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REMEDIAL INVESTIGATION REPORT FOR OPERABLE UNIT 5 VOLUME 3 OF 5 APPENDIX B - SITE-WIDE ECOLOGICAL RISK ASSESSMENT, APPENDICES C AND D DRAFT JUNE 1994

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REMEDIAL INVESTIGATION REPORT FOR OPERABLE UNIT 5

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

VOLUME 3 OF 5

APPENDIX B - SITE-WIDE ECOLOGICAL RISK ASSESSMENT

APPENDICES C AND D

JUNE 1994

U.S. DEPARTMENT OF ENERGY
FERNALD FIELD OFFICE

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JUNE 1994

U.S. DEPARTMENT OF ENERGY

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LIST OF ACRONYMS

AEC	U.S. Atomic Energy Commission
AWQC	Ambient Water Quality Criteria
BTAG	Biological Technical Assistance Group
BTV	benchmark toxicity value
CAWQC	Chronic Ambient Water Quality Criteria
CEC	cation exchange capacity
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CPC	contaminant(s) of potential concern
DCF	dose conversion factor
DOC	dissolved organic carbon
DOE	U.S. Department of Energy
DWB	drinking water benchmark
EEC	estimated environmental concentrations
EP	equilibrium partitioning
EPA	U.S. Environmental Protection Agency
ER-L	effects range-low
ER-M	effects range-median
FEMP	Fernald Environmental Management Project
FMPC	Feed Materials Production Center
FWS	U.S. Fish and Wildlife Service
IAEA	International Atomic Energy Agency
ICRP	International Commission on Radiological Protection
LOEC	lowest observable effect concentration
MCL	maximum concentration limit
NOEC	no observable effect concentration
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission

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OEPA	Ohio Environmental Protection Agency	2
PAH	polycyclic aromatic hydrocarbon	3
QA	quality assurance	4
QC	quality control	5
RCRA	Resource Conservation and Recovery Act	6
RI/FS	remedial investigation/feasibility study	7
SSOD	storm sewer outfall ditch	8
TV	toxicity value	9
USDA	U.S. Department of Agriculture	10
USGS	U.S. Geological Survey	11
WEMCO	Westinghouse Environmental Management Company of Ohio	12

EXECUTIVE SUMMARY

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Following guidance provided by Region V of the U.S. Environmental Protection Agency (EPA), a Site-Wide Ecological Risk Assessment was prepared to determine if radiological and nonradiological contaminants associated with actions at the Fernald Environmental Management Project (FEMP) represent a current or future risk to ecological receptors inhabiting this facility and nearby off-property areas, including the Great Miami River.

The Site-Wide Ecological Risk Assessment's focus was on- and off-property areas, including the Great Miami River, not likely to be remediated based on human-health concerns. Off-property areas, including the Great Miami River, were also examined. Contaminants may have entered soil, sediment, and surface water as the result of past operational and waste management activities at the FEMP.

Information summarized in previous studies conducted on the FEMP indicated that the vegetation on the site was typical of the Western Mesophytic forest region and that biological communities on the site appeared similar to those found in southwestern Ohio where similar land-use practices occur. No species or group was conspicuously low or absent in any available habitat niches; the ecological communities on the FEMP were typical of those found in the region. Several studies have documented suppressed growth in FEMP American robin nestlings. Recent studies suggested that this observed suppression may have been a result of land management practices and not related to the presence of contaminants in food items collected near nesting sites. However, the design of the studies did not eliminate the possibility that nestlings were being fed contaminated foods collected from sites distant from the nest. Remedial or removal actions that reduce the likelihood of contaminant exposure via this route would reduce the potential risks to these receptors.

Representative concentrations of media-specific nonradiological contaminants were compared to benchmark values that are protective of ecological receptors. The results of these comparisons indicated that surface soil concentrations of uranium east of the Production Area (Study Area C) represented the single greatest source of risk to terrestrial ecological receptors, in terms of its potential heavy metal toxicity. Results of this risk assessment indicated that on- and off-property soil concentrations of radionuclides did not result in a radiological dose in excess of the target level dose

(36.5 rad/year) used to evaluate the potential risk posed to ecological receptors exposed to radionuclide contaminants.

Other on-property inorganic soil contaminants present in concentrations that may have adverse impacts on ecological receptors were aluminum, antimony, cadmium, lead, manganese, molybdenum, silver, and zinc. Lead and manganese were also found in excess of benchmark values in samples collected from off-property areas. Organic surface soil contaminants present in concentrations that represent a risk to terrestrial ecological receptors were confined to Study Areas A, C, and E and included benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracence, and indeno(1,2,3-cd)pyrene. No organic contaminants were detected in off-property soils in excess of benchmark criteria.

Contaminants present in sediment samples collected from on-property locations on Paddys Run that may represent a risk to aquatic biota include barium, cadmium, cyanide, and manganese. Although uranium was detected in sediment samples collected from Paddys Run and the Great Miami River, risks associated with this sediment contaminant are believed to be minimal due to the limited bioavailability associated with this contaminant. Manganese was present in off-property Paddys Run sediments at concentrations that may pose a risk to aquatic organisms. The following contaminants were present in sediment collected from the Great Miami River in concentrations that may adversely impact aquatic biota: barium, iron, lead, manganese, phenanthrene, and zinc.

