace analysis using a mobile gas chromatograph. A procedure shall be submitted for CEPNW and regulatory review and approval prior to use. Detection/quantitation limits and precision and accuracy requirements shall be as stated the approved procedure.

[i]Soil-gas sampling and analytical procedures (and applicable detection/quantitation limits and precision and accuracy requirements) shall be as specified in CEPNW-EN PL, Engineering Division Policy Letters (CEPNW 1988) or approved alternate procedures submitted by the remediation contractor.

[j]From SW-846 Test Methods for Evaluating Solid Waste, Proposed Update II (EPA 1992).

conjunction with a mobile gas chromatograph. Soil gas sampling and analysis shall employ appropriate procedures selected from CENPW-ENPL, Engineering Division Policy Letters (CENPW 1988). The environmental conditions under which analyses shall be performed shall be as defined by the CENPW-approved offsite and mobile laboratory QA plans. Acceptable ranges for precision and accuracy shall not exceed those specified by the governing reference methods or procedures. Detection limits have been established at 0.5 times the action levels defined for specific contaminants, or as defined by the reference method, whichever is less.

The requirements of Table 3-1 represent conditions that can be routinely and reliably achieved by analytical laboratories, and shall be considered minimum performance standards that shall be reflected in the agreement for services established by CENPW with the selected offsite laboratory, as well as in the mobile laboratory QA plan submitted by the contractor. Any modification of Table 3-1 requirements shall be considered a formal modification of this QAPjP that shall be subject to regulatory review and approval as previously described in Section 1.3.

Goals for data representativeness shall be addressed qualitatively by the specification of sampling depths and intervals in Section 3.0 of the FSP. Sampling locations shall be as specified in the FSP, subject to those allowances for local conditions that may be permitted by applicable sampling procedures (specified in Section 4.0 of this QAPjP); actual sampling locations shall be documented in compliance with applicable procedure requirements, as noted in Section 4.2.1. Based on the precedent established by CENPW in the Phase 2 investigation of 1100-EM-1 [see Appendix B of DOE/RL-90-37, Remedial Investigation Phase 2 Supplemental Work Plan for the Hanford Site 1100-EM-1 Operable Unit, Revision 2 (DOE 1991a)], objectives for the completeness of this investigation shall require that contractually or procedurally established requirements for precision and accuracy be met for at least 95 percent of the total number of requested determinations. Failure to meet this goal shall be documented and evaluated in the validation process described in Section 8.0 of this QAPjP; corrective action shall be taken as warranted, as described in Section 13.0. In order to facilitate the comparability of data sets in terms of their reported precision and accuracy, all analytical results shall be reported in compliance with the reporting techniques and units specified in the reference methods identified in Table 3-1.

4.0 SAMPLING PROCEDURES

4.1 GENERAL REQUIREMENTS FOR FIELD PROCEDURES

All CENPW procedures that will be employed in the field investigations in the 1100 Aggregate Area are identified in Table 4-1, cross-referenced to the specific OUs and individual field sites at which their use will be required. Procedure approval, revision, distribution control, and update requirements shall be as defined in Section 5.0 of CEQAPP 1.1 (CENPW 1993a). If alternate contractor procedures are accepted pursuant to the requirements of Section 4.3, similar controls for contractor procedures shall be defined in the approved CQCP.

4.2 SAMPLING PROCEDURES

4.2.1 Sample Acquisition

Except where alternate procedures are approved as noted in Section 4.3, all soil gas, surface/subsurface soil sampling, and supporting geophysics investigations shall be performed in compliance with procedures contained in CENPW-EN PL, Engineering Division Policy Letters (CENPW 1988). Groundwater monitoring activities will be supported by NPW-H-P 200-1, Procedure for Measurement of Depth to Water in Wells at DOE-RL (CENPW 1993b); NPW-H-P 200-2, Groundwater Sampling Procedures (CENPW 1993c); and NPW-H-P 200-3, Management of Purge Water (CENPW 1993d). All sampling activities shall be subject to the chain of custody controls described in Section 5.0 of this QAPjP and to the procedures for sample packaging/shipping and for managing investigation-derived waste defined in CENPW-EN PL. All sampling activities except for the well sampling at OU 1100-EM-1 shall be subject to the applicable requirements of NPW-H-P-385-1-1, Health and Safety Monitoring Instruments (CENPW 1993e) and NPW-H-P-385-1-2, Hazardous Waste Site Entry Requirements (CENPW 1993f). Sampling locations, depths, intervals, and (as applicable) frequency shall be as specified in Section 3.0 of the FSP. Documentation requirements shall be as defined within individual procedures and Section 6.3 of the FSP.

4.2.2 Sample Container Requirements

Sample container types, preservation requirements, preparation requirements, and special handling requirements shall be as defined in Table 6-1 of the FSP.

4.2.3 Sample Identification

Sample identification protocols to be used in this investigation shall be as defined in Section 6.0 of the FSP.

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TABLE 4-1

Field Procedure Applicability Matrix

Operable Unit/ Field Site	Geophysics			Soil Gas		Field Screening			Soil Sampling		Groundwater Sampling[d,e]	Water Level[f] Measurement	Purge Water[g] Management	H&S Monitoring Instrument[h]	Haz Waste Site Entry Requirements[i]
	EM[a]	GPR[a]	FDEM/TDEM[a]	BTEX[a]	Chlorinated Solvents[a]	TPH[b]	VOC[c]	PCB[b]	Surface[a]	Subsurface[a]					
1100-EM-1															
Discolored Soil Site									X	X				X	X
Ephemeral Pool								X	X	X				X	X
Horn Rapids Landfill								X	X	X				X	X
G. Washington Way Diagonal Monitoring Wells											X		X		
1100-EM-2															
Tar Flow Area									X	X				X	X
Stained Sands Area									X	X				X	X
"Neptune's Potato" and Separator Tank				X	X		X		X	X				X	X
1100-EM-3															
1240 Suspect Spill Area									X	X				X	X
1240 French Drain								X	X	X				X	X
1226 Suspect Waste Oil Disposal Area						X			X	X				X	X
1212/1217 Suspect Battery Acid Disposal Area							X		X	X				X	X
1218 Service Station	X	X		X		X	X		X	X				X	X
1262 Solvent Tanks	X	X			X		X		X	X				X	X
1262 Transformer Pad								X	X	X				X	X
JA Jones Oil Storage Tanks	X	X		X		X	X		X	X				X	X
JA Jones Steam Plant Drain Pad									X	X				X	X

TABLE 4-1

Field Procedure Applicability Matrix

Operable Unit/ Field Site	Geophysics			Soil Gas		Field Screening			Soil Sampling		Groundwater Sampling[d,e]	Water Level[f] Measurement	Purge Water[g] Management	H&S Monitoring Instrument[h]	Haz Waste Site Entry Requirements[i]
	EM[a]	GPR[a]	FDEM/TDEM[a]	BTEX[a]	Chlorinated Solvents[a]	TPH[b]	VOC[c]	PCB[b]	Surface[a]	Subsurface[a]					
1100-IU-1															
6652- C SSL Active Septic System				X	X		X		X	X				X	X
6652- C SSL Inactive Septic System				X	X	X	X		X	X				X	X
Radar Berm and Pads						X	X		X	X				X	X
H-52-C Surface Gas Tank Area				X	X	X	X		X	X				X	X
Control Center Disposal Pits				X	X		X		X	X				X	X
Building 6652-C Abandoned USTs	X	X		X		X	X		X	X				X	X
Pumphouse Latrine 1500 ga. Fuel Oil Storage Tank						X	X		X	X				X	X
Pumphouse Latrine 275 ga. Fuel Oil Storage Tank				X		X	X		X	X				X	X
6652 ALE Field Storage Building Septic System				X		X	X		X	X				X	X
Mound Site Northwest of Building 6652-G	X									X				X	X
6652-I ALE Headquarters Septic System								X		X				X	X
Abandoned Underground Storage Tanks				X	X	X				X				X	X
H-52-L Missile Bunker Sump	X			X		X			X	X				X	X
Missile Bunker Landfill	X	X	X					X		X				X	X
Missile Refueling Area Berm				X	X					X				X	X
Acid Neutralization Pit										X				X	X
Missile Refueling JP-4 Fueling Area						X				X				X	X

TABLE 4-1

Field Procedure Applicability Matrix

Operable Unit/ Field Site	Geophysics			Soil Gas		Field Screening			Soil Sampling		Groundwater Sampling[d,e]	Water Level[f] Measurement	Purge Water[g] Management	H&S Monitoring Instrument[h]	Haz Waste Site Entry Requirements[i]
	EM[a]	GPR[a]	FDEM/TDEM[a]	BTEX[a]	Chlorinated Solvents[a]	TPH[b]	VOC[c]	PCB[b]	Surface[a]	Subsurface[a]					
Missile Assembly and Test Building Inactive Septic System				X	X			X		X				X	X
Missile Maintenance and Assembly Area Acid Storage Shed										X				X	X
JP-4 Fuel Pad						X				X				X	X
Missile Bunker Drainfield				X	X			X		X				X	X
Missile Bunker Discharge Ditch										X				X	X
Main Entrance Stained Soil										X				X	X
H-52-L Surface Gas Tank Storage Area				X		X				X				X	X
Generator Building						X			X	X				X	X
Horseshoe Site				X				X		X				X	X
Elevator Doors									X					X	X
Flammable Storage Block Shed										X				X	X
Missile Maintenance and Assembly Area Dry Well Drum								X		X				X	X
H-52-L NIKE Base Landfill	X	X	X	X	X			X	X	X				X	X

TABLE 4-1

Field Procedure Applicability Matrix

Operable Unit/ Field Site	Geophysics			Soil Gas		Field Screening			Soil Sampling		Groundwater Sampling[d,e]	Water Level[f] Measurement	Purge Water[g] Management	H&S Monitoring Instrument[h]	Haz Waste Site Entry Requirements[i]
	EM[a]	GPR[a]	FDEM/TDEM[a]	BTEX[a]	Chlorinated Solvents[a]	TPH[b]	VOC[c]	PCB[b]	Surface[a]	Subsurface[a]					

NOTES:
[a]Procedures are contained in CEPNW-EN PL, Engineering Division Policy Letters (CEPNW 1988).
[b]Field screening for TPHs, PCBs, shall employ commercial (EnSys, Milliport, or CEPNW-approved equivalent) immunoassay test kit procedures; see Section 7.2.
[c]Field screening for VOCs shall employ headspace sampling methods in conjunction with a portable organic vapor analyzer or mobile gas chromatograph. See Section 7.2.
[d]All sampling activities shall employ the chain of custody controls described in Section 5.0; along with the sample packaging/shipping and investigation- deceived waste management procedures defined in CEPNW-EN-PL (CEPNW 1988).
[e]Ref: NPW-HP 200-1-2, Groundwater Sampling Procedures (CEPNW 1993b).
[f]Ref: NPW-HP 200-1-1, Procedure for Measurement of Depth to Water in Wells at DOE-RL (CEPNW 1993).
[g]Ref: NPW-HP 200-1-3, Management of Purge Water (CEPNW 1993d).
[h]Ref: NPW-HP 385-1-1, Health and Safety Monitoring Instruments (CEPNW 1993e).
[i]Ref: NPW-HP 385-1-2, Hazardous Waste Site Entry Requirements (CEPNW 1993f).

4.3 PROCEDURE CHANGES

4.3.1 Alternate Procedures

If the remedial action contractor wishes to propose the use of other procedures than those defined in Table 4-1, they shall be submitted with appropriate justification for CENPW approval prior to submittal to DOE-RL, EPA, and Ecology for concurrence, as described in Section 4.1. CENPW must authorize all such change requests prior to implementation by the remedial action contractor or any affected subcontractors.

4.3.2 Field Changes

Field changes in the requirements established by the FSP, this QAPjP, or the procedures cited herein may be permitted in response to unforeseen field conditions, provided that they are documented, justified, reviewed, and approved as described in this Section. All proposed field changes shall be documented on a Field Change Authorization (FCA) form, as shown in Figure 4-1. The FCA process is shown in Figure 4-2 and is further described as follows.

The field team member initiating the field change shall describe the proposed change, identify the affected plan(s) or procedure(s), provide brief technical justification for the change, and submit the FCA to the cognizant field team leader for evaluation. If the field team leader concurs with the technical justification, work may proceed at their discretion pending confirmatory review and concurrence by the contractor's Program Manager, the Contractor Quality Control Representative (CQCR), and by CENPW. The FCA must be forwarded to the Program Manager and CQCR within one working day. If the contractor's Program Manager and CQCR approve the FCA, the Program Manager shall submit the FCA to CENPW for coordination of CENPW and regulatory review and approval. Completed and approved FCAs shall be assigned a control number and routed to all distributees for the affected plan or procedure, in compliance with CQCP requirements. However, if the contractor Program Manager/CQCR, CENPW, or the regulatory agencies disapprove a field change, such changes shall be documented as a nonconformance and resolved in compliance with CQCP requirements and the corrective action requirements of QAPjP Section 13.3.

Field Change Authorization

Ref: Master Interagency Agreement DE-AI06-90RL17074

Delivery Order No.: ______________________ FCA No.: ______________________

Task Description: ______________________

____

Affected Plan or Procedures: ______________________

____

____

Requested Variations: ______________________

____

____

____

Justification for Variation: ______________________

____

____

____

Requested by: ______________________ Date: __________
(Name/Title/Organization)

Field Change Authorized by: ______________________ Date: __________
(Name/Title/Organization)

Approved by: ______________________ Date: __________
(Contractor's Program Manager)

Comments: ______________________

____

____

Concurrence: ______________________ Date: __________
(CENPW Technical Manager)

Comments: ______________________

____

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Figure 4-1. Field Change Authorization Form.

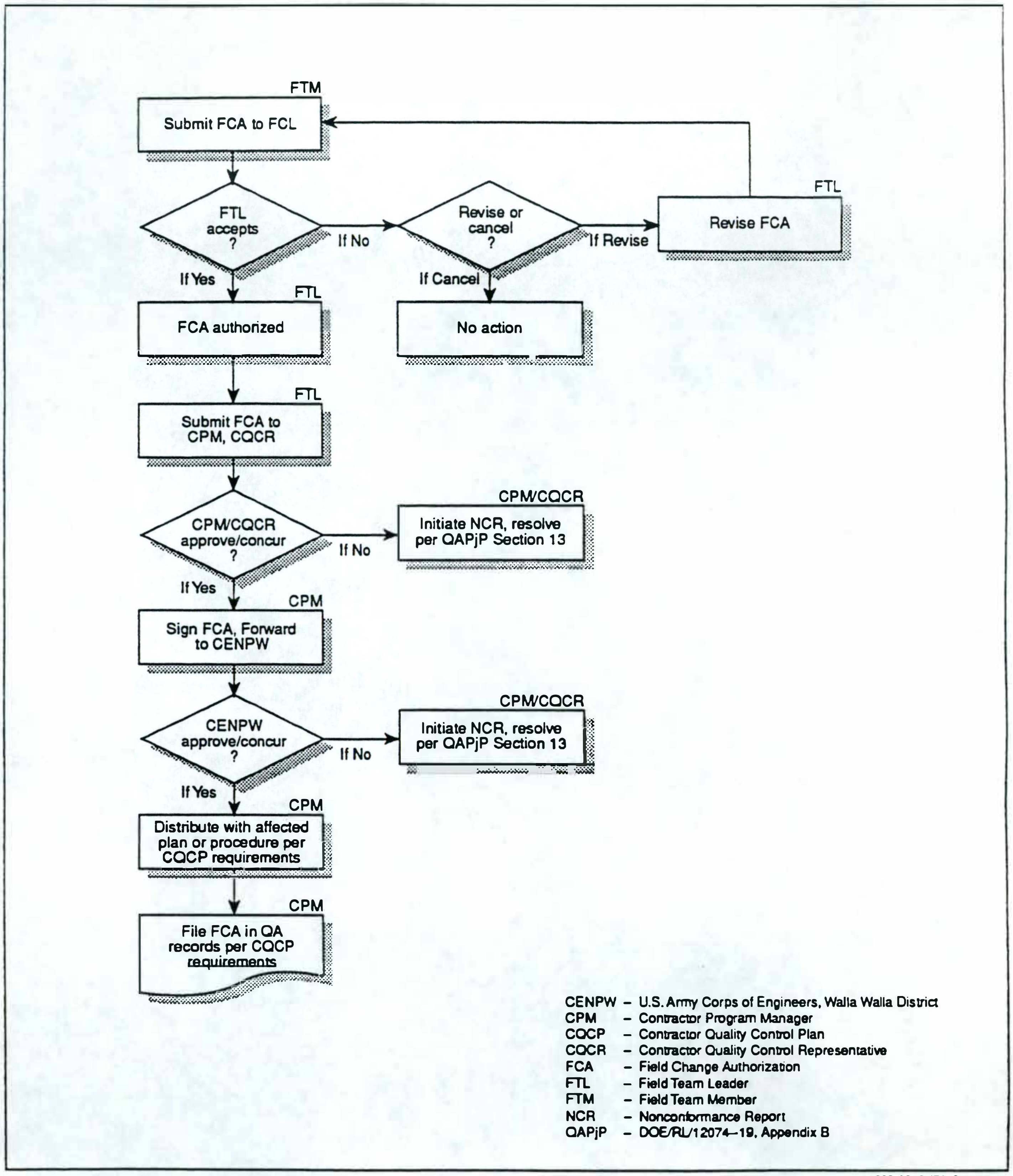


Figure 4-2. Field Change Authorization Process.

5.0 SAMPLE CUSTODY

All samples obtained during the course of this investigation shall be subject to handling and chain of custody protocols defined in Section 6.2 and Figure 6-1 of the FSP from the point of origin to receipt in the mobile laboratory and/or acceptance in the offsite analytical laboratory. Offsite laboratory chain-of-custody procedures shall be defined in the laboratory's CENPW-approved QA plan; such procedures shall ensure the maintenance of sample integrity and identification throughout the analytical process. At the direction of the CENPW Laboratory Technical Manager, requirements for the return of residual sample materials or disposal of investigation-derived wastes after completion of offsite analysis shall be defined in the offsite laboratory's procurement documentation or in internal work instructions developed in compliance with CQCP requirements that govern the operations of the mobile laboratory. Chain-of-custody forms shall be initiated for return of residual samples when so required. All analytical results shall be maintained as project quality records in compliance with the CQCP pending turnover to CEPNW for retention as permanent records as required by Section 6.6 of CEQAPP 1.1.

6.0 CALIBRATION PROCEDURES

Calibration of all of the remedial action contractor's measuring and testing equipment required to support this investigation shall comply with CENPW-approved procedures that have been developed to implement Part II, Section C, Criterion 13 of DOE/RL-90-28, Environmental Restoration Program Quality Assurance System Requirements for the Hanford Site, Revision 1 (DOE 1992). Routine operational checks for the contractor's field equipment shall be as defined within applicable CENPW procedures as defined in Section 4.2 and Table 4-1, or approved alternates, as noted in Section 4.3. All calibration requirements applicable to mobile and off-site analytical laboratory equipment shall be as defined by CENPW-approved laboratory QA plans and the standard analytical methods identified in Table 3-1.

7.0 ANALYTICAL PROCEDURES

7.1 LABORATORY ANALYTICAL METHODS

All laboratory analytical methods that have been selected for this investigation are listed in Table 3-1, cross-referenced to the parameters of interest, applicable EPA and Ecology reference methods, maximum detection or quantitation limits and appropriate references for maximum acceptable ranges for precision and accuracy, in both soil and water matrices. Methods and parameters apply to both mobile and off-site laboratories. All analytical methods have been selected from SW-846, Test Methods For Evaluating Solid Waste (EPA 1986), except for total petroleum hydrocarbons (TPHs) and asbestos, which shall be analyzed using appropriate methods from Guidance for Remediation of Releases from Underground Storage Tanks, Appendix L, "Total Petroleum Hydrocarbon Analytical Methods" (Ecology 1992). Asbestos shall be analyzed using phase-contrast light microscopy and/or transmission electron microscopy in compliance with ASTM E-883 or ASTM E-521, respectively (ASTM 1993). As noted in Section 3.0, acceptable ranges for precision and accuracy shall not exceed those specified in the governing reference methods. Detection limits have been established at 0.5 times the action levels defined for specific contaminants or those defined by the reference method, whichever is less.

As noted in Section 3.0, the requirements of Table 3-1 represent conditions that can be routinely and reliably achieved by analytical laboratories and shall be considered a minimum performance standard that shall be incorporated into the agreements for services established with the offsite analytical laboratory and into the mobile laboratory QA plan. Any modification of Table 3-1 requirements shall be considered a formal modification of this QAPjP, and shall therefore be subject to regulatory review and approval as described in Section 1.3. All analytical results shall be reported in compliance with the reporting techniques and units specified in the reference methods identified in Table 3-1, in order to facilitate the comparability of data sets in terms of their reported precision and accuracy.

7.2 FIELD SCREENING METHODS

Field screening for TPHs and PCBs shall be performed using commercial immunoassing test kits (EnSys, Millipore, or CENPW-approved equivalent). Volatile organic compound (VOC) screening shall employ headspace analysis techniques in conjunction with a portable gas chromatograph or organic vapor analyzer. Procedures for using the immunoassay test kits shall be provided by the manufacturer; detection limits and method precision and accuracy shall be as stated therein. VOC screening procedures shall be prepared by the remedial action contractor and submitted for CENPW and regulatory review and approval prior to use, as noted in Section 1.3. Detection/quantitation limits and method precision and accuracy shall be as stated in the approved procedure. Copies of the VOC screening procedure and manufacturer's instructions for use of the TPH and PCB test kits shall be retained in the project QA records in compliance with the applicable requirements of the CQCP pending turnover to CENPW and retention in compliance with Section 6.0 of CEQAPP 1.1 (CENPW 1993a).

8.0 DATA REDUCTION, VALIDATION, AND REPORTING

8.1 GENERAL CONSIDERATIONS FOR ANALYTICAL DATA ACQUISITION AND DATA MANAGEMENT

The overall process of data acquisition and data management is described graphically in Figure 8-1. Planning, readiness review, and field operations are shown, along with sample shipment, data validation, assessment of validated data [and entry into the Hanford Environmental Information System (HEIS)], reporting, and maintenance of data as project QA records. The corrective action processes potentially required as a result of readiness review, data validation, and data assessment activities are also shown; requirements for handling unacceptable or suspect data are further described in Section 8.5.

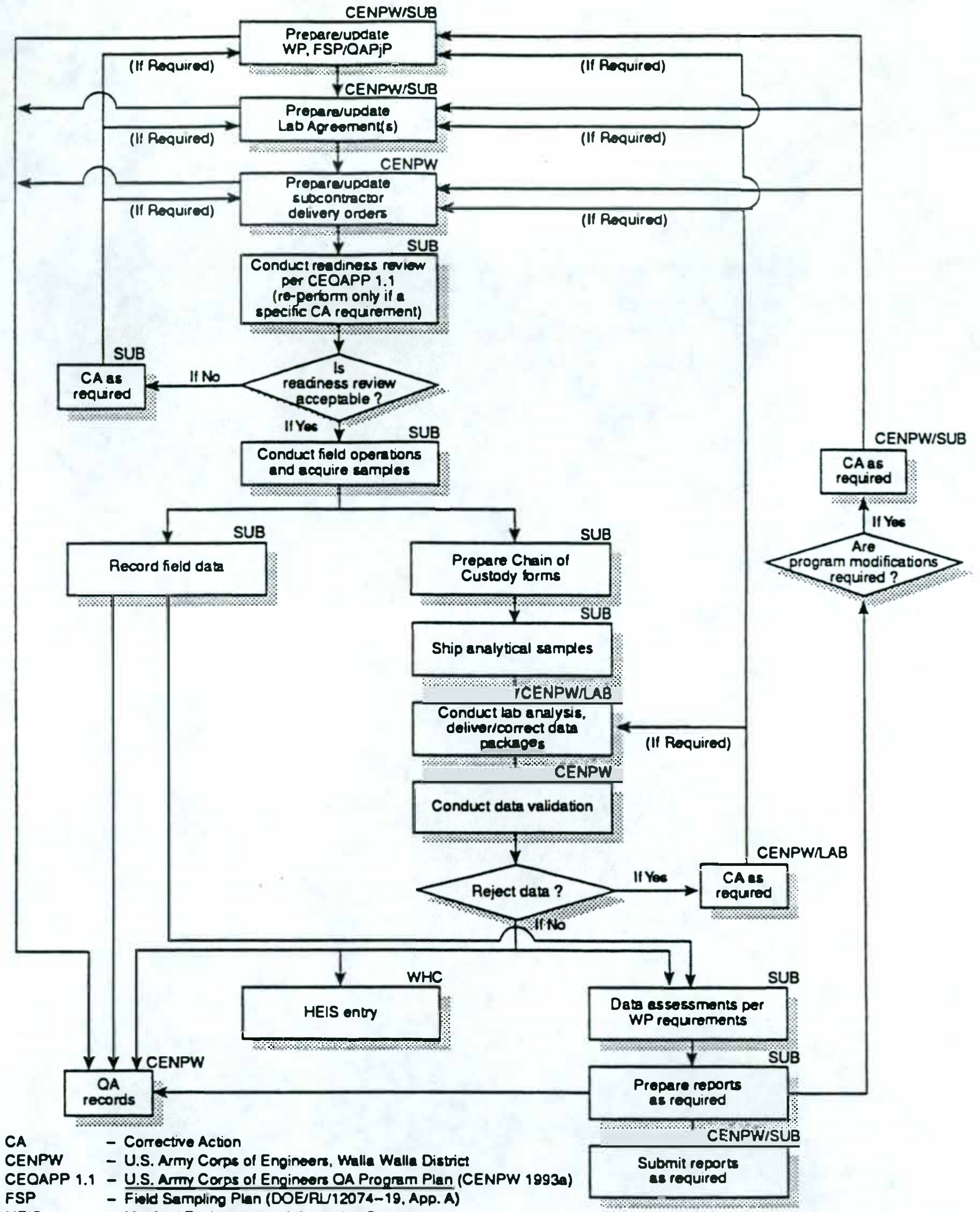
8.2 DATA REDUCTION AND DATA PACKAGE PREPARATION

The CENPW-approved offsite laboratory and the contractor's mobile analytical laboratory shall be responsible for preparing reports summarizing the results of analysis and for preparing detailed data packages that include sample identification, sampling and analysis dates, raw analytical data, reduced data, data outliers, reduction formulas, recovery percentages, quality control check data, equipment calibration data, supporting chromatogram or spectrograms, and documentation of any nonconformances affecting the measurement system in use during the analysis of the specific group of samples. Data reduction schemes shall be as documented within individual analytical methods and/or the laboratories' CENPW-approved QA plans. Completed data packages shall be reviewed and approved by the analytical laboratory's QA manager (or the contractor's managing chemist, for all parameters analyzed in the mobile laboratory) before their submittal to the CENPW Laboratory Technical Manager for tracking and initiation of data validation activities.

