8 Nonradiological Environmental Surveillance

Abstract

The nonradiological environmental surveillance program at the Paducah Site assesses the effects of DOE operations on the site and the surrounding environment. Surveillance includes analyses of air, surface water, groundwater (Section 9), sediment, soil, vegetation, terrestrial wildlife, fish, and other aquatic life. Surveillance results for 2004 were similar to results reported in previous ASERs.

Introduction

Nonradiological surveillance at the Paducah Site involves the sampling and analysis of surface water, groundwater (Section 9), sediment, soil, terrestrial wildlife, fish, and other aquatic life. This section discusses the non-radiological results of surveillance activities.

Ambient Air

As a result of the transfer of the operations of the plant to USEC in 1993, major air emission sources were transferred to USEC. Therefore, DOE does not conduct ambient air monitoring for nonradiological parameters at the Paducah Site.

Surface Water

Surface-water monitoring (except for biological monitoring) downstream of KPDES outfalls is not required by the KPDES permit. However, it is performed at the Paducah Site as part of the Environmental Surveillance Program. Figure 5.2 shows surveillance surface-water sampling locations. Nonradiological sampling is conducted at upstream Bayou Creek (L1); downstream Bayou Creek (L5 and L6) and downstream Little Bayou Creek (L11, L12, and L241); the convergence of both creeks (L8), upstream Ohio River (L29), downstream Ohio River (L30); downstream Ohio River at the confluence with the Mississippi River (L306), which is the closest public drinking water supply source downstream of the plant; and background stream Massac Creek (L64). Samples were also collected near the plant from Bayou Creek (C612, C616, K006, and L291), Little Bayou Creek (K002, L10, L55, L56, and L194), and at the C-746-K Landfill (C746K-5, C746KTB1, and C746KUP). No sample point exists for upstream Little Bayou Creek because the watershed is insufficient to develop adequate flow to monitor. Nearly all the water in Little Bayou Creek is comprised of discharges from the plant outfalls. Therefore, background water quality for Little Bayou Creek is based on L1 (upstream Bayou Creek). L29 and L64 are background waterways also used for comparison

with data from Little Bayou Creek. Table 8.1 shows the analytical parameters that are analyzed on a quarterly or semiannual basis.

As described in Chapter 5, locations in Little Bayou Creek (LBCSP1 through LBCSP6) were added to the surface-water sampling program in 2002. These locations, known as seeps, are upwellings of groundwater in the Little Bayou Creek bed. Six locations were chosen to sample each quarter to trend and observe changes in data. These locations are downstream of the plant site approximately halfway between the site and the Ohio River (Figure 5.2). Table 8.1 does not apply to the quarterly seep locations. Similar to the groundwater sampling program, a different list of analytical parameters, presented in Table 8.2, was collected.

Surface-Water Surveillance Results

Table 8.3 shows a water-chemistry comparison between upstream and downstream locations associated with the plant by presenting the maximum average concentrations of selected parameters. Similar to 2002 and 2003, in 2004 the only results of significance were identified near the plant site and downstream of Little Bayou Creek.These results averaged a concentration of 1.6 and 37.75 µg/L, respectively, which is slightly higher than 2003. TCE was also detected at upstream Bayou Creek (L1) at 2.6 µg/L.

Table 8.4 also presents the maximum average concentrations of selected parameters for the seep sampling locations. One of the six Little Bayou Creek seep locations, LBCSP5, had the highest maximum average for TCE at 437.5 µg/L, which increased significantly from 232.5 µg/L in 2003.

Compared to background, TCE is only identified above background at the seep locations, which are related to groundwater contamination at the surface.

Similar to 2003, in 2004 there were no detections of surface-water PCBs. This is a decrease in PCB concentrations from 2002, which had PCB aroclors detected at low levels near the plant site on both Bayou Creek and Little Bayou Creek. Additionally, there were no detections of PCBs in surface water in 2001.

Additional data are presented in Section 4, Tables 4.1 through 4.29, of the *Environmental Monitoring Results Annual Site Environmental Report, Calendar Year 2004, Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE/OR/07-2233 Volume II).

When compared with applicable KPDES permitted levels, 2004 surface water surveillance results indicate that there is not a threat to human health and the environment.