The concentrations of aluminum, bis(2-ethylhexyl)phthalate, cadmium, di-n-octyl phthalate, and lead measured in surface water samples collected from on-property Paddys Run locations may also represent a hazard to aquatic biota. Lead, bis(2-ethylhexyl)phthalate, and di-n-octyl phthalate were also present in surface water samples collected from off-property locations on Paddys Run in concentrations that may pose a risk to aquatic biota inhabiting this portion of the stream.

Only mercury and ammonia were detected in surface water samples collected from the Great Miami River upstream from the FEMP NPDES outfall in concentrations that may represent a risk to aquatic biota. Only aluminum was identified as a contaminant that may be hazardous to aquatic biota inhabiting the river downstream of the outfall and upstream of the mouth of Paddys Run.

Surface water samples collected from the Great Miami River downstream from its confluence with Paddys Run contained more contaminants in concentrations that may adversely impact aquatic biota than did surface water samples collected from upstream locations of the river or from Paddys Run. Concentrations of aluminum contributed significantly to the risk associated with this reach of the river as did bis(2-ethylhexyl) phthalate.

Terrestrial organisms exclusively using drainageways in Study Areas A, the South Field (areas E and G) and Study Area F as a source of drinking water may be at risk due to ingestion of mercury, trichloroethylene, and 1,2-dichloroethylene. Lead and bis(2-ethylhexyl) phthalate in Paddys Run may represent a risk to these receptors, as does di-n-octyl phthalate detected in samples collected from on-property Paddys Run locations. Of the contaminants measured in samples of water collected from the Great Miami River, concentrations of mercury, cadmium, and bis(2-ethylhexyl)phthalate exceed values protective of these receptors. The presence of these contaminants may place organisms relying exclusively on the Great Miami River as a source of drinking water at risk.

The results of the Site-Wide Ecological Risk Assessment indicate that a number of contaminants are present in soil, surface water, and sediment in concentrations that may adversely impact ecological receptors. Not only do these contaminants potentially pose a current risk to ecological receptors, but their continued release may result in long-term risk to these receptors.

B.1.0 INTRODUCTION

The purpose of the Site-Wide Ecological Risk Assessment is to determine if contaminants present in various media represent a current or future risk to ecological receptors inhabiting the Fernald Environmental Management Project (FEMP) and nearby areas, including the Great Miami River. These receptors include all organisms, exclusive of humans and domestic animals, that may potentially be exposed to FEMP contaminants.

As stipulated in the Amended Consent Agreement between the U.S. Department of Energy (DOE) and the U.S. Environmental Protection Agency (EPA) (September 1991), Operable Unit 5 must prepare the Site-Wide Ecological Risk Assessment as part of their Remedial Investigation (RI). Guidance provided by Region V of the EPA served as the basis for preparing this assessment. These guidelines emphasize that factors such as the nature and extent of contamination, the physical and toxicological properties of contaminants, the quantity and quality of ecological resources, and an understanding of the areas that will be remediated to meet human-health concerns be considered in the development of ecological risk assessments.

Based on the facility's human-health driven remediation plans, the focus of the Site-Wide Ecological Risk Assessment is to evaluate the possible risks posed by contaminants to ecological receptors inhabiting on-property areas not likely to be remediated based on human-health concerns as well as potentially impacted off-property areas. In general, the areas of the FEMP which will be remediated to meet human-health concerns are those that were used for production and/or storage of wastes generated during facility operations. This consists of approximately 20 percent of the FEMP's 1050 acres.

In order to evaluate potential exposure of ecological receptors to FEMP contaminants, habitat (e.g., grassland) and the size of the home range of receptor species selected for the models developed to quantify total radiation doses were used to subdivide the FEMP into study areas. This approach provides for a more meaningful evaluation of potential risks to ecological receptors than does examining risks associated with the entire 1050-acre site. These study areas, listed below, are also shown in Figure B.1-1 and described in detail in Section B.1.1.2:

- Study Area A — woodlot/jurisdictional wetland
- Study Area B — northern pine plantation
- Study Areas C, D, and E — grasslands
- Study Area F — Paddys Run and Paddys Run Corridor
- Study Area G — southern pine plantation.

In addition to these study areas, Operable Unit 5 evaluated potential risks posed by contaminants detected in soil in two off-property study areas, and from sediment and surface water contaminants present in the Great Miami River and off-property portions of Paddys Run.

The Site-Wide Ecological Risk Assessment examined surface soil contamination in all study areas (both on- and off-property) with the exception of the Great Miami River, and assessed contamination in surface water and sediment collected from the Great Miami River, Paddys Run, and several small, on-property bodies of water (typically drainage ditches). Although the FEMP is located above the Great Miami Aquifer, groundwater was not considered to be a specific medium of concern. Instead, ecological risks associated with contaminants of potential concern (CPCs) present in the groundwater were indirectly evaluated when the CPCs detected in the surface water were examined.

The FEMP, established by the Atomic Energy Commission as the Feed Materials Production Center (FMPC), began processing uranium ore and recycled uranium residues into pure uranium metal in 1951. Production and its support functions have always been located within the 136-acre production area (Figure B.1-1). Chemicals used to process uranium were stored in this area as well. An incinerator operated for several years near the sewage treatment plant east of the production area. Several waste pits and other waste storage units were also built on the property. Uranium was the most prevalent material processed at the FMPC and consequently, uranium in various forms is the most significant contaminant of concern at the FEMP.

