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Proposed Remedial Action Plan for the Groundwater Operable Unit Upper Continental Recharge System Source Zones near C-720, C-747-C, and C-746-D, Paducah Gaseous Diffusion Plant, Paducah, Kentucky

August 2001

INTRODUCTION

The U.S. Department of Energy (DOE) is conducting cleanup activities at the Paducah Gaseous Diffusion Plant (PGDP), Paducah, Kentucky, under its Environmental Management Program to address contamination resulting from past waste-handling and disposal practices at the plant. As part of this cleanup effort, DOE, the U.S. Environmental Protection Agency (EPA), and the Kentucky Department for Environmental Protection (KDEP) request public review and comment on this Proposed Remedial Action Plan (PRAP) for source reduction in the Upper Continental Recharge System (UCRS) within the Groundwater Operable Unit (GWOU). This document is an outgrowth of previous work conducted by the Innovative Technology Remediation Demonstration (ITRD) project team. The team included members from the DOE and its laboratories, EPA regulators and its laboratories, the KDEP, and the Kentucky Radiation Control Branch. The ITRD evaluated potential technologies suitable for the remediation of the GWOU.

DOE has considered remedial actions for a source reduction action for volatile organic compounds (VOCs), specifically trichloroethene (TCE) and its degradation products at the C-720 Building, and the C-747-C Oil Landfarm [Solid Waste Management Unit (SWMU) 1], and technetium-99 (^{99}Tc) at the C-746-D Kellogg Building (SWMU 99). The actions considered in this PRAP include the following: (1) No Action; (2) Dual Phase Extraction (DPE), Excavation, and Land Use Controls (LUCs); and (3) Six-Phase Heating (SPH), Excavation, and LUCs. Alternative 3 is presented as the preferred alternative. Preference for this proposed action is based upon the "Feasibility Study for the Groundwater Operable Unit at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky," DOE/OR/07-1857&D2.

This plan helps to fulfill the public participation requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); the Resource Conservation and Recovery Act (RCRA); Kentucky Revised Statute 224.46-530(1); and the National Environmental Policy Act (NEPA) by summarizing the GWOU Feasibility Study (FS) and requesting public comments on the alternatives identified. This PRAP also serves as a "Statement of Basis" for the modification to the Kentucky Hazardous Waste Management Permit, KY8-890-008-982.

Since the GWOU is extensive, multiple actions are planned. At a minimum, these multiple actions will focus on remediation of (a) on-site sources [including secondary sources such as dense nonaqueous-phase liquids (DNAPL)], (b) dissolved-phase groundwater plumes, and (c) potential "fenceline" containment or treatment actions. This Plan represents the first of five PRAPs currently planned for the GWOU and focuses on TCE and ^{99}Tc source reduction within the UCRS at the C-720 Building, SWMU 1, and SWMU 99. These three areas are located onsite within the perimeter of the plant security fence. It currently is anticipated that the remaining four PRAPs will focus on source reduction at the C-400 Building, sitewide containment, remediation of the dissolved phase plumes, and institutional controls for the GWOU.

Remedial investigation (RI) activities have been conducted at the C-720 Building, SWMU 1, and SWMU 99. Results from the RI for the C-720 Building and subsurface contamination at SWMU 1 are

presented in the "Remedial Investigation Report for Waste Area Grouping 27 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky," DOE/OR/07-1777&D2. RI results for SWMU 99 are presented in the "Remedial Investigation Report for Waste Area Grouping 28 at the Paducah Gaseous Diffusion Plant, Paducah Kentucky," DOE/OR/07-1846&D2.

DOE, EPA, and KDEP encourage public review and comment on the proposal for Alternative 3, Six-Phase Heating, Excavation, and LUCs. This plan has been prepared for the public to provide information and solicit public comment on the preferred alternative, as well as on the other alternatives considered. This plan provides a summary of the information presented in the "Feasibility Study for the Groundwater Operable Unit at the Paducah Gaseous Diffusion Plant," DOE/OR/07-1857&D2, which also is available for public review. The preferred alternative represents a recommendation by DOE, subject to public comment. The final remedial action plan, selected in the Record of Decision (ROD), may be different from the preferred alternative presented in this document, depending upon review and consideration of public comments. The public comment period for this PRAP is scheduled from September 4, 2001, through November 8, 2001. The "Responsiveness Summary" section of the ROD will address significant public comments received on this PRAP. The comments received for the "Statement of Basis" will become part of the record of modification for the Kentucky Hazardous Waste Management Permit, KY8-890-008-982. Additional information regarding the public participation process can be found in the "Community Participation" section of this PRAP. The administrative record for this action is available for review at the DOE Environmental Information Center (EIC). Please see page 20 for the address and normal business hours of the center.

SITE BACKGROUND

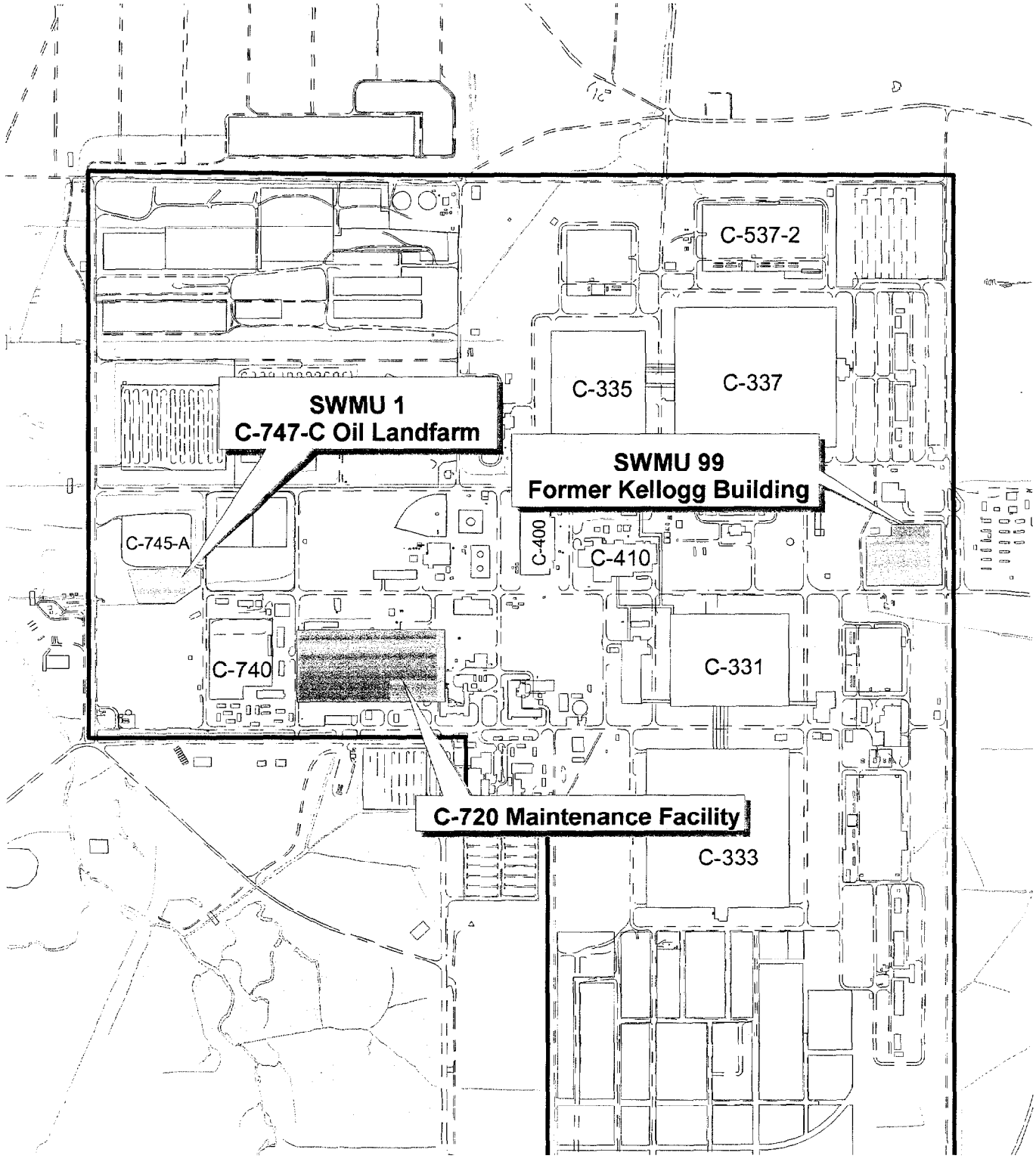
The PGDP is located in McCracken County in western Kentucky, about 6.5 kilometers (4 miles) south of the Ohio River and approximately 16 kilometers (10 miles) west of the city of Paducah.

The PGDP is an operating uranium enrichment facility owned by DOE. DOE currently leases the plant production operation facilities to the United States Enrichment Corporation. Bechtel Jacobs Company LLC is DOE's Management and Integration Contractor for DOE's environmental restoration and waste management activities at the plant.