Sediment

Sediment is an important constituent of the aquatic environment. If a pollutant is a suspended solid or is attached to suspended sediment, it can settle to the bottom (thus creating the need for sediment sampling), be taken up by certain organisms, or become attached to plant surfaces. Pollutants transported by water can either adsorb on organic and inorganic solids or be assimilated by plants and animals. Suspended solids, dead biota, and excreta settle to the bottom and become part of the organic substrata that support the bottom-dwelling community of organisms. Sediments play a significant role in aquatic ecology by serving as a repository for radioactive or chemical substances that pass via bottom-feeding biota to the higher trophic levels.

Sediment Surveillance Program

Ditch sediments are sampled semiannually as part of a nonradiological environmental surveillance program. Sediment samples were taken from 16 locations in 2004 (Figure 5.3). Sediments were sampled for the parameters listed in Table 8.5.

Sediment Surveillance Results

Table 8.6 shows the average values for locations within the area group for specific parameters. Parameters were selected to include those that were detected. The results of detected parameters are compared to determine the difference between upstream (or background) and downstream concentrations. Aluminum, barium, calcium, chromium, cobalt, copper, iron, magnesium, manganese, potassium, selenium, and vanadium were detected at all sites. The highest levels of metals were seen at the NSDD, Bayou Creek near the plant site, and Little Bayou Creek near the plant site. Consistent with 2002 and 2003, chromium was identified in the NSDD at 59.5 mg/kg and near the plant site on Little Bayou Creek at 130.6 mg/kg

Table 8.1 Nonradiological parameters for surface-water samples

Parameter
Chloride
Nitrate/Nitrite as Nitrogen
Sulfate
Alkalinity
Conductivity
Dissolved Oxygen
Flow Rate
pH
Temperature
Aluminum
Antimony
Arsenic
Barium
Beryllium
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Magnesium
Manganese
Mercury
Nickel
Phosphorous
Potassium
Selenium
Silver
Sodium
Thallium
Uranium
Vanadium
Zinc
PCB Aroclors
Polychlorinated biphenyl, Total
1,1,1-Trichloroethane
1,1,2-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
1,2-Dichloroethane
1,2-Dimethylbenzene
Benzene
Bromodichloromethane
Carbon tetrachloride
Chloroform
cis-1,2-Dichloroethene
Ethylbenzene
m,p-Xylene
Tetrachloroethene
Toluene
trans-1,2-Dichloroethene
Trichloroethene
Vinyl chloride
Ammonia
Cyanide
Hardness - Total as CaCO3
Suspended Solids

Table 8.2 Nonradiological parameters for surface-water seep-sampling locations

Parameter
Chloride
Sulfate
Alkalinity
Conductivity
Dissolved Oxygen
Flow Rate
pH
Temperature
Calcium
Magnesium
Manganese
Potassium
Sodium
Uranium
1,1,1-Trichloroethane
1,1,2-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
1,2-Dichloroethane
1,2-Dimethylbenzene
Benzene
Bromodichloromethane
Carbon tetrachloride
Chloroform
cis-1,2-Dichloroethene
Ethylbenzene
m,p-Xylene
Tetrachloroethene
Toluene
trans-1,2-Dichloroethene
Trichloroethene
Vinyl chloride

Table 8.3 Selected routine nonradiological surface-water surveillance results (average concentrations)[a]