Most of the uranium used in the production process was depleted (e.g., contains a lower percentage of the uranium-235 isotope than is found in natural uranium). Enriched uranium was also processed, but the uranium-235 isotope was generally not enriched to more than 2 or 3 percent. In addition to uranium, small amounts of thorium were occasionally processed from 1954 through 1975. Uranium production peaked at approximately 12,000 metric tons in 1960, and declined throughout the remainder of the 1960s and 1970s. The early 1980s saw some increase in production, but increasing demands for environmental compliance, coupled with the lessening demand for uranium, resulted in

an end to production in 1989. A detailed description of the FEMP facility and its operations is provided in Section 1.0 of the Operable Unit 5 Remediation Investigation Report.

Even before production ended, DOE agreed in 1986 to conduct a Remedial Investigation/Feasibility Study (RI/FS) at the FEMP. As additional information about the nature and extent of contamination became available, the scope of the RI/FS was modified accordingly. For purposes of the RI/FS, the FEMP was divided into five operable units, based in part on an understanding of the historical functions of the various areas of the site (Figure B.1-2). The scope of the five operable units was redefined in the 1991 Amended Consent Agreement; general descriptions of the operable units are:

- Operable Unit 1: Waste pit area.
- Operable Unit 2: Other waste units (the active and inactive fly ash piles, the solid waste landfill, the lime sludge ponds, and the South Field).
- Operable Unit 3: Former production area structures.
- Operable Unit 4: The four silos in the waste pit area (including the K-65 silos).
- Operable Unit 5: Environmental media (soil, groundwater, surface water, sediment, flora, and fauna).

Analytical data used to prepare this assessment are from the site-wide RI/FS database, which has been validated. Although data have been collected since 1988, this Site-Wide Ecological Risk Assessment has preferentially examined data collected in 1993, when available. In those instances when such data were limited, data collected before 1993 were evaluated. Sections 2.0 and 3.0 of the RI Report identify when data for a specific media were collected.

The remainder of Section B.1.0 of this ecological risk assessment focuses on site characterization, the nature and extent of contamination, and fate and transport processes while Sections B.2.0 and B.3.0 both include data and supporting information that quantifies the concentrations of potential contaminants present in various media (exposure assessment). In Section B.2.0, the exposure concentration of a CPC is compared to appropriate criteria/dose-response information. For ecological risks associated with exposure to radionuclides, models were developed using site-specific ecological receptors to quantify total dose (Section B.3.0). These calculated values were then compared to a radiological dose determined by the International Atomic Energy Agency (IAEA 1992) to be protective of ecological receptors.

Because exposure to radioactive metals such as uranium and thorium can impact ecological receptors both chemically and radiologically, the chemical toxicity of these two metals is evaluated in Section B.2.0, while Section B.3.0 summarizes the risk to ecological receptors due to radiation effects. Finally, a summary of toxic effects and conclusions are presented in Section B.4.0.

B.1.1 SITE CHARACTERIZATION

Sections 2.0 and 3.0 of the RI Report include an in-depth discussion of threatened and endangered species as well as descriptions of the general ecology of the FEMP. This section of the Site-Wide Ecological Risk Assessment provides a description of the study areas. As noted in Section 1.0 of the RI report, a number of organizations and universities have conducted ecological or biological studies at the FEMP. The most comprehensive survey of plant and animal communities of the FEMP was conducted by Facemire et al. (1990) in 1986-1987 and much of the information on flora and fauna presented here is a summary of that study.

B.1.1.1 General Ecology

The FEMP and surrounding areas lie in the Eastern Deciduous Forest Province characterized by oak-hickory and beech-maple forests, which historically provided a continuous, dense summer canopy. However, nearly all indigenous forest stands in southwestern Ohio have been cleared, cut, or altered for agriculture or urban development.

Vegetation communities within FEMP boundaries reflect land use practices typical of an industrial facility. The area outside the production and waste storage areas is predominantly open pasture, which continues to be used for grazing by cattle. The milk produced by cattle grazing within FEMP boundaries is analyzed for uranium on a routine basis. Forest woodlots border drainage ditches or are used as natural fence rows or hedges. Current and past land use practices have led to the development of a number of distinct terrestrial habitats, described by Facemire et al. (1990) as introduced (nonnative) grasslands, pine plantations, deciduous woodlands, and the inactive flyash pile.

Facemire et al. (1990) identified and recorded the following flora and fauna on the site: 47 species of trees or shrubs, 190 species of herbaceous plants, 20 mammal species, 98 bird species, 10 species of amphibians or reptiles, 21 species of fish, 47 families of benthic macroinvertebrates, and 132 families of terrestrial invertebrates. Appendix F lists all plant and animal species identified at the FEMP according to abundance, habitats, and seasons in which they were observed.

The white-footed mouse (*Peromyscus leucopus*) was the most abundant of the five nongame small mammal species recorded, while the short-tailed shrew (*Blarina brevicauda*) occurred in the widest variety of habitats. The meadow vole (*Microtus pennsylvanicus*), meadow jumping mouse (*Zapus hudsonius*), and eastern chipmunk (*Tamias striatus*) were also collected within FEMP boundaries. Medium-sized mammals common on the FEMP include the coyote (*Canis latrans*), red fox (*Vulpes*), opossum (*Diadelphis virginianus*), raccoon (*Procyon lotor*), groundhog (*Marmota monax*), and fox squirrel (*Sciurus niger*) (Facemire et al. 1990).