This PRAP addresses UCRS source area VOC contamination at SWMU 1 (the C-747-C Oil Landfarm) and the C-720 Maintenance Facility, and ^{99}Tc contamination at SWMU 99 (the C-745 Kellogg Building Site). SWMU 1 and the C-720 Maintenance Facility are located in the southwest portion of the PGDP within the plant security fence. SWMU 99 is located on the eastern side of the PGDP, south of the C-360 Building. A map showing the locations of SWMU 1, the C-720 Maintenance Facility, and SWMU 99 is included as Fig. 1.

SWMU 1. The C-747-C Oil Landfarm is located in the southwest portion of the plant, south of the C-745-A Cylinder Yard (Fig. 1). It includes the area bounded by Fourth Street to the east and by perimeter ditches on the north, west, and south. The total area of the unit is approximately 8,947 m^2 (96,300 ft^2) and encompasses two 104.5 m^2 (1,125 ft^2) disposal plots located in the northern part of the unit. SWMU 1 was used for the biodegradation of contaminated waste oils from 1975 to 1979. When in use, the area was plowed to a depth of 1 to 2 ft; then waste oils, contaminated with TCE, 1,1,1-trichloroethane, uranium, and polychlorinated biphenyls (PCBs) were spread across the surface. An estimated 5,000 gal of waste oil were applied to the landfarm, with the oil being added to the plots at three-to-four-month intervals. After use of the landfarm was discontinued in 1979, the site was graded to improve surface runoff.

In 1991 and 1992, potential soil and groundwater contamination at SWMU 1 was investigated as part of the CERCLA Site Investigation (SI) (see *Results of the Public Health and Ecological Assessment, Phase II, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, KY/ER4, and *Results of the Site Investigation, Phase II, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, KY/SUB/13B-97777C P-03/1991/1). Additional sampling performed in March 1996, as part of the Waste Area Group (WAG) 23 project, resulted in the delineation of PCB and dioxin contamination in surficial soils at the unit (see *Soil Characterization Addendum to the Feasibility Study for Waste Area Group 23 and Solid Waste management Unit 1 of Waste Area Group 27 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/06-1423&D2). In January and February 1998, DOE conducted a non-time-critical removal action to excavate the PCB and dioxin



LEGEND:

Plant Fence
Road
Surface Water
Facility

500 0 500 1000 Feet

TRUE NORTH 20° PLANT NORTH

U.S. DEPARTMENT OF ENERGY
DOE OAK RIDGE OPERATIONS
PADUCAH GASEOUS DIFFUSION PLANT

BECHTEL JACOBS COMPANY LLC
MANAGED FOR THE US DEPARTMENT OF ENERGY UNDER US GOVERNMENT CONTRACT DE-AC-05-98OR22700
Oak Ridge, Tennessee • Paducah, Kentucky • Portsmouth, Ohio

Science Applications International Corporation
P.O. Box 2502
Oak Ridge, Tennessee 37831

Fig. 1. Location of Solid Waste Management Units 1 and 99 and the C-720 Maintenance Facility at the Paducah Gaseous Diffusion Plant.

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contamination found above cleanup levels in surficial soils at SWMU 1 (see *Final Remedial Action Report for Waste Area Grouping (WAG) 23 and Solid Waste Management Unit 1 of WAG 27 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/07-1737&D0). The subsurface soil and groundwater contamination found at the unit during the CERCLA SI was delineated as part of the WAG 27 RI completed in 1998. No actions have been taken to address groundwater or subsurface soils contamination at SWMU 1.

C-720 Maintenance Facility. The C-720 Maintenance Facility is located in the southwest portion of the fenced security area of the PGDP, southwest of the C-400 Building (Fig. 1). It occupies an area of 26,124 m^2 (281,200 ft^2). The facility has been used since the early 1950s for the fabricating, assembling, cleaning, and repairing of process equipment. Various shops are located within the C-720 Building, including the compressor shop, machine shop, paint shop, instrument shop, vacuum pump shop, welding shop, and valve shop. Based on practices performed in these shops, the primary contaminants associated with the C-720 Maintenance Facility include VOCs (particularly TCE and its degradation products), metals, PCBs, and radionuclides. The C-720 Maintenance Facility was included in WAG 27 because it was identified as a possible source of TCE contamination in the southwestern portion of the plant during the Phase IV Groundwater Investigation (see *Northeast Plume Preliminary Characterization Summary Report*, DOE/OR/06-1339/V2&D2).

During work plan development for the WAG 27 RI, three areas were identified that may have resulted in significant contaminant releases from the C-720 area: SWMU 209 (the Compressor Shop Pit Sump), Area of Concern (AOC) 211 (the C-720 TCE Spill Site-Northeast), and the major floor drain exit points from the C-720 Building. The Compressor Shop Pit Sump is located in the east-central part of the C-720 Maintenance Building in the northwest corner of the Compressor Shop Pit. TCE contamination associated with the C-720 Maintenance Building also has impacted a large rectangular area located northeast of the building [the C-720 TCE Spill Site-Northeast (AOC 211)]. TCE was used for various purposes in the C-720 Building.

Results of the WAG 27 RI and the 1999 Data Gaps Investigation indicate that the primary source of the groundwater contamination in the Southwest Plume is SWMU 4 (the C-747-B Burial Yard), but SWMU 1 and the C-720 Maintenance Building also are believed to be contributing sources. No actions have been taken to address soil and groundwater contamination at the C-720 Maintenance Building.

SWMU 99. SWMU 99 is located near the eastern edge of the plant immediately north of Tennessee Avenue and west of Patrol Road 3. The Kellogg Building Site originally consisted of two steel and sheet metal buildings, built in 1951 as temporary support facilities during the construction of the Cascade facilities. The buildings were erected on concrete slabs with a gravel access road between the buildings. It is believed that TCE was used for various purposes in these buildings. A septic tank and a leach field that received sanitary waste from the Kellogg Buildings were located approximately 350 to 400 ft southeast of the building. The Kellogg Buildings were taken out of service and demolished in 1955, leaving only the concrete pads. The building pads now are occupied by the C-746-D Classified Scrap Yard and the C-745-E Uranium Hexafluoride (UF_6) Cylinder Storage Yard.

Soil and groundwater sampling was conducted in the vicinity of SWMU 99 for the 1991–1992 SI and the 1995 Phase IV Groundwater Investigation. In 1999, SWMU 99 was investigated as part of the WAG 28 RI to determine if the unit is a source of groundwater contamination in the Northeast Plume. As a result of the investigation, it was concluded that SWMU 99 is not a significant contributor of TCE contamination to the Northeast Plume. However, elevated ^{99}Tc concentrations in the shallow soils at SWMU 99, specifically C-746-D, may be contributing to groundwater contamination in the area. No previous remedial actions have been taken at SWMU 99. Removal of the scrap located on the Kellogg Building Pad in the C-746-D Classified Scrap Yard (SWMU 16) is part of a scrap metal removal action. Under that action, the scrap will be removed from the pad (please see *Engineering Evaluation/Cost Analysis for Scrap Metal Disposition at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/07-1880&D2, for the scrap metal removal action).

SITE CHARACTERISTICS

The topography is relatively flat at these sites, with elevations ranging from approximately 370 to 376 ft above mean sea level (amsl) at SWMU 1 and the C-720 Maintenance Facility and from 380 to 384 ft amsl at SWMU 99. SWMU 1 is grass-covered and is

bordered by drainage ditches on the north, south, and west sides. Stormwater runoff from SWMU 1 flows to one of these perimeter ditches and discharges via the Outfall 008 Effluent Ditch to Bayou Creek. Most of the ground surface surrounding the C-720 Maintenance Facility and at SWMU 99 is covered by concrete, asphalt, or gravel. Drainage from the C-720 Facility is via the plant storm drain system that eventually discharges through Outfalls 008 and 009 to Bayou Creek. Surface drainage from SWMU 99 flows to storm sewers that discharge to the Outfall 010 Effluent Ditch and into Little Bayou Creek on the east side of the plant.

The subsurface geology and hydrogeology of the three areas are similar. SWMU 1, the C-720 Maintenance Facility, and SWMU 99 are underlain by a sequence of loess, clay, silt, sand, and gravel layers deposited on limestone bedrock (see Fig. 2). In general, fill and a layer of silty clay (loess) extend from the surface to a depth of approximately 20 ft. Beneath the loess, the Upper Continental Deposits, consisting of discontinuous sand and gravel layers interbedded with silt and clay, extend to an average depth of 40 ft below ground surface (bgs). The shallow groundwater system at the site, the UCRS, consists of these Upper Continental Deposits and the overlying loess. The sand and gravel lenses of the UCRS are separated from the underlying Regional Gravel Aquifer (RGA) by a 12- to 18-ft-thick silty or sandy clay interval, designated the HU3 aquitard (Fig. 2). The RGA, a highly permeable layer of gravelly sand or chert gravel, typically extends from approximately 55 to 105 ft bgs. Three separate contaminant plumes have been identified in the RGA. The Northeast and Northwest Plumes each extend more than two miles offsite in the direction of the Ohio River. The Southwest Plume has not moved beyond the DOE property line.