8.3 VALIDATION

Validation of completed data packages shall be performed by qualified CENPW personnel or a qualified subcontractor independent from the responsible analytical laboratory. Subcontracted validation responsibilities shall be defined in procurement documentation prepared in compliance with Section 4.0 of CEQAPP 1.1 (CEPNW 1993a).

All validation activities shall comply with WHC-SD-EN-SPP-002, Data Validation Procedures for Chemical Analyses (Bechtold 1992). All data packages and analytical results shall be verified for completeness and identification of any transcription errors; 10% of all data packages shall receive full validation, in compliance with WHC-SD-EN-SPP-002 requirements. Packages requiring full validation shall be specified to the data validators by the CENPW Laboratory Technical Manager.



CA – Corrective Action
CENPW – U.S. Army Corps of Engineers, Walla Walla District
CEQAPP 1.1 – U.S. Army Corps of Engineers QA Program Plan (CENPW 1993a)
FSP – Field Sampling Plan (DOE/RL/12074–19, App. A)
HEIS – Hanford Environmental Information System
LAB – Analytical Laboratory
QA – Quality Assurance
QAPjP – QA Project Plan (DOE/RL/12074–19, App. B)
SUB – Remedial Action Contractor
WHC – Westinghouse Hanford Company
WP – Work Plan (DOE/RL/12074–19)

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Figure 8-1. Data acquisition and data management flow diagram.

8.4 FINAL REVIEW AND RECORDS MANAGEMENT CONSIDERATIONS

All verification and validation reports and supporting analytical data packages shall undergo a final review by a qualified reviewer at the direction of the CENPW Laboratory Technical Manager, before their release for further use, submittal to regulatory agencies, or transmittal to Westinghouse Hanford Company (WHC) for entry into the Hanford Environmental Information System (HEIS). All verification and validation reports, data packages, and review comments shall be retained as permanent project quality records in compliance with Section 6.6 of CEQAPP 1.1 (CENPW 1993a).

8.5 REQUIREMENTS FOR HANDLING UNACCEPTABLE OR SUSPECT DATA

Data errors or procedural discrepancies related to laboratory analytical processes shall prompt data requalification by the validator, requests for reanalysis, or other appropriate corrective action by the responsible laboratory as required by procedure WHC-SD-EN-SPP-002, Data Validation Procedures for Chemical Analyses (Bechtold 1992). However, if sample holding time requirements are compromised, insufficient sample material is available for reanalysis, or any other condition prevents compliance with governing analytical methods and data validation protocols, the situation shall be formally documented as a nonconformance in compliance with Section 3.1 of CEQAPP 1.1 (CENPW 1993a). Corrective action requests shall be prepared in compliance with CEQAPP 1.1 Section 3.2 and brought to the immediate attention of the CENPW Technical Manager and Special Assistant for Quality Assessment for their appropriate action. If problems are observed with validated data, either as part of the data assessment process described in Section 12.0 of this QAPjP or, if separately observed by CENPW or contractor personnel, the situation shall be documented as a nonconformance and corrective action initiated as previously noted. If the suspect data have been entered into Hanford Environmental Information System (HEIS), the appropriate HEIS Data Custodian shall be immediately notified in order that the data may be flagged pending resolution of the nonconformance and completion of all required corrective actions.

9.0 INTERNAL QUALITY CONTROL

Quality Control (QC) measures applicable to soil gas sampling, soil sampling, and groundwater sampling are defined, respectively, in Sections 5.2.5, 5.3.5, and 5.4.2 of the FSP.

10.0 PERFORMANCE AND SYSTEM AUDITS

At the direction of the CENPW Laboratory Technical Manager, at least one performance audit sample per analytical method identified in Table 3-1 shall be submitted blind to both the mobile and offsite laboratories as a quantitative overcheck of the accuracy of routine analytical methods. Performance audit samples shall contain a known quantity of a known compound; performance audit sample composition shall be documented by the CENPW Laboratory Technical Manager and retained as a permanent project QA record in compliance with Section 6.6 of CEQAPP 1.1 (CENPW 1993a). All performance audit samples shall be evaluated in compliance with the data validation protocols described in Section 8.3; validation summaries shall be forwarded directly to the CENPW Laboratory Technical Manager for evaluation and, as appropriate, initiation of corrective action as described in Section 13.0.

At least one systems audit of each phase of field activities shall be conducted by the remedial action contractor in compliance with CENPW-approved procedures developed to meet the requirements of Part II, Section B, criterion 9.1 of DOE/RL-90-28, Environmental Restoration Program Quality Assurance System Requirements for the Hanford Site (DOE, 1992). Systems audits of CENPW contract laboratory operations or other activities may also be conducted at the discretion of the CENPW Special Assistant for Quality Assessment, in compliance with Appendix E, Section 6.7 of CEQAPP 1.1.

11.0 PREVENTIVE MAINTENANCE

All measurement and testing equipment used in the field and in the mobile and off-site laboratories that directly affect the quality of the field and analytical data shall be subject to preventive maintenance measures that ensure minimization of measurement system downtime and corresponding schedule delays. Both the CENPW contract laboratory and the remedial action contractor's mobile analytical laboratory shall be responsible for performing or managing the maintenance of their analytical equipment. Maintenance requirements, spare parts lists and instructions shall be addressed in the laboratory QA plans, subject to CENPW review and approval as noted in Section 1.3 of this QAPjP. The remedial action contractor's measuring and testing equipment shall be drawn from inventories subject to standard preventive maintenance and calibration requirements as specified in CENPW-approved procedures developed to implement Part II, Section C, Criterion 13 of DOE/RL-90-28, Environmental Restoration Program Quality Assurance System Requirements for the Hanford Site, Revision 1 (DOE 1992).

12.0 DATA ASSESSMENT PROCEDURES

All analytical data shall be compiled, reduced in the manner described by the governing analytical method, and reviewed by the laboratory prior to submittal to the CENPW Laboratory Technical Manager for coordination of validation activities as described in Section 8.0 of this QAPjP. Assessment of the validated data shall be performed in compliance with Section 2.1 of the Work Plan.

13.0 CORRECTIVE ACTION

13.1 GENERAL REQUIREMENTS FOR CORRECTIVE ACTION

Corrective action requests that are required as a result of surveillance reports, nonconformance reports, program audit activities, or as a result of the specific request of the operable unit manager, shall be documented and dispositioned in compliance with applicable CQCP requirements, or if resulting from CENPW actions, the requirements of Section 3.2 of CEQAPP 1.1 (CENPW 1993a). Corrective action reports prepared under Section 3.2 requirements shall identify the affected requirement, the probable cause of the deviation, any data which may have been affected by the deviation, and the corrective action required both to resolve the immediate situation and to reduce or preclude its recurrence. Corrections of plans or procedures related to the overall measurement system that do not constitute nonconformances, but that may be required as a result of data validation, data assessment, or routine review processes, shall be resolved as required by their governing procedures or shall be referred to the CENPW Technical Manager for resolution and appropriate management action. All contractor documentation related to surveillances, audits, and corrective action shall be routed to the contractor's project quality records pending turnover to CENPW for retention in compliance with Section 6.0 of CEQAPP 1.1, and shall be made available for external review upon request through the CENPW Technical Manager.

13.2 CORRECTIVE ACTION REQUIREMENTS RELATED TO CALIBRATION ERRORS

Field measurement and test equipment found to be out of calibration shall be documented as a nonconformance in compliance with applicable CQCP requirements; corrective action shall be initiated as described in Section 13.1. Calibration errors related to laboratory analytical processes that may be observed during the data validation activities described in Section 8.0 shall prompt requests for reanalysis or other appropriate corrective action by the responsible laboratory as required by procedure WHC-SD-EN-SPP-002, Data Validation Procedures for Chemical Analyses (Bechtold 1992).

13.3 CORRECTIVE ACTION RELATED TO PROCEDURAL DEVIATIONS

Planned deviations from the procedural requirements described in Section 4 and Table 4-1 shall be processed in compliance with Section 5.4 of CEQAPP 1.1 (CENPW 1993a). Unapproved FCAs or unplanned procedural deviations observed during system audit, surveillance, or program audit activities shall be documented as nonconformances, findings, or observations in compliance with the procedures described in Section 10.0. Corrective action shall be initiated in compliance with applicable CQCP requirements, or, if initiated by CEPNW action, the requirements of CEQAPP 1.1 Section 3.2.

14.0 QUALITY ASSURANCE REPORTS

As previously stated in Sections 10.0 and 13.0, project activities shall be assessed by performance and system audits. Nonconformance, audit, and corrective action documentation shall be routed to the project quality records on completion or closure of the activity. A report summarizing corrective action and field change authorization activity (see Sections 4.4 and 13.2), as well as any associated corrective actions, shall be prepared by the remedial action contractor and submitted for review and approval by the CENPW Technical Manager and the CENPW Special Assistant for Quality Assessment after the completion of the field and laboratory investigations. The report shall also include an assessment of the overall adequacy of the total measurement system with regard to the DQOs described in Section 3.0.

15.0 REFERENCES

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Appendix C

1100 AREA RD/RA
SITE SAFETY AND HEALTH PLAN

June 9, 1994

Work Performed Under Master
Interagency Agreement
No. DE-AI06-90RL12074
Task Order DE-AT06-93L12107

Prepared for
U.S. Department of Energy
Operations Office, Richland

Prepared by
DEPARTMENT OF THE ARMY
Walla Walla District, Corps of Engineers
Walla Walla, Washington 99362-9265

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1.0 INTRODUCTION

1.1 PURPOSE

The purpose of this document is to establish safe work practices for on-site activities associated with implementation of the 1100 Area Remedial Design/Remedial Action (RD/RA) Work Plan, and to provide all personnel engaged in such activities with the information they need to perform their respective job duties safely and confidently. "On-site" activities shall be defined as those activities conducted within the boundaries of the areas designated as Operable Units EM-1, EM-2, EM-3, and IU-1, within the 1100 Area of the Hanford Site.

The health and safety procedures set forth in this document are based on the best information available at this time. Project personnel should be advised, however, that unknown conditions or unrecognized hazards may exist, and that known conditions may be changed by project activities.

The procedures and levels of protection stipulated in this plan are largely precautionary and have been developed to provide project personnel with a level of protection that is appropriate not only for the hazards that are known to exist, but also for hazards likely to be associated with reasonably anticipated, but as yet unconfirmed site conditions. Nevertheless, site personnel must remain constantly alert to their surroundings and attentive to the task(s) at hand. Should any situation arise which appears to be beyond the scope of the routine health and safety procedures established herein, site personnel are directed to temporarily discontinue any questionable activity, move to a location that is clearly sufficiently removed from any suspected hazardous area or condition, and contact the appropriate health and safety personnel as set forth below.

1.2 SCOPE AND APPLICABILITY

The procedures and requirements set forth in this plan are applicable to all U.S. Army Corp of Engineers - Walla Walla District (CENPW) personnel, employees of all CENPW contractors, and any other subcontractors, inspectors, and/or visitors engaged in on-site activities in connection with implementation of the 1100 Area RD/RA Work Plan.

The 1100 Area Remedial Design and subsequent remedial actions are to a large extent defined by state, U.S. Department of Energy (DOE) and other federal health and safety requirements for hazardous waste operations. Every task must be designed within the framework of those requirements.

It is anticipated that 1100 Area RD/RA field operations will commence in the fall of 1993. Ultimately, implementation of the Work Plan will encompass many individual tasks which, depending on the availability of funding and other factors could take 18 months to 2 years to complete. Many of the RD/RA tasks are either defined only in a general way at this time, or are contingent upon the results of preliminary tasks, and are likely to change as a result of future decisions and/or subsequent findings.

The corresponding "task-specific" elements of the requisite health and safety plan(s) in turn, depend on those same decisions and/or findings, as well as the time of year that the task is ultimately performed, the availability/assignment of specific personnel, and other factors.

Consequently, this Site Health and Safety Plan must, out of necessity, be a living document. General site and project information, and health and safety requirements and procedures which are common to all 1100 Area RD/RS-related activities and not likely to change for the duration of the project are presented in the main body of this document.

A brief, supplemental task-specific health and safety plan, **must be prepared** and **approved for each task,** and **discussed with designated task personnel immediately prior to mobilization.**

Guidance for preparing the task specific plan is presented in Section 14 and an example plan is provided as Attachment A below. Together, the main body of this document and an appropriately completed 1100 Area RD/RA Task Specific Health and Safety Plan, shall embody a complete "Site Specific Safety and Health Plan."

All CENPW personnel, and all contractors and subcontractors who manage and/or conduct on-site activities under the RD/RA Work Plan must do so in accordance with the provisions of this Site Safety and Health Plan. All project personnel, subcontractors, inspectors, and site visitors are directed to read this plan prior to entering any designated Operable Unit, and to conscientiously observe the stipulated health and safety procedures.

Once project personnel are familiar with general site information, and the general requirements for employee training, medical surveillance, respiratory protection, protective clothing, and air monitoring. they need only refer to the "Task-Specific Health and Safety Plan" portion of this document for all subsequent tasks.

1.3 POLICY STATEMENT

It is the policy of CENPW to protect the environment and the health and safety of site workers, visitors, and the surrounding community from any adverse effects that might result from hazardous or mixed waste related activities conducted on the Hanford Site. To that end, CENPW will aggressively apply the ALARA (As Low As Reasonably Achievable) concept to all chemical as well as radiological exposure scenarios, and will consistently strive to implement ALARA-driven work practices and health and safety procedures, above and beyond those necessary to comply with other standards.

The health and safety procedures set forth in this Site Safety and Health Plan were conceived in keeping with this policy and have been specifically developed to facilitate safe and efficient implementation of the 1100 Area RD/RA Work Plan.

The ALARA principle however, does not demand that a hazard be presumed to exist simply because it cannot be demonstrated with absolute certainty that there is no way that it possibly ever could, nor does it demand excessive levels of personal protective equipment to "control" such hypothetical hazards.

Definitive precautionary measures will be stipulated whenever there is a "reasonable possibility of exposure" to a specific safety or health hazard. Reasonable precautionary measures including initial site characterization, training employees to recognize potential hazards, on-site monitoring with direct reading instruments, and the ALARA concept will be employed in all cases to the extent necessary to ensure that any unanticipated exposure, is identified and controlled **before** it constitutes a hazard.

Activities conducted in accordance with the provisions of this plan will comply with all applicable DOE Orders, standard operating procedures (SOPs), and state and federal regulations.

2.0 SITE DESCRIPTION

The Hanford Site is a 150,000 ha (560 mi^2) reservation which has been operated by the federal government since 1943. The primary mission of the Hanford Site has been plutonium production for military use and nuclear energy research and development. The Hanford Site is located along the Columbia River in southeastern Washington and includes portions of Benton, Grant, Franklin, and Adams counties as shown in Figure 2-1. The 1100 Area, which is adjacent to the City of Richland in Benton County, comprises the southeastern-most portion of and is the main portal to the Hanford Site.

The 1100 Area is a central warehousing, vehicle maintenance, and transportation distribution center. Specific 1100 Area operations include the following:

- Vehicle, heavy equipment, bus, and railroad maintenance
- Bulk storage of petroleum products
- Gasoline station
- Bus system operations-main dispatch, holding, and transit center
- Rail system operations-main delivery, dispatch, and export center
- Warehousing operations
- Excess construction, maintenance, and administrative materials storage
- Hazardous and flammable construction and maintenance materials storage
- Classified materials destruction
- Administrative control for the above operations.

The 1100 Area was placed on the National Priorities List (NPL), in July, 1989. For NPL purposes, the 1100 Area has been divided into four Operable Units: EM-1, EM-2, EM-3, and IU-1 (see Figure 2-2). Each of these Operable Units include areas (subunits) where there have been suspected or confirmed releases of hazardous materials to the environment.

The EM-1 Operable Unit consists of the Discolored Soil Site, the Ephemeral Pool, the Horn Rapids Landfill, and the groundwater beneath EM-1. Polychlorinated biphenyls (PCBs) are the focus of remediation at the Ephemeral Pool and the Horn Rapids Landfill. Bis(2-ethylhexyl)phthalate (BEHP or di-sec-octyl phthalate DOP) is known to be present at the so-called Discolored Soil Site, and trichloroethylene (TCE), is the primary constituent of concern in the groundwater beneath EM-1.

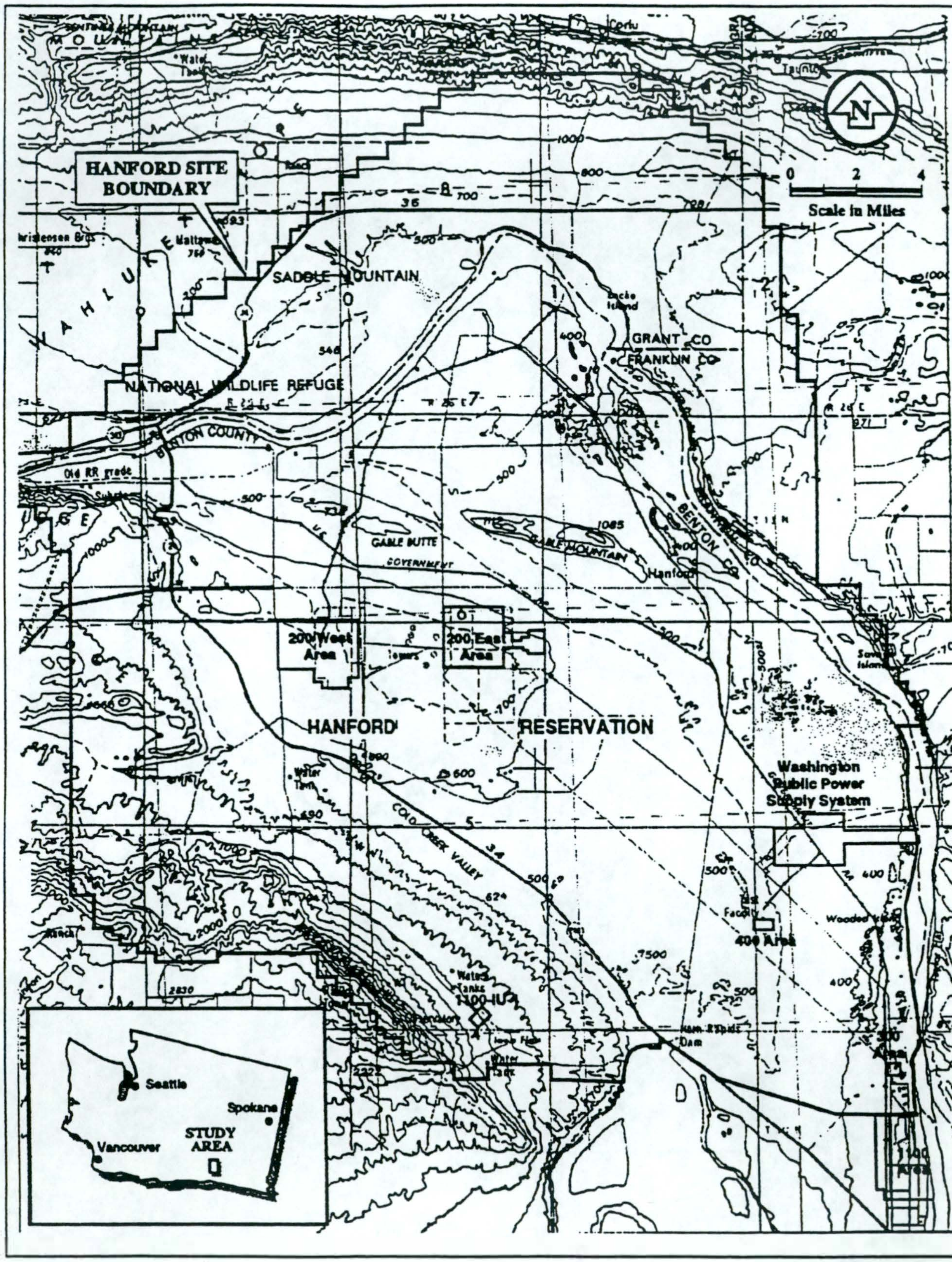

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Figure 2-1. Hanford Site and Area Designations.

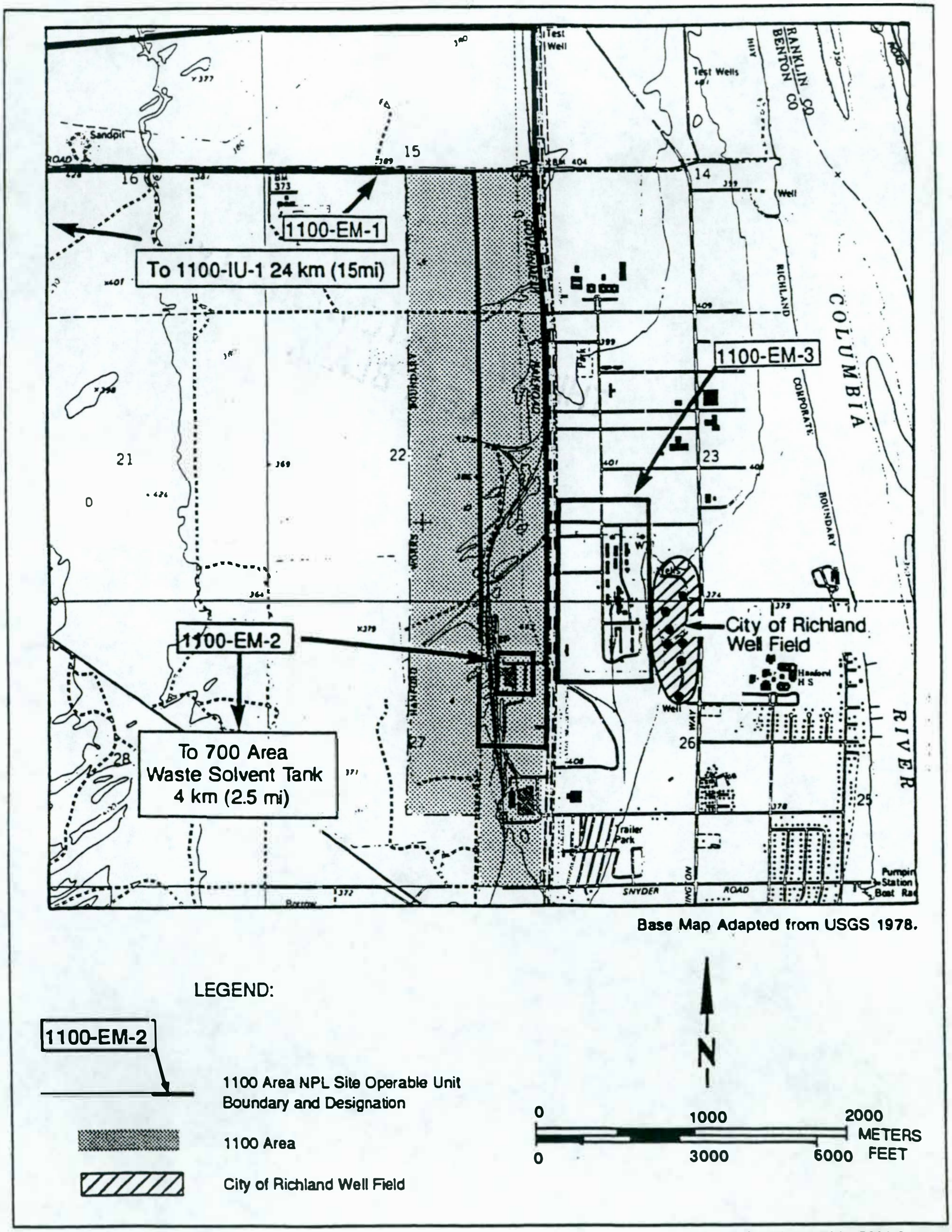

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Figure 2-2. Operable Units Within The 1100 Area NPL Site.

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EM-2, EM-3, and IU-1, encompass a variety of individual Waste Management Units (WMUs) including underground storage tanks, PCB contaminated transformer pads, drain fields, landfills, and the sites of isolated spills and buried waste ranging in size from an estimated 5 cubic yards of contaminated material, up to a 1.5 acre landfill.

2.1 1100-EM-1

1100-EM-1 (EM-1) encompasses an area on the southeast side of the Hanford site and west of the town of Richland. Due to the close proximity of EM-1 to the North Richland well field which is the water supply for the town of Richland, EM-1 has been assigned the highest priority of the Hanford operable units.

Past and present activities in EM-1 include warehousing, vehicle maintenance, and transportation distribution and have involved the use of solvents, fuels, oils, and polychlorinated biphenyls (PCBs). As indicated above, previous investigations have determined that contaminants are preset in the Discolored Soil Site, the Ephemeral Pool, the Horn Rapids Landfill, and the groundwater underlying EM-1 at concentrations that may pose a threat to human health. The following sections summarize available information and objectives for each area.