Ninety-eight species of birds were identified on the FEMP, including breeding birds, wintering birds, and spring migrants (Facemire et al. 1990). Raptor species which have been observed at the FEMP include the northern harrier (*Circus cyaneus*), red-shouldered hawk (*Buteo lineatus*), Cooper's hawk (*Acciptier cooperii*), red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), eastern screech owl (*Otus asio*), and great horned owl (*Bubo virginianus*).

B.1.1.2 Study Areas Developed for the Site-Wide Ecological Risk Assessment

As indicated in Figure B.1-1, the FEMP property apart from Operable Units 1 through 4 was divided into study areas based on habitat type and, to a lesser extent, on home-range size of potential ecological receptors. This approach permitted media-specific contaminant concentrations within a given habitat to be quantified, which allowed those habitats that may have received greater amounts of contaminants to be evaluated separately from less contaminated study areas.

B.1.1.2.1 Study Area A - Woodlot/Jurisdictional Wetland

The northwestern portion of the FEMP is characterized by wooded areas in various stages of succession. The westernmost portion of this area is represented by mature forest while the remainder of the area can be characterized as a successional woodlot disturbed by grazing. Species common to these woodlands included the American elm (*Ulmus americana*), hackberry (*Celtis occidentalis*), and wild black cherry (*Prunus serotina*); black cherry is typically found in disturbed areas characterized by gaps in the forest canopy. Facemire et al. (1990) provides an in-depth description of this habitat.

Fauna recorded as abundant or common by Facemire et al. (1990) in the woodland communities in Study Area A include 29 species of birds, the short-tailed shrew, the deer mouse (*Peromyscus maniculatus*), white-tailed deer (*Odocoileus virginianus*), and the eastern cottontail (*Sylvilagus*

floridanus). Incidental sightings of the black rat snake (*Elaphe obsoleta*) and the box turtle (*Terrapene carolina*) were also recorded.

The eastern portion of the woodlot area is characterized by hydric soils which, along with the vegetation and hydrologic characteristics documented in this area, indicate jurisdictional wetlands. The other soils in Study Area A are somewhat poorly drained and upland (DOE 1992a). A small drainage ditch, located north of the production area, passes through this study area.

B.1.1.2.2 Study Area B - Northern Pine Plantation and Study Area G - Southern Pine Plantation

Two pine plantations — one in the northeast area of the site and the other in the southwest area of the site — were planted in 1972 as part of an environmental improvement project and to serve as buffer zones between the FEMP and the surrounding area. They were planted in alternating rows of white pine (*Pinus strobus*) and Austrian pine (*Pinus nigra*). Norway spruce (*Picea excelsa*) occurs only occasionally. The trees are overcrowded and infested with *Diplodia* tip blight. Dominant herbaceous species in the pine plantations include red fescue (*Festuca rubra*), brome grass (*Bromus sp.*), Kentucky bluegrass (*Poa pratensis*), and goldenrod (*Solidago sp.*).

Soil in the northern part of Study Area B is upland, while soil in the southern part of Study Area B is hydric (Ragsdale silty clay loam) and somewhat poorly drained (Fincastle silt loam). Soil in the southern pine plantation are somewhat poorly drained Idenshaw silt loam.

The pine plantations are a preferred habitat for white-tailed deer and the eastern cottontail. Other species listed as common or abundant in the pine plantations include 17 species of birds and the deer mouse. Cooper's hawks were frequently observed in the pine plantations along with incidental sightings of the American toad (*Bufo americanus*) and Butler's garter snake (*Thamnophis butleri*). Coyotes are also periodically observed in this area (Facemire et al. 1990).

Although the pine plantation dominates Study Area G, this portion of the FEMP also contains a wooded area that includes the inactive flyash pile. Several small drainageways collect runoff from the inactive fly ash pile and discharge into Paddys Run.

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B.1.1.2.3 Study Areas C, D, and E - Grasslands

The grassland habitat on the FEMP consists of approximately 425 acres of open pasture and mown grass maintained between the riparian woodland and the pine plantations. The mowing, grazing, and brush clearing account for the predominance of introduced grasses and old-field vegetation. Dominant herbaceous species include orchard grass (*Dactylis glomerata*), red fescue, and Kentucky bluegrass. Other common species are listed in Appendix F.1. Soils in these areas range from somewhat poorly drained to well drained.

Fauna recognized as common or abundant in the grassland communities include eight species of spring migratory birds, white-tailed deer, bobwhite quail (*Colinus virginianus*), and the eastern cottontail (Facemire et al. 1990).

Although predominantly grassland, Study Area E also includes the storm sewer outfall ditch (SSOD), a tributary of Paddys Run. It originates at the stormwater retention basin, flows southwest across the southern portion of the FEMP, and enters Paddys Run near the southwest corner of the property. The corridor bordering the SSOD is dominated by riparian vegetation. Before the 1986 completion of the stormwater retention basin, the SSOD carried uranium-contaminated runoff from the production area following heavy rains. Currently, the ditch drains nearly all of Study Areas B, C, D, and E (essentially open pasture), but receives stormwater from the production area only if the stormwater retention basin overflows. During its years of operation, the retention basin has only overflowed five times. However, no overflow has occurred since May 1990. The amount of water discharged is minimal compared to the amount of stormwater captured in the basin. Because the bed of the SSOD is comprised of highly permeable sand and gravel, it is typically dry.