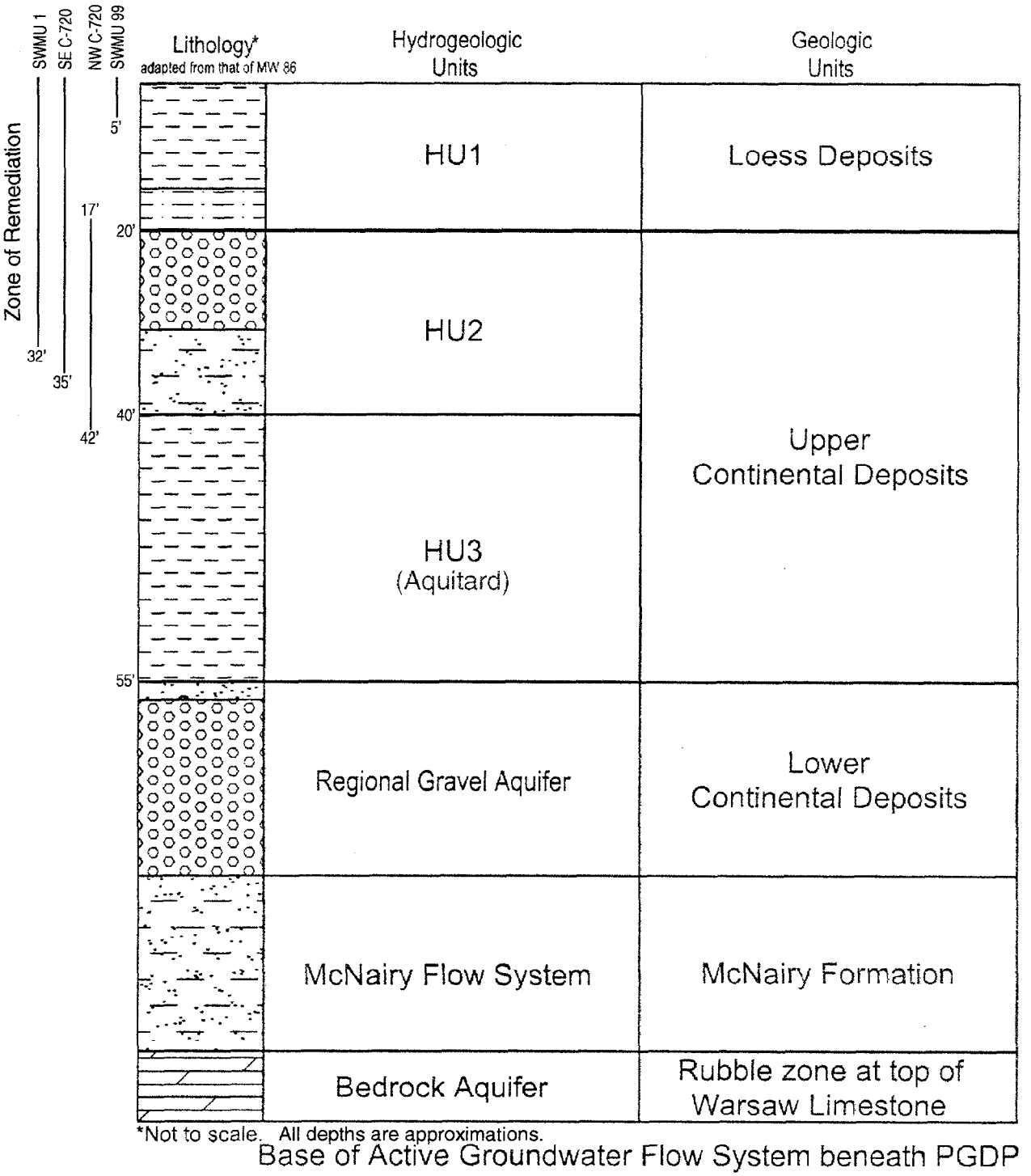
The depth of the shallow water table within the UCRS varies considerably across the PGDP. The shallow water table generally is encountered at depths between 10 to 15 ft bgs at SWMU 1 and at depths ranging from 15 to 25 ft bgs at the C-720 Maintenance Facility. At SWMU 99, the water table generally is deeper (approximately 40 to 50 ft bgs). Water within the UCRS tends to flow downward to the RGA. Groundwater flow in the RGA generally is to the north, eventually discharging into the Ohio River.

Nature and Extent of Contamination

The following section provides a brief summary of the nature and extent of the contamination at SWMU 1, the C-720 Maintenance Facility, and SWMU 99 that is being addressed by this action. More detailed information is in the *Remedial Investigation Report for Waste Area Grouping 27 at the Paducah Gaseous Diffusion Plant Paducah, Kentucky* and in the *Remedial Investigation Report for Waste Area Grouping 28 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*. These documents (which are a part of the administrative record for this PRAP) can be examined at the DOE EIC.

SWMU 1. Sampling conducted at SWMU 1 indicates that the primary site-related contaminants in subsurface soil and groundwater at the unit are TCE and its breakdown products [*cis*-1, 2-dichloroethene (*cis*-1, 2-DCE) and vinyl chloride]. The highest concentrations of TCE (439 ppm at 15 ft bgs) and vinyl chloride [4.8 parts per million (ppm) at 7 to 10 ft bgs] were found in shallow soils in the north-central portion of the unit. The TCE breakdown product, *cis*-1, 2-DCE, was detected at a maximum concentration of 2,400 ppm during soil sampling conducted in February 1996. The WAG 27 RI concluded that the former landfarm might be a small contributing source of TCE contamination to the Southwest Plume. The elevated concentrations of TCE and its breakdown products in subsurface soils suggest a small DNAPL source area may exist within shallow (<32 ft bgs) UCRS soils. DNAPLs are liquid chemicals that do not readily dissolve in water and are denser than water. Once in the ground, DNAPLs can migrate downward through the subsurface, with a portion being trapped in the pore spaces in the soil and the remaining portion continuing to migrate downward. The TCE concentrations detected in the upper RGA immediately downgradient of the former Oil Landfarm suggest that the source is located in the north-central portion of SWMU 1 and does not extend below a depth of 32 ft.

C-720 Maintenance Facility. The most significant subsurface source areas defined in the C-720 Area are associated with elevated concentrations of organic compounds, in particular TCE, *trans*-1,2-dichloroethene (*trans*-1,2-DCE), 1,1-DCE, and vinyl chloride. The highest concentrations were found in shallow (<35 ft bgs) subsurface soil samples collected from a silty, sandy, gravel layer within the UCRS. TCE and its breakdown products *trans*-1,2-DCE and



U. S. DEPARTMENT OF ENERGY
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PADUCAH GASEOUS DIFFUSION PLANT

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Fig. 2. Hydrogeologic Units.

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vinyl chloride were detected in shallow soils at concentrations as high as 68 ppm, 450 ppm, and 0.4 ppm, respectively. The organic compound 1,1-DCE was detected in a shallow soil sample at a concentration of 0.2 ppm. The concentrations and distribution of these contaminants suggest the presence of DNAPLs near the southeast corner of the building. This source area appears to be the primary source zone for a TCE plume in the RGA that emanates from the east side of the C-720 Building. This source may have originated from a leak in the storm sewer draining the C-720 Compressor Shop Pit area and is believed to extend from beneath the storm sewer to the top of the HU3 clay aquitard. Another shallow DNAPL source may exist northeast of the C-720 Building. TCE-contaminated soil located from 17 to 42 ft bgs (approximately 14 ppm) suggests the presence of a small DNAPL source located above the HU3 clay, in the area designated as the C-720 TCE Spill Site-Northeast (AOC 211). This source may have originated from operations conducted at the C-720 Concrete Pad. Elevated TCE levels in other areas around the C-720 Building suggest additional small DNAPL source zones may occur within the UCRS associated with the storm sewer system at the C-720 Maintenance Facility. Low activity concentrations of the radionuclide ^{99}Tc were detected in UCRS soil samples, but ^{99}Tc was not found above the regulatory limit (900 pCi/L) in UCRS or RGA groundwater beneath the C-720 Maintenance Facility during the WAG 27 RI. Fig. 3 depicts areas of the C-720 facility that are pertinent to this section.