2.1.1 Discolored Soil Site

The Discolored Soil Site is an area where it is believed that one or more containers of bis(2-ethylhexyl)phthalate (BEHP) where either spilled or emptied without authorization. The site lies approximately 2,000 feet northwest of Building 1171 and encompasses a east-west trending depression. Previous investigations identified visibly stained soil covering about 6 by 10 feet on the eastern end of the depression. Samples collected from surface soil at this site contained BEHP at a maximum concentration of 25,000 mg/kg. The extent of contamination with depth and the areal limits of contamination have not been defined.

2.1.2 Ephemeral Pool

The Ephemeral Pool is a 20 by 700 foot manmade depression on the western side of the Building 1171 parking lot. The pool collected runoff water from the area for discharge to central culvert. However, water has been observed to collect in the pool and evaporate or infiltrate into the soil. Previous investigations have identified the presence of PCBs in the surface soil at a maximum concentration of 42 mg/kg. The extent of contamination with depth and the areal limits of contamination have not been defined.

2.1.3 Horn Rapids Landfill

The Horn Rapids Landfill covers approximately 50 acres northeast of the Siemens Power Corporation (SPC) and north of Horn Rapids Road. The landfill was operated as an uncontrolled (presumably non-radioactive waste) landfill for Hanford Operations from the late 1940s until the 1970s. Office and construction waste, asbestos wastes, sewage sludge, and fly ash are known to have been disposed of in the landfill. Previous investigations have identified asbestos contamination and an area contaminated by PCBs. PCBs are the only contaminants requiring remediation in this area. The asbestos contaminated sections of the landfill are to be contained in place and capped.

2.1.4 Site 600-2

Site 600-2 is located on Siemens Nuclear Power Corporation property south of Horn Rapids Road and the southern boundary of the Hanford Site, adjacent to the Horn Rapids Landfill. The site is thought to have been a disposal site for military debris and, in more recent years, non-hazardous construction wastes (e.g., concrete, asphalt, and landscaping debris). Current plans call for a site walkover/visual survey and a geophysical survey to define the areal extent of the disposal site.

2.1.5 EM-1 Groundwater

EM-1 groundwater has been found to be contaminated with trichloroethylene (TCE) at maximum concentrations of 110 micrograms/liter (μg/L). Contaminated groundwater has been identified both upgradient and downgradient of the Horn Rapids Landfill. The Richland wellfield is not impacted by the TCE plume.

2.2 OPERABLE UNIT 1100-EM-2

Operable Unit 1100-EM-2 (EM-2) lies within the area of EM-1 in the southwest corner of the Hanford site and near the north boundary of the City of Richland. Past and present activities in EM-2 include vehicle maintenance and repair in Building 1171 which is located in the middle of the area.

Operations at EM-2 potentially involved the use of solvents, fuels, oils, and polychlorinated biphenyls (PCBs). Previous investigations have identified three areas within EM-2 that will require further investigation and/or remediation. The following sections contain available information and objectives for each area.

2.2.1 Tar Flow Area

A soft tar-like substance was observed on the ground surface about 1,050 feet north of the northwest corner of Building 1171. The tar-like substance was observed to have flowed over an area of about 110 feet by 30 feet. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available.

2.2.2 Stained Sands Area

An area of visibly stained sands has been identified on the east slope of a sand dune located about 900 feet north of the northwest corner of Building 1171 (Figure 1-2). Stained sands were observed over a 20 foot by 20 foot area. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available.

2.2.3 "Neptune's Potato" and Separator Tank

A trench has been identified on the north side of EM-2. A 1948 aerial photograph shows three distribution trenches at the end of the main trench that are no longer visible. A concrete tank in the vicinity may have been associated with the trench. The existing trench is 2,600 feet by 4 feet. The original trench was longer. This trench could have been used for disposal of chlorinated and nonchlorinated solvent wastes. However, sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available.

2.3 OPERABLE UNIT 1100-EM-3

Operable Unit 1100-EM-3 (EM-3), located to the northwest of EM-2, encompasses a fenced industrial area containing numerous permanent buildings (see Figure 2-3). Past and present activities in EM-3 include maintenance and warehousing in support of the Hanford site.

Operations at EM-3 included the use of solvents, fuels, oils and polychlorinated biphenyls (PCBs). Previous investigations have identified nine areas within the EM-3 that will require further investigation and/or remediation. These ares of concern include spill areas, disposal areas, storage tanks, and equipment rinse pads. The following section summarize available information and objectives for each area.

2.3.1 1240 Suspect Spill Area

An area of visibly stained soils has been identified on the south end of Building 1240. The spill is reportedly a pliable adhesive mixed with metal fragments and floor sweepings covering a 10-foot square area. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available.

2.3.2 1240 French Drain

The 1240 French Drain is located on the west side of Building 1240 by a loading dock. Although no evidence of spills into the drain has been observed, a PCB collection area was located close to the drain. The drain reportedly discharges directly into the surrounding soils. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available. However, based on the proximity of the PCB collection area to the drain, PCBs are considered a potential contaminant.

2.3.3 1226 Suspect Waste Oil Disposal Area

The 1226 Suspect Waste Oil Disposal Area is located between Buildings 1212 and 1226 and encompasses and area of about 50 square feet. According to interviews, waste oil was disposed in this area for a period of 20 years by spraying it on the ground. Since the area has been covered with gravel, visibly contaminated soils have not been observed. Potential contaminants include petroleum hydrocarbons and metals.

2.3.4 1212/1217 Suspect Battery Acid Disposal Area

Interviews have indicated that for 20 years prior to 1980, batteries were emptied at the 1212/1217 Suspect Battery Acid Disposal Area. The area has since been covered with gravel, so visibly contaminated soils have not been observed. Since battery wastes are known to have been disposed in this area, potential contaminants include bad and (long since dissociated) sulfuric acid. However, sampling has not been conducted at this site, so information regarding the type and extent of contamination is not available.

2.3.5 1218 Service Station

Underground storage tanks (UST) have been located at the 1218 Service Station. No other information is available. However, the presence of a service station and associated USTs at this site indicates that potential contaminants include petroleum hydrocarbons such as gasoline.

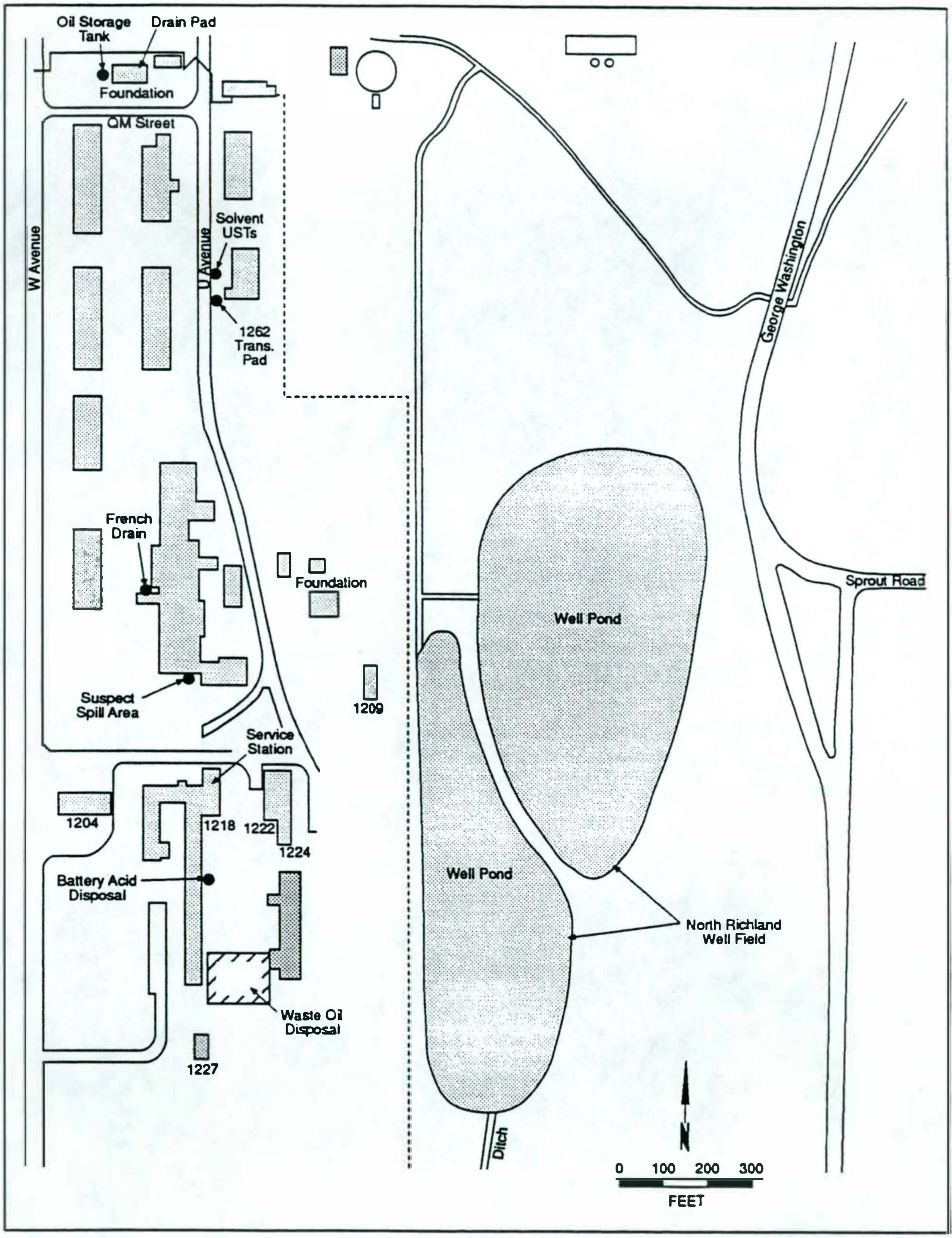

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Figure 2-3. EM-3 Location of Sites.

Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available.

2.3.6 1262 Solvent Tanks

The 1226 Solvent Tanks are located on the west side of Building 1262. Four USTs that previously contained cleaning solvents (possibly carbon tetrachloride) have been identified. Therefore, potential contaminants at this site will include chlorinated and possibly nonchlorinated solvents. Sampling has not been conducted at this site, so definitive information regrading the type and extent of contamination is not available.

2.3.7 1262 Transformer Pad

A 6 foot by 6 foot pad that apparently held transformers in the past has been identified by Building 1262. No visible stains were observed. Due to the past presence of transformers, potential contaminants at this site include PCBs. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available.

2.3.8 JA Jones Oil Storage Tanks

Fuel storage tanks for the JA Jones Steam Plant were reportedly located on the north side of EM-3. It is not known if the tanks were above or below ground. No other information is currently available, including the type of fuels that were stored in the tanks. However, the presence of fuel tanks indicates that petroleum hydrocarbons are potential contaminants at this site.

2.3.9 JA Jones Steam Plant Drain Pad

A 20 by 10 foot drain pad has been identified on the north side of EM-3. Inspections of the pad did not determine the discharge point for the drain. No visible signs of contamination were encountered. Sampling has not been conducted at this site so no information regarding the type and extent of contamination is available. Potential contaminants are unknown, but could include a myriad of constituents, such as solvent wastes, metals, and lubricating and fuels and oils.

2.4 OPERABLE UNIT 1100-IU-1

Operable Unit 1100-IU-1 (IU-1) is the site of a former missile base located 15 miles west of the EM-1 Area (Figure 2-4). The majority of the facilities lie either on the northeast slope or on top of Rattlesnake Hills, and include numerous permanent structures that performed missile launch, control, and maintenance functions. All of the missile base facilities have been abandoned with the exception of a barracks building, which houses the Arid Lands Ecology (ALE) Reserve headquarters. IU-1 is located within the 120 square mile ALE Reserve.

During active operations, missile maintenance activities involved use of solvents, fuels, acids, hydraulic fluid, and paints. Interviews conducted with former workers at the missile site have indicated that all wastes generated during operations were disposed of in on-site landfills or dumped nearby off-site. Areas of concern at IU-1 include former septic fields that may have been used for solvent disposal, storage tanks, disposal sites, and landfills. Previous investigations

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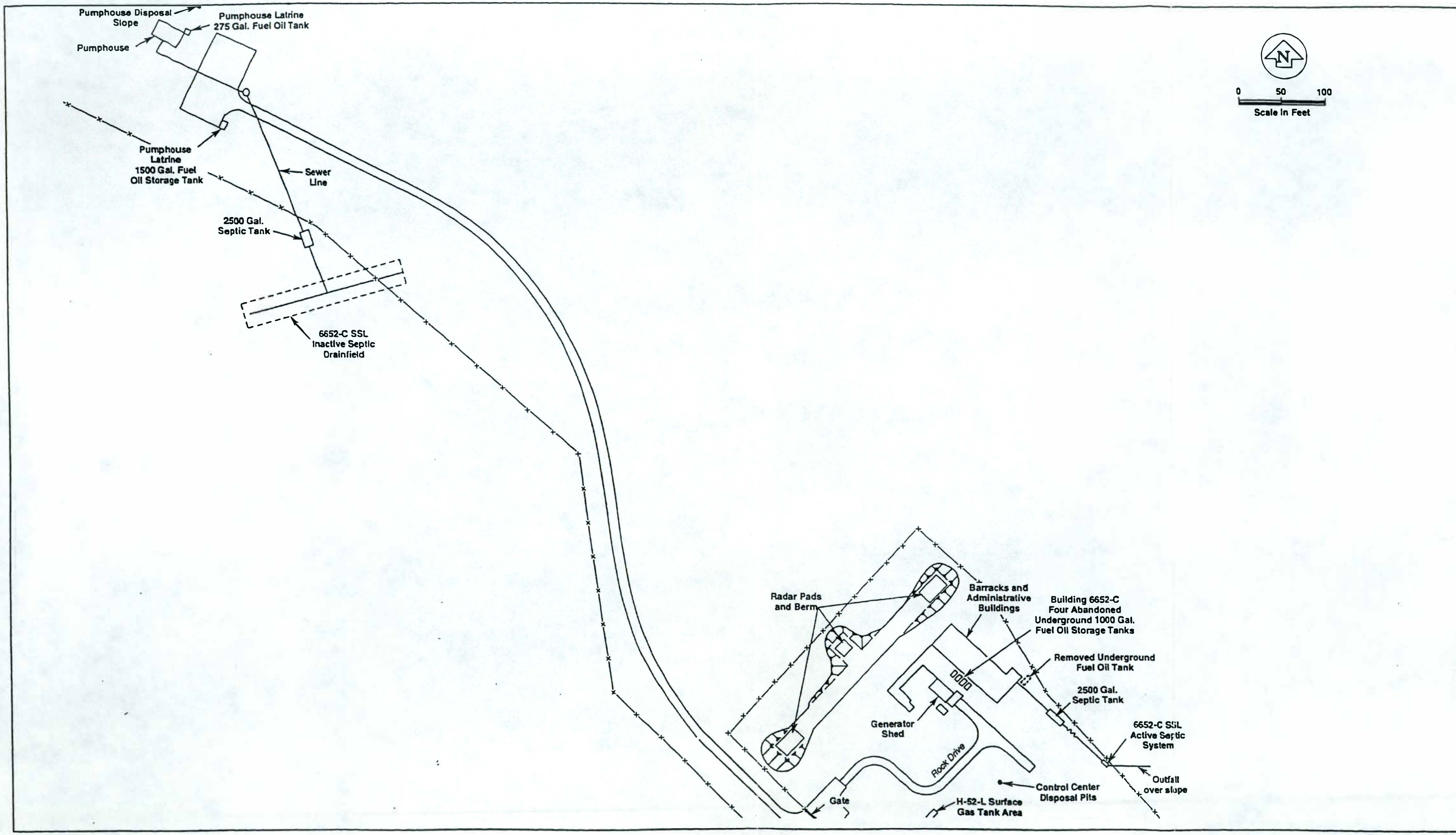

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Figure 2-4. IU-1 Missile Area (1 of 2).

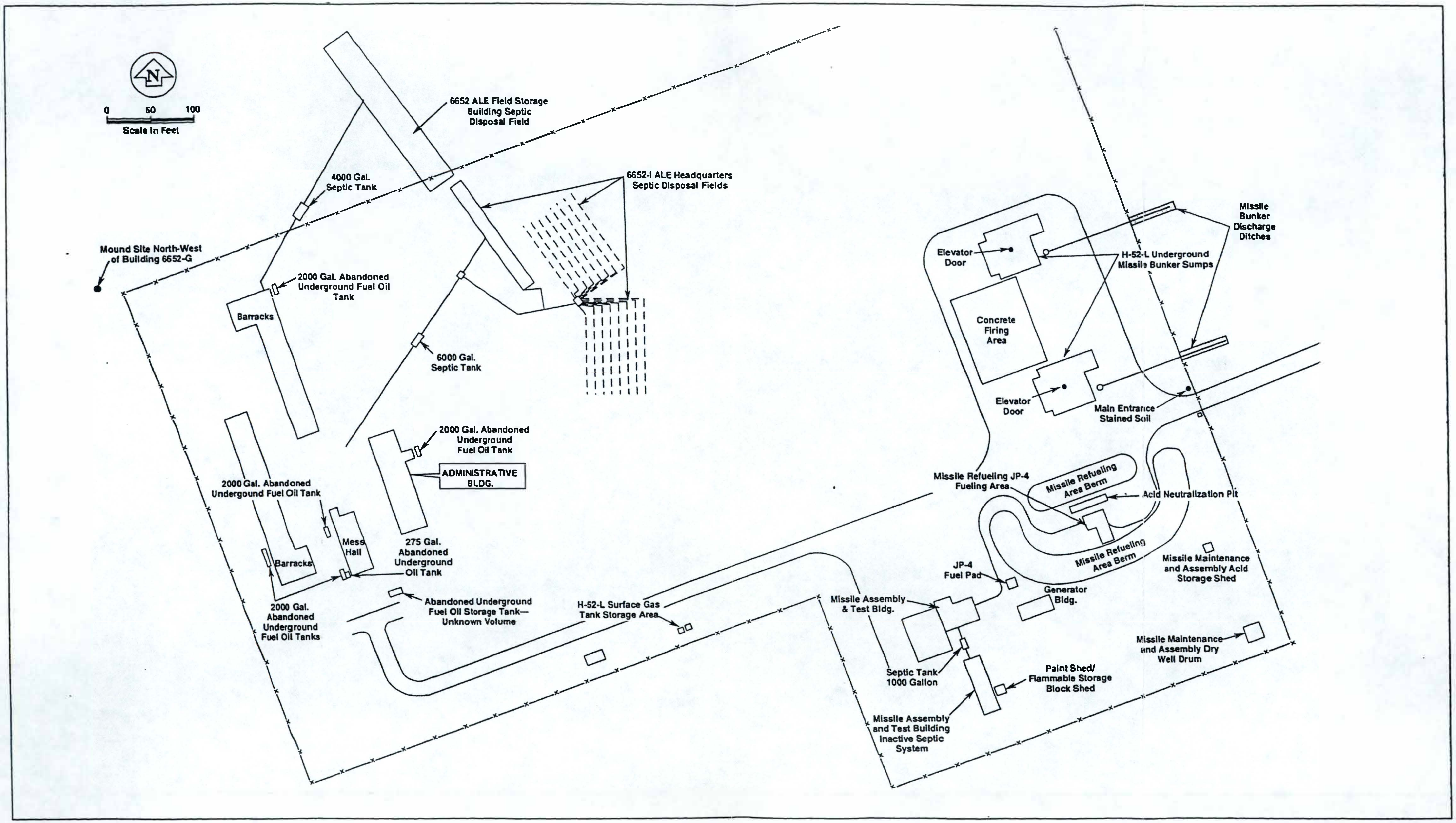

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Figure 2-4. IU-1 Missile Area (2 of 2).

have identified 32 areas within IU-1 that will required further investigation and/or remediation. The following discussion contains available information and objectives for each area.

2.4.1 6652-C SSL Active Septic System

Discharge from this septic system which includes a 2500 gallon specific tank has been observed over a slope northeast of the administrative building. The estimated area covered by the septic system field is 35 feet by 7 feet. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available. However, solvents were regularly used in site processes and are thought to have been discharged into the septic systems for disposal; therefore, potential contaminants may include chlorinated and nonchlorinated solvents.

2.4.2 6652-C SSL Inactive Septic System

Due to the possibility that solvents and other wastes were disposed of in septic systems, this area has been identified as one requiring additional investigation. The estimated area covered by the septic system field is 30 by 300 feet. In addition, a 2,5000-gallon septic tank is associated with this septic system. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available.

However, solvents were regularly used in site processes and are though to have been discharged into the septic systems for disposal. Therefore, potential contaminants may include chlorinated and nonchlorinated solvents.

2.4.3 Radar Berm and Pads

Large amounts of hydraulic fluid were used in these areas to rotate radar tracking equipment. There are three pads, each of which is 16 by 16 feet. Visible contamination has not been observed on the pads or surrounding berms. No sampling has been conducted in this area. Potential contaminants include petroleum hydrocarbons and related chemicals (hydraulic fluid).

2.4.4 II-52-C Surface Gas Tank Area

Previous investigations have identified two 475-gallon surface gasoline tanks in this area. Interviews with former site personnel have indicated that this area was also used for cleanup of paintbrushes and other items. No containment was provided during paintbrush cleanup. No visible staining was observed during previous investigations. The estimated area covered by the tanks and used for cleanup purposes is 20 by 20 feet. Potential contaminants at this site include petroleum hydrocarbons (gasoline) from the gas storage tanks, and solvents (chlorinated and nonchlorinated) and metals from cleanup of painting materials.

2.4.5 Control Center Disposal Pits

Four pits approximately 3 feet in diameter and 2 feet in depth have been identified in this are. This pits are believed to contain solid wastes. However, no sampling has been conducted to confirm if contaminants are present. Potential contaminants in this area could include anything used at the base, such as chlorinated solvents, petroleum hydrocarbons, acids, and metals.

2.4.6 Building 6652-C Abandoned USTs

Interviews with former site personnel have identified the presence of four 1,000 gallon fuel-oil USTs in the Building 6652-C area. During a previous site visit, the position of the tanks could not be determined. However, an additional tank was discovered located on the east corner of the building. In addition, site plans indicate a total of five USTs associated with this area. No other information is currently available. Potential contaminants at this site include petroleum hydrocarbons (fuel oil or diesel) from the abandoned USTs.

2.4.7 Pumphouse Disposal Slope

Previous investigations have identified dumping of solid waste on slope by the pumphouse. A small pile of debris was observed at the top, and piles of concrete were observed on the slope. The estimated volumes of debris piles are 5 feet by 5 feet by 2 feet and 85 feet by 10 feet by 1 foot. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available.

2.4.8 Pumphouse Latrine 1,500-Gallon Fuel Oil Storage Tank

This tank was known to be above ground, and has been removed. No other information is currently available. Potential contaminants at this site include petroleum hydrocarbons (fuel oil or diesel) from the storage tank.

2.4.9 Pumphouse Latrine 275-Gallon Fuel Oil Storage Tank

This tank was known to be above ground, and has been removed. No other information is currently available. Potential contaminants at this site include petroleum hydrocarbons (fuel oil or diesel) from the storage tank.

2.4.10 6642 ALE Field Storage Building Septic System

Due to the possibility that solvents and other wastes were disposed of in septic systems, this area has been identified as one requiring additional investigation. The estimated area covered by the septic system field is 200 feet by 40 feet. In addition, a 4,000-gallon septic tank is associated with this septic system. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available. However, potential contaminants may include chlorinated and nonchlorinated solvents that may have been discharged into the septic system or disposal.

2.4.11 Mound Site Northwest of Building 6652-G

The so called "Mound Site", identified during past site visits, appears to be a windbreak or the location of a soil research project by the ALE laboratory. No other information is currently available. Former use and/or potential contaminants, if any, at this site are unknown.

2.4.12 6652-I ALE Headquarters Septic System

The septic field for this system includes three separate areas: a 15 foot by 150 foot field; a 70 foot by 100 foot field; and a 70 foot by 100 foot field. In addition, a 6,000-gallon septic tank is associated with the system. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available. Potential contaminants may include chlorinated and nonchlorinated solvents that may have been discharged into the septic system or disposal.

2.4.13 Abandoned Underground Storage Tanks

Interviews with former site personnel indicate that six abandoned USTs, ranging in size from 275 gallons to 2,000-gallons, are present on this site. Some or all of the tanks may still contain fuel. A tank of unknown volume has been located behind the generator building; site plans indicate this tank is a 3,000-gallon fuel oil tank. The remaining tanks have not been located. Potential contaminants at this site include petroleum hydrocarbons (fuel oil) from the storage tanks.

2.4.14 H-52-L Missile Bunker Sump

The Missile Bunker Sump is an underground facility that was found to contain batteries, discarded transformers, and asbestos insulation during previous investigations. The area also potentially contains discarded missile fuel (contains red fuming nitric acid, aniline, furfuryl alcohol, JP3/JP4, and hydrazine) and hydraulic fluid tanks. The asbestos will be removed and properly disposed of. A geophysical survey will be conducted to locate the tanks and other buried objects, with follow up actions dependent on the results of the survey. Sampling and testing for explosive compounds may also be conducted. The building will eventually be closed.

2.4.15 Missile Bunker Landfill

Interviews with former site personnel indicate this landfill was used for disposal of construction and demolition debris. Previous investigations identified construction debris on the landfill surface. The estimated area of the landfill is 1.25 acres. Potential contaminants could include anything used at the base, such as solvents (both chlorinated and nonchlorinated), discarded missile fuel, petroleum hydrocarbons (fuels, waste oil, hydraulic fluid), acids, and metals.

2.4.16 Missile Refueling Area Berm

It has been determined that herbicides and/or defoliants were historically use on this berm. The estimated volume of the berm is 600 cubic yards. Sampling has not been conducted at this site, so no definitive information regarding the type and extent of contamination is available, however, the ROD lists dimethylhydrazine, inhibited red fuming nitric acid, aniline, furfuryl alcohol, ethylene oxide and hydrocarbons such as JP-4 fuel as potential contaminants of concern.

