Commonwealth of Kentucky

Environmental Oversight Report 2012
Paducah Gaseous Diffusion Plant

Kentucky Division of Waste Management
200 Fair Oaks Lane, 2nd Floor
Frankfort, Kentucky 40601
502-564-6716

This 2012 Environmental Oversight Report, finalized in July 2014, was prepared by the Kentucky Division of Waste Management to report activities under the U.S. Department of Energy Federal Facility Agreement (FFA) and Agreement in Principle (AIP) grants covering the period from Jan. 1, 2012, to Dec. 31, 2012. This report summarizes activities undertaken by the Commonwealth of Kentucky (Kentucky) to oversee environmental restoration activities at the Paducah Gaseous Diffusion Plant (PGDP). Copies of the report are available from the Hazardous Waste Branch, Division of Waste Management, 200 Fair Oaks Lane, 2nd Floor, Frankfort, Kentucky 40601, phone 502-564-6716.

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Introduction

In December 1950, a site 15 miles west of Paducah, Kentucky was chosen by the United States government for construction of a gaseous diffusion plant to enrich uranium. The Paducah Gaseous Diffusion Plant (PGDP) began production in September 1952 and operated almost exclusively for national defense purposes until 1964. Today the primary purpose of the PGDP is to produce fuel-grade uranium used to generate electricity in nuclear reactors. The PGDP is located on a 3,556-acre federal reservation in northwestern McCracken County. Most of the operations at the PGDP occur inside a fenced security area of approximately 750 acres. Currently, the West Kentucky Wildlife Management Area (WKWMA) surrounds and bounds the facility. Portions of the PGDP adjoin the Tennessee Valley Authority (TVA) Shawnee Steam Plant property to the north. Residential properties are most prevalent to the east of the facility.

Since construction, the PGDP has been owned by the United States Department of Energy (DOE). The United States Enrichment Corporation (USEC) assumed responsibility for operation and maintenance of the PGDP in July 1993. Although DOE retains ultimate responsibility for environmental restoration and waste management, DOE has retained a series of support contractor teams to assist with the implementation of various activities at the site. Los Alamos Technical Associates Kentucky (LATA KY) was the PGDP general support contractor to DOE throughout the period covered by this report.

In August 1988, the Kentucky Cabinet for Health Services (now the Kentucky Cabinet for Health and Family Services Radiation Health Branch) discovered technetium-99 (Tc-99), a synthetic radioactive by-product of reprocessed reactor material, in private drinking water wells approximately three-fourths of a mile northwest of the PGDP. Since the PGDP was the only known source of Tc-99 in the area, it was identified as the source of the contamination. The discovery of off-site contamination led the U.S. Environmental Protection Agency (EPA) to issue an Administrative Consent Order (ACO) in November 1988 under Sections 104 and 106 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as “Superfund.” The ACO required DOE to investigate and clean up the contamination. Extensive environmental investigations were initiated at that time and continue to the present.

A variety of environmental concerns have been identified at the site since 1988. Historical PGDP activities have adversely affected soil, sediment, surface water, and groundwater at and near the site. Groundwater sampling and analysis has detected concentrations of both trichloroethene, a degreasing agent and probable human carcinogen historically used at the PGDP for multiple purposes, and Tc-99, a radioactive byproduct of historic PGDP process operations. In addition, soils and sediment sampling and analysis have identified polychlorinated biphenyls (PCBs) and uranium. Surface water studies have also documented PCB concentrations in fish collected from both Bayou Creek (west of the site) and Little Bayou Creek (east of the site).

Site cleanup activities at the PGDP will occur in a sequenced approach consisting of pre-shutdown and post-shutdown activities. The pre-shutdown scope is associated with media-specific Operable Units (OUs). An OU is commonly composed of areas or sources containing contamination associated with similar media (e.g., groundwater surface water, soil) and exposure pathways (e.g., ingestion, inhalation, dermal exposure). Post-shutdown activities will focus on D&D of the remaining PGDP as well as upon potentially contaminated media that is presently unknown or is currently inaccessible.

The contaminant source areas for the pre-shutdown period are grouped into the following media-specific OUs:

- Surface Water OU
- Groundwater OU
- Burial Grounds OU
- Soils OU
- Decontamination and Decommissioning (D&D) OU

Additional post-shutdown OUs will include the Groundwater Sources OU, Additional Burial Grounds Sources OU, D&D OU, Soils and Slabs OU, and Lagoons and Ditches OU. Efforts to more fully define the scope of these OUs will begin approximately six months prior to shutdown of the PGDP facility.

Public Participation

Citizens Advisory Board (CAB)/Site-Specific Advisory Board (SSAB)

The Paducah Citizens Advisory Board (CAB) formerly known as the Site-Specific Advisory Board (SSAB) was formed in 1996 and chartered under the Federal Advisory Committee Act. It is a stakeholders' board that provides advice and recommendations to DOE regarding environmental management programs at the PGDP.

Nonvoting, ex-officio members include representatives from the U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency (EPA), the Kentucky Division of Waste Management (KDWM), the Kentucky Cabinet for Health and Family Services Radiation Health Branch, and the Kentucky Department of Fish and Wildlife Resources (KDFWR). These members inform the CAB of their agencies' policies and views. Elected CAB members are typically concerned citizens from McCracken County. These elected members serve in their positions for two years.

The CAB meets on the third Thursday of every month to hear from persons working on relevant environmental efforts, to listen to and discuss input from concerned citizens, to form advice and recommendations to submit to DOE, and to conduct routine CAB business functions. CAB meetings are held at the Paducah Environmental Information Center located at 115 Memorial Drive in Paducah, Kentucky. Interested parties may also contact the CAB by telephone at 270-554-6979.

Kentucky's Oversight Program

The Commonwealth of Kentucky (hereafter Kentucky) is responsible for overseeing the environmental cleanup of the PGDP. Kentucky's Energy and Environment Cabinet (EEC) has designated the Hazardous Waste Branch within the Division of Waste Management to serve as the lead agency to coordinate this oversight and to implement both the Agreement in Principle (AIP) and the Federal Facility Agreement (FFA) grant programs for Kentucky. The CHFS Radiation Health Branch (RHB) also serves a critical role in implementing these two oversight

programs. Other state entities assisting the DWM's Hazardous Waste Branch and RHB with oversight responsibilities include:

- Division of Water (DOW)
- Division for Air Quality (DAQ)
- Kentucky Department of Fish and Wildlife Resources (KDFWR)

In addition to intra-state governmental coordination, coordination with both federal agencies and citizens groups is necessary and expected. Kentucky cooperates and facilitates interactions with EPA, DOE, the CAB and other DOE-facility host states.

Agreement in Principle (AIP)

Under the AIP program, Kentucky[1] manages independent environmental monitoring by either conducting or overseeing independent environmental activities. The program also independently analyzes samples obtained and analyzed by DOE in an attempt to independently confirm DOE's analytical results, thereby lending the results greater creditability. Additionally, the program serves to disseminate information relevant to ongoing site cleanup activities to concerned citizens and the public in general. The fundamental goal of the AIP program is to allow Kentucky to conduct independent and impartial assessments of the potential environmental impacts of past, present and future DOE activities at the PGDP. Since 1991, the AIP has been periodically renegotiated and extended.

[1] For the purposes of this report, all references to activities conducted by the Paducah Gaseous Diffusion Plant Section of the Division of Waste Management (KDWM) of the Department for Environmental Protection (KDEP), in the cabinet formerly known as the Environmental and Public Protection Cabinet (EPPC) and now known as the Energy and Environment Cabinet (EEC) will be referred to as Kentucky. References to activities by other state government agencies that are not part of the ECC (and in some cases, not part of KDWM) will be specified as appropriate.

Federal Facility Agreement / Site Management Plan

The FFA is a three-party agreement between DOE, EPA and Kentucky. The FFA was developed to ensure compliance with and to avoid duplication between the corrective action provisions of the Resource Conservation and Recovery Act (RCRA) permitting program and the corrective action requirements of CERCLA. Moreover, the FFA outlines regulatory structure and guides interactions between the three parties. The FFA allows Kentucky and the EPA Region IV to address contaminated areas at the PGDP that are not subject to permitting but nonetheless require remediation and provides a framework for project management, investigation and remediation.

The Site Management Plan (SMP) is an appendix to the FFA that serves to document those operable units (OUs) and their associated SWMUs requiring remediation along with the enforceable milestones that drive this work. These milestones are set for the current FY as well as the following two years and include submittal dates for regulatory documents, dates for the initiation of project field work and dates for completion of all work within a particular operable unit known as out-year enforceable milestones. The SMP also documents the prioritization strategy for remediation of the PGDP as agreed to by the FFA parties. It is a living document that is renegotiated by the parties on an annual basis.

The *D1 2012 Site Management Plan* (SMP) was received on Nov. 14, 2011. Kentucky subsequently provided comments on Dec. 8, 2011. DOE submitted the *D2 2012 SMP* on Feb. 24, 2012, which Kentucky approved on Mar. 22, 2012. Changes to the 2012 SMP included documenting the FFA parties decision to subdivide multiple burial grounds found at the site into smaller groupings in order to better facilitate document generation and review. Given that it had yet to be formally addressed in any of the Burial Grounds OU documents, the parties also agreed to remove SMWU 13 from the Burial Grounds OU and place it into the Soils OU. Therefore the surface or subsurface contamination associated with SWMU 13 will be addressed during Soils OU project implementation along with 86 remaining Soils OU SWMUs. Due to their proximity to plant infrastructure, three additional SMWUs were moved into the Soils and Slabs OU to be addressed following plant shutdown.

2012 Site Management Plan Documents Reviewed In 2012

11/14/2011 – *2012 Site Management Plan* (1264&D1). Comments issued 12/8/11.

2/24/2012 – *2012 Site Management Plan* (1264&D2). Approval issued 3/22/12.

Kentucky AIP Program Elements for 2012

One of the primary goals of the Agreement in Principle (AIP) is to monitor current site activities through sampling and observation to identify possible threats to human health and the environment. Another goal is to ensure that DOE's environmental data is accurate and that interpretations made from the data reflect the actual environmental conditions at the areas evaluated.

To achieve these goals, Kentucky routinely inspects facilities and observes DOE operations to identify any environmental issues or concerns. Any resulting environmentally significant conditions or practices are then brought to DOE's attention.

Kentucky also collects independent environmental (soil, surface water, air and groundwater) samples, split environmental samples with DOE, and periodically works with various independent research organizations. Samples are routinely sent to an independent laboratory under contract to the AIP program. AIP sampling includes the collection of groundwater samples at the request of nearby property owners from private residential wells as a means to inform the public of current groundwater conditions near the PGDP boundaries; split environmental samples obtained to independently validate DOE's sampling results; and split tissue samples collected from animals living near the PGDP to monitor the biota.

For 2012, the primary AIP independent contract laboratory for non-radiochemical analysis was Test America Laboratories (TAL) located in Earth City, Missouri. TAL is an accredited, independent laboratory that meets or exceeds the requirements set forth by governing EPA standards. All radiochemical analysis was performed by RHB. In addition to serving as the primary AIP radiochemical lab, the RHB routinely collects airborne and surface water samples for Gross Alpha and Gross Beta analysis using automated monitoring equipment. RHB also routinely obtains surface water grab samples from predetermined locations about the plant site.

HWB staff receives all analytical data directly from TAL and CHFS. The results are interpreted and shared formally with DOE and other appropriate parties.

AIP Groundwater Investigations

During 2012, Kentucky collected samples from seven different residential wells and 97 different monitoring wells. In all, Kentucky sampled some wells more than once for a total of 283 sampling events during 2012. Of the seven residential wells sampled, all were sampled independently by Kentucky. As can be seen in Figure 2, the residential wells sampled provided broad coverage in the area surrounding the PGDP. The vast majority of the wells sampled were less than two miles from PGDP plumes and/or less than two miles from the PGDP.

Residential Wells Sampled by Kentucky AIP

In 1988, when DOE discovered TCE and Tc-99 in off-site water wells, nearby residents relying upon groundwater for domestic use were provided alternative water supplies. Subsequently, DOE created a Water Policy that provides permanent alternative water sources at no costs to residents with wells that may be affected by contaminated groundwater. To participate in this DOE funded program, residents must agree to refrain from using the groundwater.

Due to the proximity of the Northeast Plume to the eastern edge of the Water Policy boundary, residential groundwater wells located east of this boundary are an important focus of the AIP independent sampling program. Residents to the east of Metropolis Lake Road were not covered by the Water Policy until 1997. Many of the residents located in close proximity to Metropolis Lake Road still use their wells as sources of potable water. Therefore, as can be seen in Figure 2, AIP staff focused on sampling wells in this area in order to detect any evidence that the plume may have migrated east of Metropolis Lake Road. Based upon 2012 AIP sampling results, the plume does not appear to have migrated this far to the east. Six of the seven residential wells selected were only sampled once during the reporting period.

Residential wells sampled by Kentucky in 2012 are located outside the known influence of documented groundwater plumes with the exception of R2 which is located within the WKWMA. During the reporting period, AIP independently confirmed that none of the residential wells sampled had been impacted by the plumes. The fact that these wells were sampled independently, that the samples were analyzed by an independent lab and that the results were independently reviewed and interpreted by Kentucky, almost certainly gave most, if not all, of the residents receiving the results a higher level of assurance that their well water had not been impacted by the PGDP groundwater plumes. For all residential wells sampled, the results and a discussion of the results were sent directly to the well owners.