SWMU 99. The primary site-related contaminants at SWMU 99 include VOCs, radionuclides, and metals. The distribution and concentrations of TCE and ^{99}Tc suggest that the primary source of these contaminants in the RGA beneath SWMU 99 is upgradient of the unit, as presented in the *Remedial Investigation Report for Waste Area Grouping 28 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*. However, results of shallow subsurface soil sampling conducted adjacent to a buried storm drain located outside of SWMU 99 during the WAG 27 RI suggest that materials stored in the C-746-D Classified Scrap Yard may act as a contributing source of ^{99}Tc to the underlying groundwater. The shallow soils contained elevated concentrations of PCBs, ^{99}Tc (maximum activity concentration 2,650 pCi/g), and other radionuclides (uranium and thorium-234). The drain pipe currently is sealed off, but it is believed to have collected runoff from the C-746-D Classified Scrap Yard, which is located on the approximately 80 ft × 330 ft Kellogg Building Pad. The contaminated soils surrounding the Kellogg Building Pad may be a contributing source to contamination observed in the Northeast Plume in the underlying RGA, as indicated by the increasing ^{99}Tc activities in MW256 (maximum 137 pCi/L) located adjacent to the Kellogg Building Pad.

SCOPE AND ROLE OF THE RESPONSE ACTION

The GWOU is one of four operable units at the PGDP being used to evaluate and implement remedial actions. The scope of this response action encompasses three areas containing surface and subsurface sources contributing to contamination of the GWOU. Its role is to achieve final remediation of the three source areas and, by so doing, to take an interim step toward the goal of eventual groundwater remediation.

As part of the GWOU evaluations, the DOE, EPA, and KDEP have agreed that multiple actions will be required to address contamination associated with the GWOU. The DOE, EPA, and KDEP, determined that, at a minimum, the actions should focus on remediation of (a) on-site sources (including secondary sources such as DNAPLs), (b) dissolved-phase groundwater plumes, and (c) potential "fenceline" containment or treatment actions. Consistent with this decision, DOE proposes treatment of the on-site VOC source areas at SWMU 1 and the C-720 Building and excavation of unacceptably contaminated material at SWMU 99 as one of the actions required for the GWOU.

Past actions to address groundwater contamination from the plant include an interim Water Policy action that provides municipal water service to affected residences. In addition, DOE has undertaken interim actions involving hydraulic containment of the high concentration cores of the Northeast and Northwest Plumes to limit further spreading of the contamination. The current proposed action would result in a final action consisting of treatment of source area contamination at SWMU 1 and the C-720 Maintenance Facility and excavation of contaminated UCRS soils at SWMU 99. The levels of TCE contamination at the C-720 Building and SWMU 1 suggest that TCE exists as free product in the UCRS at these locations. To protect human health, the mass of TCE in soil at SWMU 1 and the C-720 Building and the mass of ^{99}Tc at SWMU 99 must be reduced, removed, or contained. Through the use of treatment technologies, this proposed final action will permanently reduce

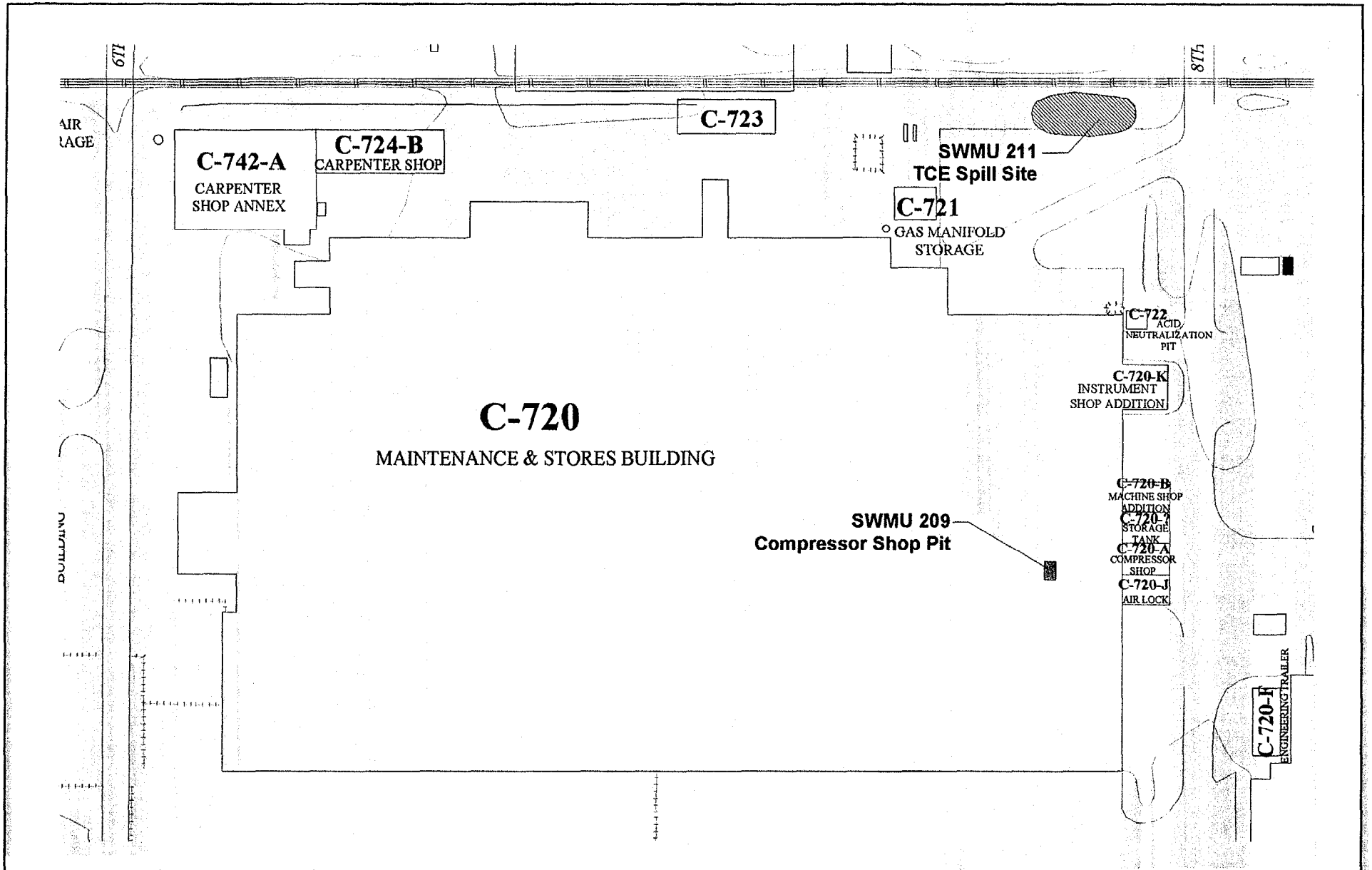

Fig. 3. Location and physical features of C-720.

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the toxicity, mobility, and volume of the VOC contamination at SWMU 1 and the C-720 Building that constitutes principal threat source materials (PTSM). (PTSM is a term used for contamination that is an obvious threat to human health and the environment, either due to the nature and concentration of contamination or due to a large mass of leachable material in the ground. At SWMU 1 and the C-720 Building, the VOC contamination is a PTSM because of toxicity, concentration, and ability to migrate to groundwater.) This action is one of several actions that will be conducted for the GWOU, and it will be a step toward the ultimate objective of fully addressing contamination in the GWOU.

SUMMARY OF SITE RISKS

The human health and ecological risks posed by contamination found at or migrating from a site determine whether a remedial action is warranted. This section of the PRAP presents a summary of the information found in the baseline risk assessment to describe the nature and extent of the risks posed to human health and the environment by the contamination in the subsurface at SWMU 1, the C-720 Area, and SWMU 99. This discussion is presented in two subsections: human health risks and ecological risks.

It is DOE's current judgement, as the lead agency, that active measures are necessary to protect human health or welfare or the environment from actual or threatened releases of pollutants, contaminants, or hazardous substances. These actual or threatened releases may present imminent and substantial danger to public health or welfare.

Human Health Risks

The human health risk assessment considered both the current and potential future uses of each of the three sites and of areas to which contaminants from the sites may migrate. Currently, each of the three sites lies within the industrialized areas of the PGDP; therefore, exposure to groundwater or uncontrolled exposure to subsurface soil is unlikely because groundwater is not used as a drinking water source, and because excavation activities occur under specific health and safety plans. Under current land use plans, each of the three sites is expected to remain industrial in the future. Of greater importance to this PRAP is the potential for contaminants in soil, especially VOCs, to migrate from subsurface soil to groundwater and for this contaminated groundwater to migrate from the site.

The highly unlikely potential future use of groundwater as a drinking water source by industrial workers was determined to present unacceptable cancer and noncancer risks at each of the three sites. At the C-747-C Oil Land Farm, the excess cancer risk was about 2 in 1,000, and the hazard index (HI) was 14. At the C-720 Area, the excess cancer risk was about 6 in 10,000, and the HI was 3. At the former C-746-D Kellogg Buildings, the excess cancer risk was about 5 in 10,000, and the HI was 7. The primary VOCs in groundwater leading to unacceptable cancer risk at all three sites were TCE and 1,1-DCE. These contaminants were found at probable exposure concentrations of 0.049 and 0.006 ppm, respectively, at the C-747-C Oil Land Farm; of 0.159 and 0.005 ppm, respectively, at the C-720 Area; and of 0.676 and 0.018 ppm, respectively, at the former C-746-D Kellogg Buildings.