Other drainageways located in Study Area E are those that receive runoff from the active flyash pile. These drainages are located to the east and west of the active flyash pile and drain into Paddys Run.

B.1.1.2.4 Study Area F - Paddys Run and Paddys Run Corridor

Paddys Run, which originates north of the FEMP, flows southward along the western boundary of the facility and enters the Great Miami River approximately 1.5 miles south of the southwest corner of the FEMP property (Figure B.1-3). The stream is about 9 miles long and drains an area of approximately 16 square miles, including the FEMP site. Nearly all the uncontrolled runoff from the FEMP flows into Paddys Run.

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Paddys Run is an intermittent stream flowing primarily from January through May. During these months, flow is generally continuous throughout its length. However, the stream has eroded through the glacial overburden and into the top of the Great Miami Aquifer from an area beginning near the K-65 silos on the FEMP to the Great Miami River. Here the flow is slight or absent for weeks at a time from June through December except during and immediately following a heavy rain. Paddys Run is steep sided, and erosion is severe during high flows. Its course has been manually changed twice to prevent erosion into the waste pit area and Paddys Run Road (WMCO 1987). Soil along Paddys Run is categorized as Fox-Genesee loams, characterized as deep, gently sloping, and well drained.

The riparian woodland bordering Paddys Run resembles a maple-cottonwood-sycamore floodplain forest (Anderson 1982). The dominant species present include eastern cottonwood (*Populus deltoides*), hackberry, American elm, and box elder (*Acer negundo*). The streambed alterations previously described have resulted in the colonization of other tree species in the floodplain area. Facemire et al. (1990) compiled an extensive list of the species identified in this area.

Twenty-three species of fish were recorded in Paddys Run by Facemire et al. (1990). The most abundant species were the bluntnose minnow (*Pimephales notatus*), creek chub (*Semotilus atromaculatus*), stoneroller minnow (*Campostoma anomalum*), and several species of shiner (*Notropis sp.*). The wide range of flow conditions in Paddys Run and the erosional nature of its sediments significantly influences the composition of the aquatic community inhabiting the stream. Despite the lack of flow for prolonged periods during the summer and autumn, Paddys Run supports a benthic macroinvertebrate community typical of other small southwestern Ohio streams (Facemire et al. 1990), and includes approximately 70 different benthic taxa (DOE 1992a).

For the Site-Wide Ecological Risk Assessment, analytical data collected from Paddys Run were grouped into two reaches for a more ecologically meaningful summation of the data. Reach 1 (Paddys Run on-property) encompassed that portion of Paddys Run within the FEMP boundaries and included sampling stations SW-1 through SW-6. Reach 2 represented that portion of Paddys Run located south of the FEMP (Paddys Run off-property) and included sampling locations SW-7 through SW-9. Sampling location W-5, located approximately 1 mile north of the FEMP northern property line, served as the background location for all samples collected from Paddys Run.

In addition to Paddys Run, Study Area F also includes the pilot plant drainage ditch. This ditch drains into Paddys Run, just south of the K-65 silos.

B.1.1.2.5 Great Miami River

The Great Miami River is the main off-property surface water body in the vicinity of the FEMP. It flows within 1 mile of the site's eastern boundary, and is the receiving water for the site's National Pollutant Discharge Elimination System (NPDES) permitted effluent (Figure B.1-3). The river generally flows to the southwest, but exhibits meandering patterns that result in sharp directional changes. Its drainage area is approximately 3360 square miles at the Hamilton gauge, located about 10 miles upstream from the FEMP discharge outfall. The FEMP is located within the Great Miami River drainage basin but the majority of the property lies above the river's present day floodplain.

The Ohio Environmental Protection Agency (OEPA) classifies the Great Miami River as a warm-water habitat capable of supporting balanced, reproducing populations of warm-water fishes and associated vertebrates, invertebrates, and plants on an annual basis (OEPA 1993). A total of 106 species of fish, including six hybrids, was recorded from the Great Miami River from 1900 to 1978 (Trautman 1957; 1981). The OEPA conducted intensive fisheries surveys along 92 miles of the Great Miami River and the lower reaches of five tributary streams in 1980 and 1989 (OEPA 1982; 1989); 63 and 76 species of fish, respectively, were collected during these surveys. Eighty genera of phytoplankton have been recorded by the U.S. Geological Survey (USGS) in samples taken at New Baltimore (downriver of the FEMP discharge outfall; Figure B.1-3) between 1974 and 1982 (USGS 1990). These genera include green algae, diatoms, and blue-green algae. Although not formally characterized, aquatic macrophytes such as *Myriophyllum sp.* and *Potomogeton sp.* have been observed above and below the FEMP outfall (Miller et al. 1990; 1992). The Great Miami River also supports a diverse benthic macroinvertebrate community. Approximately 60 taxa have been identified in samples taken from the river in the vicinity of the FEMP (DOE 1992a).

For this report, analytical data for the Great Miami River were grouped into three reaches (Figure B.1-4). Reach 1 originated north of the FEMP NPDES outfall, and consisted of samples collected from sampling station GMR-1. Reach 2 represents that portion of the Great Miami River located between the FEMP NPDES outfall and the mouth of Paddys Run. Sampling stations GMR-2, GMR-3, W-3 and ZI 1-6 were located in this reach. Reach 3 included three sampling stations (GMR-4, GMR-5, and W-4) and encompassed the section of the river downstream from its

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confluence with Paddys Run. Station W-1, located approximately 1.5 river miles upriver of the FEMP outfall, served as the background station for all samples collected on the Great Miami River.