Monitoring Wells Sampled by Kentucky AIP

The objectives of the AIP monitoring well sampling program are significantly different from those for residential well sampling. Sampling of residential wells is targeted toward determining whether PGDP plumes have negatively affected nearby potential drinking water resources. Monitoring well sampling events are conducted to evaluate and substantiate DOE's sampling procedures and to verify the quality of their laboratory analysis. In addition, these results can be used to analyze contaminant trends in particular wells. Such trends can be used to determine whether continued sampling of a well is justified or as a means of monitoring plume expansion or contraction. The concentrations detected by DOE for TCE and Tc-99 at various monitoring well locations are used in part to determine the nature and extent of contaminant plumes at PGDP as presented in DOE site plume maps. AIP monitoring well sampling can also be used to validate or correct these maps as necessary.

In 2012, 97 monitoring wells were sampled during the course of 275 sampling events. Each of the wells sampled are located either within the known plumes or in close proximity to the plumes. Kentucky split samples with DOE on 38 of the 275 sampling events conducted in 2012.

In most cases, Kentucky arranged to split samples with DOE during their scheduled sampling activities. A total of 31 of the 275 sampling events involved single samples collected from monitoring wells during 2012. A total of 10 wells were sampled twice and a total of 56 monitoring wells were sampled four times, once each quarter. These 56 monitoring wells had been installed during 2010 to provide chemical and water level information as a baseline for any

future studies.

Split sampling activities demonstrated a general similarity between those samples collected and analyzed by Kentucky and those collected and analyzed by DOE. There were nine instances in which neither Kentucky nor DOE detected TCE. There was two occasions when Kentucky detected a low level of TCE (result was estimated) and DOE reported non-detect. During the split sampling events, Kentucky monitored DOE's sampling procedures to verify this work was performed in compliance with EPA standard operating procedures for field measurements and sampling methods.

Of the 38 monitoring well samples split by Kentucky and DOE and analyzed for Tc-99, 20 had similar Tc-99 concentrations (within about 20% RPD). On 14 occasions, neither Kentucky nor DOE detected Tc-99. During an April 18, 2012 sampling event for MW-370, Kentucky detected Tc-99 in the sample while DOE failed to detect the radionuclide. Similarly, analytical results for a groundwater sample obtained from MW-459 on June 7, 2012 by both Kentucky and DOE personnel differed in that DOE's result was negative for the presence of Tc-99 while the Kentucky sample was positive. Conversely, there were two occasions when DOE reported a detectable level of Tc-99 and Kentucky did not. In one of these two instances, DOE reported a Tc-99 result of 18.4 pCi/L (+/- 13.4) for MW502, a well located within the NE Plume. In the second instance, DOE reported Tc-99 at a concentration of 22.3 pCi/L (+/- 13.2) at MW 84, which is located near the C-404 Landfill.

Kentucky also conducted split sampling at select wells associated with the C-746-U Solid Waste Landfill and the C-404 Hazardous Waste Landfill. At both of these landfills, determining whether the landfills are releasing contaminants to nearby groundwater is complicated by their proximity to major contaminant plumes. Therefore, it has been historically difficult to distinguish whether contaminants detected in the monitoring wells associated with the landfills are actually from the landfills or from sources upgradient to the landfills. As illustrated on the 2012 AIP Groundwater Sampling Locations map, many of the monitoring wells sampled were clustered in an area near the S, T and U-Landfills.

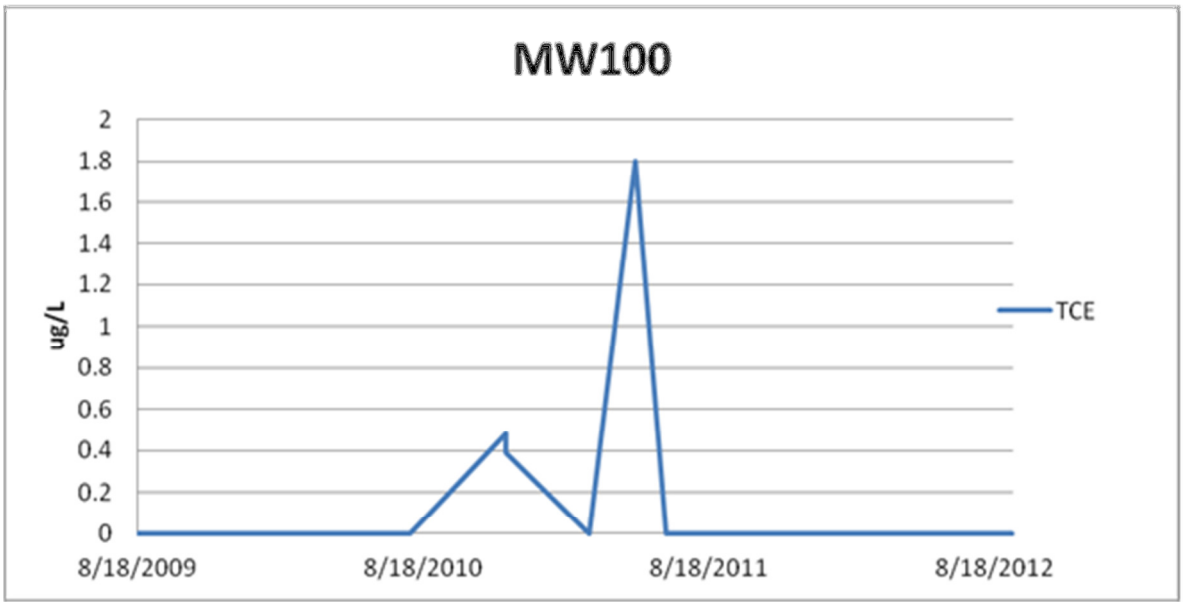

Figure 1. Monitoring Well 100 Sampling Results

Specific focus was given to MW100 due to its close proximity to the eastern edge of the Northeast Plume. This well is sometimes referred to as a sentinel well in that any movement of the plume eastward would likely be detected at MW100 sooner than at other wells. Two of the three samples obtained from MW100 in prior years contained low but detectable levels of TCE (Figure 1). These levels were below the laboratory reporting limit of 1.0 µg/L and the EPA's maximum contaminant limit (MCL) of 5 µg/L. AIP staff will continue to closely evaluate this particular well over time.

The monitoring well and residential well split sampling conducted by Kentucky has produced results that are consistent with those obtained by DOE. This is viewed as evidence to support the general accuracy of DOE data collection and analysis procedures for the period in question. In general, AIP independent oversight of DOE's groundwater sampling program helps to ensure that results obtained by DOE are accurate, reproducible and verifiable.

Seeps Sampled by Kentucky AIP

During the late 1990s six seeps were identified along Little Bayou Creek (LBC). These seeps were subsequently added to Kentucky's surface-water sampling program in 2002; a seventh

seep was discovered and added in June 2007. The seeps represent locations where contaminated groundwater containing TCE and Tc-99 is upwelling into a channelized (artificially straightened) portion of the creek. The seeps are not static and can migrate after major storm events, when high flow causes changes in depositional features and in the banks of the creek. The seeps are located downstream of the Paducah plant site, approximately halfway between the plant and the Ohio River.

Three seep samples were obtained during 2012 from two different locations in LBC (LBCSP5 and LBCSP7) as depicted on the 2012 AIP Monitoring Well and Seep Sampling Locations map (Figure 3). All three of these samples were analyzed for TCE and Tc-99. Kentucky collected two independent samples and split one sample with DOE contractors. Of the one split sample (LBCSP5) collected from the seeps and analyzed for TCE by both Kentucky and DOE, both contained detectable levels of TCE that were similar (< 20% RPD). The Kentucky sample contained 110 µg/L TCE versus 100 µg/ L for the DOE sample. These levels, which are quickly diluted once they enter the creek, are below those deemed to be of concern for humans or aquatic animals.

Additional seep samples were collected on April 19, 2012 from seeps LBCSP5 and LBCSP7 to be analyzed for Tc-99. Levels of Tc-99 detected in the two samples were 38.27 pCi/L (+/- 1.53) and 22.18 pCi/L (+/- 1.45), respectively. A seep sample obtained by Kentucky on May 21, 2012 contained 40.01 pCi/L (+/- 1.55), slightly higher than the April results but still below a level of concern. DOE did not test this sample for Tc-99. Historically, the highest concentrations of TCE and Technetium-99 consistently appear in LBCSP5.