2.4.17 Acid Neutralization Pit

A concrete drainage pit presently filled with soil and vegetation has been identified. The estimated size of the pit is 40 feet by 5 feet. Site plans identify this area as an acid neutralization pit. In addition, JP-4 from a nearby refueling area is thought to have drained into the pit. No other information is currently available. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available. However, contaminants may include metals associated with acids and petroleum hydrocarbons (JP-4).

2.4.18 Missile Refueling JP-4 Fueling Area

This area was identified during previous investigations as a refueling area. Excess fuel may have drained into the adjacent acid neutralization pit. Estimated size of the area is 20 feet by 20 feet. Sampling has not been conducted at this site, so no information regarding type and extent of contamination is available. However, based on past use of the area, potential contaminants include petroleum hydrocarbons (JP-4).

2.4.19 Missile Assembly and Test Building, Inactive Septic System

Building 6652-0, which is connected to this septic system, was determined through interviews to be the location of the electrical parts cleaning operation. Given the nature of past disposal practices, this septic system warrants further investigation. The estimated area covered by the septic system field is 70 feet by 20 feet. A 1,000-gallon septic tank is also associated with this system. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available. However, solvents were regularly used in site processes. The location of a parts cleaning operation on this septic system indicates that solvents may have been discharged into this septic systems for disposal. Therefore, potential contaminants include chlorinated and nonchlorinated solvents.

2.4.20 Missile Maintenance and Assembly Area Acid Storage Shed

Previous investigations identified discolored soil and stressed vegetation in the vicinity of this shed. A drainage ditch that runs near the shed was also observed to contain discolored soil. The estimated size of the shed is 15 feet by 15 feet. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available.

2.4.21 JP-4 Fuel Pad

This area was identified as a 10 foot by 10 foot concrete pad where fueling operations took place. No evidence of spills or staining has been observed on the pad. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available. However, based on past use of the area, potential contaminants include petroleum hydrocarbons (JP-4).

2.4.22 Missile Bunker Drainfield

The estimated area covered by the septic system field is 15 feet by 50 feet. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available. Given the nature of past disposal practices, this septic system warrants further investigation. Potential contaminants may include chlorinated and nonchlorinated solvents that could have been discharged into the septic system for disposal.

2.4.23 Missile Bunker Discharge Ditch

During previous site visits, water was observed discharging into this ditch from an unknown source. The discharge water was observed to contain particulate material. The estimated are of the ditch is 70 feet by 5 feet. Sampling has not been conducted at this site, so no information regrading the type and extent of contamination is available.

2.4.24 Main Entrance Stained Soil

An 18 foot by 15 foot area of discolored soil and debris was discovered by the main entrance to the missile launch site. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available.

2.4.25 H-52-L Surface Gas Tank Storage Area

Previous investigations have identified two 475-gallon surface gasoline tanks in this area. Interviews with former site personnel have indicated that this area was also used for cleanup of paintbrushes and other items. No containment was provided during paintbrush cleanup. No visible staining was observed during previous investigations. The estimated area covered by the tanks and used for cleanup purposes is 20 feet by 20 feet. Potential contaminants at this site include petroleum hydrocarbons (gasoline) from the gas storage tanks, and solvents (chlorinated and nonchlorinated) and metals from cleanup of painting materials.

2.4.26 Generator Building

During previous site visits, abandoned transformers and other electrical equipment were observed at this site. Sumps may have collected leakage from the transformers and generators. The building was observed to be collapsing. Potential contaminants from the generator building include petroleum hydrocarbons and PCBs. In addition, the potential for asbestos and lead particulates from the collapsing building exists. Asbestos will be removed, bagged, and properly disposed of and the building demolished. Following demolition of the building, investigation of this area will include soil sampling to identify contaminants and to determine the areal and depth limits of contamination. Results of sample analyses will be used to determine remediation options.

2.4.27 Horseshoe Site

This 0.5 acre site was identified as a possible disposal site. Large pieces of dried paint and general debris were observed on the surface of the area. No other information is currently available. Potential contaminants could include anything used at the base, such as solvents, discarded missile fuel, petroleum hydrocarbons, acids, and metals.

2.4.28 Elevator Doors

During previous site visits, a tar like sealant that may contain PCBs was observed around the launch pads and elevator doors. Included in this area are tow 12-foot by 33-foot launch pads and the elevator doors.

2.4.29 Flammable Storage Block Shed

Discolored soil and stressed vegetation was observed in the vicinity of this shed. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available.

2.4.30 Missile Maintenance and Assembly Area Paint Shed

This shed has been removed and may have been replaced with the Flammable Storage Block Shed. No visible stains were observed in the area, which is an estimated 10 feet by 10 feet. Sampling has not bee conducted at this site, so no information regarding the type and extent of contamination is available.

2.4.31 Missile Maintenance and Assembly Area Dry Well Drum

During previous site visits, a 55-gallon drum was observed buried in this area. Another 55-gallon drum was observed laying on its side near the buried drum. The unburied drum was marked "Dry cleaning solution (60-10-4F)". Vegetation was sparse in the area, which is an estimated 5 feet by 5 feet. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available. However, based on the drum labeling, potential contaminants may include chlorinated solvents.

2.4.32 B-52-L NIKE Base Landfill

This landfill is located 100 yards southeast of the main gate to the missile base. Interviews with former site personnel have indicated that everything used in base support operations was disposed of in a landfill close to the base. During previous investigations, numerous areas of discolored soil and stressed vegetation were observed on the surface of the landfill. Various debris was also observed at the surface. The estimated size of the landfill is 1.5 acres. No other information is currently available. Potential contaminants as identified in the ROD include anything used at the base, such as solvents (both chlorinated and nonchlorinated), discarded missile fuel (contains red fuming nitric acid, aniline, furfuryl alcohol, JP3/JP4, and hydrazide), petroleum hydrocarbons (fuels, waste oil, hydraulic fluid), acids and metals.

3.0 TASK DESCRIPTIONS

The anticipated remedial activities for the 1100-EM-1 Operable Unit includes the following:

- Excavating and incinerating all soil within the Discolored Soil Site that contains BEHP at concentrations above 71 mg/kg.
- Removal and landfill all soils within the Ephemeral Pool Site containing PCBs at concentrations above 1 mg/kg.
- Removing and excavating all soil within the Horn Rapids Landfill containing PCBs at concentration above 5 mg/kg.
- Capping the Horn Rapids Landfill within an asbestos cap.
- Installing groundwater monitoring wells to detect any migration of TCE at a concentration above 5 μg/L beyond the George Washington Way Diagonal.

Activities at the EM-2, EM-3, and IU-1 Operable Unit will consist of initial field sampling characterize the nature and extent of contamination and depending upon the results of that effort, excavating and either landfilling or incinerating contaminated soil as necessary.

The specific tasks associated with implement the above alternatives are identified and described in detail in Section 3.0 of the Field Sampling Plan (FSP) in Appendix A. Each subsection of FSP Section 3.0 refers to a specific task and provides a logical basis for preparing the corresponding task-specific portion of this plan.

4.0 ORGANIZATIONAL STRUCTURE AND RESPONSIBILITIES

The following organizational structure is included for the benefit of the employee in the field, to communicate to the employee the current lines of immediate safety and health authority, responsibility, and communication necessary to assure his or her safety and health.

4.1 ORGANIZATIONAL STRUCTURE FOR 1100 AREA RD/RA FIELD ACTIVITIES

For the purposes of 1100 Area RD/RA field activities and this health and safety plan, the "organizational part of the program" shall identify the personnel acting in the following capacities, positions, and/or organizations by name.

(A) The RD/RA Program Manager
(B) The Industrial Hygiene/Safety Manager (HSM)
(C) The Health Physics Manager (HPM)
(D) The Project Manager (PM)
(E) The Project Health and Safety Supervisor (HSS)
(F) The Project Health Physicist (HP)
(G) Field Team Leader (FTL)
(H) The Site Safety Coordinator (SSC)
(I) Radiation Protection Technician (RPT)

The chain of command for health and safety purposes, and the lines of communication for health and safety related issues shall progress as shown in Figure 4-1.

In the event of an on site emergency such as a fire or serious injury, the appropriate emergency response organization designated in the Task-Specific Health and Safety Plan shall be summoned immediately. The designated site emergency response coordinator shall have the authority to direct emergency activities until the arrival of emergency response personnel, at which time such authority is immediately deferred to the emergency response team leader. Once the situation is stabilized, the site emergency coordinator shall immediately notify the RD/RA program manager, and the appropriate project health and safety personnel as set forth in the "Emergency Response" section of the Task Specific Health and Safety Plan.

4.2 RESPONSIBILITY AND AUTHORITY

The designated functional titles shall be assigned the following responsibilities and authority:

- RD/RA Program Manager

  The RD/RA Program Manager has ultimate responsibility and is ultimately accountable for the safe and successful implementation of the 1100 Area RD/RA Work Plan.

  The RD/RA PM is primarily an administrator and is responsible for preparing and organizing the elements of the 1100 Area RD/RA Program, i.e. money, materials, equipment, and personnel, and directing the implementation of the program through task managers. The RD/RA PM must convey DOE's high regard for health and safety to every employee under his or her direction.

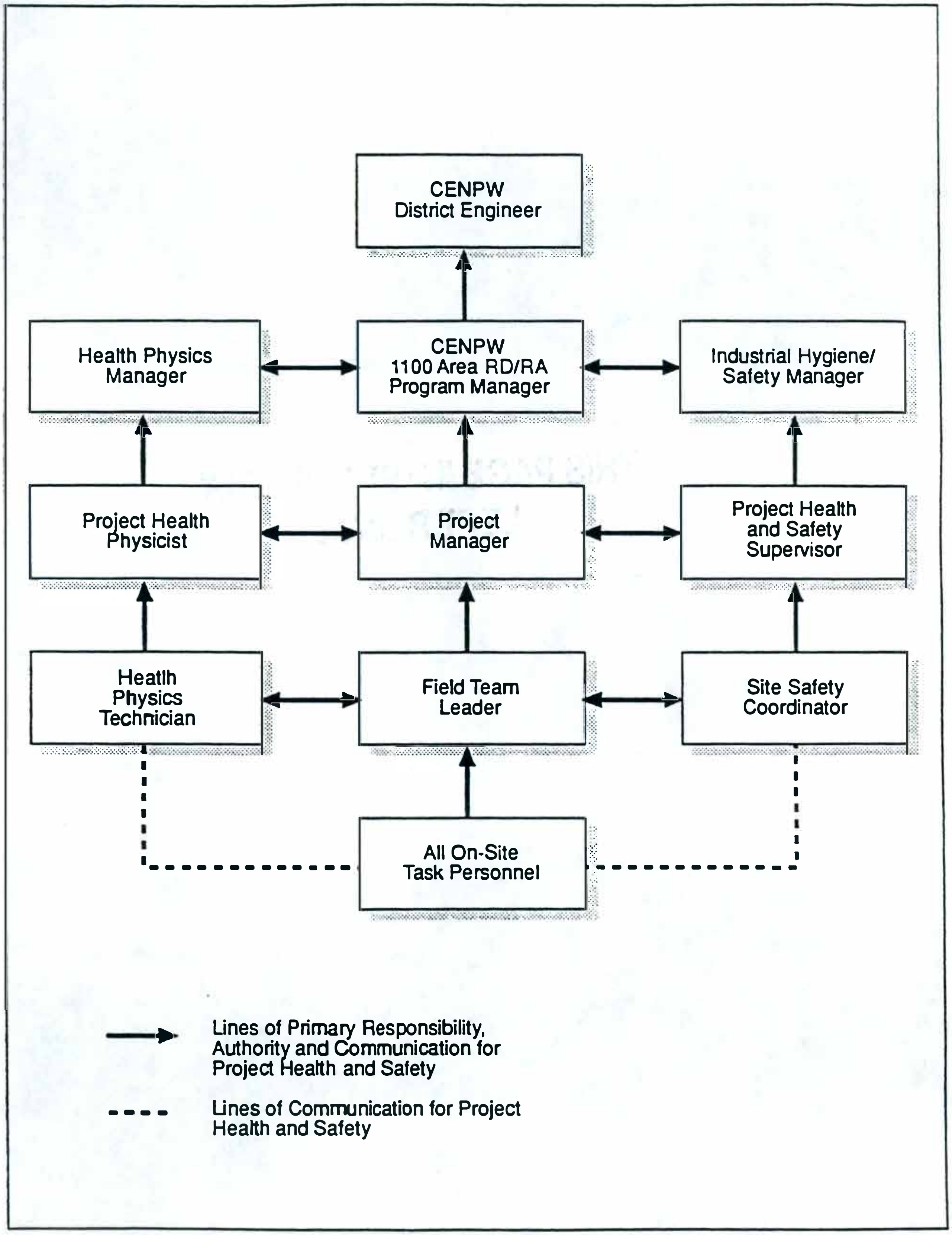

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Figure 4-1. Organizational Structure.

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- Industrial Hygiene/Safety Manager

  The designated Industrial Hygiene/Safety Manager (HSM) shall be that individual who is directly responsible for the implementation of the applicable contractor's health and safety program for the operational area where the subject field activities are to take place.

  The HSM has the authority to promulgate area-wide, if not site-wide health and safety procedures and/or requirements, to implement those requirements through his or her staff, and to take any other measures necessary to implement an effective program for the prevention of work related injuries or disease.

- Health Physics Manager

  The designated Health Physics Manager (HPM) shall be that individual who is directly responsible for the implementation of the applicable contractor's radiological health and safety (health physics) program for the operational area where the subject field activities are to take place.

  The HPM has the authority to promulgate area-wide, if not site-wide radiological health and safety procedures and/or requirements, to implement those requirements through his or her staff, and to take any other measures necessary to implement an effective program to evaluate and control worker exposure to ionizing radiation and prevent any adverse effects upon human health or the environment.

- Project Manager

  The Project Manager is responsible for utilizing the resources provided, towards the safe and successful day to day, task by task, implementation of the 1100 Area RD/RA Work Plan under the direction of the RD/RA PM.

  The Project Manager is responsible for ensuring that all personnel are adequately trained and equipped, and that all field activities are performed in keeping with all applicable regulatory and procedural requirements.

  The Project manager must be initiated each Task Specific Health and Safety Plan and distribute same to all task personnel, and conduct a health and safety briefing prior to the beginning of field work to discuss the applicable and appropriate health and safety and emergency response procedures. The Project Manager is responsible for ensuring that all sampling personnel meet, understand and comply with all safety requirements.

- Project Health and Safety Supervisor

  The Project Health and Safety Supervisor (HSS) shall be a project level Industrial Hygienist and will serve as the primary source of information and assistance regarding health and safety issues associated with 1100 Area RD/RA activities. In accordance with CENPW directives, the Project Health and Safety Supervisor must be a Certified Industrial Hygienist.

  The designated HSS will be responsible for preparing a Task Specific Health and Safety Plan when one is necessary, and all sampling, safe work, and confined space entry permits as appropriate. The HSS shall assist the Project Manager in any way necessary to comply with the provisions of this health and safety plan.

The HSS or a designee shall periodically perform "oversight" monitoring of the area and work practices during field activities. The Project Health and Safety Supervisor has the requisite authority to implement the procedures set forth in this document including the authority to temporarily halt work on a project.

- Project Health Physicist

The Project Health Physicist (HP) will be the primary source of information and assistance for assessing and controlling radiological hazards.

The HP will be responsible for preparing and/or reviewing a radiation work permit when one is required, and for assisting the Project Manager in any way necessary to comply with the provisions of this plan and any other applicable radiation protection requirements.

The HP or a designated technician shall periodically perform "oversight" monitoring of the area and work practices during field activities and will be available on an on-call basis for field support.

The HP has the requisite authority to implement the procedures set forth in this document or any other applicable radiological health requirements established in any DOE Order or contractor SOP, including the authority to temporarily halt work on a project.

- Field Team Leader (FTL)

The Field Team Leader is directly responsible for the safe and successful completion of a designated task in the field and shall have the requisite authority to direct all on-site work activities to achieve that end.

The Field Team Leader acts on behalf of the Project Manger in the field to perform a designated task in keeping with the RD/RA Work Plan and all other work permits e.g., a Radiation Work Permit, and written plans i.e., the Task Specific Health and Safety Plan.

The Field Team Leader will rely upon the expertise of the Site Safety Coordinator and the Radiation Protection Technician, but has ultimate authority for directing work activities in the field. If the Task Specific Health and Safety Plan and (if applicable) the Radiation Work Permit are properly prepared and implemented in the field, the role of the SSC and RPT should be largely to serve in an oversight capacity.

The Field Team Leader shall defer to the authority of the Site Safety Coordinator and/or Radiation Protection Technician when, in the opinion of the SSC or RPT, it is necessary to modify work practices or temporarily cease operations to protect the health and safety of the general public, task personnel, or the environment.

- Site Safety Coordinator (SSC)

The Site Safety Coordinator shall be a designated member of the team if different than the HSS or HP, who is present at the work site at all times during on-site activities, who has overall responsibility and authority for health and safety decisions in the field. The SSC has the overall responsibility for assuring that all applicable health and safety procedures are implemented by all personnel engaged in RD/RA activities in the field. The Site Safety Coordinator has on-site authority for all matters specifically related to health and safety, including the authority to temporarily cease operations pending discussion with the Project HSS or HP. The Site Safety Coordinator is responsible for performing routine on-site air monitoring as specified in the site specific health and safety plan.

The Project Health and Safety Supervisor may act as the Site Safety Coordinator, or the Project Manager may designate another individual to function in this capacity.

- Radiation Protection Technician (RPT)

  The Radiation Protection Technician shall have overall responsibility and authority for radiological health/exposure issues in the field. The RPT shall be present on-site as necessary to ensure that all applicable and appropriate radiological health and safety procedures are implemented, and perform on-site radiological monitor to verify same. The Radiation Protection Technician has on-site authority for all matters specifically related to radiological exposure/contamination including the authority to temporarily cease operations pending discussion with the Project HP.

  The Project Health Physicist may act as the on-site Radiation Protection Technician or designate another individual to function in this capacity.

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5.0 GENERAL REQUIREMENTS FOR PROJECT PERSONNEL

5.1 TRAINING

It is the policy of the CENPW that every person engaged in on-site activities associated with the 1100 Area RD/RA shall receive a level of health and safety training consistent with his or her job functions and responsibilities. The training requirements identified below have been established to provide personnel with a sufficient understanding of potential hazards, monitoring procedures, and protective measures to consistently perform all routine tasks under the 1100 Area RD/RA in a safe manner.

5.1.1 Initial Training

Employees engaged in implementation of the 1100 Area RD/RA Work Plan shall receive a total of 40 hours of off-site (as opposed to on-the-job) hazardous waste operations and emergency response training. Employees shall receive this training before they are permitted to participate in on-site operations that could expose them to hazardous substances or other safety or health hazards requiring the use of so called "Level B" or "Level A" protection. The Washington state requirement for 80 hours of training established under WAC 296-62-340(3)(a) is not enforced by the DOE at the Hanford Site. However, most all previous health and safety training received in the course of working at the Hanford Site (e.g., SCBA, radiation protection, etc.) while in a position similar to the employees current responsibilities would be applicable to and in most cases exceed the 80 hour state requirement. All personnel engaged in on-site activities must receive a minimum of 40 hours of initial training that includes the following:

- Employee rights and responsibilities under WISHA and DOE;
- Anticipated health and safety hazards associated with the site and specific task(s);
- Hazard recognition
- Work practices by which the employee can minimize risks from identified hazards;
- Basic site safety;
- Confined space entry procedures;
- All applicable, requisite Hanford Site radiation worker training;
- Discussion of employer's medical surveillance program;
- Proper use and care of personal protective equipment including chemical and radiological contamination protective clothing and respiratory protection;
- Hands-on training on self-contained breathing apparatus, air-line respirators, and 5 minute escape pack;
- Instrumentation and site monitoring procedures;
- Site control and management;
- Decontamination procedures;

- Communication procedures;
- Emergency response, self-rescue and first aid.

Inexperienced employees involved in general hazardous waste operations shall work for a minimum of three days under the direct supervision of a trained, experienced supervisor. For the purpose of this section, an inexperienced employee shall be defined as any employee who has less than three days of experience on a site or task involving a similar level of hazards and similar protective measures as the forthcoming assignment.

5.1.2 Training Requirements for "Limited" Site Workers

Other workers on site only occasionally for a specific limited task (such as, but not limited to, land surveying, or geo-physical surveying) and who are unlikely to be exposed over permissible exposure limits and published exposure limits shall receive a minimum of 24 hours of instruction off the specific work site, and a minimum of one day of actual on-site field experience under the direct supervision of a trained, experienced supervisor.

Workers regularly on site who work in areas which have been monitored and fully characterized indicating that exposures are under permissible exposure limits and published exposure limits where respirators are not necessary, and the characterization indicates that there are no health hazards or the possibility of an emergency developing, shall receive a minimum of 24 hours of instruction off the site and a minimum of one day actual field experience under the direct supervision of a trained, experienced supervisor.

5.1.3 Management and Supervisor Training

On-site management and supervisors directly responsible for, or who supervise employees engaged in, hazardous waste operations shall receive a minimum of 40 hours initial training, three days of supervised field experience and at least eight additional hours of specialized training at the time of job assignment on such topics as, but not limited to, the employer's safety and health program and the associated employee training program, personal protective equipment program, spill containment program, and health hazard monitoring procedure and techniques.

5.1.4 Refresher Training

Employees specified in paragraph 4.1 and 4.2 of this section, and managers and supervisors specified in paragraph 4.3 of this section, shall receive eight hours of refresher training annually on the items specified in paragraph 4.1 and/or 4.3 of this section. Critiques of incidents that have occurred in the past year can serve as training examples for related work, and can supplement other refresher topics.

5.1.5 Qualifications for Trainers

Trainers shall be qualified to instruct employees about the subject matter that is being presented in training. Such trainers shall have satisfactorily completed a training program for teaching the subjects they are expected to teach, or they shall have the academic credentials and instructional experience necessary for teaching the subjects. Instructors shall demonstrate competent instructional skills and knowledge of the applicable subject matter. Training conducted by contractors, CENPW or other non-WHC personnel are required to receive reciprocity approval from WHC.

5.1.6 Training Certification

Employees and supervisors that have received and successfully completed the training and field experience specified in paragraphs 4.1 through 4.4 of this section shall be certified by their instructor or the head instructor and trained supervisor as having successfully completed the necessary training. A written certification shall be given to each person so certified. Any person who has not been so certified or who does not meet the requirements of paragraph 4.7 of this section shall be prohibited from engaging in hazardous waste operations.

5.1.7 Equivalent Training

Employers who can show by documentation or certification that an employee's work experience and/or training has resulted in training equivalent to that training required in paragraphs 4.1 through 4.3 of this section shall not be required to provide the initial training requirements of those paragraphs to such employees. However, certified employees assigned to a new site shall receive appropriate, site specific training before site entry, and shall initially work under appropriate experienced supervision as outlined in paragraphs 4.1 and 4.2 above. Equivalent training includes any academic training or the training that existing employees might have already received from actual hazardous waste site work experience.

5.1.8 Training for Site Visitors

For the purposes of this section, visitors shall be defined as persons who are on-site only occasionally for limited periods (i.e., less than half a day at a time or a total of one full day per month) solely for the purpose of observing operations and who will not be directly or indirectly engaged in any on-site activities which require entry into a controlled zone or which could result in exposure to hazardous substances or other health and safety hazards.

Visitors as defined above shall under no circumstances be permitted to enter any controlled area unless they meet all of the training requirements specified in Section 4.1 or 4.2 above, and notify the Project Manager or Site Safety Coordinator of their visit at least 24 hours in advance.

Visitors who will not enter a controlled area do not require specific "hazardous waste" training but must be accompanied by a trained escort, and informed of potential hazards and pertinent emergency procedures.

Any person not strictly meeting the above definition of a visitor must at a minimum meet the training requirements for limited site workers specified in Section 4.2 above.

5.1.9 Training Responsibilities

Each Project Manager is responsible for:

1. Ensuring that his employees have the required level of training before engaging in or supervising RCRA/CERCLA related field activities.
2. Ensuring that his employees remain current in all required health and safety training as outlined below.
3. Restricting employees working on hazardous/mixed waste operations as appropriate based on identified training deficiencies.

5.1.10 Safety Briefing

The Project Manager or Site Safety Coordinator will conduct a comprehensive safety briefing for field team members prior to each identified task. All field team members shall be required to attend such a briefing and shall acknowledge their participation by signing the safety briefing acknowledgment form in the Task Specific Health and Safety Plan. The comprehensive safety briefing shall include the following topics, as applicable:

- An item by item summary of the Task Specific Health and Safety Plan with special emphasis on the following:
    - Site hazards; chemical, radiological, physical etc.
    - Chemical toxicity and symptoms of exposure
    - Work zones; exclusion zone, support zone, etc.
    - Air monitoring requirements
    - Personal protective equipment requirements
    - Location of the nearest telephone and emergency phone numbers
    - Location of the nearest infirmary and trauma center
    - Decontamination
- On-Site Authority
- Task-Specific Medical Surveillance, if required
- Vehicle Operation and Parking
- Emergency Medical Procedures
- Hand Signals
- Environmental Stress: Heat stress, cold stress, noise, etc.

5.2 MEDICAL SURVEILLANCE

All employees of CENPW and its contractors and subcontractors who are directly involved in on-site RD/RA activities must be participants in a medical surveillance program meeting the requirements of DOE Order 5480.8, "Contractor Occupational Medical Program". Such medical surveillance program routinely includes a baseline physical examination upon or shortly after hiring, a routine periodic physical examination at least annually, and a "close-out" or exit examination upon separation. The purpose of the medical surveillance program is first to identify employees who may be at a greater risk because of certain job requirements, for example a person with high blood pressure who may be required to wear a respirator and protective clothing, and second, to identify evidence of exposure to hazardous substances before the onset of occupational disease.