Of greater importance are the VOCs believed to be migrating from subsurface soils to groundwater at the C-747-C Oil Land Farm and the C-720 Area, subsequently being transported by groundwater to a downgradient location. The human health risk assessment determined that household use of groundwater by a hypothetical resident with a well located at the PGDP security fence, the downgradient location assessed, may result in cancer risks that exceed the upper end of EPA's acceptable risk range for site related exposure (i.e., cancer risk estimates exceed 1 in 10,000). These contaminants and their maximum detected concentrations in source zone soil are TCE (439 ppm) and vinyl chloride (4.8 ppm) at the C-747-C Oil Land Farm; and TCE (68 ppm), *trans*-1,2-DCE (450 ppm), vinyl chloride (0.4 ppm), and 1,1-DCE (0.200 ppm) at the C-720 Area. Additionally, the ^{99}Tc present in soil at the former C-746-D Kellogg Building is of concern. This radionuclide's maximum detected concentration in source zone soil is 2,650 pCi/g.

These risks and hazard levels indicate that there would be a significant potential risk to children and adults from exposure to contaminated groundwater, offsite or onsite. These risk estimates are based upon current reasonable maximum exposure scenarios and were developed by using assumptions that were unlikely to underestimate an individual's rate of exposure or underestimate the toxicity of the primary contaminants. (That is, the assumptions used were "conservative.")

WHAT IS RISK AND HOW IS IT CALCULATED?

A Superfund human health risk assessment estimates the "baseline risk." This is an estimate of the likelihood of health problems occurring if no cleanup action is taken at a site. To estimate the baseline risk at a Superfund site, a four-step process is followed:

Step 1: Analyze Contamination
Step 2: Estimate Exposure
Step 3: Assess Potential Health Dangers
Step 4: Characterize Site Risk

In Step 1, the risk assessor looks at the concentrations of contaminants found at a site, as well as at past scientific studies on the effects these contaminants have had on people (or animals, when human health studies are unavailable). Comparisons between site-specific concentrations and concentrations reported in past studies enable the risk assessor to determine which contaminants are most likely to pose the greatest threat to human health.

In Step 2, the risk assessor considers the different ways that people might be exposed to the contaminants identified in Step 1, the concentrations that people might be exposed to, and the potential frequency and duration of exposure. Using this information, the risk assessor calculates dose from a "reasonable maximum exposure" (RME) scenario, which represents an estimate of the highest level of human exposure that reasonably could be expected to occur within a given time period.

In Step 3, the risk assessor uses the information from Step 2, combined with the information of the toxicity of each chemical, to assess potential health risks. Two types of risk are considered: cancer risk and noncancer risk. The likelihood of any kind of cancer resulting from a Superfund site generally is expressed as an upper bound probability: for example, a "1 in 10,000 chance." In other words, for every 10,000 people exposed under the RME scenario, one extra cancer *may* occur as a result of exposure to site contaminants. An extra cancer case means that one more person could get cancer than normally would be expected from all other causes. For noncancer health effects, the risk assessor calculates a "hazard index." The key concept for noncancer health effects is that a "threshold level" (measured as a hazard index of 1) exists; below this level, noncancer health effects are not expected.

In Step 4, the risk assessor determines whether the site risks are great enough to cause unacceptable health problems for people exposed at or near a site. To do this, the risk assessor combines and summarizes the risk results for the individual chemicals and routes of exposure within the RME scenario and compares the resulting scenario risk estimates to the generally acceptable risk range for site-related exposures. If cancer risks exceed this risk range (i.e., exceeds a chance of 1 in 10,000), then remedial measures for a site must be considered and implemented. If the cancer risks fall within the risk range (i.e., chance falls between 1 in 10,000 and 1 in 1,000,000), then remedial measures must be considered and may be implemented. If cancer risks are less than the risk range (i.e., chance is less than 1 in 1,000,000), then remedial measures are not normally called for at a site. The process for examining noncancer health effects is similar.

WHAT ARE THE "CONTAMINANTS OF CONCERN"?

DOE has identified the following five chemicals as posing the greatest potential risk to human health at the three sites. These chemicals are the primary COCs for this PRAP. Discussions of other COCs are in the RI reports for WAGs 27 and 28.

TCE: TCE was detected in both subsurface soils and groundwater at the sites. This contaminant is a halogenated organic compound used in the past for a variety of purposes at the PGDP. Exposure to this compound has been associated with deleterious health effects in humans, including anemia, skin rashes, liver conditions, and urinary tract disorders. Based on laboratory studies, TCE is considered a probable human carcinogen. Over time, TCE naturally degrades to other organic compounds. TCE currently is not used at the PGDP.

***trans*-1,2-Dichloroethene (*trans*-1,2-DCE):** *Trans*-1,2-DCE and its isomer, *cis*-1,2-DCE, are degradation products of TCE. These contaminants also are halogenated organic compounds, but they are not used extensively in industry and have not been used at the PGDP. Exposure to *trans*-1,2-DCE and *cis*-1,2-DCE has been associated with liver disorders, blood disorders, and lung and eye irritation. Neither chemical has been classified by EPA as to human carcinogenicity due to the lack of adequate studies.

Vinyl Chloride: Vinyl chloride is a degradation product of TCE. It is also a halogenated organic compound and is used in industry as an intermediary of polyvinyl chloride (PVC) and other chlorinated compounds. Vinyl chloride has not been used in the PGDP manufacturing processes. Exposure to vinyl chloride has been associated with narcosis and anesthesia (at very high concentrations), liver damage, skin disorders, vascular and blood disorders, and abnormalities in central nervous system and lung function. Liver cancer is the most common type of cancer linked with vinyl chloride, a known human carcinogen. Other cancers related to exposure include that of the lung, brain, blood, and digestive tract.

1,1-Dichloroethene (1,1-DCE): Unlike 1,2-DCE and vinyl chloride, 1,1-DCE is not a breakdown product of TCE. 1,1-DCE has not been used in the PGDP manufacturing processes and its source at the PGDP is uncertain. The most likely source is believed to be as a contaminant contained in other liquid organic compounds (e.g., TCE) used in manufacturing at the PGDP. 1,1-DCE is a halogenated organic compound that is used in the production of polyvinylidine chloride copolymers and as an intermediary for synthesis of other chlorinated compounds. Exposure to 1,1-DCE has been associated with narcosis and anesthesia (at high concentrations), liver and kidney damage, eye irritation, and lung disorders. Based on laboratory studies, 1,1-DCE is a probable human carcinogen.

^{99}Tc: ^{99}Tc is one of several isotopic forms of the element technetium. Because the half-life of ^{99}Tc is too short for it to occur naturally (i.e., 211,100 years versus several billion for the age of the universe), all ^{99}Tc found in the environment is assumed to be from human activities. ^{99}Tc arises from the spontaneous fission of uranium and other fissionable material or via the irradiation of molybdenum. At the PGDP, ^{99}Tc is assumed to be present as a by-product of previous manufacturing processes. Technetium emits beta particles of low specific activity as it decays. Exposure to ^{99}Tc, like all radionuclides, is associated with the development of cancer.

Ecological Risks

A screening ecological risk assessment indicated that the potential was small for significant ecological impacts to occur from exposure to the contamination considered in the PRAP. This was based upon the location of the contamination being addressed (i.e., in the subsurface or below significant cover such as a cement pad), the relatively small size of the contaminant source areas, and the industrial nature of the units. Generally, the assessment concluded that there was little potential for significant exposure of wildlife at the three units, under current conditions.

REMEDIAL ACTION OBJECTIVES

The remedial action objectives (RAOs) describe what the proposed site cleanup is expected to accomplish. The RAOs for the three sites are to do the following:

- Reduce VOC contamination in UCRS soil to levels that no longer would result in unacceptable contaminant levels at point of exposure; and
- Reduce or eliminate migration of contaminants to groundwater to speed the return of groundwater resources to beneficial use.

This proposed action will achieve these RAOs by reducing contaminant concentrations in soil to target cleanup levels such that risks from migrating contaminants, at points of exposure, are at acceptable levels. Consistent with CERCLA and the National Contingency Plan (NCP), at points of exposure involving groundwater use, these levels will be the chemical-specific regulatory values established by the Safe Drinking Water Act [i.e., maximum contaminant levels (MCLs)] for those contaminants with MCLs and risk-based concentrations for those contaminants without MCLs. Also consistent with CERCLA and the NCP, at points of exposure involving contact with surface water, these levels will be the chemical-specific regulatory values for use of surface water [e.g., ambient water quality criteria (AWQC)] by humans or ecological receptors for those contaminants with regulatory values and risk-based concentrations for those contaminants without regulatory values. Target cleanup levels for contaminants in soil within the source areas and their basis of selection will be presented in the ROD. Because the MCLs for COCs are expected to be the limiting levels, the MCLs for the contaminants of concern (COCs) being addressed by this action are presented in Table 1. The risk levels to be used for contaminants without MCLs or regulatory values for surface water will fall within EPA's Target Risk Range for site-related exposure (i.e., a cancer risk level between 1 in 10,000 and 1 in 1,000,000 and an HI of 1).