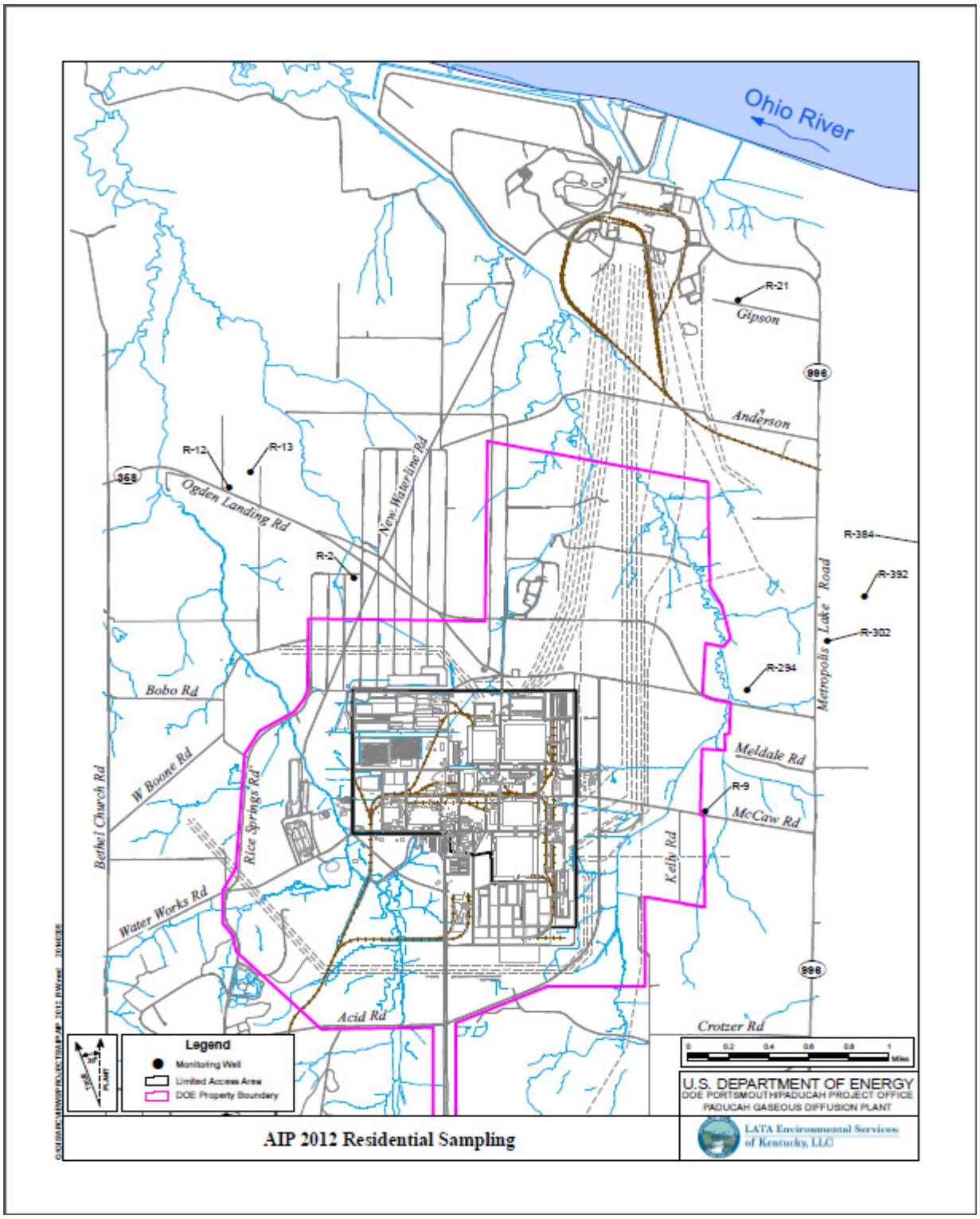

Figure 2. Residential Wells

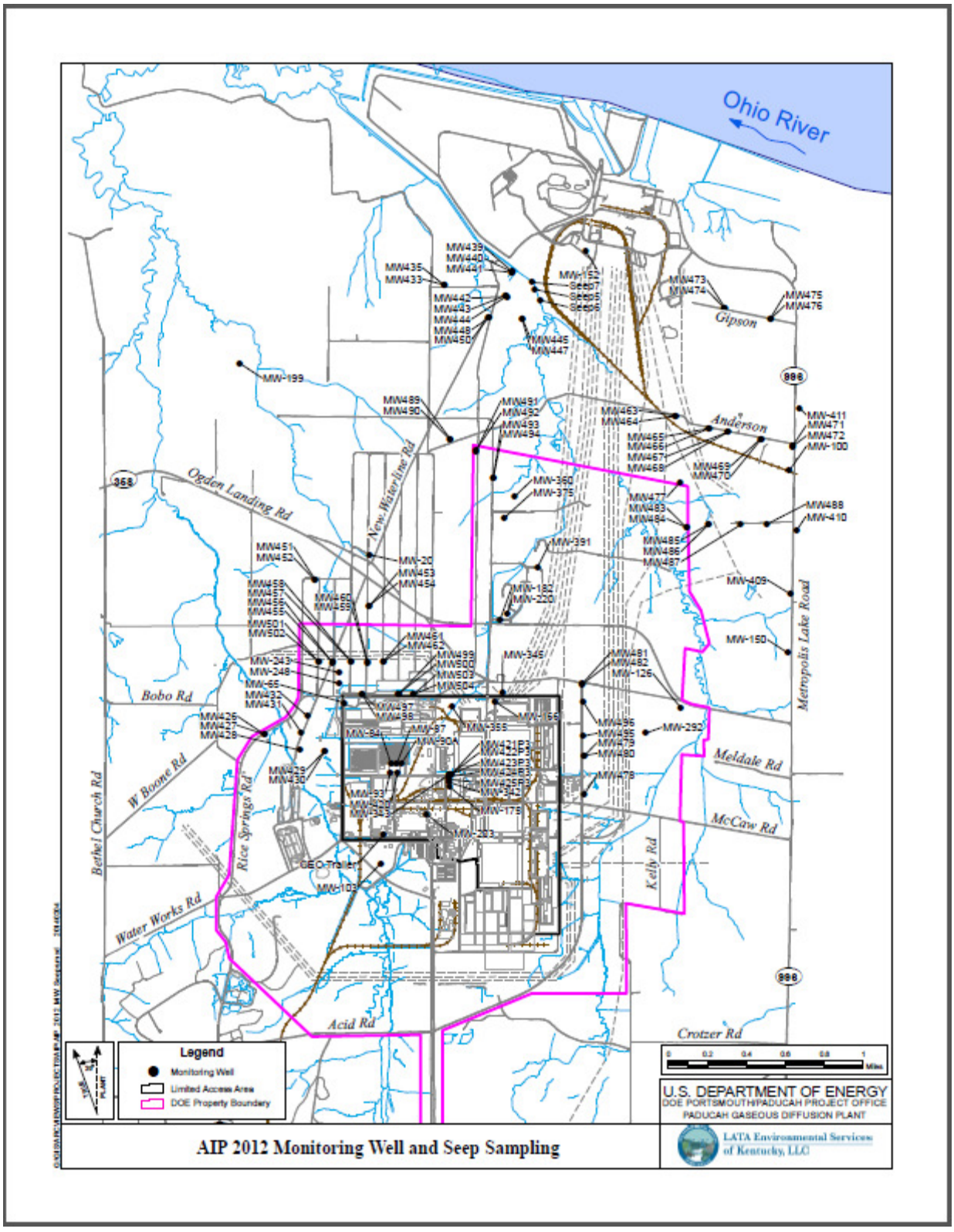

Figure 3. AIP Monitoring Well and Creek Seep Sample Locations

AIP Inspection Activities

The Paducah Gaseous Diffusion Plant (PGDP) was inspected on a weekly basis during 2012. These inspections took place in areas of the plant located both within and outside of the security fence. Locations within the security fence that were routinely inspected included areas adjacent to the process buildings (C-310, C-331, C-333, C-335, C-337), the C-340 Metals Plant, the C-400 Maintenance Facility, the C-410 Feed Plant, the former scrap metal yards, the cylinder yards, the process and sanitary wastewater treatment facilities, the C-404 Landfill, and classified burial grounds. Areas within buildings were not inspected. Those areas beyond the security fence that were routinely inspected included the wastewater lagoons, the Northwest Pump-and-Treat Unit, the C-613 Sedimentation Basin, the closed K-Landfill, the water treatment plant and lagoons, and numerous plant outfalls.

In addition to the areas listed above, several other sites of specific interest were also routinely inspected. These included an area where significant quantities of contaminated nickel area stored, the C-746-U Landfill, several hundred monitoring wells, and numerous signs located adjacent to nearby creeks.

There are approximately 6,875 nickel ingots stored on-site near the C-746-A Warehouse. About 50 of the ingots contain trace amounts of asbestos and all are believed to be volumetrically contaminated with radionuclides (primarily Tc-99). These ingots were inspected on a quarterly basis to ensure that they were completely covered with the required tarps.

The C-746-U Landfill periodically receives waste generated during PGDP cleanup operations. It was inspected on a weekly basis during the course of the year. The specific areas inspected included the landfill working face, the leachate collection building, the sedimentation basin, Outfalls 019 and 020, and the nearby S & T Landfill complex.

In addition to the ingot and landfill inspections, a total of 543 monitoring well inspections were also completed during the year. Elements of interest during these inspections included the well padlock, outer casing condition, whether water was present in vault or flush mount wells, the condition of protective bollards, and concrete pad condition.

Lastly, an effort was made to inspect the condition of several caution signs that were installed along Little Bayou and Bayou creeks during the last decade. The signs are needed to communicate the possible presence of contamination in creek sediments to recreational users. Signs located at nine creek crossings were inspected on a periodic basis.

Sediment Basin Sampling Methodology

The C-613 Northwest Storm Water Control Facility (a.k.a. the C-613 Sediment Basin) was completed in March 2003 as part of the first phase of the scrap metal removal project (SMRP). The sediment basin began operation in March 2003, has a capacity of 4.5 million gallons and was designed to collect contaminated sediments suspended in surface water runoff from the 27-acre former scrap yard area. The basin collects storm water runoff and allows the associated sediment a period of time to settle, after which the storm water is discharged through the Kentucky Pollutant Discharge Elimination System (KPDES) Outfall 001 into Bayou Creek (Figure 4). The Kentucky Division of Water (DOW) permit for Outfall 001 specifies that total suspended solids (TSS) will not exceed 30 mg/L averaged over a 30-day period and that pH shall not exceed a range of 6 to 9 standard units.

The sediment basin sampling regimen has varied since the basin became operational in 2003. Previous year's sampling provided baseline analyte concentrations, allowed the determination of trends and identified specific contaminants of concern. Based on this information, the sample regimen was both reduced and standardized beginning in the first quarter of 2008. Due to stabilization of reported analyte concentrations as well as budgetary constraints, the sampling regimen was again modified in 2012. The frequency of sample collection was reduced from quarterly to semi-annually. However, the sampling schedule still contains one non-discharge sampling event per year. This allows for assessment of possible changes in contaminant concentrations that may impact Bayou Creek.

The modified sampling regimen for 2012 is as follows:

First Semi-Annual Sampling Events:

Part 1) Sediment Basin, KPDES Outfall 001 and Iron Bridge Sampling Points

Purpose: The purpose of the first semi-annual event is to obtain samples from the basin inlet, outlet (Outfall 001) and at a point where WKWMA recreators can be exposed to Bayou creek water (Iron Bridge). These three samples are collected during a Sediment Basin discharge event.

Part 2) C-612 Northwest Pump & Treat Discharge Sampling Point

Purpose: This annual sample of the Northwest Pump & Treat discharge water provides a verification of the NW Pump & Treat system effectiveness. The sample is collected at the same time as Part 1 sampling.

Second Semi-Annual Sampling Events:

Part 1) Sediment Basin, KPDES Outfall 001 and Iron Bridge Sampling Points

Purpose: The purpose of the second semi-annual event is to obtain samples from the basin inlet, outlet (Outfall 001) and at a point where WKWMA recreators can be exposed to Bayou creek water (Iron Bridge). These samples are collected during a Sediment Basin discharge event.

Part 2) KPDES Outfall 001 and Iron Bridge Sample Points

Purpose: This annual sample is collected to determine analyte concentrations when there is no active discharge from the Sediment Basin. This sample is referred to as a non-discharge event. The sample is collected during the second semi-annual event as this has historically been a period of both steady rainfall and stream flow. The sampling event was designed to be representative of a WKWMA recreator's average possible contaminant exposure during normal stream flow conditions.

All samples are analyzed for the following analytes:

Total Suspended Solids (TSS)

Metals, including Uranium and Mercury

Gross Alpha/Beta activity

Isotopic Uranium (U-234, U-235 and U-238)

Note that the elements silicon, boron and molybdenum were removed from the metals analysis as concentrations were historically stable (silicon and boron) or not historically detected (molybdenum).

Results: TSS and pH

During the 2012 reporting period, neither the TSS concentrations nor the pH limits exceeded DOW KPDES Outfall 001 permit requirements. Flocculent, a material used to enhance particulate precipitation, was not used during 2012. The Scrap Metal Removal Project was completed in early March of 2007. In the spring of 2008 the entire area was hydro-seeded. Since that time the grass cover has become well-established, which has resulted in lower Sediment Basin turbidity results. Based on a comparison of these sample results and the Outfall 001 discharge requirements, Kentucky concludes that the Sediment Basin continues to perform its primary design function, which is to help insure compliance with Kentucky Division of Water KPDES requirements for Outfall 001.

Results: Uranium Metal, Uranium radionuclides and alpha/beta

Concentrations of total uranium, uranium isotopes U-234, U-235 & U-238 and gross alpha/beta readings were consistently lower at Outfall 001 than in the Sediment Basin during both semi-annual sampling events. The following is a 2012 data comparison presentation of the C-613 Sediment Basin sampling point (Inlet) results to the KPDES Outfall 001 sampling point (Outlet) results and results associated with the "Iron Bridge" sampling point.

2012 First Semi-Annual Sampling Event:

Part 1) Sampling Performed on January 24, 2012:

U) Inlet: 196.0 µg/L	Outlet: 61.3 µg/L	Iron Bridge: 15.8 µg/L
α) Inlet: 72.0 pCi/L	Outlet: 13.8 pCi/L	Iron Bridge: 7.5 pCi/L
β) Inlet: 69.0 pCi/L	Outlet: 25.3 pCi/L	Iron Bridge: 11.4 pCi/L
U-234) Inlet: 31.7 pCi/L	Outlet: 0.36 pCi/L	Iron Bridge: 2.30 pCi/L
U-235) Inlet: 1.88 pCi/L	Outlet: 0.03 pCi/L	Iron Bridge: 0.11 pCi/L
U-238) Inlet: 54.4 pCi/L	Outlet: 0.41 pCi/L	Iron Bridge: 5.33 pCi/L

Part 2) Samples Not Collected:

Due to confusion stemming from a recent change in sampling regimen, the annual C-612 Northwest Pump & Treat Discharge Sample was not collected.

2012 Second Semi-Annual Sampling Event:

Part 1) Samples Not Collected:

Due to an extremely dry year, there was only one Sediment Basin discharge event that occurred during the second half of 2012. Due to a scheduling conflict, AIP personnel were unable to collect this sample.

Part 2) Sampling Performed on November 30, 2012:

The non-discharge sample is collected when the Sediment Basin is not being actively discharged. This sample point is considered to be representative of a WKWMA recreator's average possible contaminant exposure.

U) Outlet: 1.3 µg/L	Iron Bridge: 1.3 µg/L
α) Outlet: 13.8 pCi/L	Iron Bridge: 0.56 pCi/L
β) Outlet: 25.3 pCi/L	Iron Bridge: 17.3 pCi/L
U-234) Outlet: 0.36 pCi/L	Iron Bridge: 0.69 pCi/L
U-235) Outlet: 0.03 pCi/L	Iron Bridge: 0.01 pCi/L
U-238) Outlet: 0.41 pCi/L	Iron Bridge: 0.42 pCi/L

Sediment Basin sampling has been performed regularly since the basin became operational. The following data were compiled from 2003 to 2012 concerning average uranium concentrations (averaged from all results available for a given year) and the annual discharge through the Sediment Basin (in gallons). The average yearly rainfall in the Paducah, Kentucky area is 49.3 inches.

Average Uranium (total) concentrations, Sediment Basin discharge volume, annual rainfall and percentage of annual rainfall for each year from 2003 through 2012 are as follows:

2003: Inlet: 346.0 µg/L Outlet: 156.0 µg/L
Annual Discharge: Not Applicable Rainfall: 47.84 inches (97% of Average)

2004: Inlet: 371.0 µg/L Outlet: 206.0 µg/L
Annual Discharge: Partial Year Only Rainfall: 40.66 inches (82% of Average)

2005: Inlet: 458.0 µg/L Outlet: 193.0 µg/L
Annual Discharge: 57,800,000 Gallons Rainfall: 37.45 inches (76% of Average)

2006: Inlet: 454.0 µg/L Outlet: 244.0 µg/L
Annual Discharge: 101,100,000 Gallons Rainfall: 67.11 inches (136% of Average)

2007: Inlet: 276.0 µg/L Outlet: 36.0 µg/L
Annual Discharge: 34,000,000 Gallons Rainfall: 43.33 inches (88% of Average)

2008: Inlet: 338.0 µg/L Outlet: 110.0 µg/L
Annual Discharge: 51,000,000 Gallons Rainfall: 53.69 inches (109% of Average)

2009: Inlet: 439.0 µg/L Outlet: 46.0 µg/L
Annual Discharge: 45,000,000 Gallons Rainfall: 55.60 inches (113% of Average)

2010: Inlet: 176.7 µg/L Outlet: 93.3 µg/L
Annual Discharge: 32,550,000 Gallons Rainfall: 36.67 inches (74% of Average)

2011: Inlet: 188.0 µg/L Outlet: 75.7 µg/L
Annual Discharge: 51,012,000 Gallons Rainfall: 74.85 inches (152% of Average)

2012: Inlet: 196.0 µg/L Outlet: 31.3 µg/L
Annual Discharge: 2,820,000 Gallons Rainfall: 30.06 inches (61% of Average)

Based on an analysis of the data, Kentucky concludes that the concentration of elemental uranium received from the northwest corner drainage basin and discharged at Outfall 001 is roughly proportional to the volume of rainfall and subsequent runoff. The data also show that the concentration of uranium decreases by roughly one-half to greater than one half between the inlet and Outfall 001 during the evaluation period. Although average inlet concentrations have varied during the ten-year reporting period, outlet concentrations at Outfall 001 (2007 to 2012) continue to trend downwards. The highest reported average inlet concentration was 458.0 µg/L in 2005 and the lowest was 176.7 µg/L in 2010. The 2010 (lowest) average inlet concentration of 176.7 µg/L was 2 ½ times lower than the year before, while the average rainfall received was 1 ½ times less. The highest reported average Outfall 001 concentration was 244.0 µg/L in 2006 and the lowest was 31.3 µg/L in 2012. The 2012 average outlet

concentration of 31.3 µg/L was the lowest and was also significantly less than the previous ten-year running average of (119.1 µg/L).