An employee will also receive a physical examination or medical consultation by a licensed physician as soon as possible upon notification that he or she has developed signs or symptoms indicating possible overexposure to hazardous substances or health hazards, or that he or she has been injured or exposed to hazardous substances above a permissible exposure limit in an emergency situation.

Any employee who suspects that he or she has been exposed to a hazardous substance in excess of an allowable exposure limit, or who develops clinical signs or symptoms of overexposure, must notify the Site Health and Safety Supervisor immediately.

5.3 RESPIRATORY PROTECTION

Any site worker who may be required to use either a supplied-air or air-purifying respirator must be a participant in the medical surveillance program and have the written approval of a licensed physician to use such equipment.

Site worker who must use supplied-air respirators (EPA Level A or B) must have the equivalent of 40 hours of initial training as described in Section 4.1.1 above. Personnel who must use so-called "Level C" protection (air-purifying respirators) must also have a minimum of 40 hours of initial off-site training.

Prior to using any respirator in a potentially hazardous atmosphere, the employee must receive training on how to properly use and care for the particular respirator he or she will be using in the field, and practice donning and using the respirator in a safe atmosphere.

Prior to using any air-purifying, positive or negative pressure respirator in the field, the employee must be quantitatively fit-tested for the specific size, make, and model of respirator that he or she will be using.

Use of respirators by persons having beards (including more than one day's growth), large sideburns, or mustaches which may interfere with a proper respirator-face seal will not be permitted.

5.4 FIRST-AID, CPR, AND THE BLOOD-BORNE PATHOGEN STANDARD

A 10-person first-aid kit shall be immediately available to workers engaged in on-site activities. Where there is a reasonable possibility of toxic or corrosive materials splashing into a worker's eye, an emergency eye wash station/shower shall also be available.

During any given on-site activity, at least one, and ideally more than one of the workers engaged in that activity must be current in first-aid and CPR. Acting in the capacity of a designated (either by design or by default) emergency first-aid provider, however, is not mandatory and anyone who is uncomfortable with the possibility of being so-designated should notify the Site Health and Safety Supervisor. No one is expected to administer first-aid as a routine part of his or her job duties on this project. It is possible, however, that an employee could be called upon to administer first-aid or CPR to a stricken colleague in a work-related emergency situation.

The Occupational Safety and Health Administration has recently promulgated regulations to protect health professionals who may be occupationally exposed to blood and other potentially infectious materials. The primary concerns are, of course, the AIDS and Hepatitis B viruses (HIV and HBV) which may be present in infected individuals' body fluids.

At least certain portions of the blood-borne pathogens regulations apply to so-called "secondary first-aid providers who provide first-aid only infrequently in response to workplace accidents," which is exactly the role of first-aid trained field personnel on this project.

For the purposes of the standard, occupational exposure means "a reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of the employee's duties."

OSHA's position is to "treat all human blood and other potentially infectious materials as if they were infectious for HBV and HIV." Consequently, in the event that an employee does administer CPR or render first-aid involving contact with a victim's blood or other body fluids, occupational exposure as defined above is presumed. In essence, emergency first-aid personnel do not fall under the blood-borne pathogen requirements unless and until they administer first-aid.

While there is some risk associated with any contact with another human being's body fluids, the risk associated with providing emergency first-aid is low and the measures set out below are intended to reduce the risk even further. The prevailing opinion in the emergency medical community is that the direct life-saving benefits of immediate emergency first-aid i.e., administering CPR to a heart attack victim, or controlling severe bleeding in traumatic injury cases, far outweigh the associated risks.

In the event that it is necessary for you to administer first-aid or CPR on the job, use rubber gloves, a plastic bag, or even newspaper to limit direct contact with the victim's blood. Do not eat anything, smoke, or touch your eyes until you thoroughly wash your hands. If available, use a disposable resuscitator (CPR) mask to administer CPR. Disposable rescue-CPR masks, latex or NBR rubber gloves, face shields and safety glasses or goggles will be available in all field first-aid kits. An "Ambu" bag will also be available for protecting accident victims pending evacuation.

Immediately report any first-aid/CPR-related exposure incident to the Site Health and Safety Supervisor. Work with the Site Health and Safety Supervisor to make arrangements to see a licensed physician, preferably one of your own medical monitoring program physicians who is already familiar with your company's program and perhaps even you personally.

The Site Health and Safety Supervisor will immediately submit a request for testing of the "source individuals" blood for HIV and HBV. If there is consent by the source individual the results of the source individuals's blood test will be made available to you as soon as possible through the attending physician.

The post-exposure medical evaluation will include a review of the exposure incident, a review of your medical history including HBV vaccination status, a review of the source individual's blood test results if available, a baseline sample of your blood, and possibly (if appropriate in the opinion of the attending physician) a Hepatitis B vaccination or booster.

Following the post-exposure-evaluation, the attending physician will provide a written opinion to your employer. This opinion shall be limited to a statement that you have been informed of the results of the evaluation and told of the need, if any, for any further evaluation or treatment. Your employer is required to provide you with a copy of the physician's opinion within 15 days. The physician's written opinion shall be the only information provided to your employer regarding the exposure incident; all other medical findings and records will remain confidential.

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6.0 GENERAL WORK SAFETY PRACTICES

The following general procedures are common to all on-site activities in 1100 Area Operable Units and must be observed by on-site personnel, where applicable, at all times.

6.1 GENERAL WORK PRACTICES

- On-site personnel shall have a portable two-way radio or cellular phone with them at all locations where there is no immediate access to an ordinary phone.

- On-site personnel shall remain cognizant of which way the wind is blowing. Use a small portable wind sock, ventilation smoke tubes or other appropriate means of determining wind direction **before** and <u>always</u> approach such an area from the up-wind direction.

- Exposure to hazardous chemical and/or radioactive substances via the ingestion route as a result of inadvertent hand to mouth contamination is the most likely route of exposure for on-site personnel. Eating, drinking, smoking, taking medications, chewing gum, etc., is prohibited within any exclusion zone. Do not handle soil, water samples, or any other potentially contaminated items unless wearing latex rubber surgical gloves, Nitrile-Butyl Rubber (NBR), Neoprene or Viton rubber gloves or other as specified in a Task Specific Health and Safety Plan.

- Be alert to potentially changing exposure conditions as evidenced by perceptible odors, unusual appearance of excavated soils, oily sheen or separate phases in water samples, etc.

- Tools and equipment shall be kept off the ground whenever possible to avoid tripping hazards and the spread of contamination.

- Where the use of portable electric tools or other appliances is required, portable ground fault circuit interrupters (GFCIs), double insulated tools, or properly grounded three wire systems must be used to prevent electrical shock.

- While working within a designated "exclusion" or "controlled" zone, personnel shall use the "buddy system" or be in visual contact with someone outside of the controlled zone at all times. In Immediately Dangerous to Life and Health (IDLH) situations, each employee working within the exclusion zone <u>must</u> have a "buddy" who is also within the exclusion zone, or be in visual or voice communication with dedicated on-site emergency response personnel.

- Vehicles will not be permitted off main roadways unless so authorized by DOE.

- Catalytic converters on the underside of vehicles are sufficiently hot to ignite dry grass. <u>Never</u> park or allow a running vehicle to sit in a stationary location over dry grass or other combustible materials.

- Vehicles are to be equipped with two fire extinguishers and one shovel for fighting fires during the months of June through October.

- When an equipment operator must negotiate in tight quarters, provide a "spotter" i.e, a second person to ensure adequate clearance.

- Have a signalman direct backing as necessary.

- All employees working on or adjacent to a highway or in the vicinity of heavy equipment traffic, and all flaggers must wear high visibility vests.

- Team members must attempt to minimize vehicle tire disturbance of all stabilized sites (i.e., make gentle starts, stops, and turns, and go slow).

- Where applicable, all team personnel are required to attend a job safety briefing addressing each item in the Task Specific Health and Safety Plan prior to the start of the task(s).

6.2 TRENCHING, TEST PITS, AND DRILLING

- All excavation must be performed in accordance with WISHA Occupational Safety and Health Standards for Excavating WAC 296-155-650 thru 657.

- Stand upwind of excavations, boreholes, well casings, drilling spoils, etc., (as indicated by the recommended onsite windsock) whenever possible.

- Stand well clear of all trenches during excavation. Always approach any intrusion into potentially contaminated material from upwind.

- Personnel should avoid direct contact with contaminated material or items unless necessary for sample collection or required observation. Remote handling of casing, auger flights, etc. will be practiced whenever practical.

- Do not, under any circumstances, enter or ride in or on any backhoe bucket, materials hoist, or any other similar device not specifically designed for carrying human passengers.

- Do not enter any test pit or trench greater than four feet in depth unless a trench shield is in use, or the sides are adequately shored or laid back to at least the angle of repose specified in WISHA Excavation Standards.

- Keep hands and feet, and all loose fitting clothing such as chemical protective coveralls, well clear of rotating augers.

- All drilling team members must make a conscientious effort to remain aware of their own and others' positions in regards to rotating equipment, cat heads, u-joints, etc. and be extremely careful when assembling, lifting and carrying flights or pipe to avoid pinch joint injuries and collisions.

- Moving a drilling rig with the mast raised is prohibited.

- A minimum clearance of 10 feet shall be maintained at all times between drilling masts, crane booms, "cherry pickers", etc. and power lines, plus an additional 0.4 inches per each 1kV greater than 50 kilovolts.

- Work operations on site shall not start before sunrise and shall cease at sunset, unless the entire control zone is adequately illuminated with artificial lighting as determined by the Site Health and Safety Supervisor.

- Personnel not directly involved in any sampling, drilling, excavating, or other activity shall remain a safe distance from the operation as instructed by the Field Team Leader.

6.3 CONFINED SPACE ENTRY GUIDELINES

For the purposes of this section a confined space shall be defined as any space not currently used or normally intended for human occupancy, that has a limited means of egress, and which is subject to the accumulation of toxic contaminants or a flammable or oxygen deficient atmosphere, or posing other potential hazards to employees such as engulfment (e.g., sawdust, or grain storage bins) or electrical or mechanical hazards should equipment or machinery be inadvertently activated while an employee is in the confined space. Confined spaces include but are not limited to storage tanks, process vessels, bins, boilers, ventilation or exhaust ducts, air pollution control devices, sewers, underground utility vaults, tunnels, pipelines, and open top spaces more than 4 feet in depth, such as test pits, waste disposal trenches, vaults, and vessels, where there is the possibility of an explosive, oxygen deficient or toxic atmosphere.

Work in confined spaces can be done safely provided workers recognize the potential hazards and take appropriate precautions prior to entering the space. Any one or more of the hazards discussed in subsequent sections which would be of little or no concern in an open area outdoors or in an occupied building with ordinary ventilation, could produce an IDLH (Immediately Dangerous to Life or Health) atmosphere in a poorly ventilated confined space.

On January 14, 1993, OSHA promulgated final regulations for working in confined spaces (29 CFR 1910.146). At a minimum, entry into even a "low hazard" confined space such as a crawlspace beneath an inhabited building, requires monitoring the atmosphere in the space for flammable gases, oxygen deficiency, acutely toxic gases such as hydrogen sulfide, and (if applicable) total organic vapors prior to going in, and having an observer stationed outside of the space.

Situations that are potentially more hazardous, such as entering a manhole, a leachate collection sump, or an enclosed vessel, require a confined space entry permit (basically an approved written plan) that is good for that day and that task only. The permit will typically require additional specific measures including ventilating the space using a manhole blower, selecting and using the appropriate personal protective equipment, training employees to use such equipment, developing an emergency response plan, and having immediate access to a telephone, cellular phone, or walkie-talkie (with someone at the other end), and appropriate back-up personnel, and emergency health and safety equipment such as self-contained breathing apparatus and emergency retrieval equipment available at the work location.

Over half of the workers who die in confined spaces are would-be rescuers. It does your colleague no good to die with him. Do not under any circumstances enter a confined space in a rescue attempt, unless emergency rescue procedures have been addressed and are followed as specified in the Confined Space Entry Permit, and emergency response personnel have been summoned.

Your responsibility as a site-worker engaged in routine activities is to recognize a confined space as such, and to stay out of it. Before entering any confined space for any reason, site personnel and contractors must secure a confined space entry permit that is good for one day for one specific task, which specifies the exact procedures to be followed to enter the confined space. If you have any questions regarding a potential confined space situation, contact the Project Manager. When in doubt, don't go in.

6.4 PERSONAL PROTECTIVE EQUIPMENT

- Appropriate eye and/or face protection and rubber gloves as specified in the task-specific procedures must be worn at all times when on-site. In general, hard hats, safety glasses and steel toed supportive footwear must be worn on-site at all times unless otherwise specified in a Task Specific Health and Safety Plan. Appropriate head and eye protection and substantial footwear shall be worn at all times.

- Personnel shall maintain a high level of awareness of the limitations in mobility, dexterity and visual impairment inherent in the use of Level B and Level C personal protective equipment.
- Be alert to the symptoms of fatigue and heat stress, and their effect on the normal caution and judgment of yourself and others.
- Always strive to use an appropriate level of personal protection. Lesser levels of protection can result in otherwise preventable exposure; excessive levels of safety equipment can impair efficiency, increase the likelihood of accidents, and may well in itself represent the single greatest hazard present (i.e. heat stress, high pressure compressed air systems, etc.).

6.5 DECONTAMINATION

- After working in a radiation zone or exclusion zone, or any controlled area, thoroughly wash hands and face before eating or putting anything in your mouth, i.e., avoid hand to mouth contamination.
- An emergency eye wash must be available when exposure to corrosive chemicals is possible.
- At the end of each work day, or each job, disposable clothing shall be removed and placed in plastic garbage bags (appropriate in most sampling applications), drums (chemical contamination) or plastic lined radioactive waste containers as appropriate. Contaminated clothing that can be cleaned shall be sent to the laundry.
- Employees must shower at the designated on-site facilities prior to leaving the site if directed to do so in a Task Specific Health and Safety Plan by the Health Physicist, or Site Safety Coordinator. Otherwise individuals are expected to thoroughly shower at home as soon as possible after leaving the site.
- Keep all equipment that is used in a contaminated area in that area until the job is done. All such equipment must be surveyed and decontaminated as specified in a Task Specific Health and Safety Plan and/or Work Plan before moving it into the clean zone.

6.6 EMERGENCY PREPARATION

- A multi-purpose dry chemical fire extinguisher and a complete field first-aid kit shall be available on every sampling site (in the vehicle is acceptable).
- A portable deluge shower shall be available on those project sites where large areas of the body may be contaminated by fast acting toxic or corrosive substances.

- Establish prearranged hand signals or other means of emergency communication when wearing respiratory equipment, since this equipment seriously impairs speech communications.

- Sampling personnel must be familiar with the appropriate emergency medical procedures to be followed in each operational area as specified in the Task-Specific Health and Safety Plan.

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7.0 PHYSICAL HAZARDS

7.1 HEAT STRESS

Heat stress is the result of a number of interacting factors including environmental conditions such as ambient temperature, humidity, and radiant (solar) heat load, and task-related conditions such as workload, protective clothing, and the physical state of the individual worker. Working in a hot environment can have far reaching effects on workers, especially those who are unacclimated to the heat, ranging from transient heat fatigue to heat exhaustion and heat stroke (the latter being a serious, life threatening situation).

All employees must be aware of the possibility of and alert to the symptoms of heat stress. Should any employee experience extreme fatigue, cramps, dizziness, headache, nausea, profuse sweating, pale clammy skin, or erratic behavior, the employee is to immediately leave the work area, undergo decontamination and remove protective clothing, rest in a shaded area, cool off, and drink plenty of cool water. If symptoms do not subside after a reasonable rest period (15 minutes to a half hour), the employee shall notify the Site Health and Safety Supervisor and seek medical assistance.

Employees engaged in hazardous waste operations must bear in mind that working in protective clothing can greatly increase the likelihood and severity of heat stress, at temperatures and under working conditions which would otherwise be of little or no concern.

The work site WBGT shall be monitored whenever employees are required to work in chemical or radiological protective clothing beyond a single layer ordinary Tyvek, or a single layer of cotton coveralls in ambient temperatures exceeding 18.3°C (65°F).

Under normal working conditions, the wet bulb globe temperature (WBGT) serves as a fairly reliable indicator of potential heat stress. Consequently, it offers an acceptable approach to controlling the heat stress hazard by adjusting the work-rest period based on the WBGT and workload as provided in Table 1, p. 92 of the American Conference of Governmental Hygienists 1992-1993 Threshold Limit Values (See Table 7-1).

When working in protective clothing however, the body's cooling mechanism is severely impaired if not entirely defeated and the recommendations of Table 1 based on the environmental WBGT are no longer applicable. The relative humidity inside of an impermeable chemical protective suit is typically 100% and the wet bulb temperature is essentially equal to the dry bulb temperature.

In order to apply Table 1 of the TLV booklet while working in chemical protective clothing, the WBGT values must be adjusted by -2°C for work in cotton coveralls or single tyvek disposable coveralls, and by -6°C for work in one or more layers of protective clothing which impedes sweat evaporation. Even then, Table 1 is to be used only as a guideline and shall be superseded by procedures based on site worker's vital signs as discussed below.

TABLE 7-1. PERMISSIBLE HEAT EXPOSURE THRESHOLD LIMIT VALUES (VALUES ARE GIVEN IN °C WBGT)

	Work Load		
Work-Rest Regimen	Light	Moderate	Heavy
Continuous work	30.0	26.7	25.0
75% Work - 25% Rest, each hour	30.6	28.0	25.9
50% Work - 50% Rest, each hour	31.4	29.4	27.9
25% Work - 75% Rest, each hour	32.2	31.1	30.0

Adapted from American Conference of Industrial Hygienists, "Threshold Limit Values and Biological Exposure Indices for 1992-1993."

Conversion °C to °F : °F = (9/5 x °C) + 32

When the adjusted WBGT exceeds 27.7°C (82°F), employees shall use the "buddy system" to monitor each other's pulse rate at the start of each rest period and the use of cooling vests, or vortex cooling adapters shall be considered. If the pulse rate exceeds 110 beats per minute, the employee shall take his oral temperature with a clean disposable calorimetric oral thermometer. If the oral temperature exceeds 37.5°C (99.6°F), the next work period shall be shortened by one third, without shortening the rest period. The pulse rate and oral temperature shall be monitored again at the beginning of the next rest period and if the oral temperature exceeds 37.5°C (99.6°F), the work period shall again be shortened by one third, etc., until the oral temperature is below 37.5°C (99.6°F). No employee shall be permitted to continue working in PPE if his oral temperature exceeds 38.1°C (100.6°F). Cooling vests shall be required regardless of the work/rest regimen if the adjusted WBGT exceeds 32.2°C (90°F).

Employees shall be encouraged to drink small amounts of water frequently. Drinking within a hazardous waste "exclusion zone", or radiation "surface contamination area" is prohibited. Drinking water in a "controlled area" however, i.e. within the operable unit at the support zone - decontamination zone border is permissible and recommended provided that the water is stored in a clean closed container such as a plastic water cooler with a spigot, and single-use paper cups, stored in a clean, enclosed dispenser, are available to drink from.

7.2 COLD STRESS

The primary hazards associated with working in the cold are hypothermia (decrease in body temperature) and frostbite.

Hypothermia is the most frequent cause of accidental death among individuals lost, stranded, or otherwise unprepared for extended periods of exposure, but is rarely a serious occupational hazard. Nevertheless, workers should be aware of the symptoms of hypothermia: An involuntary increase in muscle tension (goose bumps) and mild shivering occurs in response to a lowered body temperature and results in a metabolic heat production 1.5 to 2 times resting levels. If the core temperature drops to 35°C (95°F), violent whole body shivering will occur resulting in greatly increased heat production, but also possibly temporarily rendering the individual totally helpless. At this point, under controlled working conditions, most individuals seek shelter and warmth. Further cooling to a core temperature below 32.2°C (90°F) (i.e. for the lost or stranded individuals mentioned above), will result in loss of muscle coordination, irrational behavior, unconsciousness, and eventually death (core temperature below 80°F).

The American Conference of Governmental Industrial Hygienists has established Threshold Limit Values in the form of work/warm-up schedules for employees working in temperatures below -26.1°C (-15°F). Since outdoor temperatures at the Hanford Site rarely drop this low during normal work hours, such TLVs may have limited applicability.

Employees who must work under cold conditions should:

- Eat a proper diet and never consume alcoholic beverages to "keep warm."
- Always wear a hat, cover the neck, and use a layered system of clothing. Ideally the innermost layer should be polypropylene or a similar material which will "wick" moisture away from the skin.
- Wear proper boots (rubber boots which trap moisture are not recommended unless absolutely necessary) and an appropriate number of pairs of socks (too many can be as bad as too few). Steel toed boots can aggravate the problem. Where steel toed boots are required under conditions of extreme cold, workers should wear steel toed packs or steel "toe caps" on the outside of regular packs.
- Wear windproof outer layer of clothing.
- Workers who must travel during periods of extreme cold should have appropriate clothing and equipment to deal with the environment in the event of a breakdown or other emergency.

When working in multiple layers of PPE, overheating and sweating inside of the suit(s), and the resultant hypothermia due to wet clothing is likely to become the most serious problems. When working in multilayered or impermeable layers of PPE, employees should initially wear less warm clothing than they would normally wear without the PPE, and should of course remain alert to the symptoms of hypothermia.

Frostbite is a much more realistic hazard than hypothermia. As the body attempts to keep vital internal organs warm, it increases blood flow to the "core" at the expense of the extremities (hands and feet), which are also likely to be the most exposed parts of the body.

Frostbite does not become a factor until temperatures drop below 15°F, and in calm winds is not a serious concern for a properly clothed individual until temperatures drop below -28°C (-20°F) (i.e., a "windchill index" of -20°F). That same -28°C (-20°F) however, in a 25 mile per hour wind results in a windchill factor of-58°C (-74°F) and represents a serious frostbite hazard (see Table 7-2).

Frostbite is most likely to occur in extremities, especially the fingers and toes, and in the cheeks and ears. In very early stages of frostbite, the affected body part may feel numb and appear white. As frostbite progresses, the individual may experience pain and a loss of flexibility in the affected body part and the affected skin may appear waxy or translucent. Mild frostbite can be treated by immersing the affected part in <u>warm</u> water. Frost bitten tissue <u>should not</u> be rubbed. Deep frostbite is a very serious condition which requires immediate medical treatment.

Preventative measures for frostbite:

- Wear proper boots and socks. Be aware of the fact that steel toed boots may aggravate the situation.

- Wear mittens rather than gloves if possible.
- Avoid the use of tobacco, as it constricts blood flow.
- Always wear a hat and/or a hood which covers the ears.
- In extreme conditions, wear a mask or skin cap which covers the entire face except for the nose and mouth.
- Be aware of the conditions which are likely to cause frostbite [i.e., windchill index below -28°C (-20°F)], be aware of the symptoms, and be prepared.

7.3 IONIZING RADIATION

The potential for exposure to ionizing radiation on the Hanford Site does exist. The likelihood of encountering radiological contamination is highly area dependent however, and at least for 1100 Area RD/RA health and safety purposes, the likelihood, and the nature and extent of radiological contamination is fairly well characterized.

TABLE 7-2. COOLING POWER OF WIND ON EXPOSED FLESH EXPRESSED AS EQUIVALENT TEMPERATURE (UNDER CALM CONDITIONS)*

Estimated Wind speed (in mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (°F)											
calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148

(Wind speed greater than 40 mph have little addi-. tional effect)	LITTLE DANGER In < hr with dry skin. Maximum danger of false sense of security.	INCREASING DANGER Danger from freezing of exposed flesh within one minute	GREAT DANGER Flesh may freeze within 30 seconds

Trenchfoot and immersion foot may occur at any point on this chart.

*Developed by U.S. Army Research Institute of Environmental Medicine, Natick, M.A. Adapted from American Conference of Industrial Hygienists, "Threshold Limit Values and Biological Exposure Indices for 1992-1993."
Conversion °F to °C : °C = 5/9 (°F - 32)

In the majority of cases, radiological contamination in soil and groundwater in the 1100 Area if detected at all, could be present in concentrations such that the routine PPE, decontamination, and personal hygiene procedures identified in later sections potential chemical contaminants, will also provide an appropriate level of protection against potential radiological contaminants. Samples will be routinely analyzed for radiological contamination, and periodic screening will be conducted during sampling activities to ensure that this remains the case.

The Health Physicist for the project or his designee has prime responsibility for performing radiation monitoring, designating radiation action limits, choosing radiation protective clothing, and other radiation related issues. The Project Health and Safety Supervisor shall be an additional resource for radiological health information and will collaborate with the HP as necessary to effectively address potential radiological hazards. Where appropriate, specific information regarding radiation health hazards and their control will be presented in the Task Specific Health and Safety Plan, in addition to radiation worker training and update courses.

7.4 FIRE AND EXPLOSIONS

The dry chemical fire extinguishers which are required on all field vehicles, are effective for fires involving ordinary combustibles such as wood, grass, flammable liquids, and electrical equipment. They are appropriate for small, localized fires such as a drum of burning refuse, a small burning gasoline spill, a vehicle engine fire, etc. No attempt should be made to use a hand-held fire extinguisher for well established fires or large areas or volumes of flammable liquids.

In the case of fire, prevention is the best contingency plan. Smoking in the Exclusion or Decontamination Zone, within 25 feet of any area or well to be sampled , or anywhere in the Arid Lands Ecology Reserve (100-IU-1) is strictly prohibited. Where permitted, all smoking materials should be extinguished with care.

Catalytic converters on the underside of vehicles are sufficiently hot to ignite dry grass. As a general rule, Hanford Site contractors and subcontractors should avoid driving over vegetation that is higher than the ground clearance of the vehicle, and be aware of the potential fire hazard posed by the catalytic converter, at all times. Never allow a running vehicle to sit in a stationary position over combustible materials.