Table 1. MCLs for the primary COCs in groundwater

COCs	MCL
TCE	0.005 ppm
cis-1,2-dichloroethene	0.07 ppm
trans-1,2-dichloroethene	0.100 ppm
vinyl chloride	0.002 ppm
1,1-dichloroethene	0.007 ppm
^{99}Tc	900 pCi/L

Notes:
ppm – parts per million or mg/L in water
pCi/L – picocuries per liter

SUMMARY OF ALTERNATIVES

Three alternatives, which are subsets of the alternatives developed and evaluated in the GWOU FS, were evaluated for the three sites covered by this PRAP. The three alternatives consist of the following:

- No Action at any of the three sites;
- DPE at the C-720 and SWMU-1 (oil landfarm) sites, along with contaminated concrete removal and soil excavation at SWMU-99 (Kellogg Pad), and LUCs; and
- SPH at the C-720 and SWMU-1 (oil landfarm) sites, along with soil excavation at SWMU-99 (Kellogg Pad), and LUCs.

The preferred alternative is SPH at the C-720 and SWMU 1 sites, soil excavation at SWMU 99, and LUCs.

A description of each alternative is included below.

Alternative 1: No Action

Under the No Action Alternative, active mass removal, treatment, or containment would not be performed. This remedial alternative provides a basis for assessing the effects of taking no action and provides a baseline against which the other alternatives are compared. No additional monitoring or site restrictions are included as part of this alternative. The five-year reviews mandated by CERCLA would be required, since untreated wastes would remain onsite. Because no action would be taken at these three areas, they

would remain in their present condition and there would be no reduction in risk.

Alternative 2: DPE, Excavation, and LUCs

Alternative 2 consists of the removal and treatment of contaminated groundwater and unsaturated zone VOCs from the UCRS at sites C-720 and SWMU 1 (oil landfarm) and the excavation of unacceptably contaminated soil from the SWMU 99 Kellogg Pad. A DPE system would be used to remove the contaminated groundwater and soil vapor. DPE, also known as multi-phase extraction or vacuum-enhanced extraction, is a technology that uses a high vacuum system to remove various combinations of contaminated groundwater, separate-phase petroleum product, and VOCs from the subsurface. In DPE systems for liquid/vapor treatment, a high vacuum system is utilized to remove liquid and gas from low permeability or heterogeneous formations. The vacuum extraction well includes a screened section in the zone of contaminated soils and groundwater. It removes contaminants from above and below the water table. The system lowers the water table around the well, dewatering the formation. Contaminants in the vadose zone then are accessible to vapor extraction. Once above ground, the extracted vapors or liquid-phase organics and groundwater are separated and treated. The DPE portion of Alternative 2 includes the following components: (1) installation of recovery wells at each of the two sites (C-720 and SWMU 1), (2) withdrawal of UCRS groundwater by pumping, (3) withdrawal of VOCs from the vadose zone by high vacuum (approximately 20-25 inches of mercury) extraction, (4) treatment of groundwater and soil vapor, and (5) discharge of treated groundwater through a National Pollutant Discharge Elimination System (NPDES) permitted outfall.

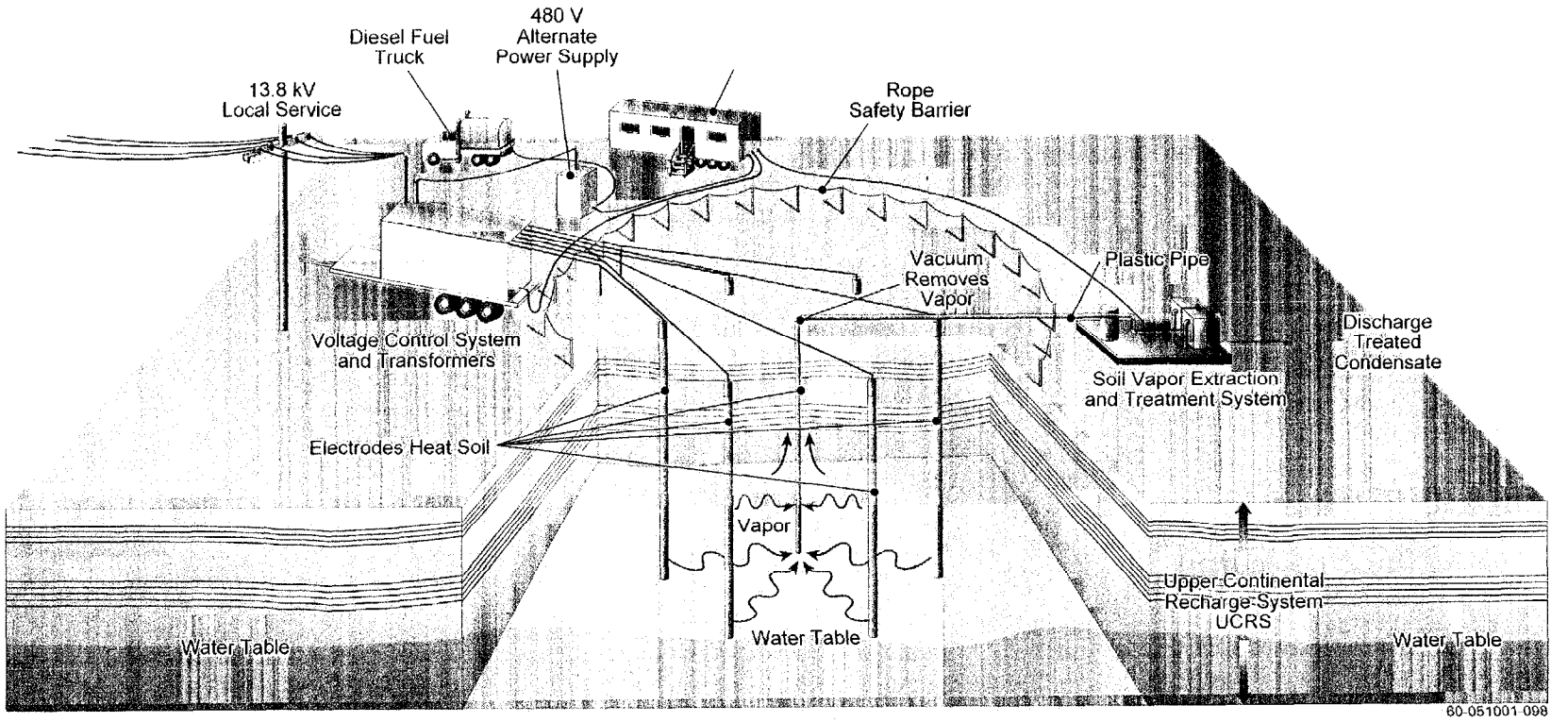
Additional remedial action would include the breakup and removal of the western pad of SWMU 99. If the concrete pad and its associated piping are removed, unacceptably contaminated soil under and around the pad area would be excavated since the contaminated soils are at shallow depths and are easily accessible. The pad covers an area approximately 180 × 330 ft. The average depth of contaminated soil requiring excavation is estimated to be 3 ft. In addition, a 10 ft band of soil around the pad's perimeter would be removed to an average depth of 3 ft. Removal of the western Kellogg Pad would generate approximately 2,200 yd^3 of concrete and 5,578, yd^3 of contaminated soil (Note: volumes are *in situ*, undisturbed volumes) that would require disposal. Removal and disposal of scrap metal currently stored on the pad are being completed under another CERCLA action (Scrap Metal EE/CA).

Contaminated soil and concrete excavated from SWMU 99 Kellogg Pad would be disposed of at an appropriate disposal facility. The excavated area would be backfilled with clean soil, graded to drain, seeded, and mulched.

Five-year reviews mandated by CERCLA would be required for this alternative, since untreated wastes would remain onsite. In addition, LUCs would be implemented. These include property record notices, administrative controls, and access controls. Property record notices would alert anyone searching property records to important information about contamination and response actions on the property. Administrative controls would include measures such as the current "excavation/penetration permit program," which requires workers to obtain formal authorization (i.e., internal permits/ approvals) before beginning any intrusive activities. Access controls could include measures such as fences, gates, and security activities determined to be necessary to ensure protectiveness after performance of response actions.