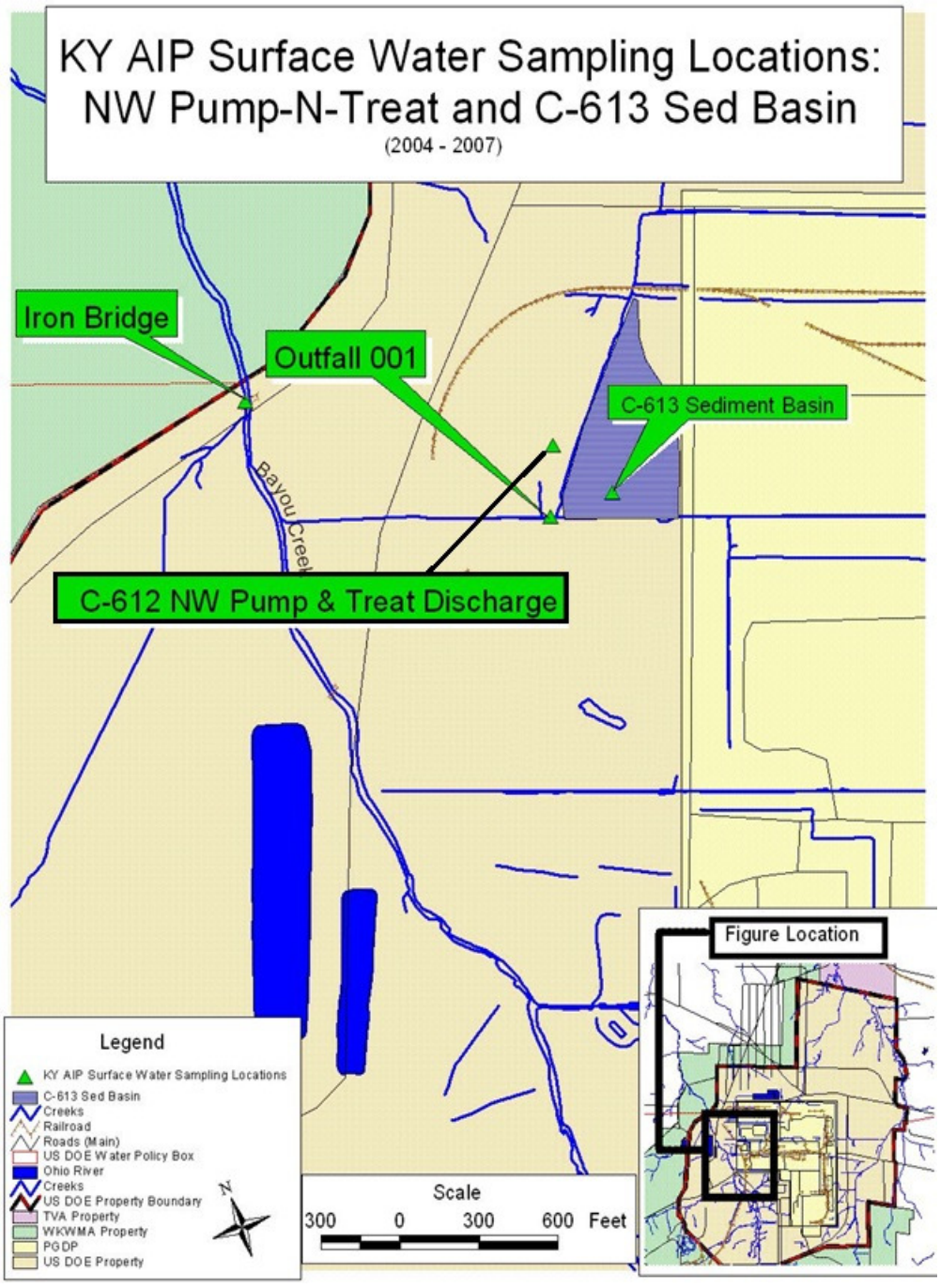

Figure 4. Basin Sampling Locations

Based on continuing data analysis and field observations, Kentucky concludes that former Scrap Yard storm water runoff continues to contribute to the off-site migration of metals and low-level radionuclides. Data shows that the operation of the Sediment Basin has a pronounced effect on the reduction of radionuclide activity and turbidity. Therefore, Kentucky believes that operation of the C-613 Sediment Basin should continue.

Radiation Health Branch AIP Sampling

The Radiation Health Branch (RHB) has a robust environmental monitoring program, funded by the AIP, designed to ensure that there is no danger to public health from PGDP's radionuclide releases to groundwater, surface water, or air. In 2012, RHB collected 1,845 samples and performed 1,574 analyses on both those samples and the additional 289 samples collected by EEC-HWB.

Groundwater

RHB monitors groundwater by collecting quarterly samples at 11 wells surrounding the site (Figure 5). Gross alpha/beta analysis is performed on the samples. Additional isotope specific analyses may be performed based on the results of the gross measurement.

The majority of the locations are private drinking water wells that are potentially impacted by the TCE/Tc-99 plume travelling away from the site. These wells are no longer used for drinking water. RHB continually evaluates the results from this activity, along with results from third party activities and activities at the site, to determine the need for additional monitoring locations or modification of current locations.

In 2012, there were no abnormal measurements from RHB groundwater monitoring efforts.

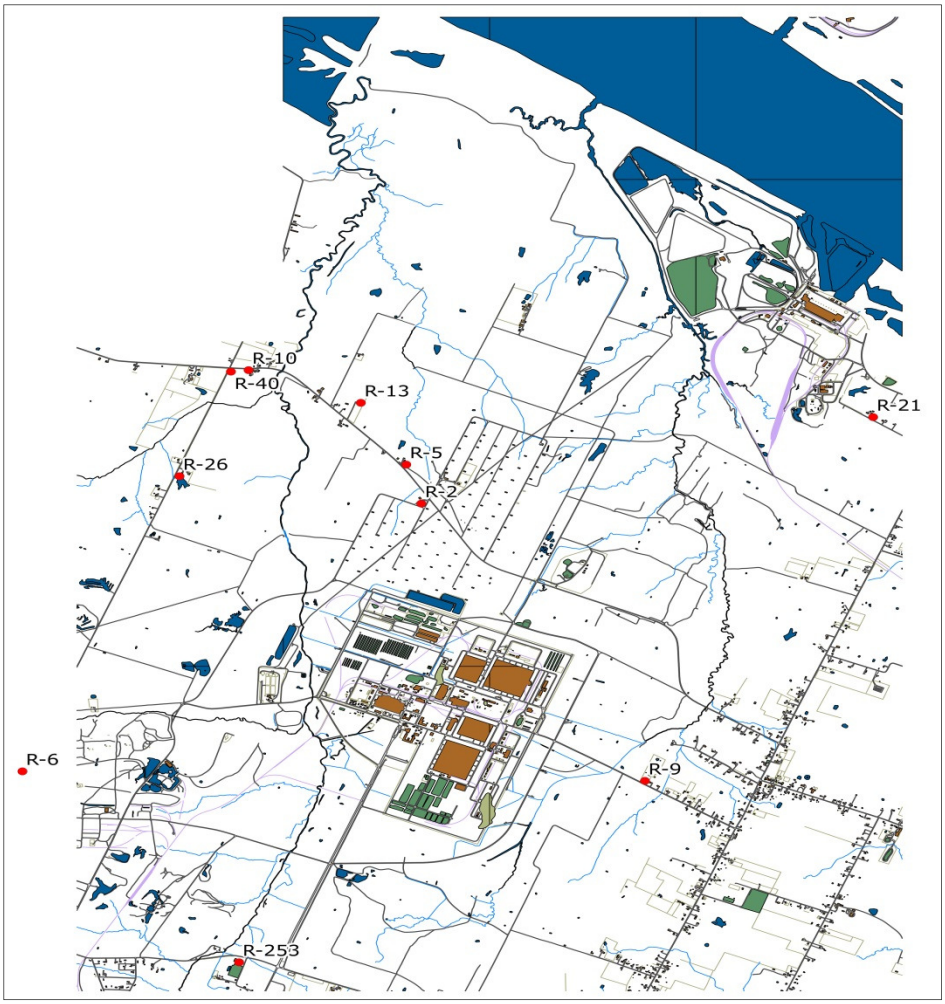

Figure 5. RHB Groundwater Monitoring Locations

Surface Water

RHB monitors surface water by taking quarterly samples at 32 locations surrounding the site (Figure 6) and through continuous sampling (ISCO) at an additional 8 locations (Figure 7). Gross alpha/beta analysis and isotope specific analyses are performed on the samples, with the ISCO samples being collected and composited over 21 day periods.

The locations for surface water monitoring were selected based on outfalls from the site, locations of known runoff from contaminated areas, and historical sampling locations. The background locations are located upstream in Bayou Creek (ISCO B and BBCUG), upstream in

Little Bayou Creek (LBCUG), upstream of the C-746-K Landfill (UPC746K), and approximately 5 miles to the southeast on Massac Creek (a known unimpacted local waterway, not shown on map).

In January of 2012, due to reductions in the federal budget, 4 (ISCOs A, D1, D2, and F) of the 8 continuous sampling locations were discontinued. The locations ISCO D1 and ISCO D2 were previously utilized to capture runoff from the northwest corner of the plant. This runoff was diverted to a sedimentation basin (C-613) before discharge to KPDES 001. Locations ISCO A and ISCO F previously monitored KPDES001/004/008. These discontinuations do have the downside of no longer allowing determination of the specific source of contamination. However, as all of the flow from KPDES outfalls on that side of the plant pass ISCO C, all of the surface water previously monitored at the discontinued locations will still be monitored by ISCO C.

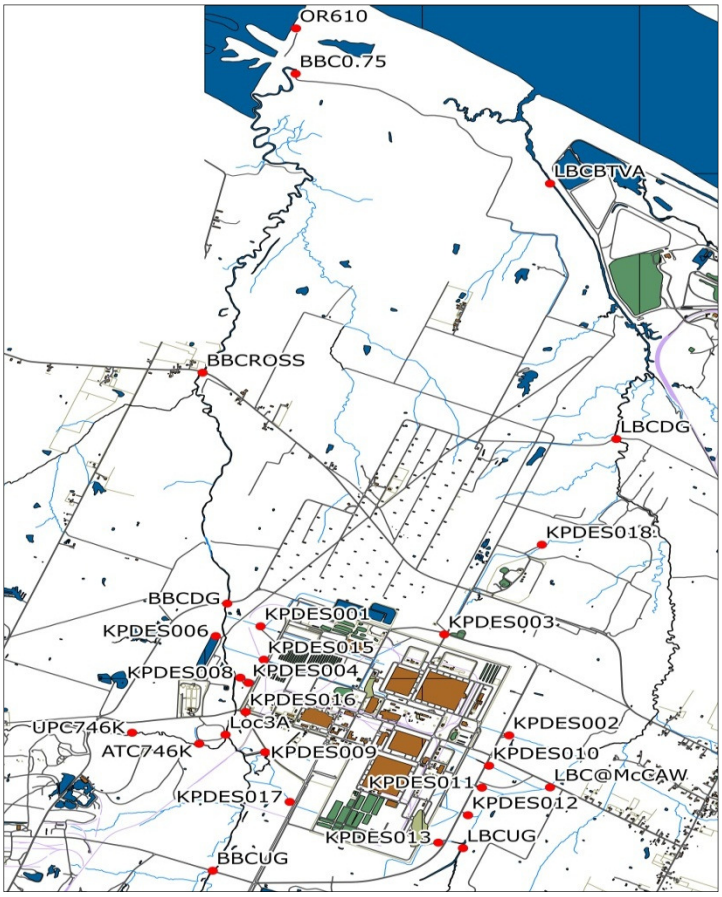

Figure 6. RHB Quarterly Surface Water Sampling Locations

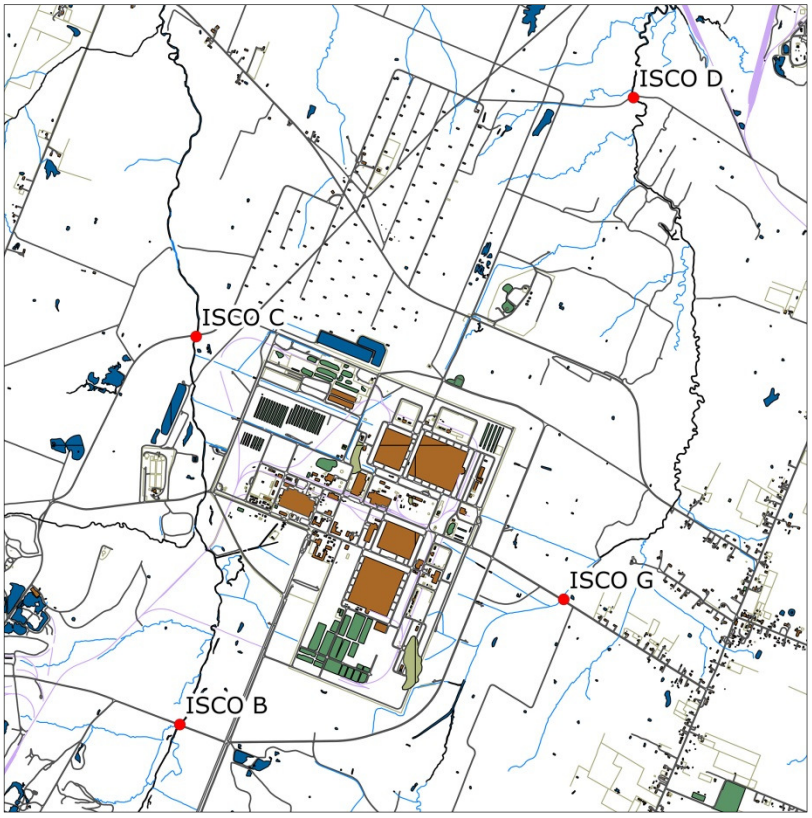

Figure 7. RHB ISCO Sampling Locations

In 2012, there were no abnormal measurements from RHB surface water monitoring efforts.