Parameter	Upstream Bayou[1]	Bayou Near Site[2]	Downstream Bayou[3]	Little Bayou Near Site[4]	Downstream Little Bayou[5]	Creek Convergence[6]	C-746-K Landfill Area[7]	Upstream Ohio River[8]	Downstream Ohio River[9]	Massac Creek[10]	Cairo, IL[11]
Aluminum (mg/L)	0.886	1.320	0.443	**1.649**	1.216	0.545	0.451	0.627	0.606	0.240	0.398
Ammonia (mg/L)	ND	**0.425**	0.23	0.275	ND	ND	0.26	ND	ND	ND	ND
Barium (mg/L)	0.045	**0.126**	0.037	0.121	0.082	0.042	0.056	0.027	0.029	0.048	0.043
Calcium (mg/L)	14.9	**88.2**	39.3	31.6	38.2	27.0	18.6	20.5	25.1	12.9	37.2
Chloride (mg/L)	12.0	**141.3**	48.7	42.4	22.4	25.0	21.0	7.7	9.3	11.8	23.4
Cobalt (mg/L)	ND	0.0061	**0.0017**	ND	0.0015	0.0012	ND	ND	ND	ND	ND
Copper (mg/L)	0.0093	0.0123	0.0120	**0.0128**	0.0083	ND	0.0089	ND	ND	0.0116	ND
Hardness ($CaCO_3$) (mg/L)	53.25	**321.25**	145.50	112.25	120.33	105.33	68.80	75.33	89.00	49.00	124.33
Iron (mg/L)	0.572	**1.953**	0.553	1.341	1.031	0.826	0.565	0.512	0.433	0.758	0.496
Lead (mg/L)	ND	**0.0061**	ND	ND	ND	ND	ND	ND	ND	ND	ND
Magnesium (mg/L)	2.59	**33.58**	13.01	8.43	6.36	8.55	4.08	4.72	6.10	3.08	11.97
Manganese (mg/L)	0.13	0.14	0.08	0.23	**0.37**	0.21	0.11	0.08	0.06	0.28	0.06
Nickel (mg/L)	ND	0.0152	0.0088	**0.0747**	ND	ND	ND	ND	ND	ND	ND
Nitrate as Nitrogen (mg/L)	0.63	**2.81**	1.39	1.03	1.27	1.11	0.68	0.42	0.94	0.70	1.20
PCB-1260 (mg/L)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1268 (mg/L)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phosphorous (mg/L)	0.12	**0.29**	0.15	0.22	0.13	0.11	0.08	0.11	0.11	0.06	0.12
Potassium (mg/L)	2.925	**23.6**	8.04	2.73	2.55	4.09	3.60	1.72	1.87	2.47	2.64
Suspended Solids (mg/L)	ND	25.5	ND	43	14	29	ND	**35**	26	ND	34.5
Trichloroethene (mg/L)	2.3	1.6	ND	ND	**37.75**	ND	ND	ND	ND	ND	ND
Uranium (mg/L)	ND	0.003	**0.054**	0.017	0.008	0.002	0.006	ND	ND	ND	ND
Zinc (mg/L)	ND	**0.0564**	0.0265	0.03435	ND	ND	ND	ND	ND	ND	ND

a = The results presented in the table are the average values for the locations within the area grouping using the highest value for each location in the average calculations.
Bold values indicate the highest concentrations for the parameter specified.
ND = Not detected

The following footnotes correspond with column titles in the above table. These are groupings of sample locations in the area described in the title.

1 = L1
2 = C612, C616, K006, L291
3 = L5, L6
4 = K002, L10, L55, L56, L194
5 = L11, L12, L241
6 = L8
7 = C746K-5, C746KTB1, C746KUP
8 = L29
9 = L30
10 = L64
11 = L306

Table 8.4 Selected routine nonradiological surface-water seep-sampling surveillance results (average concentrations)[a]

Parameter	LBCSP1	LBCSP2	LBCSP3	LBCSP4	LBCSP5	LBCSP6
Calcium (mg/L)	22.1	24.9	24.9	**26.6**	23.9	21.7
Magnesium (mg/L)	8.59	9.33	9.00	**9.45**	8.52	7.73
Manganese (mg/L)	0.0196	0.0162	0.0272	0.0055	0.0061	**0.0796**
Potassium (mg/L)	**2.12**	1.64	1.51	1.68	1.59	1.61
Sodium (mg/L)	30.38	30.35	31.80	**32.83**	32.15	30.23
Sulfate (mg/L)	12.2	12.2	11.5	13.0	**15.0**	14.7
Trichloroethene (mg/L)	4.2	9.1	24.8	22.5	**437.5**	192.5

a = The results presented in the table are the average values for the locations within the area grouping using the highest value for each location in the average calculations.

Bold values indicate the highest concentrations for the parameter specified.

Seep sampling is representative of groundwater. Seep sampling results are compared to groundwater MCLs for evaluation. Sample results for TCE at a surface water location downstream of the seeps showed levels less than the KPDES permitted level of 81 µg/L.