Alternative 3: SPH, Excavation, and LUCs

Alternative 3 consists of volatilization and removal of contaminated groundwater and vadose zone organic chemicals at sites C-720 and SWMU 1 (oil landfarm) by application of SPH in the UCRS and the excavation of unacceptably contaminated soil from the SWMU 99 Kellogg Pad. SPH typically uses six electrodes located in a hexagonal shape with a neutral electrode located in the center of the hexagon serving as a vapor extraction well. A typical array diameter is 25–35 ft, with the heated zone being approximately 40% larger than the array diameter (i.e., approximate volume of 2,325 yd^3, assuming 50 ft depth). The technology uses *in situ* heating to raise the temperature of the soil to a level where the target contaminant(s) is/are volatilized. The technology can be deployed in the vadose and saturated zones, and may be used in low-permeability or highly heterogeneous soils. Common power sources (60Hz) may be used to heat the ground (typical subsurface applied voltages range from 150–600 V), producing *in situ* steam to liberate the contaminants, which are removed by way of a vapor recovery system. A schematic of a typical SPH System is shown in Fig. 4. Alternative 3 also would



U.S. DEPARTMENT OF ENERGY
DOE OAK RIDGE OPERATIONS
PADUCAH GASEOUS DIFFUSION PLANT

BECHTEL JACOBS
BECHTEL JACOBS COMPANY, LLC
MANAGED FOR THE US DEPARTMENT OF ENERGY UNDER
US GOVERNMENT CONTRACT DE-AC-05-98OR22700
Oak Ridge, Tennessee • Paducah, Kentucky • Portsmouth, Ohio

SAIC
Science Applications International Corporation
P.O. Box 2502
Oak Ridge, Tennessee 37831

Fig. 4. Schematic of a Six-Phase Soil Heating System.

DOCUMENT No. DOE/OR/07-1910&D1

Figure No. 4

DATE 05/10/01

include excavation and removal of the SWMU 99 Kellogg Pad, as discussed under Alternative 2.

Alternative 3 includes the following components: (1) installation of multiple SPH arrays at each of the two sites (C-720 and SWMU 1), (2) withdrawal of volatile organics and steam from the vadose zone by high vacuum (approximately 20–25 inches of mercury) extraction, (3) treatment of soil vapor and steam condensate, (4) discharge of treated groundwater through an NPDES permitted outfall, and (5) excavation and disposal of unacceptably contaminated soil (5,578 yd^3) and concrete (2,200 yd^3). Excavation would be used at SWMU 99, since it contains shallow contamination that is easily accessible.

Five-year reviews mandated by CERCLA would be required for this alternative, since untreated wastes would remain onsite. In addition, LUCs would be implemented. These include property record notices, administrative controls, and access controls. Property record notices would alert anyone searching property records to important information about contamination and response actions on the property. Administrative controls would include measures such as the current "excavation/penetration permit program," which requires workers to obtain formal authorization (i.e., internal permits/ approvals) before beginning any intrusive activities. Access controls could include measures such as fences, gates, and security activities determined to be necessary to ensure protectiveness after performance of response actions.

EVALUATION OF ALTERNATIVES

Each of the remedial alternatives was evaluated using nine criteria established by the National Oil and Hazardous Substances Contingency Plan. The criteria were derived from the statutory requirements of CERCLA Section 121. This PRAP addresses the first seven criteria; the final two criteria (i.e., state and community acceptance) will be addressed after public comment. Brief descriptions of all nine criteria are included as follows.

Threshold Criteria:

1) **Overall protection of human health and the environment**. This criterion requires that the remedial option adequately protect human health and the environment, in both the short-term and long-term. The elimination, reduction, or control of unacceptable risks must be demonstrated.

2) **Compliance with applicable or relevant and appropriate requirements (ARARs).** This criterion requires that the options be assessed to determine if they will comply with ARARs of both state and federal law or provide grounds for invoking a waiver.

Balancing Criteria:

3) **Long-term effectiveness and permanence.** This criterion focuses on the level or risk remaining after implementing the proposed action and the adequacy and reliability of controls used to manage remaining waste (untreated waste and treatment residuals) over the long-term (i.e., after remedial objectives are met). Remedial actions that produce the highest degree of long-term effectiveness and permanence are those that leave little or no waste at the site, make long-term maintenance and monitoring unnecessary, and minimize the need for institutional controls.

4) **Reduction of contaminant toxicity, mobility, or volume through treatment.** This criterion is used to evaluate the degree to which the option makes use of recycling or treatment to reduce the toxicity, mobility, or volume of the contamination.

5) **Short-term effectiveness.** This criterion is used to evaluate the effect of implementing the option relative to the potential risks to the general public, potential threat to workers, potential environmental impacts, and the time required until protection is achieved.

6) **Implementability.** This criterion is used to evaluate potential difficulties associated with implementing the option. This may include technical feasibility, administrative feasibility, and the availability of services and materials.

7) **Cost.** This criterion is used to evaluate the estimated costs of the option. Expenditures include the capital cost, annual operation and maintenance (O&M) costs, and the combined net present value of capital and O&M costs.

Modifying Criteria:

8) **State Acceptance.** This criterion provides for consideration of any formal comments on this PRAP by the Commonwealth of Kentucky.

9) **Community Acceptance.** This criterion provides for consideration of any formal comments from the community on this PRAP.

A comparison of the options for the first seven criteria is presented in Table 2. Criteria 8 and 9 will be evaluated after the public comment period and presented in the "Responsiveness Summary" section of the ROD.

Based on the result of the detailed analysis, all of the alternatives, except the No Action Alternative, meet the minimum requirements of overall protection of human health and the environment when combined with restrictions of groundwater use. DOE will address the selection of institutional controls necessary to effect such restrictions under a separate CERCLA action. That action will consider a range of alternative actions to achieve the goals of protecting human health and the environment.

Alternative 1 is not compliant with ARARs. Alternatives 2 and 3 are compliant with ARARs, and the remedial actions could be implemented in compliance with ARARs.

Alternative 1 does not meet the balancing criterion for long-term effectiveness and permanence, since residual risks would exist, and contaminants that might migrate into the environment would remain in place. Alternatives 2 and 3 meet the criterion for long-term effectiveness and permanence, since both alternatives reduce the magnitude of residual risk by treatment of VOC contamination at the C-720 and SWMU 1 sites and by excavation at SWMU 99. Five-year reviews will be required for Alternatives 2 and 3.

Alternative 1 does not include any treatment; therefore, it does not satisfy the statutory preference for treatment. Alternatives 2 and 3 will provide treatment after the VOCs are extracted at the C-720 and SWMU 1 sites. Excavation of unacceptably contaminated concrete and soil at SWMU 99 (Alternatives 2 and 3) would not satisfy the statutory preference for treatment, but would result in the removal of unacceptable contamination.

For the short-term effectiveness criterion, Alternative 1 would not pose any additional risks to workers or the community. Alternatives 2 and 3 would pose minimal impacts in terms of risks to the community. Since these alternatives include on-site treatment and excavation of soils, there may be slight increases in risk exposure to on-site workers; however, these risks are manageable by adherence to health and safety requirements and PGDP procedures.

Alternatives 1, 2, and 3 are technically and administratively feasible to implement. Alternatives 2 and 3 assume that on-site and off-site disposal capacity is readily available for the excavated soils.

Since Alternative 1 is a No Action Alternative, there are no costs associated with implementation. Both capital and O&M costs for Alternative 2 are greater than those for Alternative 3. Alternative 2 would require a longer treatment time.

Alternative 3 is preferred over Alternative 2 based on the key criteria of long-term effectiveness and cost. Alternative 3 will attain a higher degree of long-term effectiveness since cleanup goals will be more easily attained. Costs associated with Alternative 3 are lower due to a shorter period of operation.

SUMMARY OF THE PREFERRED ALTERNATIVE

The preferred alternative for each of the three sites is as follows.

- C-720 Bldg. – SPH
- SWMU 1 (oil landfarm) – SPH
- SWMU 99 Kellogg Pad – Excavation

SPH was selected as the preferred treatment alternative based on its ability to remove TCE from soil and groundwater. The implementation of SPH at sites C-720 and SWMU 1 and excavation of unacceptably contaminated soil and concrete at SWMU 99 will reduce the volume of COCs in the soils and groundwater in the UCRS source area and prevent them from entering the RGA where they present a risk to potential future groundwater users. Although highly effective in removal of VOCs, it is expected that the SPH system and excavation will reduce the volume of COCs in the source areas, leading to a more rapid return of groundwater to beneficial use than would the No Action Alternative. The volatile COCs will be removed in the vapor