Air

RHB monitors air by taking continuous samples at 10 locations surrounding the site (Figure 8) collected at 21 day periods. A gross alpha/beta analysis is performed on each filter, and the filters are composited quarterly for isotope specific analyses.

The locations for air monitoring were selected based on prevailing winds at the plant and expected release points/types from the plant. The background location is approximately 3 miles southeast of the plant at the Barkley Regional Airport (not shown on map) and is > 90 degrees offset from prevailing winds. RHB continually evaluates the results from this activity, along with

results from third party activities and activities at the site, to determine the need for additional monitoring locations or modification of current locations.

In January of 2012, due to reductions in the federal budget, the frequency of filter collection was reduced from weekly to once per 21 days. The potential consequences of this reduction are that there is an increased probability of overloading the filters in drier months due to increased dust and greater sampled volume, and a 200 percent increase in potential response time following a release. Both have yet to be an issue.

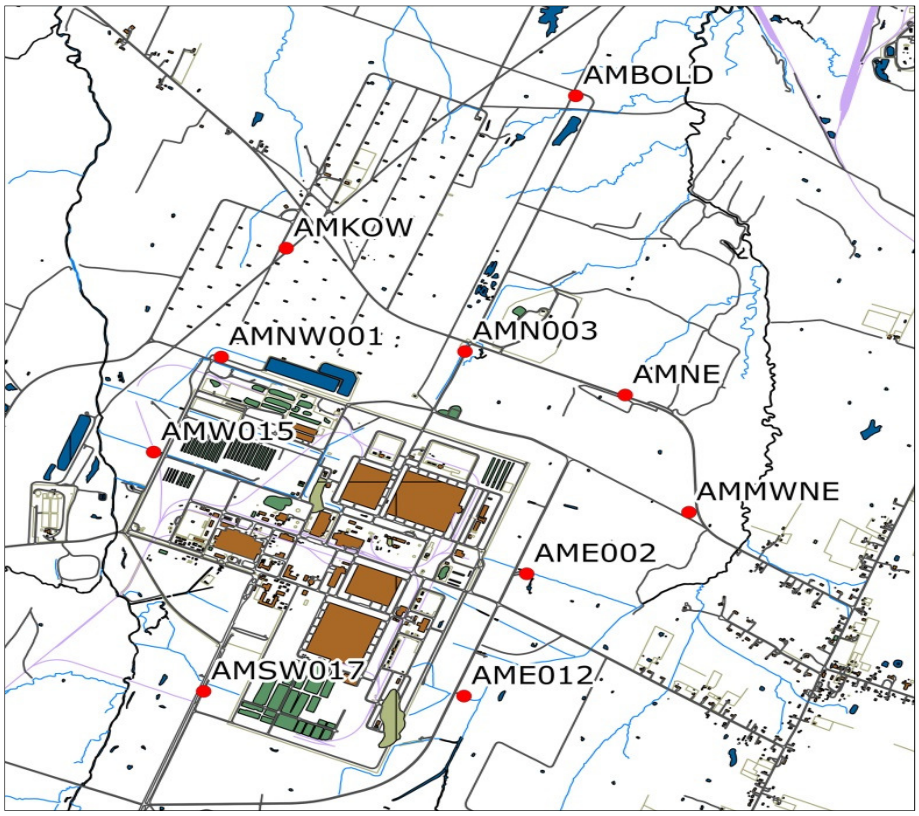

Figure 8. RHB Air Monitoring Locations

In 2012, there were no abnormal measurements from RHB air monitoring efforts.

Kentucky FFA Program Elements for 2012

Surface Water Operable Unit

The Surface Water Operable Unit (SWOU) is comprised of 31 Solid Waste Management Units (SWMUs) which are either creeks or ditches or have likely contributed significant contamination to the creeks and ditches that receive surface water runoff from the PGDP. Controlling the off-site migration of contaminants from these areas is a high priority. For this reason, several removal and interim remedial actions have already been completed to address some on-site and off-site ditches that were known areas of contamination. However, other areas will require further investigation and possible remediation. These areas include portions of outfall ditches and the large stretches of Little Bayou and Bayou creeks.

The PGDP uses approximately 17 million gallons of Ohio River water daily. After use, this water is discharged via unlined ditches through outfalls to both Little Bayou Creek and Bayou Creek. These two creeks converge and ultimately discharge into the Ohio River. The Kentucky Division of Water regulates these discharges from the outfalls under two Kentucky Pollutant Discharge Elimination System (KPDES) permits. Waters that are discharged through these outfalls include storm water runoff, wastewater from groundwater treatment systems, process wastewater, cooling wastewater, sediment basin discharge water and sanitary wastewater. These discharges, while unlikely to contain unacceptable levels of contamination, have the potential to mobilize existing contamination present in the ditches and creeks.

Throughout 2010, Kentucky participated with DOE and EPA in many scoping meetings, conference calls and field visits to scope the remedial investigation work plan for the off-site portion of the SWOU. An ecological risk assessment for the PGDP focusing on the surface water exposure pathways is required as part of the SWOU RI. This ecological risk assessment was also discussed and scoped as part of work plan development. The D1 work plan was submitted to Kentucky for review and comment in 2011.

Subsequent to the review of Kentucky's comments, DOE submitted the D2 Surface Water OU Off-Site Work Plan on Jan. 11, 2012 which attempted to address Kentucky's concerns. Kentucky conditionally concurred with the work plan on Feb.15. To address these conditions

and finalize the work plan, the parties determined that additional reconnaissance fieldwork was required. Three field trips to the Ohio River flood plain north of the PGDP provided much needed information that helped to identify flow paths in that portion of the operable unit. DOE then submitted the D2/R1 Work Plan on June 13 and Kentucky concurred with the document on June 19.

During the summer of 2012 it was agreed that the out-year enforceable milestone for the SWOU should be extended, in part due to the possibility that other remedial and removal actions completed in the upcoming years may further contaminate some of the areas that will be investigated under the SWOU. Therefore, the Remedial Investigation Report for the Surface Water OU is scheduled to be submitted in 2029.

Surface Water OU Documents reviewed in 2012:

D2 Work Plan for the Surface Water Operable Unit Remedial Investigation/ Feasibility Study at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky DOE/LX/07-0361&D2 – *(KY Conditionally Concurred 02-15-2012)*

D2/R1 Work Plan for the Surface Water Operable Unit Remedial Investigation/ Feasibility Study at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky DOE/LX/07-0361&D2R1 – *(KY Concurred 06-19-2012)*

Groundwater Operable Unit

Northeast Plume Containment System (Pump-and-Treat)

The Northeast Plume originates near the central portion of the PGDP and flows from the northeastern portion of the plant towards the Ohio River. The plume extends over two miles past the PGDP security fence and has a width of approximately one-half mile. The Northeast Plume's primary contaminate is TCE.

The Northeast Plume Containment System (NEPCS) became operational in early 1997. The NEPCS utilizes two extraction wells pumping at a combined average rate of 170 gpm. The

purpose of the NEPCS (Figure 9) is to hinder the growth of the plume's centroid (i.e., highest concentration of TCE). Extracted groundwater is first transferred to an equalization tank. From there it's pumped through 5,500 feet of piping to an on-site cooling tower. The cooling tower serves as an air striper to remove TCE from the groundwater. Once released to the air, the TCE is degraded to harmless constituents by sunlight. Overall, concentrations of TCE in the centroid of the Northeast Plume have steadily decreased since 1997.

A proposal to modify, or optimize, the NEPCS gained momentum following a 2010 Environmental Monitoring System upgrade which included the installation of approximately 60 new monitoring wells. Some of these new wells were placed within the known footprint of the Northeast Plume. Analytical data from these wells revealed that the Northeast Plume contains two higher concentration cores rather than the assumed single centroid. Since the original NEPCS was predicated upon a single-core plume, the need to optimize the system such that it would retard the growth of both cores became evident. The 2011 announcement by the United States Enrichment Corporation (USEC) that it would likely shut down the cooling tower being utilized by the NEPCS served to heighten the since of urgency. USEC stated that tower operations could cease as early as 2013.

Several meetings were held between the FFA parties to discuss how best to optimize the NEPCS. The optimized system would need to be designed so that it would capture both cores. To accomplish this goal, the current extraction wells would likely need to be relocated closer to the PGDP's eastern fence line. Groundwater models were utilized to examine potential configurations of extraction wells, along with variable pumping rates to achieve optimal mass capture. Since the current NEPCS utilizes USEC-operated cooling towers (and USEC provided notice to potentially cease operations in 2013), optimization efforts would also require that new skid-mounted air strippers be installed to replace the USEC cooling towers.

Care must be taken when optimizing the NEPCS since increasing pumping rates near the eastern fence line has the potential to "pull" contamination from the Northwest Plume to the east. Preliminary computer models predicted that an additional extraction well may need to be installed near the C-400 building (the source of the Northwest Plume) to ensure that contamination from one flow system does not cross over into another flow system. DOE will address the overall extraction system optimization, well locations, and proposed pumping rates

in a revised remedial action work plan (RAWP). The RAWP is due to be submitted to regulators in 2013.

Figure 9. Northeast Plume Containment System

Northeast Plume Optimization Documents Reviewed In 2012:

Note: Kentucky received many extension requests for the revised RAWP in 2012; however, no documents were submitted for review.

Figure 10. Building 612 – Northwest Plume Groundwater System

Northwest Plume Optimization

The Northwest Plume was identified in 1988 but its areal and vertical extent has been further defined over the years. The plume's primary contaminants include both TCE and Tc-99. The Northwest Plume is the largest of the PGDP's groundwater plumes, stretching over two-and-a-half miles from the security fence toward the Ohio River. This plume is also known to be actively discharging both TCE and Tc-99 to a section of Little Bayou Creek.

The Interim Remedial Action Record of Decision (ROD) for the Northwest Plume was signed in July 1993. The ROD required that a groundwater pump-and-treat system be designed and installed to control the migration of the plume's higher concentration core (i.e., centroid). The design ultimately allowed the system to attain this goal by requiring pumping of contaminated groundwater from two well fields, one located to the north and the other to the south near the

plant's security fence. Each well field contains two extraction wells both pumped at a rate around 50 gallons per minute. A wastewater treatment unit (Figure 10), located at the plant's northwest corner, was constructed to treat the contaminated groundwater produced by the four extraction wells. As of Dec. 31, 2012, the Northwest Plume Groundwater System (NWPGS) system has removed 2,880 gallons of TCE since it became operational in Aug. 28, 1995. The total amount of contaminated groundwater treated at the NWPGS, since inception, is approaching two billion gallons.

In 2009, DOE, Kentucky and the U.S. EPA began to investigate whether the four well pump-and-treat system might perform more efficiently if pumping were to be concentrated near the northwest corner of the plant. Subsequently, a computer modeling simulation performed by DOE's contractor indicated that two new extraction wells pumping rate of 110 gallons each and placed near the northern fence line and east of the existing south well field would effectively capture much of the contaminated groundwater feeding the large plume. Based these model results, the FFA parties moved forward with plans to optimize pumping rates and select new locations for the installation of the two new extraction wells. An Explanation of Significant Differences (ESD) served to memorialize the overall change to the original ROD. The parties also agreed that the north well field would be deactivated and that the existing south extraction well field would be placed in standby mode, in case it was needed in the future. Fieldwork for this project began in March 2010 and the system became fully operational in August of that same year.

The optimized pump-and-treat system appears to be performing as designed. Results from the performance evaluation appear to indicate that the true capture zone is larger than the capture zone predicted using the site's numerical groundwater model. Data also suggests that much of the contaminated groundwater is being pulled toward the easternmost of the two extraction wells, EW 233. Contaminant levels have risen in this well but have decreased somewhat in EW 232, the westernmost extraction well. Contaminant levels may have also decreased in MW 456, a well which appears to be located directly downgradient of the plume's high concentration core.

Northwest Plume Optimization Documents Reviewed In 2012:

No documents were submitted for review.

Southwest Plume Sources

The Southwest Plume was discovered in 1998 during the Waste Area Grouping (WAG) 27 remedial investigation (RI) and further investigated in 2004. The Southwest Plume is the smallest of the three plumes originating from the PGDP and the only plume that has not migrated beyond the DOE property boundary. The plume is known to contain both dissolved-phases of TCE and Tc-99.

The 2004 investigation focused on four source areas that were thought to be potential contributors of contamination to the plume. The areas in question were the C-747-A Oil Landfarm (SWMU 1), the northeast and southeast corners of the C-720 Building (SWMUs 211A and 211B, respectively), and a section of the plant's storm sewer system (SWMU 102). The SWMU 4 Burial Ground is also believed to be a significant contributor to the Southwest Plume; however, it is being addressed under a separate Burial Grounds Operable Unit.

In 2008, DOE agreed to conduct a Focused Feasibility Study to address all potential Southwest Plume sources with the exception of SWMU 4. Electrical Resistance Heating (ERH) was evaluated and ultimately chosen as the primary technology to address the suspected sources. Following its selection, the use of the ERH technology was reevaluated due in part to its high cost and the limited volumes of TCE believed to be present at the four source areas. These efforts ultimately yielded a revised Focused Feasibility Study that contained an evaluation of other robust, less costly alternatives.