In the event of a fire or explosion:

1. If the situation can be readily controlled with available resources without jeopardizing the health and safety of yourself or other site personnel, take immediate action to do so. If not:

2. Isolate the fire to prevent spreading if possible.

3. Clear the area of all personnel working in the immediate vicinity.

4. Immediately notify site emergency personnel by calling 911 or calling the Hanford Patrol on Channel 1 of the 2-way radio, or 373-3800 on the cellular phone.

7.5 BIOLOGICAL HAZARDS

Normal tetanus bacteria live in soil. All field team members should have updated tetanus immunizations.

The field team will be made aware of site activities that may disturb the local wildlife population. Snakes, insects, and other animals can and will bite if disturbed. Avoidance is the best solution, but field personnel will be briefed regarding the potential for encountering wildlife and prompt first aid measures should they be necessary.

Lymes disease, caused by a spirochete bacteria similar to that causing syphilis, is carried by deer ticks and is endemic in some 37 states, including Washington. The first symptoms commonly include severe itching and a red "bulls eye" of inflammation around the bite. Later symptoms include extreme malaise, and pain and stiffness in joints resembling rheumatoid arthritis. Lymes disease is easily treated and the effects are completely reversible if treated early. Field personnel experiencing any of the above symptoms should seek medical attention and inform the examining physician of the possibility of occupational exposure to ticks.

7.6 ELECTRICAL HAZARDS

Overhead power lines, downed electrical wires, and buried cables all pose a danger of shock or electrocution if workers contact or sever them during site operations. Electrical equipment used on site may also pose a hazard to workers. Careful observation for overhead electrical hazards will be performed prior to raising masts on drill rigs or using cranes. The appropriate Hanford operating group will be contacted for underground utility clearances prior to drilling or excavating operations. All contractor's requirements for excavation permits, other work permits, and clearances for operations near power lines will be adhered to.

7.7 NOISE

Noise may pose a health and safety hazard during activities such as drilling, excavation, and/or construction. All personnel who are exposed to 8 hour time weighted average noise levels in excess of 85 A weighted decibels must be participants in a hearing conservation program in keeping with WAC 296-62-09015 requirements. It is reasonable to assume that baseline noise levels in the vicinity of the operator's position on a drilling rig or other heavy equipment are in excess of the 85dBA action level, and require the use of hearing protection. A good rule of thumb is that if you have to raise your voice in order to carry on a normal conversation at a distance of three feet in the presence of steady state (continuous) noise, you should be wearing hearing protection such as disposable ear plugs. Likewise, any activity such as pile driving, or driving casing on a drilling operation which generates impact noise levels sufficient to cause wincing or discomfort shall also require the use of hearing protection. Hearing protection is available and should be included in your standard field kit along with hard hat, safety glasses, and other basic equipment items.

8.0 CHEMICAL HAZARDS

Tables 8-1 lists the allowable exposure limit in air (the lowest of the OSHA Permissible Exposure Limit (PEL), ACGIH Threshold Limit Value (TLV), or NIOSH Recommended Exposure Limit (REL)) for volatile organic and semi-volatile organic substances, and toxic metals which are either known to exist (based on previous sampling results) or are suspected (based on site history) at the various 1100 Area subunits as described in Section 2.

Given the concentrations observed in most of the operable units to date, it is doubtful that organic vapor concentrations (even in the headspace of a well at equilibrium over the contaminated groundwater) will exceed any applicable airborne exposure limit. In all cases which involve a reasonable possibility that any employees' exposure may approach an allowable exposure limit, employees shall approach the suspect area from upwind and monitor the airborne concentration of organic vapors and/or dust with an appropriate direct reading instrument, and follow appropriate health and safety procedures as discussed in the air monitoring and respiratory protection sections.

The specified PPE (personal protective equipment), decontamination, and personal hygiene practices will adequately control exposure to organic chemicals via the dermal and ingestion routes.

It is important to note that any or all of the substances in Table 8-1 could be present in soil or groundwater at concentrations which pose a potential threat "to human health or the environment," but are likely to exist only at low concentrations that do not represent a threat under normal working conditions, or at high concentrations in limited quantities in isolated areas.

Symptoms of acute exposure to the suspected hazardous substances are listed in Table 8-2. Health effects and symptoms of chronic exposure groundwater are presented in Table 8-3.

The maximum anticipated concentrations of non-volatile organics, metals, and radionuclides are such that implausible quantities of soil or groundwater would have to be mechanically suspended in the air and inhaled as an aerosol to pose a health hazard via the inhalation route. Inhalation of these substances does not represent a viable exposure route under any conceivable sampling scenario. An indirect real-time procedure for monitoring airborne concentrations of substances which are potentially hazards as aerosols is presented in Section 10.1 below.

The maximum concentrations of radionuclides detected do not reflect an external (i.e. gamma) radiation hazard, and the maximum concentrations of the metals detected are prohibitive of any meaningful exposure via absorption through the skin. Consequently, skin absorption, per se, is not an issue for these substances.

TABLE 8-1

ALLOWABLE OCCUPATIONAL EXPOSURE LIMITS

SUBSTANCE	STRICTEST EXPOSURE LIMIT[a]
METALS (mg/m^3)	
Cadmium	Reduce exposure to lowest feasible concentration (REL[c]) 0.005 (PEL[b])
Chromium	0.5 (TLV[d] for trivalent chrome)I, 0.05 (TLV[d] for hexavalent chrome)
Copper	1.0 (TLV[d])
Lead -inorg. dust as Pb	0.05 (PEL[b])
Mercury-inorganic	.05 mg Hg/m^3 (REL[c])
Nickel	.015 mg Ni/m^3 (REL[c])
Zinc	5.0 (REL for zinc oxide)
VOCs Volatile Organic Compounds (ppmv)	
Benzene	0.1 ppm (REL[c])
Carbon tetrachloride	2 ppm ceiling (REL[c])
Ethylbenzene	100 ppm (TLV[d])
Gasoline	300 ppm (TLV[d])
Methylene chloride	Lowest feasible concentration (REL[c]) 50 ppm (TLV[d])
Stoddard Solvent/Mineral Spirits	100 ppm (TLV[d])
Tetrachloroethylene (PCE)	50 ppm (TLV[d])
Toluene	100 ppm (TLV[d] intended change to 50 ppm)
Total Xylenes	100 ppm (REL[c])
1,1,1-Trichloroethane	350 ppm ceiling (REL[c])
Trichloroethylene (TCE)	25 ppm (REL[c])
SEMIVOLATILE COMPOUNDS/PCBs (mg/m^3)	
Aroclor 1242 (PCB)	0.001 mg/m^3 (REL[c])
Aroclor 1254 (PCB)	0.001 mg/m^3 (REL[c])
Bis(2-ethylhexyl)phthalate	5 mg/m^3 (TLV[d])
OTHER	
Asbestos	100,000 fibers $>5\mu m$ long per m^3

[a] Unless otherwise noted, all values are 8-hr time weighted average concentrations in air.
[b] Permissible exposure limit promulgated by the Occupational Safety and Health Administration (29 CFR 1910.1000).
[c] Recommended exposure limit published by the National Institute for Occupational Safety and Heath (1988)
[d] Threshold limit value published by the American Conference of Governmental Industrial Hygienists (1993)

TABLE 8-2

SYMPTOMS OF ACUTE EXPOSURE

SUBSTANCE	SYMPTOMS
VOCs	
Benzene Carbon Tetrachloride Ethyl Benzene Gasoline Methylene Chloride Stoddard Solvent/ Mineral Spirits Tetrachloroethylene 1,1,1-Trichloroethane Trichloroethylene Toluene Xylene	Headache, dizziness, light headedness, nausea, disorientation/confusion, vomiting, eye/nose/respiratory irritation, skin irritation/burning sensation, dry, scaly, fissured dermatitis. Unconsciousness and death due to anaesthetic effects may occur at extremely high concentrations. Severe respiratory effects if liquid is aspirated into lungs.
SEMIVOLATILE COMPOUNDS/PCBs	
PCBs	Acute skin irritation/chloracne. Irritation to eyes, nose, throat
Bis(2-ethylhexyl)phthalate	Very low acute toxicity
METALS	
Arsenic	weakness, loss of appetite, nausea, vomiting, diarrhea
Chromium	coughing, wheezing, headache, shortness of breath
Cadmium	respiratory tract irritation, cough, chest pain
Lead	abdominal pain, constipation, headache, aching bones, fatigue, sleep disturbance
Mercury	irritation of skin, mucous membranes, extreme irritability, excitability
Nickel	irritation of eyes, nose, lungs, chest pain, coughing, eczema
OTHER	
Asbestos	None

TABLE 8-3

HEALTH EFFECTS/SYMPTOMS OF CHRONIC EXPOSURE

SUBSTANCE	HEALTH EFFECTS
Benzene	dermatitis, central nervous system damage, aplastic anemia, leukemia (cancer)
Carbon Tetrachloride	dermatitis, central nervous system damage, liver damage, suspected liver carcinogen
Methylene Chloride 1,1,1-Trichloroethane (TCA) Trichloroethylene (TCE) Tetrachloroethylene (PCE)	dermatitis, peripheral nervous system damage, heart sensitization, liver, kidney damage
Ethyl Benzene Stoddard Solvent/Mineral Spirits Toluene Xylene	dermatitis, central nervous system damage, liver, kidney damage
Bis(2-ethylhexyl)phthalate	Liver carcinogen in rats and mice. No evidence of causing cancer in humans.
PCBs	eye and skin irritation, chloracne, liver damage, animal carcinogen
Arsenic	skin lesions, diarrhea, gastrointestinal distress, skin cancer, lung cancer
Chromium	chronic asthmatic bronchitis, dermatitis, ulceration of skin lung cancer
Cadmium	server pulmonary irradiation, pulmonary edema, emphysema
Lead	anemia,peripheral nervous system damage, central nervous system damage, kidney damage
Mercury	weakness, fatigue, loss of appetite, loss of weight, insomnia, diarrhea, irritability, loss of memory, tremors, delirium with hallucinations, psychosis
Nickel	cancer of lung and nasal passages
Asbestos	asbestosis, lung cancer, mesothelioma

In the case of both radionuclides and metals, however, repeated hand to mouth contamination via food or tobacco products over an extended period of time, could represent a potentially significant route of exposure. In this case, the simplest protective measures also offer the greatest potential benefit. Site workers must make a habit of observing the minimum health and safety procedures emphasized throughout the remainder of this document, i.e. personal protective equipment (i.e. rubber sampling gloves and perhaps aprons or coveralls), decontamination (removal and disposal of gloves), and personal hygiene (washing hands before eating or smoking).

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9.0 RESPIRATORY PROTECTION AND PERSONAL PROTECTIVE EQUIPMENT

9.1 RESPIRATORY PROTECTION

9.1.1 Permissible Use of Respirators.

The hierarchy of desirability of methods of controlling employee's exposure to potentially harmful airborne contaminants (from most to least desirable) consists of: 1) reducing the availability of the contaminant to the employee via engineering controls, 2) reducing the availability of the employee to the contaminant via work practice controls, and finally, 3) reducing the resultant "dose" if not the exposure, via the use of personal respiratory protective devices. Consequently, to the extent that it is technically and economically feasible, employee exposures to potentially harmful concentrations of airborne contaminants shall be reduced by installing permanent, built-in engineering controls, or by modifying work practices.

Given the physical limitations and transient nature of most RCRA/CERCLA operations, the use of personal respiratory protection is recognized as an acceptable control methodology. Nevertheless, alternative methods of controlling employee exposures should always be examined. Furthermore, every effort shall be made to apply the "ALARA" (As Low As Reasonably Achievable) principle to potential chemical as well as radiological exposure associated with all RCRA/CERCLA operations.

9.1.2 Employee Qualifications

All employees who may be required to use air-purifying or supplied air respirators to bring exposure levels within allowable exposure limits, or in an emergency situation, must meet all of the applicable requirements set-forth in Section 4 above.

9.1.3 Selection and Use of Respiratory Protection

Appropriate respiratory protection is to be selected by a qualified health and safety professional and used where there is a reasonable possibility of employee exposure to a health hazard via the inhalation route.

Site personnel shall habitually approach all potentially contaminated areas from upwind and monitor total organic vapor concentrations in the air as they approach. An appropriate direct reading instrument will be used to monitor organic vapor levels in air. Specific action levels and appropriate levels of respiratory protection will be determined based on the contaminants known or suspected to be present, the appropriate allowable exposure limit in air, and the instrument response to specific substances as discussed in Section 9 below.

NIOSH recommends limiting employee exposure to certain volatile organic compounds such as vinyl chloride and methylene chloride, which have been detected in parts per billion concentrations in some soil samples and/or wells, to the "lowest feasible concentration" or the "lowest reliably detected concentration". This does not however, compel the use of supplied air respirators, when the likelihood of any exposure whatsoever is remote to begin with.

Respiratory protection, like all personal protective clothing and equipment, in itself poses certain health and safety hazards. All respirators impair verbal communication. Full-face respirator masks limit peripheral and overhead vision. Full-face air purifying respirators are prone to fogging to the extent that vision may be completely obscured. All respirators, particularly full-face air purifying respirators exacerbate heat stress. Air-line respirators limit mobility and create tripping hazards. Self contained breathing apparatus (SCBAs) weigh 25 to 35 pounds and add to cardio-pulmonary stress, and contribute to worker fatigue with the added possibility of back strain. In addition, sustained work periods are limited to approximately 30 minutes per tank of air. The use of respiratory protection is not a trivial matter and should be considered only where the potential exposure hazards are at least as great as the hazards associated with the use of respiratory protection equipment itself.

In situations that are otherwise known to be safe but where there exists <u>any remote possibility</u> of a rapid deterioration of conditions, (such as certain confined space entries or other situations which offer limited access to "safe air"), employees shall, at a minimum, be issued self-contained "5-minute" escape packs.

Procedures and action levels will be specified for each task in the applicable Task-Specific Health and Safety plan.

9.1.4 Use of Contact Lenses with Respiratory Protection

Contact lenses may be used with half-face air purifying respirators and appropriate eye protection, full-face air purifying respirators, and full-face supplied air respirators in non-IDLH atmospheres.

The use of contact lenses with full face respirators in IDLH atmospheres or potentially IDLH confined spaces is prohibited. NIOSH approved prescription spectacles shall be provided to all employees who require vision correction and who must use full face respirators in an IDLH atmosphere. Prescription face mask spectacles shall also be provided to all employees who must use full face respirators who require vision correction and do not wear contact lenses.

9.2 PERSONAL PROTECTIVE CLOTHING AND EQUIPMENT (PPE)

The purpose of personal protective clothing and equipment (PPE) is to shield or isolate individuals from the chemical, physical, biological, and radiological hazards that may be encountered at a hazardous waste site.

None of the subunits sampled to date have revealed contamination levels which pose an acute dermal exposure hazard. Long term, repeated contact could result in potentially significant exposure via direct skin contact, but a more plausible concern is the potential for repeated exposure via the ingestion route as a result of smoking cigarettes, or eating with contaminated hands.

Commonly available glove materials, such as neoprene, and nitrite butyl rubber are not as resistant to halogenated solvents (TCE, PCE and TCA), or aromatics (benzene, ethylbenzene, toluene and xylene) as certain other glove materials such as Viton (which costs over $40.00 per pair) or polyvinyl alcohol-PVA (which dissolves in water) when challenged by the pure liquid product. Under the anticipated exposure conditions, however, namely intermittent handling of contaminated soil or groundwater and subsequent decontamination, neoprene and NBR gloves are perfectly acceptable, if not optimum choices for the given applications.

9.2.1 PPE Ensembles

The following scheme shall be used to designate the required level(s) of personal protective equipment and respiratory protection:

LEVEL A

Level A shall refer to the use of a fully encapsulating chemical protective suit, and either a pressure-demand self contained breathing apparatus or a pressure-demand supplied air respirator (air line) with escape provisions. Level A shall be used when the greatest level of skin, respiratory, and eye protection is required. Level A is appropriate when substances with a high degree of hazard to the skin are known or suspected to be present in concentrations which could pose a dermal hazard and skin contact is possible, or when there is a possibility of exposure to gases or vapors which may be toxic via the dermal exposure route.

LEVEL B

Level B shall refer solely to the use of a pressure-demand self contained breathing apparatus, or a pressure demand supplied air respirator with escape provisions. Level B shall be used when the highest level of respiratory protection is required but a level of skin protection less than Level A is needed.

Level B is required in atmospheres containing less than 19.5% oxygen, in atmospheres which are potentially IDLH (immediately dangerous to life or health), in atmospheres containing known concentrations of substances which warrant the use of the highest level of respiratory protection, and in atmospheres known to contain incompletely identified gases or vapors as indicated by a direct reading instrument.

LEVEL C

Level C shall refer solely to the use of full or half-face air purifying respirators. Level C protection may be used when the types of air contaminants have been identified, concentrations are measured, and all criteria for the use of air purifying respirators are met. Full face respirators shall be used when a high level of eye and face protection is required, or when the primary hazard is an airborne particulate and a higher respirator fit/protection factor is required such as in the case of airborne radionuclides.

LEVEL D

Level D refers to work without respiratory protection and is permissible only when the atmosphere contains no known or suspected hazards.

Since the appropriate ensembles of chemical or radiological protective clothing used in conjunction with Level B, C, and D respiratory protection may vary tremendously, the numerical designations "1," "2," and "3" described below, shall be used to specify the level of protective clothing that is to be utilized in conjunction with the specified level of respiratory protection. The level of PPE can thus be completely defined by the designation "C-2," "B-1," etc.

LEVEL 3 PROTECTIVE CLOTHING

1. Long pants.
2. Shirt (T-shirt acceptable).
3. Safety glasses or safety goggles.

4. Face-shield if splash hazard exists.

   Note: 3 and 4 are not required if using full-face respirator.

5. Inner one piece tyvek suit.

6. Hooded one-piece waterproof outer suit (Saranex, Chemrel, or PVC).

   Note: Double radiation whites may be substituted for 5 and 6 if radiological contamination is primary hazard. However, where chemical hazards within a radiation zone require the use of Level 3 protective clothing, radiation whites are not required in addition to the double layer chemical protective clothing.

7. Inner gloves of PVC, NBR, or latex rubber taped to inner suit.

8. NBR (nitrile butyl rubber) or neoprene rubber outer gloves taped to outer suit. Viton rubber when warranted by chemical contamination.

9. Solvent-resistant steel-toed rubber boots taped to inner suit.

10. Disposable outer boot covers (booties) taped to outer suit.

LEVEL 2 PROTECTIVE CLOTHING

1. Long pants.

2. Long sleeved shirt with collar.

3. Steel-toed rubber boots or steel toed leather boots and outer boot covers (booties).

4. Outer disposable booties (required if working in radiation zone).

5. Safety glasses or safety goggles.

6. Face-shield if splash hazard exists. Note: 5 and 6 not required if using full-face respirator.

7. Light-weight cotton coveralls, one-piece tyvek or water resistant poly-tyvek suit, or (in designated radiation zone) one pair of radiation whites.

8. Inner PVC, NBR, or latex rubber gloves.

9. NBR (nitrile butyl rubber) or neoprene rubber outer gloves.

LEVEL 1 PROTECTIVE CLOTHING

1. Long pants.

2. Long sleeved shirt with collar.

3. Steel-toed leather boots or steel toed rubber boots where wet decontamination may be required.

4. Safety glasses or safety goggles, and where appropriate, face shield.

5. Hard hat (where overhead hazards exist).

6. Lightweight cloth overalls when performing any sampling or any invasive procedure.

7. NBR, PVC or latex rubber surgical gloves when sampling or handling any potentially contaminated surface or item. Where the type of glove is not specified, disposable NBR rubber gloves such as Best N-Dex are convenient and offer protection against a wider variety of substances than either PVC or Latex gloves.

A minimum of Level 1 protective clothing as specified above must be worn by sampling personnel while engaged in any on-site activities in the 1100 Areas. In the majority of situations under consideration, exposure via splashing in the eyes, and hand to mouth contamination are the most viable exposure routes. In such cases, appropriate eye/face protection, sampling gloves, and personal decontamination (washing hands before eating or smoking) offer a substantial level of protection.

Level 2 shall be worn whenever contamination of clothing could pose a significant exposure route or contribute to the spread of contamination "off-site." Reusable cotton coveralls or a single tyvek suit are acceptable where the primary hazards are due to the presence of low concentrations of particulates such as soil contaminated with chromium, cadmium, PCBs, etc, or groundwater contaminated with low concentrations (one or two orders of magnitude above drinking water standards) of metals, organics, or radionuclides. A single layer of polyethylene coated tyvek (poly-tyvek), PVC, Saranex, or Chemrel is appropriate where the primary hazard is contaminated surface or groundwater and contamination levels are such that any exposure via skin contact poses a potential hazard. Where "Level 2" protection is required within a radiation zone, it is not necessary to wear tyvek in addition to the required radiation whites unless splash hazards are a major concern.

Level 3 protective clothing consists of two more or less separate layers of taped protective coveralls, boots, and gloves and represents the highest level of dermal protection below the Level A fully encapsulating suit. Level 3 protective clothing shall be reserved for those situations where liquid or particulate contaminants are known or suspected to be present in concentrations which could result in significant exposure via the dermal exposure route, and skin contact is a plausible consideration.

The heat stress-related hazards posed by "Level 3" protective clothing contra-indicates its use "strictly as a precautionary measure". Appropriate applications of Level 3 protective clothing include situations where whole body exposure to corrosive liquids or nearly pure phase organic hydrocarbons and/or solvents is likely, where high levels of PCB contamination exist in soil, and where high concentrations of pesticides or other substances which are toxic via the dermal exposure route are present.

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10.0 MONITORING

10.1 MONITORING GUIDELINES

The objectives of site monitoring are to provide a rational basis for the selection of appropriate levels of personal protective equipment, work practice controls and other site control procedures, and, most importantly in the case of on-site 1100 Area RD/RA activities, to continuously document and verify that the selected hazard control procedures are appropriate for the actual site conditions.

Existing soil and groundwater monitoring data and knowledge of historical activities are sufficient to identify an appropriate initial level of PPE for the types of activities anticipated in most of the 1100 Area sub-units. The latter two objectives however, namely documentation of employee exposure levels and evaluation of the adequacy of hazard control measures on an on-going basis, can only be accomplished by on-site environmental and/or personal monitoring conducted as the work is in progress. Biological monitoring (urine or blood samples) may provide useful supplemental information but is typically "after the fact" and difficult to correlate with "exposure."

Real-time site monitoring will typically be limited to air monitoring, or soil and water monitoring indirectly via some sort of modified air monitoring (headspace) procedure. Real-time air monitoring is itself limited to the relatively few types of direct reading instruments available.

Direct reading colorimetric detector tubes are available for several hundred inorganic and organic chemical substances and are very effective in certain applications. Detector tubes are not suitable for determining "time weighted average" concentrations however, and frequently do not have low enough detection limits to evaluate compliance status with a permissible exposure limit (PEL), threshold limit value (TLV), or NIOSH recommended exposure limit (REL).

Direct reading compound-specific instruments are available for certain highly toxic substances such as mercury vapor, hydrogen cyanide and hydrogen sulfide.

Combustible gas detectors and oxygen meters are available for identifying immediately dangerous and/or explosive atmospheres and are very effective for such applications.

Available direct reading air monitoring instruments for the remaining thousands of potentially toxic gases and vapors that may be present on a hazardous waste operation consist of photoionization detectors (PIDs) such as the HNU, Photovac MicroTip, and Thermoenvironmental OVM, flame ionization detectors such as the Foxboro OVA, and infrared spectrometers such as the Miran IB.

Direct reading instruments for semi or non-volatile contaminants which may be present in air as aerols are virtually non-existent. Where soil contamination levels are well characterized however, it is possible to estimate total suspended and/or PM-10 particulate concentrations with a direct reading instrument such as a MiniRam, and indirectly demonstrate that the resulting airborne concentrations of specific soil contaminants are within acceptable limits.

Where direct reading instruments or acceptable alternate methods are unavailable, and there is a reasonable possibility of employee exposure to hazardous levels of airborne contamination, personal air monitoring and/or biological monitoring must be used to verify that employees are adequately protected.

Where Level B protection (pressure demand supplied air) is employed, it may be necessary to continuously monitor the work area for explosive atmospheres or other potentially IDLH conditions. Once Level B protection is employed, however, the inhalation route is essentially eliminated as a viable route of exposure. At that point personal air monitoring to characterize "exposure" or verify compliance with an allowable exposure limit for a specific substance provides very little meaningful information. It is far more enlightening in such cases to perform the appropriate biological monitoring to verify that the selected level of PPE is indeed effective.

10.2 MONITORING REQUIREMENTS

Direct reading instruments are very useful but must be "bench" calibrated regularly and field calibrated daily. Those responsible for using the instruments and interpreting the results must be knowledgeable in the theory of operation, response factors, limitations, and calibration and maintenance procedures.

All direct reading instrument air monitoring data must be recorded on one (or more as appropriate) daily Air Monitoring Data Sheet(s) as shown in Attachment B.

The project health and safety supervisor (with input from health physics) shall establish monitoring procedures in a task-specific health and safety plan as necessary to:

- Identify IDLH conditions.
- Verify that the initial level of employee protection selected is appropriate.
- In the absence of supplied air respiratory protection, verify that site workers are not exposed to levels or concentrations of hazardous substances which exceed permissible exposure limits or other published allowable exposure levels, or where PPE is used to reduce employee exposure to allowable levels, verify that the exposure is within the capabilities of selected PPE.
- Periodically evaluate site conditions and verify that the selected levels of protection and control measures remain appropriate.

10.3 ESTABLISHING ACTION LEVELS

It is highly unlikely that employees will be exposed to hazardous chemical or radioactive substances at levels which pose a safety or health "hazard" in the course of routine RD/RA activities in the 1100 Area. Real-time air monitoring with direct reading instruments will be used to continuously verify that the designated health and safety procedures and levels of personal protective equipment are in fact appropriate for existing conditions, and to immediately identify any excursions from anticipated exposure levels.