Table 8.5 Semiannual nonradiological parameters for sediment samples.

Parameter		
Grain Size Diameter	Lead	Zinc
Aluminum	Magnesium	PCB-1016
Antimony	Manganese	PCB-1221
Arsenic	Mercury	PCB-1232
Barium	Nickel	PCB-1242
Beryllium	Potassium	PCB-1248
Cadmium	Selenium	PCB-1254
Calcium	Silver	PCB-1260
Chromium	Sodium	PCB-1268
Cobalt	Thallium	Polychlorinated Biphenyl
Copper	Uranium	Moisture
Iron	Vanadium	Total Organic Carbon (TOC)

Table 8.6 Selected routine nonradiological sediment surveillance results (average concentrations)[a]

Parameter	Upstream Bayou[1]	Bayou Near Site[2]	Downstream Bayou[3]	Upstream Little Bayou[4]	Little Bayou Near Site[5]	Downstream Little Bayou[6]	C-746-K Area[7]	NSDD[8]	Massac Creek[9]
Aluminum (mg/kg)	2765	6580	4500	7025	6190	3285	2930	**7210**	3350
Arsenic (mg/kg)	ND	6.4	**8.1**	ND	ND	ND	ND	ND	ND
Barium (mg/kg)	31.5	**68.6**	42.0	57.5	63.0	28.9	34.2	52.0	35.1
Beryllium (mg/kg)	ND	0.60	ND	0.51	**0.65**	ND	0.31	0.51	ND
Cadmium (mg/kg)	ND	1.3	ND	ND	**2.1**	ND	ND	ND	ND
Calcium (mg/kg)	574	**6465**	633	1190	1145	574	914	2155	410
Chromium (mg/kg)	6.1	40.7	8.7	12.9	**130.6**	18.0	13.4	59.5	5.6
Cobalt (mg/kg)	3.0	5.2	2.7	4.5	**5.5**	2.4	3.1	2.7	3.3
Copper (mg/kg)	4.9	28.9	5.9	6.7	11.5	12.0	11.2	**51.4**	6.6
Iron (mg/kg)	5765	**11250**	5470	10665	10095	4615	6305	9240	4955
Lead (mg/kg)	ND	ND	ND	ND	**19**	ND	ND	ND	ND
Magnesium (mg/kg)	298	766	431	663	446	294	345	**831**	333
Manganese (mg/kg)	256	159	265	159	404	140	**297**	112	244
Mercury (mg/kg)	ND	**0.53**	ND	ND	ND	ND	ND	0.24	ND
Nickel (mg/kg)	3	12	ND	5	5	ND	4	**26**	ND
PCB-1248 (µg/kg)	ND	ND	ND	ND	ND	ND	ND	**2280**	ND
PCB-1254 (µg/kg)	ND	ND	ND	ND	ND	ND	ND	**805**	ND
PCB-1260 (µg/kg)	ND	ND	ND	ND	260	ND	ND	**395**	ND
PCB-1268 (µg/kg)	ND	ND	ND	ND	ND	**120**	ND	ND	ND
Potassium (mg/kg)	189	519	389	263	253	209	190	**596**	279
Selenium (mg/kg)	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silver (mg/kg)	ND	ND	ND	ND	ND	ND	ND	**2**	ND
Sodium (mg/kg)	ND	**232**	100	122	ND	ND	100	ND	ND
Thallium (mg/kg)	ND	ND	ND	ND	ND	ND	ND	ND	ND
Uranium (mg/kg)	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium (mg/kg)	10.9	20.0	11.3	**20.2**	20.0	8.6	14.3	18.1	9.5
Zinc (mg/kg)	12	**100**	24	16	77	25	25	59	ND

a = The results presented in the table are the average values for the locations within the area grouping using the highest value for each location in the average calculations.
Bold values indicate the highest concentrations for the parameter specified.
ND = Not detected

The following footnotes correspond with column titles in the above table. These are groupings of sample locations in the area described in the title.
1 = S20 (background location to 2 and 3)
2 = C612, C616, K001, S1, S31
3 = S33
4 = S21 (background location to 5 and 6)
5 = S2, S30
6 = S27, S34
7 = C746KTB2, C746KUP (background location to 8 and 9)
8 = S32
9 = S28

(highest level). Arsenic was found downstream in Bayou Creek and near the plant site. Zinc was found at all locations, except the reference site. Generally, contaminants are more abundant near the plant site and decrease in areas downstream of the plant site.