The Focused Feasibility Study (FFS) issued in 2011 lists four remedial action objectives; among which are the requirements to treat and remove Principal Threat Waste (PTW) and to reduce VOC migration from contaminated subsurface soils such that a Maximum Contaminant Level (MCL) exceedence in the aquifer at the SWMU boundary is prevented. PTW is defined by EPA as those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. The FFS did not develop alternatives for the portion of SWMU 102 originally suspected of being a source to the Southwest Plume since follow on investigations concluded that it was not a source of VOC contamination.

A proposed plan was also issued in 2011, which recommended "Enhanced In-Situ Biological" (EISB) treatment at SWMU 1 and "Land Use Controls (LUCs) and Monitoring" at C-720, in lieu of electrical resistance heating. Kentucky disagreed with DOE's preferred alternatives, citing their lower ranking in relation to other more aggressive alternatives evaluated in the FFS. Several revisions of the proposed plan followed and the document was ultimately approved in late September 2011.

The first draft of the Record of Decision (ROD) for this action was intentionally issued out of sequence on July 22, 2011, in order to maintain the agreed upon schedule for document submittal. Regulators reviewed the D1 ROD and determined that it did not adequately contain a scenario for active treatment at SWMUs 211A and 211B. A couple of document review cycles followed until the D2/R1 ROD was approved by Kentucky on March 23, 2012. The approved ROD addresses TCE concentrations at SWMU 1 that exceed 73 µg/kg and those at SWMUs 211-A and 211-B that exceed 75 µg/kg in subsurface soils. It also requires that TCE present at SWMU 1 be remediated using deep soil mixing combined with steam and zero-valent iron. Interim land use controls will also be an integral part of the SMWU 1 remedy. The remedy selected for SWMUs 211-A and 211-B will be either EISB or LUCs with long-term groundwater monitoring depending upon the levels of contamination identified during a remedial design support investigation.

To address the remaining uncertainty regarding the lateral and vertical extent of VOC contamination at SWMU 1 and C-720, DOE presented a Remedial Design Support Investigation (RDSI) Characterization Plan to Kentucky on Feb. 8, 2012 intended to resolve outstanding data gaps. The primary data gap identified during a data quality objective process was a lack of definition regarding the aerial and vertical extents of VOC contamination. Since a considerable amount of time had elapsed since many of the soil samples had been collected from these areas, the RDSI would also serve to update TCE concentrations and volume of contamination estimates. The RDSI field work was completed in October 2012 and the results obtained for SWMU 1 were presented and summarized in a Remedial Design Report (RDR). Data collected at SWMU-211-A and SWMU 211-B was to be presented in a Final Characterization Report to be issued by DOE in 2013.

Two preliminary design documents were reviewed in 2012 that provided some limited information regarding remedy implementation at SWMU 1. The D1 30% Remedial Design was approved by Kentucky in August 2012. This was followed by approval of the D1 60% Remedial Design in November 2012. These reports summarized data collected during the RDSI at 22 locations associated with SWMU 1. This data, along with historical data, were incorporated into the design planning for the preferred alternative. The D1 90% Remedial Design Report and any subsequent revisions will be submitted in calendar year 2013.

Southwest Plume Sources Documents Reviewed in 2012:

D2 Record of Decision for SWMUs 1, 211-A and 211-B, and Part of 102 VOC Sources for the Southwest Groundwater Plume DOE/LX/07-0365&D2 – (KY Conditionally Concurred 03-05-2012**)**

D2 *Remedial Design Work Plan for Solid Waste Management Units 1, 211-A, 211-B, and Part of 102 Volatile Organic Compound Sources for the Southwest Groundwater Plume* DOE/LX/07-1268&D2 – (KY Conditional Approval 03-20-2012)

D2/R1 Record of Decision for SWMUs 1, 211-A and 211-B, and Part of 102 VOC Sources for the Southwest Groundwater Plume DOE/LX/07-0365&D2/R1 – (KY Approved 03-23-2012)

D2/R1 *Remedial Design Work Plan for Solid Waste Management Units 1, 211-A, 211-B, and Part of 102 Volatile Organic Compound Sources for the Southwest Groundwater Plume* DOE/LX/07-1268&D2/R1 – (KY Approved 05-31-2012)

D1 Remedial Design Support Investigation Characterization Plan for the C-747-C Oil Landfarm and C-720 Northeast and Southeast Sites (Incorporated as Appendix A of the Remedial Design Work Plan for SWMUs 1, 211A and 211B Volatile Organic Compound Sources for the Southwest Groundwater Plume DOE/LX/07-0350&D1 – (KY Approved 05-31-2012)

D2/R2 Remedial Design Work Plan for Solid Waste Management Units 1, 211-A, 211-B, and Part of 102 Volatile Organic Compound Sources for the Southwest Groundwater Plume DOE/LX/07-1268&D2/R2 – (KY Approved 06-27-2012)

D1 30% Remedial Design Report In Situ Source Treatment Using Deep Soil Mixing for the Southwest Groundwater Plume Volatile Organic Compound Source at the C-747-C Oil Landfarm (Solid Waste Management Unit 1) DOE/LX/07-1276&D1 – KY Approved 08-28-2012

D1 60% Remedial Design Report In Situ Source Treatment Using Deep Soil Mixing for the Southwest Groundwater Plume Volatile Organic Compound Source at the C-747-C Oil Landfarm (Solid Waste Management Unit 1) DOE/LX/07-1276&D1 – KY Approved 11-09-2012

Groundwater Remedial Action – C-400 Building

The C-400 Building (Figure 12) was constructed early in the PGDP's history to serve as the primary parts cleaning facility for the plant. For decades, large quantities of TCE (a degreasing agent and probable human carcinogen) were used to clean parts and equipment. Over time, a significant but unknown quantity of TCE leaked from the building and entered the subsurface as a Dense Non-Aqueous Phase Liquid (DNAPL). The C-400 Building was identified in 1999 as being the most significant source of TCE to groundwater present at the PGDP. Electrical Resistance Heating (ERH) was selected in the August 2005 Record of Decision as the technology best suited to remediate this source of contamination.

For the purposes of this project, ERH was to be implemented in two phases. Phase I (completed) was designed to treat relatively shallow TCE contamination present at the southwest corner and eastern side of the building. Phase II would treat the more highly contaminated southeastern corner, including contamination located within the deeper Regional Gravel Aquifer (RGA).

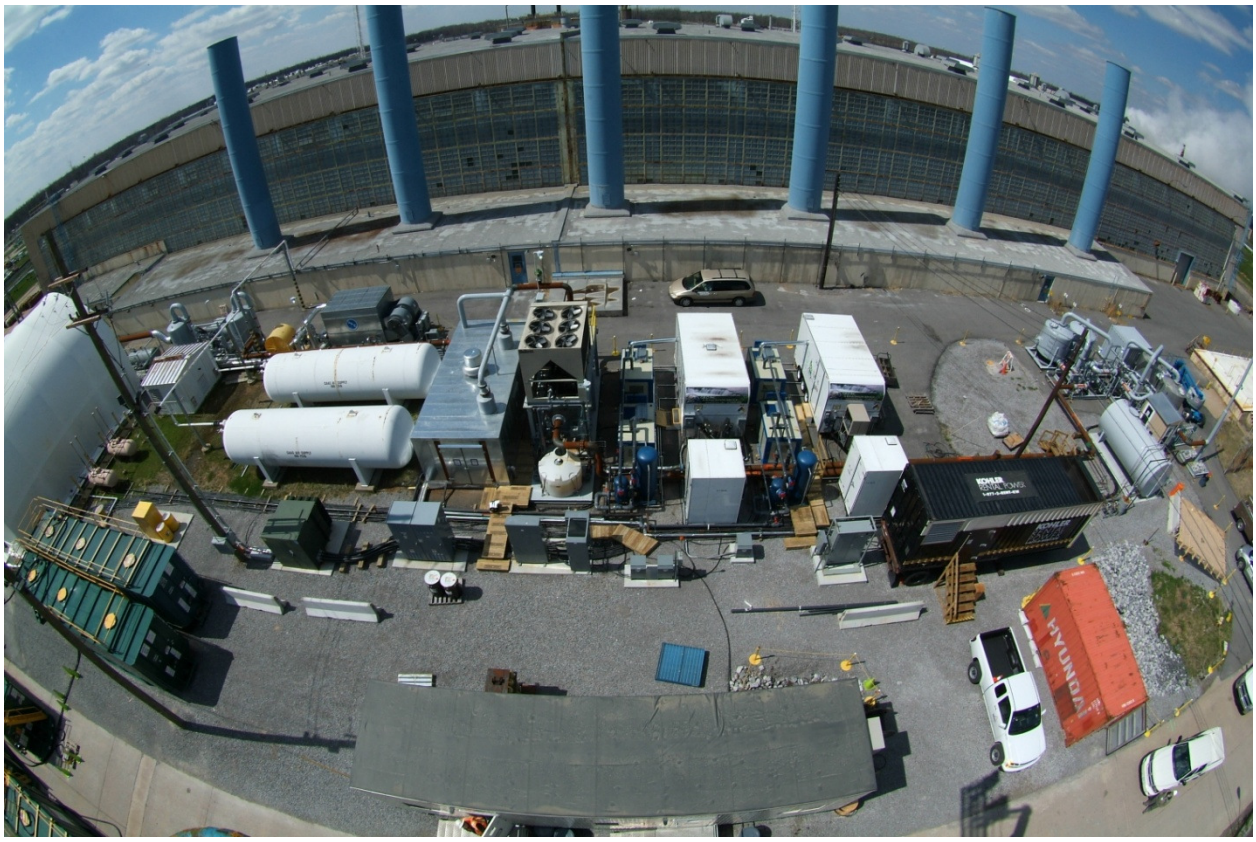

Figure 11. C-400 Groundwater/Vapor Treatment System

During the latter part of Phase I it became apparent there were issues with using ERH to heat the RGA. The ERH system was unable to generate the temperatures required to boil TCE deeper than about 10 to 15 feet into the aquifer. Consequently, DOE, Kentucky, and EPA agreed that a technology other than ERH should be used during Phase II of the remedial action to address TCE present in the lower RGA aquifer.

DOE's Revised Proposed Plan for the C-400 Interim Remedial Action received on December 21, 2011 sought to address the technical issues associated with heating the RGA by proposing a two-step approach to remediating the southeastern corner of C-400 (Phase II). Since ERH had worked well in the UCRS during Phase I, the proposal was to continue to use ERH to address TCE contamination present in the UCRS, but to utilize In-Situ Chemical Oxidation (ISCO) to treat the RGA. ISCO relies upon injected chemicals, or oxidants, to react with and destroy contaminants as they are circulated through the subsurface. On January 25, 2012, Kentucky formally agreed with DOE's recommendation to split Phase II of the project into two

sub-phases, Phase IIa and Phase IIb. However, the details presented in the Revised Proposed Plan continued to be debated.

On February 3, 2012, Kentucky submitted initial comments on the Revised Proposed Plan. In its comments, Kentucky expressed concern that the level of uncertainty surrounding the estimate of TCE mass remaining in the RGA would make it difficult to determine how much oxidant would be required if ISCO were to be implemented. Kentucky also noted that the Revised Proposed Plan was silent as to what oxidant would be used or how DOE would determine when enough oxidant had been added. The groundwater monitoring system as presented in the plan also appeared somewhat inadequate (only three monitoring wells were depicted). DOE later specified that potassium permanganate ($KMnO_4$) would likely be the oxidant used if ISCO were to be implemented and that the number of monitoring wells installed would be greater than that presented in the plan.

Following the agreement to bifurcate Phase II of the remedy into sub phases, DOE generated the first draft of its Remedial Design Report for Phase IIa of the project. Kentucky received this document on March 8, 2012 and transmitted its comments to DOE on April 9, 2012. Issues raised in Kentucky's comments included an identified scarcity of planned temperature monitoring points at the center of ERH heating arrays, concern regarding statements that air monitor interlocks intended to prevent the inadvertent release of contaminants to air might be temporarily disabled, and a lack of clarity regarding how hydraulic control would be monitored during remedy implantation. DOE's June 18, 2012 response to Kentucky's comments stated that it would address the lack of temperature sensors at the centers of arrays by relocating six (6) sensor wells to these locations. DOE also sought to alleviate Kentucky's concerns regarding the air monitoring interlock issue by indicating that manual monitoring would be conducted anytime that an interlock needed to be temporarily disabled. In addition, DOE clarified that hydraulic control would be maintained by extracting more water than was injected. Due to the fairly flat groundwater gradient near C-400, hydraulic control monitoring would rely more upon temperature monitoring outside the treatment zone and less upon automatic water level measurements. Kentucky granted final approval of the Remedial Design Report for Phase IIa on September 18, 2012.

Figure 12. C-400 Building

Kentucky received the D1 Remedial Action Work Plan (RAWP) for this project on April 30, 2012. In its comments, Kentucky requested additional information on the baseline sampling approach presented in the work plan which DOE subsequently provided. Kentucky also requested clarification as to why some locations specified in the work plan were to be sampled while others were not (e.g., boring D208). A DOE response was later given explaining why sampling was not needed in certain areas. In addition, DOE agreed to collect additional samples at location D208. Kentucky also stressed that downgradient monitoring wells should be installed following confirmation of groundwater flow direction near C-400. Kentucky suggested that upgradient wells could be installed first, thereby allowing them to be used to refine flow direction estimates before installing the downgradient wells. DOE proposed to address this issue during design rather than in the RAWP. Kentucky agreed and subsequently approved the final version of the Phase IIa RAWP on Sept 18, 2012. Installation of Phase IIa components at C-400 began later that month.

While Phase IIa of the C-400 project continued at a steady pace during 2012, Phase IIb was somewhat up in the air owing to the fact that a technology suitable for use in the RGA had yet to be agreed upon. In its D1 Proposed Plan, DOE had expressed a preference for using ISCO to treat the RGA beneath the building's southeastern corner but the regulators had expressed some reservations with this plan.