Table 2. Comparison of remedial alternatives

Evaluation Criteria	Alternative 1: No Action	Alternative 2: DPE and Excavation and LUCs	Alternative 3: SPH and Excavation and LUC
Overall Protection of Human Health and the Environment	Not Protective.	Protective through source reductions when combined with institutional controls identified in a separate CERCLA action and groundwater RGA actions; VOCs removed from C-720 and SWMU 1 UCRS; ^{99}Tc reduction at SWMU 99 UCRS.	Protective through source reduction when combined with institutional controls identified in a separate CERCLA action and groundwater RGA actions; VOCs removed from C-720 and SWMU 1 UCRS; ^{99}Tc reduction at SWMU 99 UCRS.
Compliance with Applicable or Relevant and Appropriate Requirements	Chemical Specific ARARs require in excess of 100 years.	This action will be conducted in compliance with ARARs. This action, when combined with other remedial actions, will help to reduce GWOU contaminant levels to acceptable concentrations.	This action will be conducted in compliance with ARARs. This action, when combined with other remedial actions, will help to reduce GWOU contaminant levels to acceptable concentrations.
Long-Term Effectiveness and Permanence	Not effective for at least 100 years; five-year review required.	Low residual risk; moderate to high reliability; five-year review required; minimal environmental impacts.	Low residual risk; high reliability; and five-year review required; minimal environmental impacts.
Reduction of Toxicity, Mobility, or Volume through Treatment	None.	Reduced VOC mass through DPE and treatment; reduced ^{99}Tc mass though excavation of unacceptably contaminated soils.	Reduced VOC mass through SPH extraction and treatment; reduced ^{99}Tc mass though excavation of unacceptably contaminated soils.
Short-Term Effectiveness	No change to current conditions.	Minimal or no short-term impacts. Excavation of unacceptable soil and concrete will require control of fugitive dust and Best Management Practices for control of stormwater and sediment transport.	Minimal or no short-term impacts. Excavation of unacceptable soil and concrete will require control of fugitive dust and Best Management Practices for control of stormwater and sediment transport. Steam and electrical hazards to workers may be present.
Implementability	Feasible to implement.	Feasible to implement, assuming on-site and off-site disposal facilities are available.	Feasible to implement, but vendors are limited, and assuming on-site and off-site disposal facilities are available.
Present Worth Cost ($K)	Estimated Capital Cost: $0 Estimated Annual O&M: $0 Estimated Present Worth: $0	Estimated Capital Cost: $14,029 Estimated O&M*: $6,739 Estimated Present Worth: $20,768	Estimated Capital Cost: $12,838 Estimated O&M*: $4,586 Estimated Present Worth: $17,425

*O&M costs include confirmatory sampling and decontamination and decommissioning.

phase of the process and treated. The liquid phase of the SPH system also will remove some of the ^{99}Tc, which is highly soluble, where it will be treated. It is not expected that ^{99}Tc will be entrained in the vapor phase emissions, and some residual materials may remain in the vadose zone.

Wastes and contaminated environmental media generated during the implementation of this alternative include treatment residuals, contaminated soil, and concrete. The wastes will be treated or disposed of in an appropriate disposal facility.

The preferred alternative meets the statutory preference for treatment where possible. The SPH system will remove VOCs from groundwater and soil vapor.

Preliminary identification of preferred alternative design criteria and considerations

Design and construction considerations necessary for implementation of the preferred alternative include:

- Spacing of electrodes to get optimum removal efficiency;
- Location of a local power supply;
- Sizing of treatment systems, pumps, and demisting system for soil vapor;
- Placement of electrodes and extraction wells in relation to vadose zone;
- Water treatment system discharge;
- Soil conductivity;
- Best Management Practices for stormwater at SWMU 99;
- Scheduling removal of scrap from SWMU 99;
- Air emissions, including fugitive dust at SWMU 99; and
- Waste classification for on-site versus off-site disposal.

Time frame for design and implementation of preferred alternative

The preferred alternative can be designed and initiated within 12-18 months.

Operation, Maintenance, and Long-Term Monitoring Requirements

O&M requirements for the SPH treatment systems will include routine maintenance of pumps, pipes, gages, and treatment units. Depending on the moisture content of the soil, it may be necessary to add small amounts of potable water to the electrodes. The voltage control system and transformers may require maintenance during operation. At the end of the treatment period, the SPH system will be decontaminated and decommissioned. No long-term O&M will be required.

This remedial alternative may result in "contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure"; therefore this remedial action would be reviewed "no less often than every five years," in accordance with 40 CFR 300.430 (F)(4)(ii).

Land Use Controls

LUCs will be implemented for the preferred alternative, and a Land Use Control Implementation Plan (LUCIP) will be developed consistent with the *Land Use Control Assurance Plan (LUCAP) for the Paducah Gaseous Diffusion Plant,* DOE/OR/07-1799&D2. The LUCIP for any LUCs selected as part of this action will be submitted for review and approval by KDEP and EPA. Upon final approval, the LUCIP will be appended to and become part of the LUCAP and will establish LUC implementation and maintenance requirements enforceable under CERCLA and the *Federal Facility Agreement for the Paducah Gaseous Diffusion Plant.*

LUCs for the preferred alternative will include property record notices, administrative controls, and access controls. Property record notices would alert anyone searching property records to important information about contamination and response actions on the property. Administrative controls would include measures such as the current "excavation/penetration permit program," which requires workers to obtain formal authorization (i.e., internal permits/approvals) before beginning any intrusive activities. Access controls could include measures such as fences, gates, and security activities determined to be necessary to ensure protectiveness after performance of response actions.

COMMUNITY PARTICIPATION

Community involvement is a critical aspect of the cleanup process at the PGDP. DOE, EPA, and KDEP encourage the public to read and comment on this PRAP. The preferred option discussed in this document represents a preliminary decision that is subject to public comment. A Notice of Availability will be published in *The Paducah Sun* announcing the 45-day public review period for this document. This PRAP is scheduled to be available for public review September 4, 2001. The administrative record for this action is available for review at the DOE Environmental Information Center (see page 19).

A public meeting will be conducted if requested in writing. All comments at the meeting will be recorded in a transcript that will be made available to the public. Comments will be addressed in the responsiveness section of the Record of Decision. The KDEP Division of Waste Management will conduct a public hearing immediately following the public meeting, if requested. A hearing is a formal gathering during which public comments are recorded officially by a hearing officer (to be designated by the Kentucky Natural Resources and Environmental Protection Cabinet), as required by RCRA and Kentucky Hazardous Waste regulations. Written requests for a public hearing should state the issues to be discussed. If either a meeting or a hearing is requested, a notice will appear in *The Paducah Sun*. To request a public meeting and/or submit comments on this PRAP, please contact Gary Bodenstein, Paducah DOE Site Office, P.O. Box 1410, Paducah, KY 42001, phone (270) 441-6851. To request a public hearing and/or submit comments on this "Statement of Basis," please contact Michael V. Welch, Kentucky Division of Waste Management, 14 Reilly Road, Frankfort, KY 40601, phone (502) 564-6716.

This document serves both as a Proposed Remedial Action Plan and as a Statement of Basis.

To send written comments or obtain further information about this Proposed Remedial Action Plan, contact:
Gary Bodenstein, Project Manager
U. S. Department of Energy
Paducah Site Office
P.O. Box 1410
Paducah, KY 42001
(270) 441-6851

To send written comments about this Statement of Basis, contact:
Michael V. Welch
Kentucky Department for Environmental Protection
Division of Waste Management
14 Reilly Road
Frankfort, KY 40601
(502) 564-6716

Administrative Record Availability

Information about this site considered during the response action determinations for this project, including the Proposed Remedial Action Plan, is available for review at the
DOE Environmental Information Center (270) 554-6979
115 Memorial Drive
Barkley Centre, Paducah, KY 42001

Normal Hours of Operation (Except the Week of the Second Saturday of Each Month):
10:00 A.M. to 6:00 P.M. Monday, Wednesday, Thursday, Friday
12:00 P.M. to 8:00 P.M. Tuesday

Hours of Operation for the Week of the Second Saturday of Each Month:
10:00 A.M. to 6:00 P.M. Monday, Thursday, Friday
12:00 P.M. to 8:00 P.M. Tuesday
2:00 P.M. to 6:00 P.M. Wednesday
8:00 A.M. to 12:00 P.M. Saturday

The Proposed Remedial Action Plan also is available at the
McCracken County Public Library (270) 442-2510
555 Washington Street, Paducah, KY 42001

Hours: 9:00 A.M. to 9:00 P.M. Monday through Thursday
9:00 A.M. to 6:00 P.M. Friday and Saturday
1:00 P.M. to 6:00 P.M. Sunday

or contact:

Kentucky Department for Environmental Protection
Division of Waste Management
14 Reilly Road, Frankfort, KY 40601
Attention: Matthew Hackathorn (502) 564-6716

(Record reviews at the Kentucky Department for Environmental Protection are by appointment only.)

United States Environmental Protection Agency
61 Forsyth Street, S.W., Atlanta, GA 30303-8960
Attention: Carl Froede, Jr. (4WD-FFB) (404) 562-8550
froede.carl@epa.gov

The record of decision and the proposed modification to the Kentucky Hazardous Waste Management Permit will be made available at the Environmental Information Center and at the Paducah Public Library after they have been signed by the United States Department of Energy, the United States Environmental Protection Agency, and the Kentucky Department for Environmental Protection.

The United States Department of Energy, the United States Environmental Protection Agency, and the Kentucky Natural Resources and Environmental Protection Cabinet do not discriminate upon the basis of race, color, national origin, sex, age, religion, or disability in the provision of services. Upon request, reasonable accommodations will be provided. These accommodations include auxiliary aids and services necessary to afford an individual with a disability an equal opportunity to participate in all services, programs, and activities. To request appropriate accommodations for a public hearing or meeting (such as an interpreter) or alternate formats for printed information, contact Matthew Hackathorn at (502) 564-6716 or Stacey Young at (270) 441-5204.