B.1.1.2.6 Terrestrial Off-Property Areas

To help in the evaluation of potential risk to ecological receptors living near but not on the FEMP, off-property soil samples collected in 1987 during the 1987 Characterization Investigation Study were grouped into two inner and outer "contours." The inner contours represented surface soil sampling locations near the perimeter of the fence while the samples collected from the outer contour were located outside the inner contour and were therefore furthest from the FEMP. Representative concentrations of contaminants were identified for each of these areas and potential risks to ecological receptors evaluated.

B.1.2 NATURE AND EXTENT OF CONTAMINATION

This section summarizes the nature and extent of contamination at the FEMP. A more detailed discussion of this subject is included in Section 4.0 of the RI Report.

Contamination within Operable Unit 5 media resulted from routine processing and waste management activities at the FEMP. The refining process is well-documented and provides an indication of the distribution of radiological and inorganic chemical constituents at the FEMP. The primary radiological constituents expected in Operable Unit 5 media include uranium isotopes (U-238, U-234, and U-235) and their progeny. Thorium-232 and its progeny are also expected, but in lesser amounts. Low levels of uranium activation and fission products, associated with processing recycled uranium from other DOE facilities are also anticipated.

The predominant inorganic chemicals used to process uranium at the FEMP were nitric acid, hydrochloric acid, hydrofluoric acid, magnesium metal, calcium hydroxide (lime), and calcium-magnesium carbonate (dolomite). The ore concentrates processed at the FEMP contained elevated concentrations of inorganic impurities including arsenic, calcium, magnesium, phosphorus, sodium, thorium, and vanadium. Magnesium metal represented a major waste product of the refining process.

Relatively few organics were employed directly in the refining process. A kerosene-tributyl phosphate mixture was used as a solvent in the extraction of uranyl nitrate. Other organic materials used at the FEMP included lubricants, cutting oils, coolants and water soluble oils, PCBs from

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lubricants and electrical equipment, pesticides, herbicides, solvents and cleaning fluids. As a result of the many oils and oily materials burned at the FEMP, chlorinated dibenzo p-dioxins/dibenzofurans (CDDs/CDFs), polycyclic aromatic hydrocarbons (PAHS) and phenols may have been produced.

Surface water and sediment contaminants detected in drainage ditches in the production area and the waste storage areas include various radionuclides (e.g., total and isotopic uranium), hazardous substance list (HSL) organics, and HSL inorganics. Contaminants present in the sediments and surface waters in Paddys Run include radionuclides (primarily isotopic uranium), and HSL inorganics. Contaminated sediments are confined primarily to on-property areas. The periodic scouring of Paddys Run during high flow tends to limit sediment contaminant accumulations.

Surface water contamination in the Great Miami River consists primarily of uranium and low levels of isotopic radium and thorium. Sediment contaminants include radionuclides, HSL inorganics, and organic compounds. Relatively similar concentrations of radionuclides are found at all sampling locations downstream of the FEMP NPDES outfall line. HSL organic and inorganic contamination appears to be confined to the area immediately downstream of the outfall.

Uranium contamination of FEMP surface soils is widespread, whereas the occurrence of other radionuclides tend to be more localized. The highest concentrations of uranium have been found in surface soils in:

- The vicinity of Plants 2/3, 5, 6 and 8.
- The northeastern portion of the former production area.
- Localized areas of the northwestern portion of the processing area.
- The fire training area.
- Locations within the administrative area adjacent to the Plant 8 and Plant 4 stacks.
- A localized area of contamination adjacent to the former solid waste incinerator.

Inorganic surface soil constituents detected in above-background concentrations are generally associated with elevated concentrations of uranium and include beryllium, cadmium, selenium, and silver. This association between elevated concentrations of uranium and inorganic constituents is

expected, as processing activities at the FEMP did not selectively isolate or concentrate metals other than uranium.

Volatile organic and semi-organic compounds and PCBs were detected in samples collected in the vicinity of all major FEMP processing and support facilities. However, these contaminants have not been detected in samples collected near the sewage treatment plant. Like the elevated concentrations of inorganic constituents, these organic contaminants tend to be located in areas exhibiting elevated concentrations of uranium.

B.1.3 REMOVAL ACTIONS

As summarized in Section 1.0 of the Operable Unit 5 RI Report, twenty nine removal actions and other abatement actions have been completed or are underway at the FEMP. These actions are or are being implemented as best management practice initiatives or to achieve compliance with DOE orders or state discharge limits. The following is a summary of those removal actions most likely to directly impact ecological receptors. A more detailed discussion of all these activities is provided in Section 1.0 of the RI report.

Until recently, stormwater runoff at the FEMP has not been controlled but simply collected via a network of storm sewers. During low and normal rainfall, stormwater was diverted through the outfall line into the Great Miami River. However, during heavy rainfall, runoff was sent directly into the SSOD and Paddys Run. This runoff contained significant quantities of uranium and other contaminants. In addition to the SSOD, nearly all ditches on the FEMP flowed into Paddys Run.