In an attempt to alleviate some of the regulator's concerns, DOE convened a two-day meeting in Nashville, Tennessee during which DOE, the regulators, and DOE's contractors discussed how ISCO might be successfully implemented in the RGA. During these discussions the regulators inquired as to how DOE would determine when ISCO treatment had succeeded. DOE suggested that a 90% reduction in dissolved-phase TCE concentrations would be a good metric against which to evaluate success. The regulators countered, suggesting that perhaps a hard limit of 1,100 ppb (0.1% of TCE solubility limit) would be more suitable. The regulators also expressed concern that perhaps another heating technology known as Steam Enhanced Extraction (SEE) had not been fully evaluated as a potentially viable remedial technology for the RGA. The regulators requested that DOE perform a fair and impartial technical evaluation of SEE relying in apart upon a simulation and cost estimate that would be provided by a reputable SEE vendor. The evaluation would also serve to compare SEE against the ISCO alternative. It was agreed that finalization of the Proposed Plan would be put on hold pending receipt and regulatory review of the technical evaluation.

DOE provided its evaluation titled, *Supplemental Technical and Cost Evaluations of In-Situ Chemical Oxidation and Steam Enhanced Extraction for the Phase IIb Portion of the C-400 Interim Remedial Action* to the regulators on Sept 14, 2012. One conclusion of the report was that ISCO was preferred by DOE and its contractor over SEE due in part to the uncertainty surrounding how SEE would perform in the RGA. The SEE technology uses steam injected at high pressures to heat and volatilize TCE or other volatile organic compounds. Similar to ERH, SEE also uses vapor extraction wells to remove the volatilized compounds from the subsurface. DOE's concern was that a phenomenon known as *steam override* which can occur in highly permeable and more homogeneous formations might become a problem in the RGA. Steam override prevents steam from penetrating very far laterally into a formation from a given injection point thereby limiting its effectiveness.

On Oct 23, 2012, in an attempt to further evaluate whether steam override would present a problem in the RGA, DOE agreed to contract with Dr. Ron Falta of Clemson University to perform a steam injection simulation. Results of this modeling were pending as of the end of 2012.

C-400 IRA Documents Reviewed In 2012:

D1 Revised Proposed Plan for Phase IIB of the Volatile Organic Compound Contamination at the C-400 Building DOE/LX/07-1263&D1 – (KY Submitted Comments 02-03-2012)

D1 Remedial Design Report, Certified for Construction Design Drawings and Technical Specifications Package for the Groundwater Operable Unit for the Phase IIa VOC Contamination at the C-400 Building. DOE/LX/07-1272&D1 – (KY Approved 04-09-2012)

D2 Remedial Design Report, Certified for Construction Design Drawings and Technical Specifications Package for the Groundwater Operable Unit for the Phase IIa VOC Contamination at the C-400 Building. DOE/LX/07-1272&D2 – (KY Approved 07-17-2012)

D2/R1 Remedial Design Report, Certified for Construction Design Drawings and Technical Specifications Package for the Groundwater Operable Unit for the Phase IIa VOC Contamination at the C-400 Building. DOE/LX/07-1272&D2/R1 – (KY Approved 09-18-2012)

D1 Addendum to Remedial Action Work Plan for Phase IIa of the Interim Remedial Action for the Volatile Organic Compound Contamination at the C-400 Cleaning Building. DOE/LX/07-1271&D1 – (KY Submitted Comments 05-31-2012)

D2 Addendum to Remedial Action Work Plan for Phase IIa of the Interim Remedial Action for the Volatile Organic Compound Contamination at the C-400 Cleaning Building. DOE/LX/07-1271&D2 – (KY Approved 07-30-2012**)**

D2/R1 Remedial Action Work Plan for Phase IIa of the Interim Remedial Action for the Volatile Organic Compound Contamination at the C-400 Cleaning Building. DOE/LX/07-1271&D2/R1 – (KY Approved 09-18-2012)

Burial Grounds Operable Unit

The historic generation of various types of waste materials at the PGDP led to the on-site subsurface disposal of some of these wastes in areas referred to as Burial Grounds. The existing Burial Grounds Operable Unit consists of 10 areas that are designated by their respective SWMU numbers as listed below:

SWMU 2 C-749 Uranium Burial Ground

SWMU 3 C-404 Low-Level Radioactive Waste Burial Grounds

SWMU 4 C-747 Contaminated Burial Yard and C-748-B Burial Area

SWMU 5 C-746-F Burial Yard

SWMU 6 C747-B Burial Grounds

SWMU 7 C-747-A Burial Grounds and Burn Area

SWMU 9 C-746-S Landfill

SWMU 10 C-746-T Landfill

SWMU 30 C-747-A Burial Grounds and Burn Area

SWMU 145 Area P

Disagreements between the parties pertaining to the Burial Grounds OU Feasibility Study (BGOU FS) eventually led to a formal dispute. Much of the disagreement related to how burial ground wastes should be classified in terms of its potential threat to human health and the environment. This dispute was resolved on Feb. 10, 2012.

Critical to the resolution was DOE's willingness to recognize that PTW is present at SWMUs 2, 3, 4 and 7. The final resolution agreement incorporated the resolution of 109 comments achieved during the earlier period of informal dispute. The parties also agreed that in order to make the project more manageable, the original FS would be separated into two separate feasibility study reports with SWMUs 5 and 6 being evaluated under one FS and SWMUs 2, 3, 7 and 30 being addressed under a second FS. It was similarly agreed that SWMU 4, another on-

site burial ground, would follow its own path to include further investigation followed by generation of a stand-alone FS.

SWMUs 5 and 6

The D2/R1 FS for SWMUs 5 and 6 was submitted by DOE on Feb. 29th. Kentucky conditionally concurred with the document on April 13th. Three meetings among the parties were held in May. Subsequently, DOE submitted the D2/R2 FS on Aug. 7 followed by a submittal of a D1 Proposed Plan on Aug. 25.

Kentucky invoked informal dispute on the D2/R2 FS for SWMUs 5 and 6 on Sept. 26. A primary basis for Kentucky's dispute was the inclusion of FS Alternative 2, which Kentucky deemed not to be protective of human health and the environment over the long-term. In addition, Kentucky also disagreed with the manner in which known seeps were addressed in the FS in that their potential risk appeared to be unnecessarily downplayed in the document. Kentucky also noted that text changes in the document appeared to minimize risk associated with buried waste and contamination at SWMU 5. Kentucky and EPA made a request to delay comment on the Proposed Plan until after the FS informal dispute had been resolved. Beginning in October, seven conference calls were held in an attempt to resolve the dispute. On Dec. 19, a Memorandum of Agreement (MOA) was signed by the three parties that formally ended the dispute. The MOA recognized that some Kentucky equivalent Nuclear Regulatory Commission regulations addressing near surface disposal of low level waste were ARAR while others were not. In addition, it was agreed that a RCRA Subtitle D engineered cap would meet the intent of Kentucky's regulations to prevent inadvertent intrusion into buried low-level waste at SMWU 5. Additional language was also added to address the potential for mobile contaminants to exit SWMU 5 via seeps. Lastly, it was agreed that Alternative 2 would not be carried forward for detailed analysis.

SWMUs 2, 3, 7 and 30

The D1 FS for SWMUs 2, 3, 7 and 30 was submitted to Kentucky on April 30th, 2012 for review. Kentucky submitted comments on the document on August 22. Two conference calls were

subsequently held at DOE's request during which Kentucky clarified some of its comments. It is anticipated that the D2 FS will be submitted to the regulators during the first quarter of 2013.

SWMU 4

The FFA parties continued to develop the SWMU 4 Sampling and Analysis Plan during the early part of 2012. The final D2/A2/R2 version of this plan was approved by Kentucky on July 11, 2012. This made it possible for field work to begin on Sept. 24 with the deployment of passive gas samplers. These samplers were retrieved 14 days later and sent off for analysis. Surface soil sampling then began on Oct 16 with data from the passive gas samplers being used to guide the placement of 20 foot deep soil sample borings. A conference call was held on Nov. 13 during which the FFA parties discussed potential future soil boring locations.

BGOU Documents Reviewed in 2012:

Feasibility Study for the Solid Waste Management Units 5 and 6 of the Burial Grounds Operable Unit (DOE/LX/07-130a&D2/R1) – (KY Submitted Comments 4-13-12)

Feasibility Study for the Solid Waste Management Units 5 and 6 of the Burial Grounds Operable Unit (DOE/LX/07-130a&D2/R2) – (KY Submitted Non-Concurrence 12-19-12)

Proposed Plan for the Burial Grounds Operable Unit Source Areas: Solid Waste Management Units 5 and 6 (DOE/LX/07-1275&D1) – (KY Approved 12-19-12)

April 2012, Feasibility Study for the Solid Waste Management Units 2, 3, 7 and306 of the Burial Grounds Operable Unit (DOE/LX/07-1274&D1) – (KY Submitted Comments 8-22-12)

Addendum to the Work Plan for the BGOU RI/FS, Solid Waste Management Unit 4 Sampling and Analysis Plan (DOE/OR/07-2179&D2/A2/R1) – (KY Submitted Comments 5-24-12)

Addendum to the Work Plan for the BGOU RI/FS, Solid Waste Management Unit 4 Sampling and Analysis Plan (DOE/OR/07-2179&D2/A2/R2) – (KY Approved 7-10-12)

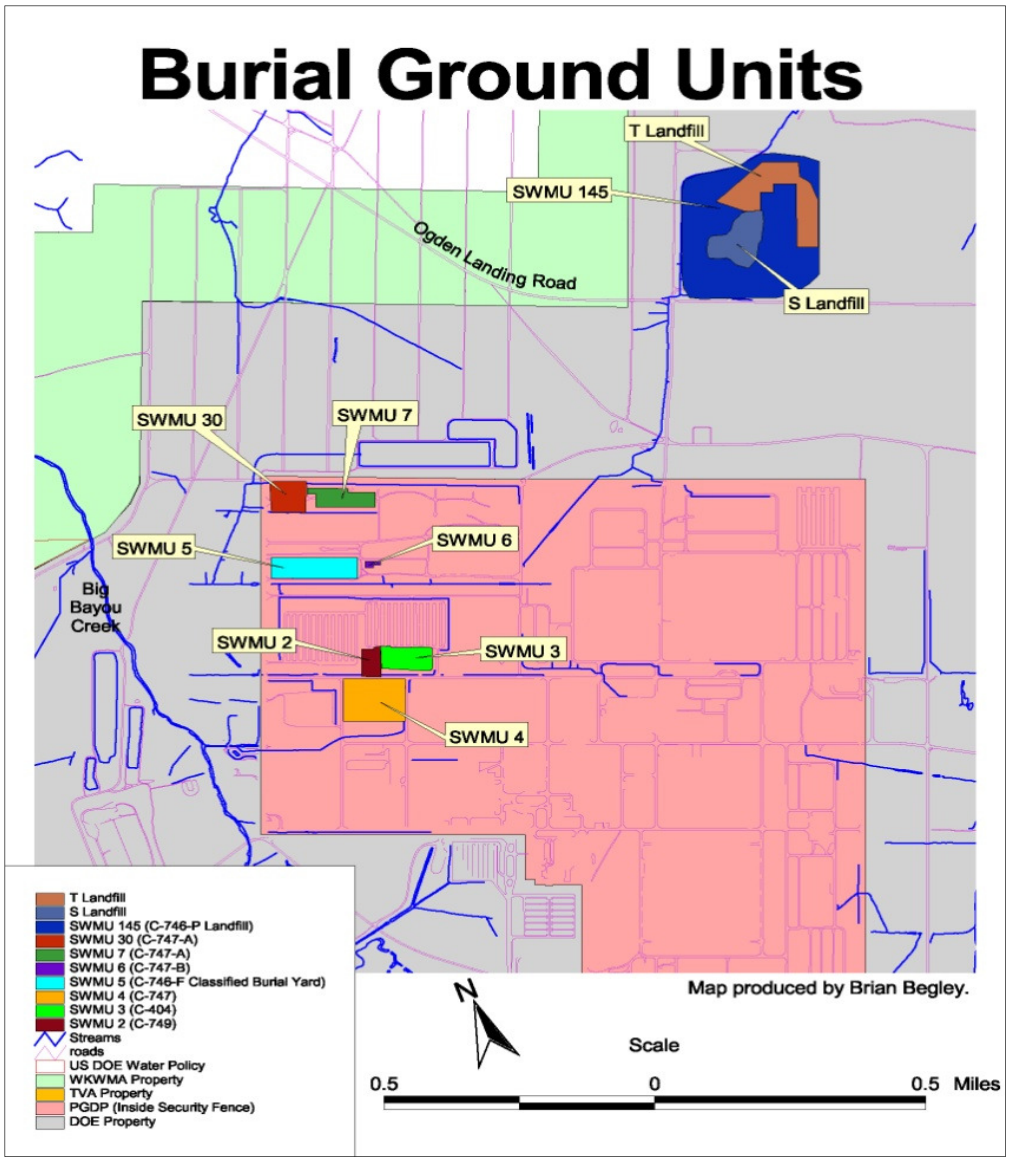

Figure 13. BGOU Units

Soils Operable Unit

As with the other PGDP operable units, the Soils Operable Unit (OU) is a grouping of contaminant source areas being addressed through remediation and removal actions. The Soils OU includes a range of sites with different sizes, locations, and impacts associated with a range of historical activities, all of which can affect potential current and future distribution of contamination. Historical activities resulting in contamination included: spills; the creation of

scrap yards, soil or rubble piles; the release of PCB to soils; and impacts from a range of other discrete activities. The prevalent contaminants found in soils at PGDP are polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs) [benzo(a)pyrene equivalents], Tc-99, and uranium in various isotopic forms. As a general rule, soil depths investigated as part of the Soils OU are limited to 0-10 feet below ground surface and up to 16 feet below ground surface in areas containing subsurface pipelines. Any contamination existing beneath these depths would be addressed by the Groundwater OU.