Polychlorinated biphenyls were found in the NSDD, Little Bayou Creek near the plant site, and downstream Little Bayou Creek with the highest levels seen at the NSDD. The most abundant aroclor was PCB-1260. Additional sediment data are presented in Section 4, tables 4.30 through 4.45, of the *Environmental Monitoring Results Annual Site Environmental Report, Calendar Year 2004, Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE/OR/07-2233 Volume II).

Results are consistent with levels seen in previous years' data. These areas are either within the DOE-controlled area or are posted for protection of the public.

Soil

The major source of soil contamination is from air pathways. Because DOE no longer controls any major air emission sources, routine soil surveillance is not performed. However, surface soil contamination is being addressed by the Surface Soils OU (see Environmental Restoration Program in Section 3).

Vegetation

Because DOE no longer operates any major air emission sources, routine vegetation surveillance activities are not performed.

Terrestrial Wildlife

Annual Deer Harvest

The deer population in the WKWMA is sampled annually to determine levels of radionuclides (Section 5), PCBs, and inorganic elements that might be attributed to past plant practices. There were five deer harvested in 2004 from the WKWMA and one deer harvested in 2002 from the Stewart Island Habitat Restoration in Livingston County, Kentucky, to serve as a reference sample.

Polychlorinated biphenyls tend to accumulate in fat tissue. PCB-1268 was present in deer from the Paducah Site, while PCB-1260 was detected in the background deer. Table 8.7 shows the PCB results. All measurable PCBs were well below the Food and Drug Administration (FDA) standard of 3 parts per million (ppm) for red meat.

A risk assessment was conducted using the concentrations of PCBs found in deer, assuming 20 percent fat content and that a hunter would eat the two deer with the highest levels of PCBs found. The risk assessment concluded that the risk to the hunter who eats 100 pounds of the two worst-case deer (50 pounds/deer) would have an average increased cancer risk of 0.0000058, or approximately 5.8 chances of cancer development (over a lifetime) per one million people who eat the deer (Hampshire 2005).

A comparison of the metals detected in the 2004 deer with the average metals data from background deer collected over the past 10 years shows only a few chemicals that are significantly above background. Average chronium in liver,

Table 8.7 Summary of PCB detections in deer for 2004[a]

Parameter	Deer 1	Deer 2	Deer 3	Deer 4	Deer 5	Background Deer[b]
PCB-1260 (mg/kg)	ND	ND	ND	ND	ND	.337
PCB-1268 (mg/kg)	.147	.023	.025	.087	.116	ND

[Result] = Detected at the result indicated.
mg/kg = part per million
ND = Not detected
[a] Other PCB aroclors were analyzed but not detected in any deer.
[b] Background deer were collected during 2002 from Stewart Island Habitat Restoration in Livingston County, Kentucky.

muscle, and kidney are observed at greater than 2 times background levels. Average barium and silver in the kidney are also observed at greater than 2 times background levels. Similar levels for these metals have been observed in previous years. All other metals are not significantly above background levels. Overall evaluation of the results indicate that consumption of deer meat is not a threat to human health.

Additional deer data are presented in Section 4, tables 4.46 through 4.49, of the *Environmental Monitoring Results Annual Site Environmental Report, Calendar Year 2004, Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE/OR/07-2233 Volume II).

Fish and Other Aquatic Life

Watershed (biological) monitoring was conducted, as required, by KPDES Permit KY0004049. The KPDES permit also requires toxicity monitoring of one continuous outfall and three intermittent outfalls on a quarterly basis. Watershed or biological monitoring of Bayou Creek and Little Bayou Creek has been conducted since 1987.