In late 1986, the FEMP completed the construction of the first chamber of the stormwater retention basin. Runoff previously channeled into the SSOD was now being collected in the basin, held for at least 24 hours to permit solids to settle, and then pumped through the outfall line into the Great Miami River. A second chamber was added in 1988 to reduce the likelihood that water would over flow into the SSOD. The stormwater retention basin has not overflowed since May 1990.

Removal Action No. 2 (Waste Pit Area Runoff Control) involved the installation of a runoff control system designed to collect stormwater from the areas around the waste pit and Operable Unit 4 (K-65 silos) and direct it through treatment systems prior to discharge to the Great Miami River.

Completed in 1992, this removal action has reduced the amount of runoff entering Paddys Run from the waste pit area.

Removal Action No. 16, completed in August 1993, involved the installation of drainage control structures and regrading to control stormwater runoff from the perimeter of the production area. Stormwater from these areas is now redirected to the existing stormwater system and the stormwater retention basin.

Although some drainage ditches still flow directly into Paddys Run, these various actions have resulted in controlling the major sources of contaminated surface water runoff; the impact on water quality in Paddys Run and the Great Miami River previously associated with this runoff has been greatly reduced.

Excavation of contaminated soil adjacent to the sewage treatment plant incinerator (Removal Action No. 14) was initiated in August 1992. Surface soils exhibiting uranium concentrations in excess of a project specific threshold value were removed, containerized, and transferred to a controlled storage area on the FEMP. Completed in November 1993, this removal action significantly reduced the concentration of uranium present in soils in this portion of the FEMP.

B.1.4 CONCEPTUAL MODEL

This section evaluates the major fate and transport processes at the FEMP relevant to the Site-Wide Ecological Risk Assessment. A detailed discussion of fate and transport processes may be found in Section 5.0 of the Operable Unit 5 RI Report. As discussed previously, all production activities occurred within the 136-acre production area. Chemicals used to support uranium processing were all stored within this area and all maintenance and garage facilities were located here as well. To comply with DOE orders for estimating radiation dose to nearby residents, the FEMP has been operating 24-hour continuous air monitoring stations along the site perimeter since 1972. In addition, the site monitors its liquid effluent for radionuclides as well as for compliance with its NPDES permit. These data have demonstrated that uranium is the primary contaminant associated with the FEMP.

B.1.4.1 Principal Pathways and Contaminants

As summarized in Section 5.0 of the RI Report, Operable Unit 5 media do not have original contaminant sources. However, as discussed in Section B.1.2, large amounts of contaminants have

been released into the environmental media from other operable units in the past 40 years and before environmental management activities could be implemented around the contaminant source areas, some of the contaminants migrated from their original sources and spread throughout a wide area. Operable Unit 5 source contaminants are therefore contaminants in environmental media outside other operable units.

Although Operable Unit 5 sources include contaminated glacial overburden soil, perched water in the glacial overburden, sediment along the SSOD, and groundwater in the Great Miami Aquifer, for the purposes of the Site-wide Ecological Risk Assessment, the Operable Unit 5 contaminant sources of greatest importance include contaminated surface water and sediment in Paddys Run and the Great Miami River and contaminated surface soil. From their original sources, contaminants migrated and will continue to migrate through surface water runoff and air emissions.

Surface water contaminant transport mechanisms include:

- Erosion of contaminated surface soils into Paddys Run.
- Flow of contaminated surface water runoff into Paddys Run.
- The discharge of treated or untreated stormwater and groundwater into the Great Miami River through the FEMP discharge outfall line.

Factors governing the extent and magnitude of surface soil erosion include rainfall intensity, slope length and steepness, vegetative cover, and erosion control practices. Contaminants adsorbed to soil particles may be dissolved and transported via runoff water and into receiving water. Surface water runoff is considered a viable transport pathway for all contaminated surface soil in Operable Unit 5. Contaminants being transported with surface water runoff are also assumed to be washed off from surface soil in and around the FEMP. Having entered a water body, a contaminant may continue to move in two phases; adsorbed to sediments eroded from the land surface or dissolved in the water column.

Because both Paddys Run and the SSOD are losing streams in the vicinity of the FEMP, the effect of contaminated groundwater entering these surface water bodies is considered insignificant.

Air emission transport mechanisms that may potentially bring contaminants in contact with ecological receptors include volatilization of organic compounds and wind erosion of contaminated particulate

matter. However, review of organic contaminant data present in the RI/FS database indicates that volatile organic compound contamination in surface soil is not widespread. Isolated areas of contamination are characterized by only a few compounds and over time, the volatilization rate of these organics will decrease and should not represent a significant contaminant source over the long term. As a result, volatilization is not considered to represent a significant contaminant release mechanism.

Of greater significance is wind erosion of contaminated particulate matter. Soil characteristics dictate the erosion potential and resuspension of source contaminants. However, under current conditions, airborne resuspension is limited because surface soil at the FEMP is generally well developed and highly vegetated. These same features also reduce the loss of soil particles to surface waters. While erosion occurs to some degree at the FEMP (in particular, along some portions of Paddys Run), the site is located on a plateau that is not prone to significant amounts of soil erosion, thus limiting the probability of contaminant releases.