Numerous comment resolution meetings were held from January through September to discuss the D1 Soils OU Remedial Investigation Report. During these meetings the SWMUs covered in the original RI were assessed for completeness of characterization. The fifty SWMUs deemed complete were included in the D2 version of this RI. The sixteen SWMUs needing further work were postponed to a second RI. Twenty others were placed in the Soils and Slabs OU, thereby effectively postponing further investigation of these units until after plant shutdown.

The Soil OU RI Report D2 was received on Oct. 2, 2012. Following some additional conference calls, the Division sent its conditional concurrence letter to DOE on Dec. 27, 2012. This letter contained 24 conditions that DOE was to meet before Kentucky approval could be granted. A response from DOE will be forthcoming in 2013.

Soils Operable Unit Documents reviewed in 2012:

Soils Operable Unit Remedial Investigation Report at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE/LX/07-0358&D2) – (KY Submitted Comments 12-27-12)

Sitewide Evaluation Report

Following the discovery of contaminated soil piles (Figure 14) east of the plant, Kentucky requested that DOE provide a Sitewide Evaluation Work Plan and subsequent report to address any previously unaccounted for areas of radiological contamination that might be present on publicly accessible portions of the PGDP reservation. Kentucky specified that DOE would have to comply with these requests as a condition of Kentucky's certifying that human health exposures were in fact under control at the PGDP in accordance with the EPA-mandated Environmental Indicators (EIs) determination.

EIs are EPA defined interim cleanup milestones used to demonstrate incremental progress towards the goal of final site cleanup. One of these EIs is a demonstration that current human exposures to site contaminants are under control. In order for human exposures to be considered under control, a site must demonstrate or take action to ensure that current human exposures to known site-related contaminants are below appropriate risk-based levels of concern. EPA authorizes certain authorized states, such as Kentucky, to perform these determinations.

The purpose of the Sitewide Evaluation Work Plan was to provide the details as to how DOE would identify areas accessible to the public that might contain radiologically contaminated soils and/or rubble. These areas would only be a concern if, when evaluated relative to a teen recreational user exposure scenario, they would result in this receptor receiving an unacceptably high annual radiological exposure. The radiological contaminant of greatest concern for the purposes of identifying publicly accessible contamination is U-238. As originally scoped, work to be completed under the Work Plan included aerial and radiological flyover surveys of DOE owned and adjacent property, a visual walkover survey to further assist in identifying anomalies (e.g., soil and rubble areas), and a radiological walkover survey to identify any anomalies that might exhibit radioactivity in excess of twice gamma background. The latter two surveys were to be confined to DOE property located outside the Limited Security Area (the fenced industrialized portion of the site).

In September 2009, DOE informally submitted an internal draft of the Sitewide Evaluation Work Plan to Kentucky for review and comment. In its comments transmitted to DOE in January 2011,

Kentucky identified what it believed to be several shortcomings within the draft document. Many of the issues identified were related to a lack of detail in the document as to what specific actions were to be taken in the field. Other comments took the form of requests for further clarification of the meaning of material presented in the draft document. For instance, it was requested that the official first draft of the document include additional maps such as one that would depict the area to be covered by the 100 percent visual survey included as part of the work scope. In addition, clarification was requested regarding a statement that appeared to suggest that aerial surveys might take the place of walkover surveys in some areas, an approach that Kentucky rejected. Kentucky also requested changes to allow for the collection of additional environmental samples from any areas identified as "hot spots" during the course of the walkover survey.

Figure 14. Radiological Surveying of a Typical Soil Pile

Other issues raised in Kentucky's comments dealt with the manner in which the radiation walkover surveys would be completed. For example, DOE was asked to specify whether the surveys would be completed on foot or using a motorized vehicle. Clarification as to this point

was important because radiological sensors attached to a motorized vehicle moving too fast (e.g., greater than 5 mph) would be unlikely to accurately detect the presence of radiological contamination. DOE was also asked to indicate how it intended to detect U-238 at levels in excess of measured background and no-action levels derived for the teen recreational user. Essentially, this question pertained to the instrumentation that DOE intended to use to complete its survey. These comments and questions were transmitted to DOE on January 27, 2011.

On Jan. 30, 2012, DOE requested an extension for issuing the D1 Site Evaluation Report (SER) to March 5, 2013. This extension would allow DOE the time to develop and issue a technical memorandum and survey plan to address regulator concerns, revise the work plan, conduct additional characterization activities and incorporate those results into the D1 SER. Kentucky approved the extension on Feb. 9, 2012. Several meetings were then held to address technical issues but before all work could be completed, budget constraints prevented further work on the project.

Decontamination and Decommissioning Operable Unit

Across the country, aging DOE facilities contain structures that are contaminated and no longer serve a useful purpose. Many of these structures no longer have an active mission, are in a state of disrepair and contain radioactive and other dangerous contaminants. The process of addressing these structures is referred to as Decontamination and Decommissioning (D&D). The PGDP has numerous structures that will eventually be subject to the D&D process. At present, only those inactive structures under DOE management that are not being used to support the U.S. Enrichment Corporation's uranium enrichment activities, are being addressed under DOE's D&D program. The D&D activities conducted in 2012 included those associated with the C-410/420 Complex and the C-340 Complex as described below.

C-410/420 Complex Infrastructure D&D

The C-410/420 Complex is undergoing D&D under a pre-existing CERCLA non-time critical (NTC) removal action. The removal process was initiated in 2003 and covered the removal and

subsequent disposition of all equipment, piping and various other materials from inside the complex's buildings (essentially the complete gutting of the buildings).

Several D&D milestones were achieved in 2012. For instance, isolation was completed on the 15 cold traps and final capping in preparation for storage was initiated. Equipment removal from the Zone 53 basement and removal/stabilization of the UF-6 production systems were completed. In addition, stabilization of the HVAC systems throughout the building continued and stabilization was completed on the fluorine clean-up reactor. The vacuum system was also completely removed or stabilized and asbestos removal continued throughout the structure. Lastly, all water was pumped from the Zone 54 basement.

Figure 15. C-410/420 Exterior

Figure 16. Interior of C-410 – D&D Activities Underway

C-340 Complex Infrastructure D&D

D&D activities at the C-340 Complex continued in 2012. Interior fixative application was completed and the equipment was demobilized. PCB sample results were evaluated and the data was used to develop a strategy for waste segregation and disposal.

On Jan. 6, 2012, DOE submitted a D2/A1 Action Memorandum Addendum for the C-340 Metals Reduction Complex. In this addendum, DOE requested an ARAR waiver that would permit use of an alternative approach to transite removal. Transite panels form the outer walls of the building and must be removed prior to final building demolition. Kentucky, citing an inconsistency with its regulations, declined to approve the Addendum and deferred to EPA any decision on the waiver request. EPA then requested that DOE withdraw the Addendum. Manual transite removal consistent with the original Action Memorandum commenced on Aug. 22, 2012 and final demolition of the structure began on Sept. 26 of the same year.

Figure 17. Partial Demolition of C-340 Building

D&D Documents Reviewed in 2012

Action Memorandum Addendum for the C-340 Metals Reduction Plant Complex, DOE/LX/07-0290&D2/A1 – (Kentucky Submitted Non-Concurrence 1-26-12)

Waste Management

Waste Disposition Options (WDO) Project

In early 2000, DOE, EPA, and Kentucky began considering the potential construction of an on-site CERCLA waste repository (*i.e.*, CERCLA cell) to permanently dispose of remediation and D&D wastes generated at the Paducah Gaseous Diffusion Plant (PGDP). This approach to waste disposal is consistent with that utilized at several other DOE sites around the country such as the Oak Ridge Reservation in Tennessee and the Hanford site in Washington. As much as 3.7 million cubic yards of waste are projected to be generated at the PGDP during the course of site cleanup, much of it when several large process buildings are eventually

demolished. An on-site repository would allow the site to safely dispose of non-hazardous, hazardous, TSCA, low-level radioactive and low-level radioactive mixed wastes on-site, thereby avoiding more costly off-site disposal. However, the option to ship all or a portion of the waste offsite to a DOE owned or commercial waste facility still exists. All waste management options under consideration are being evaluated in a feasibility study using criteria prescribed under CERCLA.

Options being evaluated are grouped into the broad categories of on-site disposal versus off-site disposal. Since it is somewhat uncertain as to how much waste will actually require disposal, both the on-site and off-site alternatives are further broken down into subcategories based upon certain assumptions. For instance, the base case subcategory assumes that some of the waste generated will go to an existing on-site solid waste landfill whereas the high volume subcategory assumes that this landfill will not be available for use and that all waste will require disposal in an on-site cell or transport and subsequent disposition in an off-site landfill.

A significant element in the evaluation of the on-site repository option is the development of the Preliminary Waste Acceptance Criteria, or PWAC. The PWAC provides a first estimate of how much contaminated waste an on-site CERCLA cell could contain and still remain protective of a future groundwater user located near the landfill. The PWAC is designed to be conservative so that it can be safely assumed that a leaking landfill containing this quantity of contamination would not contaminate groundwater above a known level of concern.

In May 2012 DOE issued a first draft of its waste disposal alternatives feasibility study which contained calculated PWAC values for multiple contaminants that may be disposed of in an on-site repository. Kentucky reviewed this draft and provided comments to DOE and its contractor in September of that year.

While the document largely followed the format agreed to in the feasibility study work plan approved in 2011, Kentucky noticed a deviation from the approved approach to modeling landfill performance that effectively prevented the model from allowing as much water to contact the waste. In the model, this had the effect of decreasing the amount of contamination that could reach a potential groundwater user. For some highly mobile contaminants (e.g., Tc-99), the end result was that the amount of contaminant that the model predicted could be disposed of safely

in the landfill (i.e., the PWAC) was increased relative to what the model would have predicted had it been run as prescribed in the approved work plan. This oversight was brought to DOE's attention and was subsequently corrected. However, DOE retained the right to argue in the future that it is technically possible to construct an landfill drainage layer that will continue to shed water from the landfill's cap for many hundreds of years into the future, thereby preventing greater amounts of water from contacting the waste. If this could be demonstrated to the regulator's satisfaction, DOE would ultimately be allowed to place larger quantities of certain mobile contaminants in a future on-site cell.

In its comments, Kentucky also noted that certain relatively immobile contaminants that would likely be placed into an on-site cell, although not limited by their ability to contaminate groundwater, would nonetheless require concentration and mass-based restrictions due to their propensity to become more toxic over time and their potential to harm an inadvertent intruder. DOE has agreed to evaluate these types of contaminants during the development of the final waste acceptance criteria assuming a cell is to be constructed on-site.

Following finalization of the feasibility study DOE will issue a Proposed Plan that will include a description of the preferred alternative. The public will then be asked to provide input regarding this preferred alternative. A decision as to whether the on-site option is selected is expected sometime in 2014.

Waste Dispositions Options Documents Reviewed In 2012:

Remedial Investigation/Feasibility Study for CERCLA Waste Alternatives Evaluation (DOE/LX/07-0244&D1) – (KY Submitted Comments 9-12-12).

Solid Waste Management Units (SWMUs)

During the reporting period from Jan. 1 to Dec. 31, 2012, Kentucky received one SWMU Assessment Report (SAR) Revision and granted three No Further Action (NFA) status requests. Additionally, SARs were submitted by DOE for two newly identified SMWUs. There are currently no SWMUs listed in either Appendix A-4(a) (DOE Material Storage Areas for which the permittee has submitted SARs and are Under Review by the Cabinet) or in Appendix A-4(b)

(SWMUs Under Review by the Cabinet) in the PGDP Permit. A summary of SWMU activity during 2012 is presented below.

TABLE 1

REVISED AND NEWLY-DISCOVERED SWMU ASSESSMENT REPORTS SUBMITTED TO KENTUCKY BETWEEN JANUARY 1 AND DECEMBER 31, 2012

SWMU Number	Name	OU Location	Sub-project	Status	SAR Report Date	Date(s) SAR Amended	Date of NFA or RFI
12	C-747-A UF_4 Drum Yard	N/A	N/A	Under Review	8/24/1987	3/16/2012	N/A
569	C-743-T17 Sample Return Refrig	N/A	N/A	Under Review	5/23/2012	N/A	N/A
570	Sample Return Sealand	N/A	N/A	Under Review	5/23/2012	N/A	N/A

TABLE 2

SOLID WASTE MANAGEMENT UNITS FOR WHICH KENTUCKY GRANTED NO FURTHER ACTION STATUS BETWEEN JANUARY 1 AND DECEMBER 31, 2012

SWMU Number	Name	OU Location	Sub-project	Status	SAR Report Date	Date(s) SAR Amended	Date of NFA or RFI
12	C-747-A UF_4 Drum Yard	N/A	N/A	NFA	8/24/1987	3/16/2012	4/24/2012
569	C-743-T17 Sample Return Refrigerator	N/A	N/A	NFA	5/23/2012	N/A	5/24/2012
570	Sample Return Sealand	N/A	N/A	NFA	5/23/2012	N/A	5/24/2012

SWMU Documents Reviewed In 2012:

4/16/12: Received Revised SARs for SWMU 12

4/24/12: Granted No Further Action status to SWMU 12

5/23/12: Received SAR for Newly Discovered SWMUs 569 & 570

5/24/12: Granted No Further Action status to SWMUs 569 & 570