The objectives of the Watershed Monitoring Program are as follows:

- Determine whether discharges from the Paducah Site and its associated SWMUs are adversely affecting instream fauna,
- Assess the ecological health of Bayou Creek and Little Bayou Creek,
- Assess the degree to which abatement actions ecologically benefit Bayou Creek and Little Bayou Creek,
- Provide guidance for remediation,
- Provide an evaluation of changes in potential human health concerns, and
- Provide data that could be used to assess the impact of inadvertent spills or fish kills.

The 2004 sampling effort was conducted in accordance with the *Bayou Creek and Little Bayou Creek Watershed Monitoring Plan*. The plan is required by the KPDES permit. In January and February 2003, the U.S. Fish and Wildlife Service and the KDOW, respectively, requested additional changes to the watershed monitoring plan. The plan was revised in April 2003 to include the following changes:

- Fish bioaccumulation sampling will not be performed in 2003, but fish will be sampled for PCBs and metals, including mercury, in even years of sampling to avoid elimination of population by sampling (this began in CY 2004).
- The targeted species for the bioaccumulation samples at Bayou Creek will be changed from spotted bass to creek chubs and green sunfish.
- Sampling location UTM 6.9 will be deleted and a location on the West Fork of Massac Creek will be added. The West Fork of Massac Creek will be considered a reference site.
- Sampling location BM 7.6 was eliminated as a sampling site because a new reference site is being added at the West Fork of Massac Creek.
- Sampling location BM 5.55 will be moved downstream to BM 4.6.

Sampling for fish community and benthic macroinvertebrates at LUM 5.0 will be discontinued. These samples will be added to LUM 2.7 on Little Bayou Creek.

Study Area and Methods

As specified according to *Big Bayou Creek and Little Bayou Creek Revised Watershed Monitoring Program, April 2003,* the fish and benthic macroinvertebrate communities were sampled in June 2004 at eight locations, including locations in Massac Creek and in the West Fork of Massac Creek, both which serve as sources of background fish (MAM 8.6 and WFM 0.5, respectively). Figure 8.1 shows the eight locations, with the exception of MAM 8.6 and WFM 0.5 which are located offsite.

Benthic macroinvertebrate samples were collected with a Surber square-foot bottom sampler from appropriate locations within a designated riffle at each site. Samplers selected locations within the reaches of the stream and samples were processed in a laboratory following EPA methods. The Modified Hilsenhoff Biotic Index (mHBI) was used to evaluate the water quality of the sample locations. Organisms were identified to the lowest practical