Direct reading instruments must be selected based on the anticipated hazardous substance(s) and the response characteristics of available instruments. Specific action levels must be established such that an adequate level of protection is provided for all known or suspected contaminants. Consequently, action levels must take into account the allowable exposure limits and instrument response to specific compounds. Table 10-1 lists the organic substances detected in soil and groundwater and the relative responses of various direct reading instruments. For the purposes of this exercise an excellent response "E", shall be defined as "1" or 100% relative to the reference calibration gas, good "G" shall be .75 or 75%, fair "F" shall be .50 or 50%, poor "P" shall be .25 or 25% and no response "NR" shall be defined as zero response.

Where one contaminant is predominant, it is a straight forward matter to apply a direct reading total organic monitoring instrument such as a Photovac MicroTip to evaluate employee exposure levels provided that the detection limit of the instrument is not greater than the allowable exposure limit of contaminant. For example, if the allowable exposure limit of a particular substances is 100 ppm, and the instrument response to that substance relative to the reference calibration standard is 50%, the allowable exposure limit as indicated by the instrument reading would be 50 ppm. An instrument reading of 50 ppm in this case could be a reasonable "Action Level" to don appropriate respiratory protection.

In many cases, the exact contaminant(s) are unknown, or the allowable exposure limit is qualitative (i.e., "lowest feasible concentration") or smaller than the practical detection limit of the instrument (i.e., 0.1 ppm TWA for benzene). In such cases it is reasonable to establish an Action Level for respiratory protection at any detectable reading or, where there is a "reasonable possibility of exposure", to use Level C respiratory protection from the start and designate a conservative "action level" to upgrade to a higher level of protection (typically supplied air).

Assuming benzene is the only contaminant, and the employee is already wearing an air purifying respirator with a protection factor of "10", continuous readings of 1 ppm in the breathing zone would be a reasonable Action Level to withdraw from the area and upgrade the level of respiratory protection to Level B.

Where several different compounds are likely to be present in concentrations which may result in exposure levels in excess of the respective allowable limits, it is still possible to use a total organic vapor monitoring instrument effectively particularly when the substances and relative concentrations in soil or groundwater are relatively well defined.

The Action Level, or the allowable exposure limit for a particular substance as indicated on an 11.7 eV photo ionization detector is the appropriate (TLV, PEL, REL) exposure limit times the instrument response (1, .75, .5, etc.) for that particular substance as described above.

Each substance, however, contributes to the "total" organic vapor detected by the instrument. The relative contribution of each volatile organic to total organic vapor concentrations in air, can be approximated according to the substance's concentration in soil or groundwater relative to the total concentrations of all volatile organics.

A "resultant action level" of the mixture can be approximated by multiplying the lowest applicable exposure limit in mg/m^3 for each substance by the appropriate instrument response factor, and then calculating the resultant "action level" according to the procedures for calculating the TLV of mixtures in Appendix C, Section A, 1, of the 1992-1993 ACGIH TLV Booklets.

This approach is conservative in that it accounts for substances having low exposure limits and/or poor instrument response factors, but not overly conservative in that it utilizes real site data where available, to account for the fact that the measured "total organic vapors" do not necessarily consist solely of the single most damning substances.

TABLE 10-1

RELATIVE RESPONSE* OF DIRECT READING INSTRUMENTS TO ORGANIC CHEMICALS DETECTED IN GROUNDWATER
(Excellent, Good, Fair, Poor, No Response)

Chemical Substance	10.2 PID	11.7 PID	FID
Benzene	E	E	E
Carbon Tetrachloride	NR	G	P-F
Ethylbenzene	E	E	E
Gasoline	E	E	E
Methylene Chloride	NR	E	E
Stoddard Solvent/Mineral Spirits	P	E	G
Tetrachloroethylene (PCE)	E	E	G
Toluene	E	E	E
1,1,1-Trichloroethane (TCA)	NR	E	E
Trichloroethylene	E	E	G
Xylene	E	E	E

* From Manufacturer's Data

10.4 INSTRUMENT CALIBRATION PROCEDURES

All direct reading instruments must be field calibrated at the beginning and end of each day of use. Field calibration data, and all subsequent air monitoring data must be recorded on an Air Monitoring Data Sheet. Whenever possible, instruments should be calibrated directly to the specific compound of interest. When this is not practical, each instrument shall be calibrated to an appropriate "default" calibration gas representative of a wide spectrum of instrument response, as follows:

All photo ionization detectors shall be zeroed in clean air, and calibrated (spanned) to 100 ppm (parts per million by volume) isobutylene, in air.

The Foxboro Organic Vapor Analyzer flame ionization detector shall be bench calibrated periodically, to 9, 90, and 900 ppm methane in air, in the 1X, 10X, and 100X ranges, respectively. In the field, at a minimum, the OVA shall be zeroed in clean air, and calibrated to 9 ppm methane in air in the 1X and 10X ranges at the beginning and end of each day of use. If the "Gas Select" knob must be set to greater than "4," or less than "2" in order to read the target "9" ppm, or "0.9" ppm in the 10X range, the instrument shall be bench calibrated in all three ranges as discussed above.

All combustible gas indicators (CGIs) operating on the catalytic combustion principle must be calibrated directly to 50% LEL (2.5%) methane if the instrument is to be used to monitor methane. For all other petroleum hydrocarbon applications combustible gas indicators may be calibrated to 50% LEL (0.75%) pentane, or 50% LEL hexane (0.55%). In each case, the instrument should read between 45 and 55% LEL. In every case, the CGI calibration gas should contain 15% or 17% oxygen, with the balance nitrogen. Prior to calibrating the CGI, the oxygen detector (on those instruments which have oxygen detectors) should be "zeroed" in clean ambient air, to 21% oxygen. Upon completing the CGI calibration, while the instrument is still reading the CGI calibration gas, the % 0_2 reading must be checked in order to verify that the oxygen level readings have dropped to 15% or 17% O_2 as appropriate, plus or minus 1.5% 0_2.

Direct reading hydrogen sulfide detectors shall be periodically bench calibrated to both 10 ppm, and 40 ppm H_2S. The instrument should be zeroed in clean air, and spanned directly to 10 ppm H_2S and subsequently checked using 40 ppm H_2S. If, upon running 40 ppm H_2S through the instrument the reading is either less than 30, or greater than 50, the H_2S detector must be replaced. In the field, at a minimum, the instrument shall be zeroed in clean air, and spanned to 10 ppm H_2S, before and after each day of use. The instrument should read 10 ppm plus or minus 1 ppm.

11.0 WORK ZONES AND SITE CONTROL

Typically access to an operable unit and/or surrounding area will be restricted to RD/RA personnel. Consequently the entire work area is in essence a "controlled area." Different levels of protection within a controlled area may be entirely justified depending on the specific activities in progress and the anticipated hazards.

Hazardous waste work sites controlled areas should be divided into as many (or as few) specific zones as needed to meet operational and safety objectives. For illustration, this manual describes three frequently used zones:

- Exclusion Zone or Controlled Zone, (the contaminated job site).
- Contamination Reduction Zone (CRZ) or Decontamination Zone (the area where decontamination takes place).
- Support Zone (the uncontaminated area where workers should not be exposed to hazardous conditions).

Delineation of these three zones should be based on sampling and monitoring results and on an evaluation of potential routes and amount of contaminant dispersion in the event of a release. Movement of personnel and equipment among these zones should be minimized and restricted to specific Access Control Points to prevent cross-contamination from contaminated areas to clean areas. An idealized schematic representation of the layout of work zones for an excavation is given in Figure 11-1. An appropriate layout should be established for each task on a case by case basis.

Exclusion Zone

The Exclusion Zone is the area where contamination does or could occur. The primary investigative or clean-up activities are performed in the Exclusion Zone.

Personnel who may work within an Exclusion Zone include sampling personnel, operators, drillers, work parties, and specialized personnel such as health physicists and/or industrial hygienist. All personnel within the Exclusion Zone must wear the level of protection designated for their job function in the Task Specific Health and Safety Plan.

The required level of protection in the Exclusion Zone may vary according to job assignment. For example, a worker who collects samples from open containers might require Level B protection, while one that performs walk-through ambient air monitoring might only need Level C protection. When appropriate, different levels of protection within the Exclusion Zone should be assigned to promote a more flexible, effective, and less costly operation, while still pursuing the lowest feasible exposure as a target.

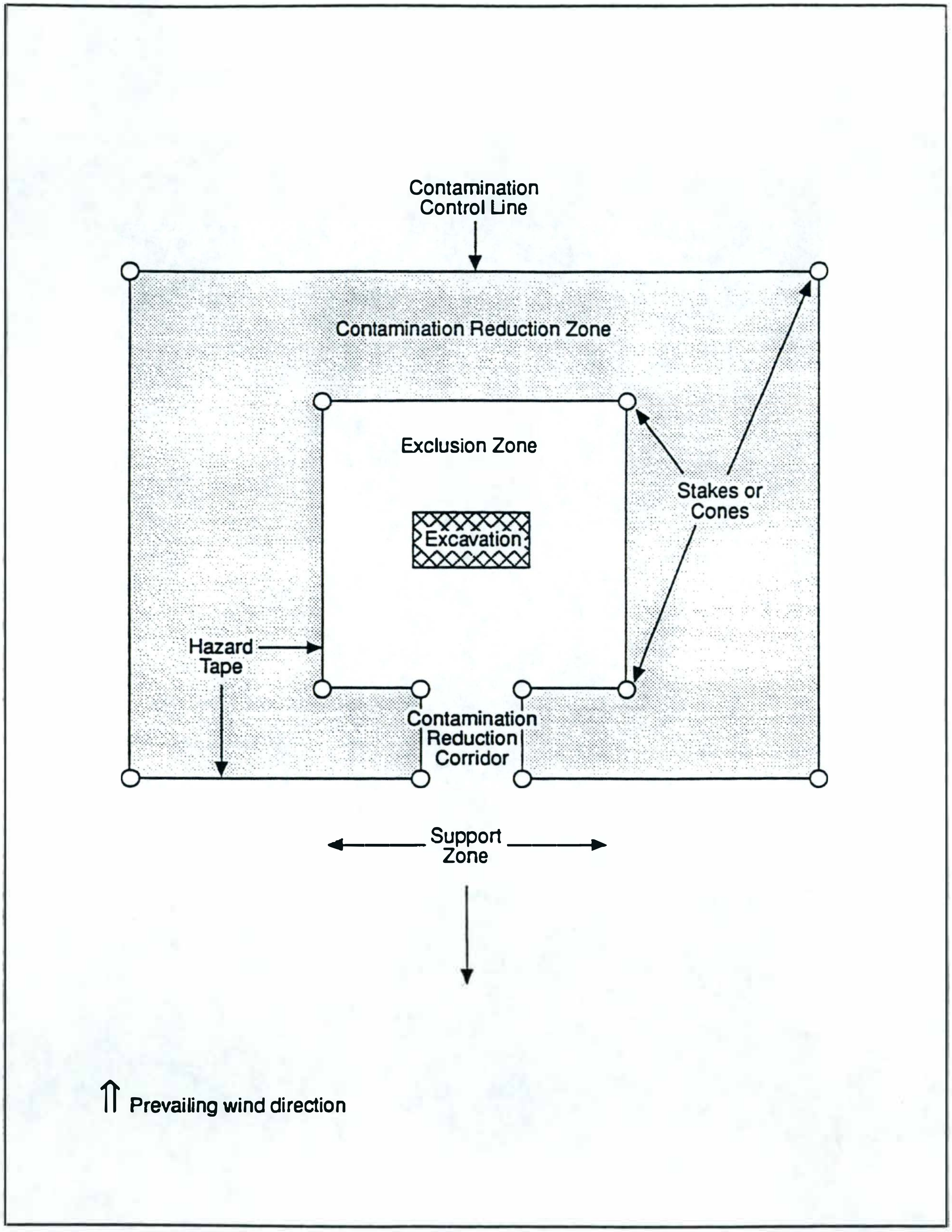

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Figure 11-1. Work Zones.

Contamination Reduction Zone

The Contamination Reduction Zone (CRZ) or Decontamination (Decon) Zone is the transition area between the contaminated area and the clean area. This zone is designated to reduce the probability that the clean Support Zone will become contaminated or affected by other site hazards. The distance between the Exclusion and Support Zones provided by the CRZ, together with decontamination of workers and equipment, limits the physical transfer of hazardous substances into clean areas. The boundary between the CRZ and the Exclusion Zone is called the Hotline. The degree of contamination in the CRZ decreases as one moves from the Hotline to the Support Zone, due both to the distance and the decontamination procedures.

Decontamination procedures take place in a designated area within the CRZ called the Contamination Reduction Corridor (CRC). They begin at the Hotline. At least two lines of decontamination stations should be set up within the CRC: one for personnel and one for heavy equipment. A large operation may require more than two lines. Access into and out of the CRZ from the Exclusion Zone is through Access Control Points: one each for personnel and equipment entrance, one each for personnel and equipment exit, if feasible.

Personnel within the CRZ should be required to maintain internal communications, line-of-sight contact with work parties, work party monitoring (e.g., for air time left, fatigue, heat stress, hypothermia), and site security.

Support Zone

The boundary between the Support Zone and the CRZ, called the Contamination Control Line, separates the possibly low contamination area from the clean Support Zone. Access to the CRZ from the Support Zone is through two Access Control Points if feasible: one each for personnel and equipment. Personnel entering the CRZ should be required to wear the personal protective clothing and equipment prescribed for working in the CRZ. To reenter the Support Zone, workers should remove any protective clothing and equipment worn in the CRZ, and leave through the personnel exit Access Control Point.

Personnel may wear normal work clothes within this zone. Any potentially contaminated clothing, equipment, and samples must remain in the CRZ until decontaminated.

Support Zone personnel are responsible for alerting the proper agency in the event of an emergency. All emergency telephone numbers, change for the telephone (if necessary), evacuation route maps, and vehicle keys should be kept in the Support Zone.

12.0 DECONTAMINATION GUIDELINES

12.1 PREVENTION

The single most important "decontamination procedure" is to observe work practices which minimize contact with contaminated materials and thus the potential for contamination. For example, do not walk through isolated visibly or otherwise highly contaminated areas (hot spots), do not sit or lean on potentially contaminated containers or equipment, and do not directly handle contaminated materials.

The potential for personal or equipment contamination associated with the 1100 Area RD/RA will be limited almost entirely to direct or indirect contact with contaminated soil or groundwater. Conscientious efforts to limit contact with soil or groundwater or potentially contaminated sampling equipment and containers to disposable gloves and (where required) coveralls will obviate the need for rigorous decontamination procedures.

Remedial actions which are beyond the scope of sampling or excavating contaminated soil must be examined on a case by case basis, and may require more rigorous decontamination procedures, which will be specified in the Task Specific Health and Safety Plan, as appropriate.

12.2 TYPES OF CONTAMINATION

Residual contamination, if any, left on skin, clothing, or sampling equipment after contact with 1100 Area soil or groundwater may consist of extremely low concentrations of toxic metals, organic chemicals including PCBs radionuclides, and inorganic salts. As discussed above, skin absorption is less of a concern than subsequent ingestion as a result of hand to mouth contamination via food or tobacco products.

12.3 PERSONAL DECONTAMINATION PROCEDURES

Personal decontamination following routine sampling activities will consist of removing and discarding sampling gloves and tyvek coveralls (where applicable). Where cotton coveralls are used, they should be placed in a plastic garbage bag and submitted to the laundry.

Sampling personnel must wash their hands before eating or smoking after any sampling task.

12.4 DECONTAMINATION EQUIPMENT

Decontamination equipment routinely used for RD/RA activities shall include a source of clean water for washing hands, respirators, and sampling equipment, two dish pans or wash tubs (one for respirators and one for collecting wash water) and plastic garbage bags for solid waste.

12.5 DISPOSAL METHODS

All potentially contaminated items including personal protective equipment, sampling equipment, and equipment used for decontamination must be decontaminated or collected in plastic garbage bags and disposed of properly. Waste water generated as a result of washing/rinsing of hands and/or sampling utensils shall be handled and disposed of in the same manner as purge water from the well(s).

12.6 EMERGENCY DECONTAMINATION

On-site activities under conditions which do not exceed the action levels specified in this plan will not result in conditions where "emergency decontamination" beyond removal of disposable protective clothing, is a concern.

Tasks which involve activities and/or circumstances where such conditions may be anticipated require appropriate emergency decontamination procedures to be specified in a task specific health and safety plan.

13.0 EMERGENCY PROCEDURES

The emergency information provided in the Task Specific Health and Safety Plan must be based on the most current information available. Team members should never lose site of the fact that unknown conditions may exist, and known conditions may change. Even a Task Specific Health and Safety Plan prepared immediately prior to start-up cannot possibly account for every unknown, or anticipate every contingency which may arise. Planning, preparedness, and recognition of hazards before they become emergencies are always the most desirable emergency procedures.

Each site worker should be constantly alert for changing conditions or potentially hazardous situations or procedures, and should immediately bring any recognized hazards to the attention of the Site Safety Coordinator.

Should higher than expected levels of contamination be encountered in the soil or groundwater as indicated by instrument readings, visible contamination, perceptible odors, or physical signs or symptoms of overexposure, or in the event of any situation which is obviously beyond the scope of the procedures and levels of protection specified in the Task Specific Health and Safety Plan, work activities shall be temporarily halted pending discussion with the Project Manager, the Industrial Hygienist and/or the Health Physicist, and implementation of appropriate protective measures.

Under such circumstances, before work is resumed, the field procedure change authorization section of the task-specific health and safety plan addressing the new site conditions must be completed and distributed, and all personnel must receive a revised safety briefing and be properly equipped for the actual working conditions encountered in the field.

Emergency phone numbers and the location of the nearest infirmary are included in the applicable area-specific sections, and must be specifically identified on a task-specific basis in the task-specific health and safety plan.

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14.0 PREPARATION OF A TASK SPECIFIC HEALTH AND SAFETY PLAN

An 1100 Area RD/RA Task Specific Health and Safety Plan must be completed and discussed with task personnel for every task performed under the RD/RA Work Plan which involves a reasonable possibility of worker exposure to safety or health hazards.

Exactly what constitutes a "task" which requires a separate and unique health and safety plan however, will vary depending on the situation. For example a task involving taking 10 soil samples around the perimeter of four separate storage basins may be treated as a single task and require only one Task Specific Health and Safety Plan provided that the tasks and potential hazards are similar in all cases. If, on the other hand, the same "task" involves taking two additional samples of sludge within a storage basin where the anticipated hazards, required levels of protection, decontamination procedures, and emergency procedures might be considerably different, a separate Task Specific Health and Safety Plan would be in order.

This however, is the main advantage of the general plan/task-specific short-form approach. It facilities the preparation of truly task-specific health and safety procedures with a minimum of duplicated effort. In the case of the example given above, a task-specific "sludge sampling" plan could be prepared at the same time as the soil sampling plan and would involve appropriately modifying only the relevant items as discussed below.

Items 1 through 7 are to be completed by the originator of the Task-Specific Health and Safety Plan (in most cases, the Project Manager or the designated Task Manager). The remainder of the plan should be completed by an appropriately qualified individual (most likely the Project Health and Safety Supervisor) based on the information provided in Sections 1 through 7.

14.1 ITEM 1 PROJECT NAME AND BASIC PROJECT INFORMATION TO BE COMPLETED BY ORIGINATOR

Self-explanatory.

14.2 ITEM 2 PROJECT DESCRIPTION

The originator of the Task Specific Health and Safety Plan should describe the nature and purpose of the project, the objectives, the methods that will be used to achieve the objectives, and to the extent possible, the individual tasks that the project will involve.

14.3 ITEM 3 LOCATION

The location of the project should designate the area, the operable unit and subunit (when applicable), the specific facility of interest (disposal trench, storage basin, etc.) and the physical location with specific reference points wherever possible.

14.4 ITEM 4 FACILITY/WORK SITE DESCRIPTION

The originator should include a brief description of the facility under investigation, the worksite, working conditions, and the nature and extent of hazardous substances which are known to be present or which may be encountered. For example, will the project involve work inside of a structure, or in a security area? Will work be performed around the perimeter of a storage basin on flat stable ground, on a sloped berm or through the middle of a potentially unstable crib? Previous chemical or radiological analytical results and/or suspected contaminants should also be briefly described here.

14.5 ITEM 5 PROPOSED PERSONNEL AND TASKS

The proposed personnel should be listed by name along with their intended job functions.

14.6 ITEM 6 POTENTIAL HAZARDS

The originator of the Task Specific Health and Safety Plan should identify and briefly describe any and all health and safety hazards which he or she feels may be reasonably anticipated.

Item 6 is intended to make the originator think about the potential hazards the task is likely to involve and to provide the preparer with additional insight regarding the nature of the task.

14.7 ITEM 7 SIGNATURE OF ORIGINATOR

Self Explanatory.

14.8 ITEM 8 TASK ORGANIZATION

Identify the key personnel responsible for project health and safety. Identify the nature and extent of health physics technician coverage required and the HPT(s) authorized to work on the particular task.

Finally, list each individual on the field team by name and job function/task.

14.9 TRAINING AND SPECIAL REQUIREMENTS FOR TASK PERSONNEL

Simply refer to Section 5.1 in main body of plan, if applicable, and/or list any specific requirements unique to this particular task.

14.10 ITEM 10 CHEMICAL/RADIOLOGICAL HAZARD EVALUATION

Identify the media and hazardous characteristics of the substances which site workers may encounter.

The list of hazardous contaminants which could potentially be present on a site will frequently include literally hundreds of chemical substances and/or radionuclides which are known or suspected to have been discharged in quantities ranging from less than one, to tens of thousands of kilograms, or picocuries to thousands of millicuries or more. In such instances it is not necessary or desirable to identify every possible contaminant in the Task Specific Health and Safety Plan.

For example, a lengthy list of radioactive isotopes, along with the associated activity levels, beta energies, gamma photon energies, alpha energies, etc., will do little to enhance a site worker's perception of health and safety hazards posed by a site whereas information such "beta/gamma emitters" or "alpha emitters" and a qualitative discussion of the related hazards will tell the employee everything he needs to know for health and safety purposes in straight-forward terms.

The HSS (in conjunction with the Project Health Physicist, when radionuclides are suspected) shall determine and list the chemical and/or radiological hazards of greatest concern. The determination will be based on the following:

1. Quantities released and/or soil, water, or soil gas concentrations.

2. Expected environmental fate (persistence, degradation etc.)

3. Toxicity: Carcinogenicity, LD_{50}, etc.

4. Vapor Pressure

5. Warning properties (odor thresholds, irritation, etc.)

6. Availability and response of direct reading instruments.

It is important to address all contaminants that will require specific monitoring or personal protective equipment without producing an unmanageably long list. For example if the suspected chemicals are gasoline and five different particulate hazards, it may be appropriate to choose benzene and hexane (toxic gasoline components) and one or two of the most toxic particulates as the surrogate contaminants.

Identify the applicable exposure limit(s), IDLH (immediately dangerous to life and health) concentration, and potential health effects of each contaminant or representative of a class of contaminants, for example, xylene, for xylene, toluene and ethylbenzene.

Compound specific MSDSs (material safety data sheets) may be included as an addendum. When a site worker is exposed to soil potentially contaminated with volatile and semi volatile organics, pesticides, PCBs, metals, inorganics, and radionuclides, however he has no way of knowing which substance(s) he is exposed to, and compound specific MSDS sheets are largely meaningless. The purpose of Item 10 is to characterize the nature and extent overall chemical and radiological hazards of concern at a glance and should not be compromised with more information than is necessary or useful in the context of a Task Specific Health and Safety Plan.

14.11 OTHER POTENTIAL HAZARDS IDENTIFIED IN ITEM 6

Each of the potential hazards identified in Item 6, shall be characterized and discussed in this section, to the extent necessary to permit personnel to safely perform their designated task(s). This section may simply refer to the reader to appropriate sections of the main document for a general discussion of a potential hazard, or could provide detailed task-specific procedures for an activity known to involve particular hazards.

14.12 ITEM 12 PERSONAL PROTECTIVE EQUIPMENT

Identify the initial level of personal protective equipment required for each task i.e., C-2, B-2, etc., as discussed in Section 9.2 of the main document; note that at a minimum, Level 1 protective clothing will be required.

Identify the specific equipment/items required for each designated "Level."

Specify the inner and outer glove material(s) required, boot material, outer coverall material if different than Saranex, and discuss any "other" specified items.

In the event that on-site air monitoring or other "action levels" are exceeded specify the corresponding upgrade in PPE (if applicable).

14.13 ITEM 13 AMBIENT AIR/SITE MONITORING PROCEDURES FOR CHEMICAL/RADIOLOGICAL HAZARDS

Appropriate monitoring instruments, monitoring frequencies, and any other special monitoring considerations should be specified in Item 13. Refer the reader to the main body of this document for additional guidance.

14.14 ITEM 14 ACTION LEVELS

Identify specific "action-levels" as determined by the designated monitoring procedures, and the specific "action" corresponding to each action level. Action levels should be based on the allowable exposure limits and instrument response to the substances listed in Item 10.

14.15 ITEM 15 PERSONAL MONITORING

Personal monitoring requirements including who is to be monitored (by job function), how they are to be monitored, how often they are to be monitored, and what they are to be monitored for, should be specified in Item 15.

14.16 ITEM 16 EXTERNAL RADIATION DOSIMETRY REQUIREMENTS

Identify the type of radiation dosimeter(s) (if any) required, by task.

14.17 ITEM 17 BIOLOGICAL MONITORING/MEDICAL SURVEILLANCE/ RADIOLOGICAL BIOASSAY

Identify the nature and extent of any special biological monitoring, any non-routine medial surveillance, or radiological bioassay associated with the task.

14.18 ITEM 18 WORK ZONES AND ON-SITE CONTROL

Work zones, site layout, and zone boundaries e.g., red tape, yellow tape, etc. should be specified as appropriate. The "exclusion zone, decontamination zone, support zone" concept is widely accepted but may not be applicable in every case. Alterative site control strategies are perfectly acceptable where applicable as long as the primary objectives of preventing the spread of contamination, and protecting site personnel and the public are achieved. Include a sketch.

14.19 ITEM 19 DECONTAMINATION

The specific stations, required equipment, and step by step decontamination procedures must be clearly identified for both personnel and equipment.

Emergency decontamination procedures should also be specified.

14.20 ITEM 20 SANITATION REQUIREMENTS

Identify the work site sanitation requirements in the Site Specific Health and Safety Plan. At a minimum, provisions for employee sanitation needs must meet OSHA standards for "Sanitation at Temporary Workplaces" 29 CFR 1910.120(N).

The Field Team Leader should secure all required sanitation equipment and facilities, and locate the same at the work site.

The Site Safety Coordinator should ensure that all required sanitation equipment and facilities are available prior to start-up, and maintained throughout the duration of the project.

14.21 ITEM 21 LOGS, REPORTS, AND RECORDKEEPING

The reader may be referred to Section 5 of the main body of this plan for general certification requirements. Identify all task-specific health and safety-related documentation which must be generated and/or available on-site.

14.22 ITEM 22 EMERGENCY PROCEDURES

Specific procedures to be followed in the event of a fire, chemical emergency or on-site injury or illness including emergency contacts, radio channels, phone numbers, etc. must be identified in the Task Specific Health and Safety Plan. Acute exposure symptoms, and appropriate first-aid procedures must be identified for each of the substances listed in Item 10. A site map showing the location of the nearest phone, first-aid facility and designated hospital/emergency medical facilities should be included as an addendum. At least two on-site personnel must be certified in first-aid and CPR. Where applicable specific emergency back-up personnel or task specific emergency equipment (such as tripods, harnesses, hoists, etc. for confined space entry) must be listed also. A copy of the emergency procedures section of the Task Specific Health and Safety Plan must be posted at the work site.

14.23 ITEM 23 SAFETY BRIEFING

The Project Manager, HSS, or Site Safety Coordinator and designated Health Physicist (where applicable) must organize and conduct a comprehensive pre-job safety briefing prior to start-up of every project falling under the scope of a Task Specific Health and Safety Plan. The purpose of the safety briefing is to convey vital project-specific information to team members, to reinforce each employee's safety awareness, and to perform a last minute check that critical safety measures are in place (i.e. fire extinguisher and first-aid kit). The safety briefing is a critical aspect of the entire health and safety effort and must be well thought out and organized, just as decontamination or any other aspect of the health and safety plan.

In addition, the safety briefing is an ideal forum to discuss any lingering concerns, and to share first-hand experiences and/or lessons from other similar projects, near misses, accidents, etc.

All field team personnel in attendance at the safety briefing must sign a safety briefing attendance sheet such as that included in Item 23. Only personnel whose signature appears in

Item 23 of the Task Specific Health and Safety Plan shall be permitted beyond the Contamination Control Line into the Decontamination or Exclusion Zones.

14.24 ITEM 24 FIELD PROCEDURE CHANGE AUTHORIZATION

The Site Safety Coordinator is authorized to make reasonable and appropriate changes in procedures designated in the Task Specific Health and Safety Plan contingent upon verbal authorization from either the Project Manager, Project Health and Safety Supervisor, or Project Health Physicist as appropriate. Written authorization should follow within 48 hours of verbal authorization.

ATTACHMENT A

TASK SPECIFIC HEALTH & SAFETY PLAN

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1. Project Name Horn Rapids Landfill Remediation

   Task Excavation of PCB Contaminated Soil

   Prepared/Requested by I.M. Eager

   Proposed Start-Up Date/Duration Sept 15-30 1993

Rev. Level 0

Prepared/Reviewed by Project Health and Safety Supervisor

Printed Name ______________________

Signature ______________________ Date ______ 19 ______

Reviewed by Site Safety Coordinator

Printed Name ______________________

Signature ______________________ Date ______ 19 ______

Reviewed by Project Manager

Printed Name ______________________

Signature ______________________ Date ______ 19 ______

Title ______________________

Note to Project Managers:

A signed copy of the Health and Safety Plan and a signed and completed copy of the safety briefing must be maintained at the field site and included in the project records.

The Project Health and Safety Supervisor must be a Certified Industrial Hygienist per CENPW requirement.

2. Project Description:

Field screening metholodologies will be employed to direct excavation of the PCB contaminated landfill cell. When field screening indicates that the 50 mg/kg clean-up standard has been achieved, confirmatory samples will be taken from the walls and base of the excavation. After removal of soil contaminated at concentrations in excess of 50 mg/kg PCBs is complete, the landfill will be capped.

3. Location:

The Horn Rapids Landfill (HRL) is located on the Hanford site approximately 1,000 feet northeast of the Siemans Nuclear Power Corp. (formerly Advanced Nuclear Fuels Corp.) along the Horn Rapids road. It is on the southern boundary of the Hanford Reservation and immediately adjacent to the city of Richland property. The facility is bordered to the south by a wire fence which runs parallel to the Horn Rapids road. A gate with a padlock and chain limits access to the land-fill area. The landfill is contained within the CERCLA 1100-EM-1 Operable Unit boundaries. Figure 1 shows a map of the HRL and vicinity.

4. Facility/Work Site Description:

The Horn Rapids Landfill covers approximately 50 acres northeast of the Siemens Power Corporation (SPC) and north of Horn Rapids Road. The landfill was operated as an uncontrolled (presumable non-radioactive waste) landfill for Hanford Operations from the late 1940's until the 1970's. Office and construction waste, asbestos wastes, sewage sludge, and fly ash are known to have been disposed of at the landfill. Previous investigations have identified asbestos contamination and an area contaminated by PCBs at concentrations as high as 100 mg/kg. PCBs are the only contaminant requiring remediation in this area. The asbestos contaminated section of the landfill are to be contained in place and capped.

5. Proposed Personnel and Tasks:

Project Manager Randy Chong

Field Team Leader Richard Fink

Proposed Task Personnel	Job Function/Tasks

6. Potential Hazards

X	Chemical		Confined Space Entry
	Radiological	X	Trips, Slips, Falls
X	Fire/Explosion	X	Trenching/Shoring
X	Heat Stress/Cold Stress	X	Heavy Equipment/Vehicular Traffic
	Electrical		Overhead Hazards
X	Machinery/Mechanical Equip		Unstable/Uneven Terrain
	Torch Cutting and Welding	X	Noise
	Fugitive Dust	X	Dangerous Wildlife, Poisonous Plants/Insects

Description/Other

7. I, ______________________, attest that this information is accurate to the best of my knowledge and hereby request a Health and Safety Plan for the task(s) designated above.

Signature/Title Date

8. Task Organization

1100 Area RD/RA Program Manager: ________________________ Phone:______

Industrial Hygiene/Safety Manager: D. W. Coonfare __________ Phone: 522-6798

Health Physics Manager: ______________________________ Phone:_______

Project Manager Randy Chong ______________________ Phone: 522-6774

Project Health and Safety Supervisor: M.B. Remington Phone: 522-6782

Field Team Leader: Richard Fink ______________________ Phone:_______

Site Safety Coordinator: M.B. Remington ______________ Phone:________

Health Physics Technician Coverage

[X] None [ ] Intermittent [ ] Continuous [ ] See Radiation Work Plan

HPT coverage required when:

HPT coverage required until:

Authorized HPT's:

________________________________ ________________________________

________________________________ ________________________________

________________________________ ________________________________

________________________________ ________________________________

8. Task Organization (Cont'd)

Field Team

Name	Job Function/Task
	Back Hoe Operator
	Soil Sampling/Site Monitoring
	Truck Driver
	Front End Loader Operator

9. Training and Special Requirements for Task Personnel

Refer to Section 5.1 in Site Safety and Health Plan.

Personnel Current in First Aid/CPR (Names)

10. Chemical/Radiological Hazard Evaluation

Waste/Media		Potential Hazardous Characteristics	
X	Airborne Contamination		Ignitible
	Surface Contamination		Corrosive
X	Contaminated Soil		Reactive
	Contaminated Groundwater		Explosive
	Contaminated Surface Water	X	Toxic (non-radiological)
	Solid Waste		Radioactive
	Liquid Waste		
	Sludge		

This task will involve the reasonable possibility of exposure to the substances listed below at concentrations or in quantities which may be hazardous to the health of the site personnel.

Substance	Applicable Exposure Limit	IDHL Level	Health Effects
Polychlorinated biphenyls	0.001 mg/M^3 REL	5 mg/M^3	Unbearable itching/skin eye irritation at high concentrations. Chloracne, liver damage. Liver carcinogen in rats and mice. IDLH level based on skin irritation

10. Chemical/Radiological Hazard Evaluation (Cont'd)

Primary Hazard
(Rate: negligible, low, med, high, ext)

Substance	Inhalation of Gases/ Vapors	Inhalation of Dusts/ Mists	Ingestion	Dermal Absorption of Solids/Liquids and/or Skin Contam.	Dermal Absorption of Gases/Vapors	Corrosive/ Irritant	Ignit-ability	Reactivity/ Explosion
PCBs	neg	low	low	low	neg	low	NA	NA
non-specific waste halogenated hydrocarbon/ solvents	low	neg	neg	neg	neg	neg	neg	neg

11. Other Potential Hazards Identified in Item 6 above:

Fire and Explosion

Although fire and explosion hazards encountered during sampling activities are expected to be minimal, workers should be aware that flammable gases and volatile organic liquids may be encountered. To minimize fire and explosion potential, the following precautions should be adhere to:

a. A fire extinguisher and shovels will be carried in each vehicle.

b. No smoking or open flames will be allowed within the waste site.

c. Do not park or drive vehicles with catalytic converters in tall grass.

Heat Stress and Cold Stress

Since sampling activities will be taking place outside during the winter months, heat stress will not be a problem. Cold stress could be a problem since cold temperatures, wind, and/or wet weather is possible.

Cold stress will be dealt with by wearing insulated inner and outer clothing and watching the temperature and wind chill closely. Workers will wear rain jackets or other means of protective clothing to keep them dry during periods of wetness. If cold stress becomes a concern, work/rest regimes will be arranged. The American Confederation of Government Industrial Hygienist, Threshold Limit Value Booklet (1990-1991 edition) shall be used for assessing cold stress.

Heat stress is a major concern and symptoms must be monitored by the FTL if the ambient temperature exceeds 70°F onsite during work activities as it will during the May and September rounds of groundwater sampling. Although there is no need for workers to wear chemical suits or other restrictive clothing, heat stress is still a potential problem. In chapter 8 of the *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities* there is a checklist that shall be used for all workers, especially those personal protective equipment (PPE).

Electrical

All temporary wiring shall conform to the National Electric Code. All outdoor receptacles shall be ground fault interrupter protected.

Machinery and Mechanical Equipment

No heavy machinery will be required in this phase of the RI work. Some mechanical equipment such as pumps, etc., will be used. All equipment is small and of minimal concern.

Trips, Slips, Falls, and Unstable and Uneven Terrain

The ground in the HRL area is uneven with numerous holes, tripping hazards, and uneven walking/working surfaces. In addition, surface debris is known to exist at the landfill. Care should be taken to avoid stepping on sharp or piercing objects on the ground surface.

NOTE: Terrain around test wells is generally flat and free of debris. During the winter months, care should be taken due to icy or wet conditions, ponding water, etc.

Good housekeeping practices must be followed to reduce clutter at the HRL site. This will reduce the risks of trips, slips, and falls. Plan routes in and around the site to avoid tripping hazards.

NOTE: The change of personnel injury due to tripping, slipping, and falls are compounded when respiratory protection is worn. Personnel must be aware of this and take care to think ahead and plan movements to allow for reduced visibility and mobility.

Cutting and Welding Procedures

Cutting and welding is not anticipated for this task; however, if performed, the precautions checked below, as well as the precautions discussed in paragraph 6.3, will be followed.

- Combustibles will be relocated or protected.
- Combustible floor will be wetted down or covered.
- Flammable gas concentrations (% Lower Explosive Limit) in air will be checked.
- Wall, floor, duct, and tank openings will be covered.
- A fire extinguisher will be provided.

Fugitive Dust Control

Due to occasional high winds and the arid climate, the Hanford site always has a potential for dust problems. No soil disturbance will take place during the sampling activity. Refer to Environmental Protection Agency (EPA) publication EPA/540/285/003 "Dust Control at Hazardous Waste Sites."

Trenching and Shoring

Do not enter any excavation greater than four feet in depth unless the site walls above four feet are laid back to an angle of at least 1 1/2 horizontal to 1 vertical.

Heavy Equipment/Vehicle Traffic

Private vehicles are restricted from the site. "Vehicular traffic" per se will not be an issue. Site workers must remain alert to the presence of heavy equipment. Stay well clear of backhoe bucket. Make eye contact with the operator and make certain that he is aware of your presence before walking or performing any other activity in the vicinity of a backhoe, front end loader, or truck.

Noise

Heavy equipment operators must wear ear plugs. Other site workers must wear ear plugs when it is necessary to work in the immediate vicinity (i.e., within 25 feet of a backhoe, drilling rig, etc.) of heavy equipment.

Dangerous Wildlife and Insects

Workers should be aware that rattlesnakes and scorpions are indigenous to the are. Be cautious when overturning rocks, boards, or other debris. High-top boots are recommended but not required. All safety shoes will meet American National Standards Institute Z41-1983.

12. Personal Protective Equipment Requirements

Refer to Section 9.2 in main body of Site Safety and Health Plan for detailed explanation of Levels of Protection.

Location	Job Function/Task	Initial Level of Protection
Exclusion Zone		
	Back hoe Operator	B C D 1 2 3
	Soil sampling	B C D 1 2 3
	Front End Loader Operator	B C D 1 2 3
	Truck Driver	B C D 1 2 3
	________	B C D 1 2 3
	________	B C D 1 2 3
Decontamination Zone		
	________	B C D 1 2 3
	________	B C D 1 2 3

In the event that one or more of the action levels specified in Section 13 below is/are exceeded, the Levels of Personal Protective Equipment for each task shall be upgraded as follows:

Location	Job Function/Task	Upgrade Level of Protection
Exclusion Zone		
	Back hoe Operator	B C D 1 2 3
	Soil Sampling	B C D 1 2 3
	Front End Loader Operator	B C D 1 2 3
	Truck Driver	B C D 1 2 3
	________	B C D 1 2 3
	________	B C D 1 2 3
Decontamination Zone		
	________	B C D 1 2 3
	________	B C D 1 2 3

List the specific protective equipment and material (where applicable) for each of the Levels of Protection identified above.

12. Personal Protective Equipment Requirements (Cont'd)

Respiratory Protection

[X] Level D	[X] Level C	[ ] Level B
No respirator		
___ 5-minute emergency escape pack	___ Half-face air purifying respirator	___ Pressure demand air line
	X Full-face air purifying respirator	___ Pressure demand air line with escape provisions
	___ 5-minute emergency escape pack	___ Pressure demand SCBA

Where air purifying respirators are authorized, organic vapor/dust-mist are the appropriate canisters/cartridges for use with the specific substances and concentrations anticipated. Cartridges shall be replaced at the start of each work day.

Personal Protective Clothing/Equipment

[X] Level 1	[X] Level 2	[ ] Level 3
X Standard work clothes	X Standard work clothes	___ Standard work clothes
___ Hard Hat	X Hard Hat	___ Hard Hat
___ Steel toed leather boots	X Steel toed boots	___ Steel toed boots
___ Safety glasses	X Hearing protection	___ Safety glasses
___ Hearing protection	X Inner gloves	___ Hearing protection
___ Inner gloves	X Outer gloves	___ Inner gloves
___ Outer gloves	___ Boot covers (booties)	___ Outer gloves
X Cotton coveralls	X Tyvek coveralls	___ Tyvek coveralls
___ Boot covers (booties)	___ Saranex (or other) coveralls	___ Saranex (or other) coveralls
___ Other	___ Other	___ Other

Specify inner glove Soil sampler must wear NBR rubber sampling gloves.
Specific outer glove NBR
Specify boot Bata "polyblend" or equivalent.
Specify coveralls if other than Saranex ___
Specify "other" ___

Comments: Truck driver must wear hard hat and safety glasses when outside of cab.

13. Ambient Air/Site Monitoring Procedures for Chemical/Radiological Hazards

The following instruments shall be used to monitor the work environment and workers' breathing zones prior to site entry and at the specified intervals.

Instrument	Monitoring Frequency				
_X_ PID (HNU, OVM) w/_10_eV lamp	Cont.	15 min.	30 min	<u>hourly</u>	other _X_
___ OVA	Cont.	15 min.	30 min	hourly	other ___
___ Combustible Gas Indicator	Cont.	15 min.	30 min	hourly	other ___
___ H2S Detector	Cont.	15 min.	30 min	hourly	other ___
___ Colorimetric Detector Tubes	Cont.	15 min.	30 min	hourly	other ___
_X_ Other (describe below)	Cont.	15 min.	30 min	<u>hourly</u>	other _X_

Description/Other:

Monitor airborne suspended particulate concentrations in workers' breathing zones with a MiniRam once per hour or upon any indication of elevated dust concentrations (truck traffic, dry conditions, visible dust).

Monitor organic vapor concentrations in workers' breathing zones hourly or upon any indication of elevated airborne concentrations i.e. perceptible gasoline like or "solvent" odors, visible contamination.

14. Action Levels for Chemical/Radiological Hazards

Task personnel shall observe the following Action Levels:

Instrument	Action Level	Specific Action
MIE MiniRam	10 mg/M^3	Don air purifying respirator
	100 mg/M^3	Temporarily discontinue operations. Move upwind of excavation.
PID	Any continuous reading > background Any peak >10 ppm	Don air purifying respirator
	Any continuous reading >10 ppm Any peak >100 ppm	Temporarily discontinue operations. Move upwind of excavation. If levels persist or reoccur, upgrade to Level B.

15. Personal Monitoring Requirements

[ ] Passive Chemical Dosimeter [ ] Personal Air Monitoring [ ] Other

Description/Other:

None

16. External Radiation Dosimetry Requirements.

[ ] Basic TLD
[ ] Pencil
[ ] PADI
[ ] Other
[X] HMPD
[ ] Finger Ring
[ ] Time Keeping

Description/Other

17. Biological Monitoring/Medical Surveillance Surveillance/Radiological Bioassay

[ ] Yes This project requires medical surveillance or biological monitoring procedures beyond the provisions of the routine medical surveillance
[ ] No program, see description below:

Description

None.

18. Worker Zones and Site Control

The entire site is within a "controlled area." Establish an exclusion zone around excavation activities. Back hoe and front end loader operate within exclusion zone. Trucks operate up to the edge of, but should not enter the exclusion zone. Control access and egress to exclusion zone through a designated decontamination corridor. Separate "Contamination Reduction" or "Transition" zone is not necessary.

Sketch

19. Decontamination

Personnel and equipment leaving the Exclusion/Controlled Zone shall proceed through the following decontamination stations and procedures:

Personnel Decontamination

Station	Procedure
1. Boot wash	Wash boots in detergent solution
2. Boot rinse	Rinse boots in clean water
3. Doffing	Remove outer gloves Remove Tyvek Coveralls Remove inner gloves.

Equipment Decontamination

Only designated health physics personnel shall decontaminate equipment if radiological contamination is detected. Use item 12 for PPE requirements.

Station	Procedure
1. Gross decon.	Scrape/brush mud off of tires, trucks, bucket.
2. Equipment wash	Spray steps, tires, tracks with detergent solution.

The following decontamination equipment is required:

2 Galvanized steel wash tubs
1 3 gallon hand-pump sprayer
2 long handle scrub brushes
Plastic garbage bags

Emergency decontamination procedures:

The potential levels of contamination do not warrant emergency decontamination procedures. Remove gross contamination and potentially contaminated protective clothing, and initiate appropriate first-aid.

20. Sanitation Requirements

Potable water supply available on work site?	[ ] Yes [X] No
Potable water must be brought on-site.	[X] Yes [ ] No
Are permanent toilet facilities readily accessible?	[ ] Yes [X] No
Portable toilets required on work site?	[X] Yes If Yes, how many? 1 [ ] No
Temporary washing/shower facilities required at work site:	[ ] Yes If Yes, describe below. [X] No

Description:

21. Logs, Reports, and Recordkeeping

The following logs, reports, and records shall be developed, retained, and made available to the Department of Energy (DOE), regulating agencies, and to QA safety and health personnel request:

a. Log of task-specific training.

b. Daily safety inspection log.

c. Employee/visitor register.

d. Air monitoring data sheets.

e. Certification of environmental and personal decontamination.

The MSDS are kept onsite and made available to anyone requesting them.

Description/other:

22. **Emergency Procedures** This page is to be posted at prominent location at site.

Yes No

[X] [ ] On site 2-way Communications Required

Emergency Channel/Contact 1

Nearest Telephone Cellular telephone on site 373-3800

Other Required Emergency Back-Up Equipment

ABC Class Fire Extinguisher

10-person First Aid Kit

Fire and Explosion

In the event of a fire of explosion, if the situation can be readily controlled with available resources without jeopardizing the health and safety of yourself, the public, or other site personnel, take immediate action to do so, otherwise:

1. Notify emergency personnel by calling Hanford Patrol on Channel 1 of radio, or 373-3800 on cellular phone.

2. If possible, isolate the fire to prevent spreading.

3. Evacuate the area.

22. **Emergency Procedures** (Cont'd)

On Site Injury or Illness

In the event of a non-life threatning injury requiring more than minor first aid, or any employee reporting any sign or symptom of exposure to hazardous substances, immediately take the victim to Hanford Environmental Health Foundation located at 3038 George Washington Way in Richland phone 376-7411 . In the event of life-threatening or traumatic injury, implement appropriate first-aid and immediately call for emergency medical assistance at Channel 1 or 373-3800. The nearest designated trauma center is Kadlec Hospital, located at 888 Swift Blvd. in Richland. Phone 946-4611.

Emergency Response Authority

Mike Remington is the designated on-site emergency coordinator and has final authority for first response to site emergency situations.

Upon arrival of the appropriate emergency response personnel, the site emergency coordinator shall defer all authority but shall remain on the scene if necessary to provide any and all possible assistance. At the earliest opportunity after the emergency situation is stabilized, the site safety coordinator or the site emergency coordinator shall notify the individuals listed below.

FUNCTION	NAME	TELEPHONE (WORK)	TELEPHONE (HOME)
Project Manager	Randy Chong	522-6774	
Health and Safety Officer	M. B. Remington	522-6782	
Environmental Engineer	R. A. Lilas	522-6924	
Safety and Health Manager	D. W. Coonfare	522-6798	

22. Emergency Procedures (Cont'd)

Chemical Exposure

Site workers must notify the site health and safety officer immediately in the event of any injury or any of the signs or symptoms of overexposure to hazardous substances identified below:

Substances Present	Symptoms of Acute Exposure	First Aid
petroleum hydrocarbons	progression of symptoms of acute exposure similar to alcohol intoxication: Headache dizziness, nausea, confusion, disorientation unsteady gate.	Move victim to fresh air. Consultation with physician at earliest opportunity.
PCBs	itching, acute eye, skin irritation	Shower. Consultation with physician at earliest opportunity.

Item 23. **SAFETY BRIEFING CHECKLIST**

The following personnel were present at a prejob safety briefing conducted at ________ (time) on ________ (date) at ________________ (location), have read the above plan, and are familiar with its provisions:

Name	PN # or SS #	Signature
____________________	__________	______________________________
____________________	__________	______________________________
____________________	__________	______________________________
____________________	__________	______________________________
____________________	__________	______________________________

The following items will be checked and verified where applicable prior to start of work:

	Yes	N/A	Ver'd
Fully charged ABC Class fire Extinguishers (2) available onsite?	[ ]	[ ]	[ ]
Fully stocked first aid kit available onsite?	[ ]	[ ]	[ ]
All project personnel advised of location of nearest phone?	[ ]	[ ]	[ ]
Cellular phone onsite?	[ ]	[ ]	[ ]
All project personnel advised of location of designated medical facility of facilities?	[ ]	[ ]	[ ]
All PPE onsite?	[ ]	[ ]	[ ]
SSHP covered in prejob safety meeting?	[ ]	[ ]	[ ]
Warning/posting signs onsite? Rad/Chemical/Noise/No Smoking?	[ ]	[ ]	[ ]
Emergency pressurized eye/body was station onsite?	[ ]	[ ]	[ ]
All personnel advised of location of facility if it exists?	[ ]	[ ]	[ ]
MSDS's available onsite?	[ ]	[ ]	[ ]
Training records available onsite?	[ ]	[ ]	[ ]
Copy of pertinent regulations onsite, OSHA, Army, EPA, etc.?	[ ]	[ ]	[ ]

____
Printed Name of Field Team Leader or
Site Safety Officer

____
Signature Date

Item 24. FIELD PROCEDURES CHANGE AUTHORIZATION

Instruction Number to be changed:	Duration of Authorization [ ] Today Only [ ] Duration of Task	Date:

Description of Procedures Modified:

Justification:

Person Requesting Change	Verbal Authorization Received From
Name:	Name: Date:
Title:	Title:
Signature:	Signature:

(Signature of person named above to be obtained within 48 hours of verbal authorization)

ATTACHMENT B

1100 AREA RD/RA
AIR MONITORING DATA SHEET

CENPW 1100 Area RD/RA
Air Monitoring Data Sheet

Sheet ____ of ____

Task: ______________________________

Location: ______________________________

Time In: __________ Time Out: __________ Weather: __________ Temp: ________ Wind D: _____ V: _____

Instrument Type: ______________________________ Serial No.: ______________

Calibration Gas and Concentration: ______________________ Instrument Reading: ______________

Span/Gain/RF Setting (if applicable): ______________________ Field Technician's Initials: ________

Time	Station	Instrument	Reading	Monitoring Location Procedure/Observations/Comments

General Recommendations/Comments

____

____

____

____

____

______________________________ ______________________________

Printed Name Signature

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