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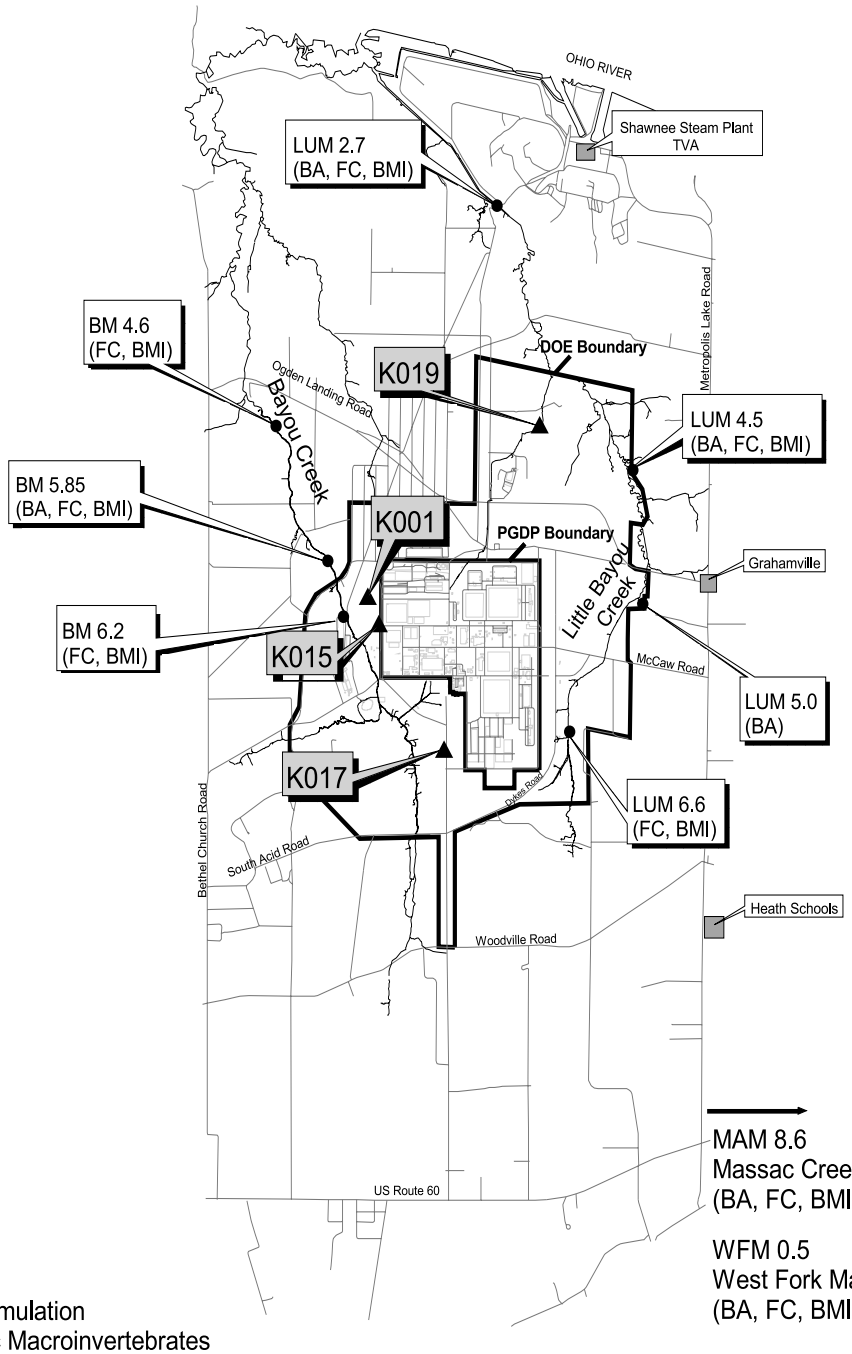

Figure 8.1 Biological monitoring locations

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taxon and enumerated. Instream and riparian habitat and water quality were assessed at each site following standard procedures outlined by the EPA. An analysis of the data includes general descriptive and parametric statistics to evaluate trends in temporal and spatial changes that could be associated with abatement activities or remedial actions. Metrics of the benthic macroinvertebrate community, such as total density; total taxonomic richness; taxonomic richness of the pollution-sensitive Ephemeroptera, Plecoptera, and Trichoptera; percent community similarity index; and dominants in common are included in the analysis of the data.

Quantitative samplings of the fish communities in the PGDP area were conducted by electrofishing. Block nets defined the sample reaches [eight to 120 m (26 to 394 feet)] of each site sampled. A three-pass depletion method was used in collecting the samples. Data from these samples were used to estimate species' richness, population size (numbers and biomass per unit area), and annual production. All fish sampling locations overlap locations used in the benthic macroinvertebrate community task. All field sampling was conducted according to standard operating procedures.

The frequency for the bioaccumulation monitoring task has been changed in the Watershed Monitoring Program (WMP) to every two years and monitoring was not conducted in 2004.

Watershed Monitoring

Results of watershed monitoring are reported to KDOW annually. The 2004 monitoring is reported in the *Watershed Monitoring Report for Calendar Year 2004, Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (BJC 2005b). Additional analysis of the data can be seen in this report. The report conclusions, which meet the objectives of the WMP, are presented as follows.

As in previous years, fish communities examined in 2004 showed some changes in density, biomass, total numbers, and species richness. The most dramatic change occurred in Bayou Creek mile 6.2, from 2003 to 2004, where density increased 4.7 times and biomass increased 2.2 times. This was attributed to the large numbers (4848 individuals) of central stonerollers collected.

An increased number of fish was seen in lower Little Bayou Creek and is probably the result of high water at the site, which would allow the fish to move into the area from the Ohio River. The changes noted for this year are not necessarily indicative of contaminant impacts. A possible factor affecting fluctuating levels of fish populations at several of the sites may be attributed to shifting stream bed substrates that affect changes in habitat within the streams sampled. The stream changes include restructuring the size of runs, pools, riffles, and associated cover. All fish observed this year were found to be in good health, having a condition factor of "good" on the mHBI.

Figure 8.2 is a graphical representation of the mean PCB concentrations in longear sunfish tissue or spotted bass at locations in Bayou Creek and Little Bayou Creek during selected months from October 1996 to June 2004. A sample was not obtained in May 1997 for sample location LUM 4.5 due to the low volume of fish. Numbers reported as less than the detection level are graphically represented as 0.5 times the detection limit. Polychlorinated biphenyls have varied over the past seven years and have consistently been above the background level. The FDA action limit for fish is 2 ppm. All results in 2004 were below this value for fish collected near the plant site. The 2004 average concentration has slightly increased from the 2002 concentration (samples were not collected in 2003). Overall, there is a general down trend with a flattening profile for the locations monitored at Little Bayou Creek.

In accordance with the 2003 WMP, metals analyses were performed for the first time in 2004. Overall, most of the metals analyses results for the Bayou Creek and Little Bayou Creek sites do not vary significantly from the background levels. Cadmium and lead were present only at the Bayou Creek location, but in small concentrations.

Additional data are presented in Section 4, tables 4.50 through 4.54, of the *Environmental Monitoring Results Annual Site Environmental Report, Calendar Year 2004, Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE/OR/07-2233 Volume II).

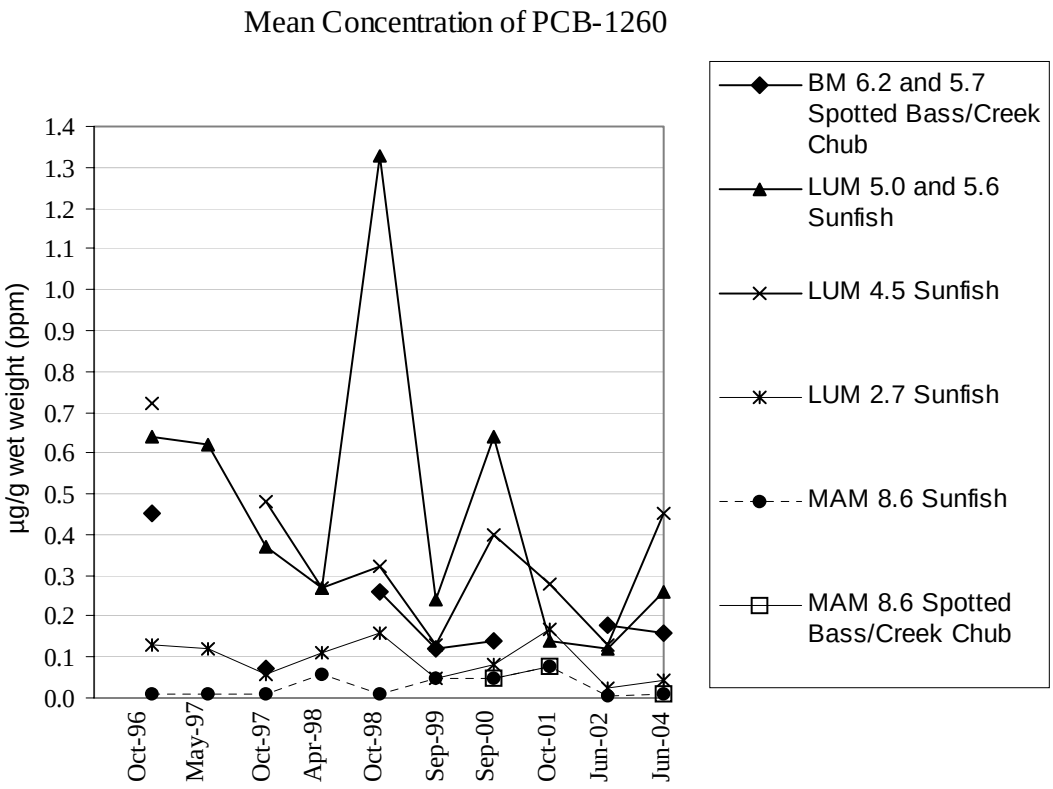

Figure 8.2 Average concentration of PCB-1260 in fish tissue from 1996–2004