The following sections summarize how CPCs present at the FEMP react with soil and water. Chemical interactions occurring with surface soil, water, and sediment may retard the movement of contaminants, increase the pathway travel time to ecological receptors, and decrease or attenuate contaminant concentrations at the receptor location. Ecological receptors present in the various study areas may be affected by direct exposure to contaminated interstitial waters, by consuming contaminated surface waters, by being directly exposed to contaminated soil, or by consuming contaminated vegetation or terrestrial organisms living in these media.

B.1.4.2 Contaminants in Surface Soil

At the FEMP, uranium present in the soil may exist in a variety of forms, including uranyl nitrate, uranium oxide, metallic uranium, and uranium tetrafluoride. Metals as such uranium can react with soil in a variety of ways including ion exchange, absorption, precipitation, or complexation. Ion exchange tends to be reversible, but is highly dependent on the type of clay mineral present, the composition of ions occupying the exchange sites, and soil pH. Metal ions, including radionuclides, form complexes with dissolved ligands such as chloride, phosphate, carbonate, and sulfate that change the size and charge of the species, ultimately influencing its bioavailability. Adsorption of metals is affected not only by the presence of ligands but also by the type of surface soil. Clay minerals have different adsorption affinities for charged species that are related to geometric and chemical factors.

This affinity is typically expressed as the cation exchange capacity (CEC) and relates to the molecular structure and chemical composition of the mineral lattice and soil particle size distribution.

The fate and transport of contaminants from the source in the soil to vegetation is controlled by both the leaching rate of contaminants from the soil by infiltrating water and by species-specific rates of uptake by the vegetation. These processes are difficult to quantify on a site-specific basis. The leachability of surface soil by infiltrating water depends primarily on the geochemical properties of the soil and the specific CPC. Consequently, no general statement can be made that would apply to soil leachability for the entire FEMP site. Positively charged forms of uranium tend to sorb to many different soil types, form rigorous complexes with insoluble organic matter, and adsorb to iron-manganese (Fe-Mn) oxides; these factors limit its movement through the environment. However, negatively charged or neutral carbonate and hydroxide uranium complexes formed in carbonate solutions can be highly mobile (Sheppard and Thibault 1992).

The mobility of organic contaminants in soils and other media is affected by chemical processes that in part depend on their volatility, the octanol-water partition coefficient (K_{ow}), water solubility, and chemical concentration. In general, the more water insoluble an organic compound is, the more hydrophobic it is and the more likely it is to be adsorbed onto soil or organic structures. Water-insoluble organics also have a tendency toward self association in a polar medium such as water. Hydrophobic compounds tend to have higher K_{ow}s and a greater affinity to organic matter contained within the soil matrix. Conversely, compounds with high aqueous solubilities have relatively low K_{ow}s. Root uptake of organic compounds is generally inefficient and a significant portion of the plant uptake these compounds from contaminated soils apparently results from volatilization and leaf uptake (Suter 1993).

Terrestrial receptors can come in contact with contaminants via a number of pathways. At this site, particularly in areas immediately downwind of the production area (Figure B.1-6), direct contact with contaminated soil (e.g., burrowing, grooming, or incidental ingestion while browsing), or ingestion of contaminated vegetation by herbivores, represent likely routes of exposure. Other possible exposure routes include ingestion of contaminated surface water or prey. While exposure to contaminants via inhalation of suspended particulates is possible, the heavy vegetation at this site reduces the probability that this represents a significant route of exposure.

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B.1.4.3 Contaminants in Surface Water

Although uranium and other contaminants may enter the Great Miami River, Paddys Run, or on-property drainage ditches as free ions, it is more probable that they are bound to either particulate organic matter or soil. Sediment particle size and composition influence how "tightly" bound contaminants are, and therefore determine the biological availability of uranium and other contaminants and the manner in which they are transported through an aquatic system. Small colloidal particles tend to have a higher affinity for most metals and other contaminants than do large particles, and clays generally exhibit a greater capacity to bind metal ions than do other soil types. Once in an aquatic system, contaminants are either deposited in bottom sediments, remain in suspension, or are absorbed directly from water by aquatic organisms (e.g., ingestion or absorption through gill epithelia). The hydrodynamic processes that dictate flow through a system (advection) and the disruptive events like storms and floods (dispersion) will govern the transport of dissolved chemicals and suspended particulates through an aquatic system, while sediment transport of bound contaminants will determine rates and areas of contaminant deposition (Burns and Baughman 1985).

In general, sediments can represent a sink and a potential source for contaminants if environmental conditions such as temperature, pH, microbial activity, dissolved oxygen, and acid volatile sulfide concentrations are conducive to their release into interstitial water. Sediments also play an important role in contaminant transport because many contaminants are readily adsorbed onto and transported with sediment particles. Once released from the sediments, contaminants can be absorbed directly by benthic organisms, generally through gill epithelia. In addition to direct absorption, numerous benthic organisms ingest sediments when they feed. In this instance, contaminants may be absorbed through the intestinal wall or can become available to predators if the benthic organisms are consumed before gut evacuation.

As previously discussed (Section B.1.1.2.4), Paddys Run is a dynamic, highly erosional stream. Water level and current velocity rise rapidly after heavy rain, resulting in bank erosion, shifts in the stream's channel, and significant movement of the sediment bedload. Under these conditions, sediment is not likely to represent a long-term sink for contaminants in this system. Although these conditions reduce the likelihood that contaminants accumulate in Paddys Run sediments, contaminants present in samples collected from both Paddys Run and the Great Miami River were evaluated in this Site-Wide Ecological Risk Assessment.

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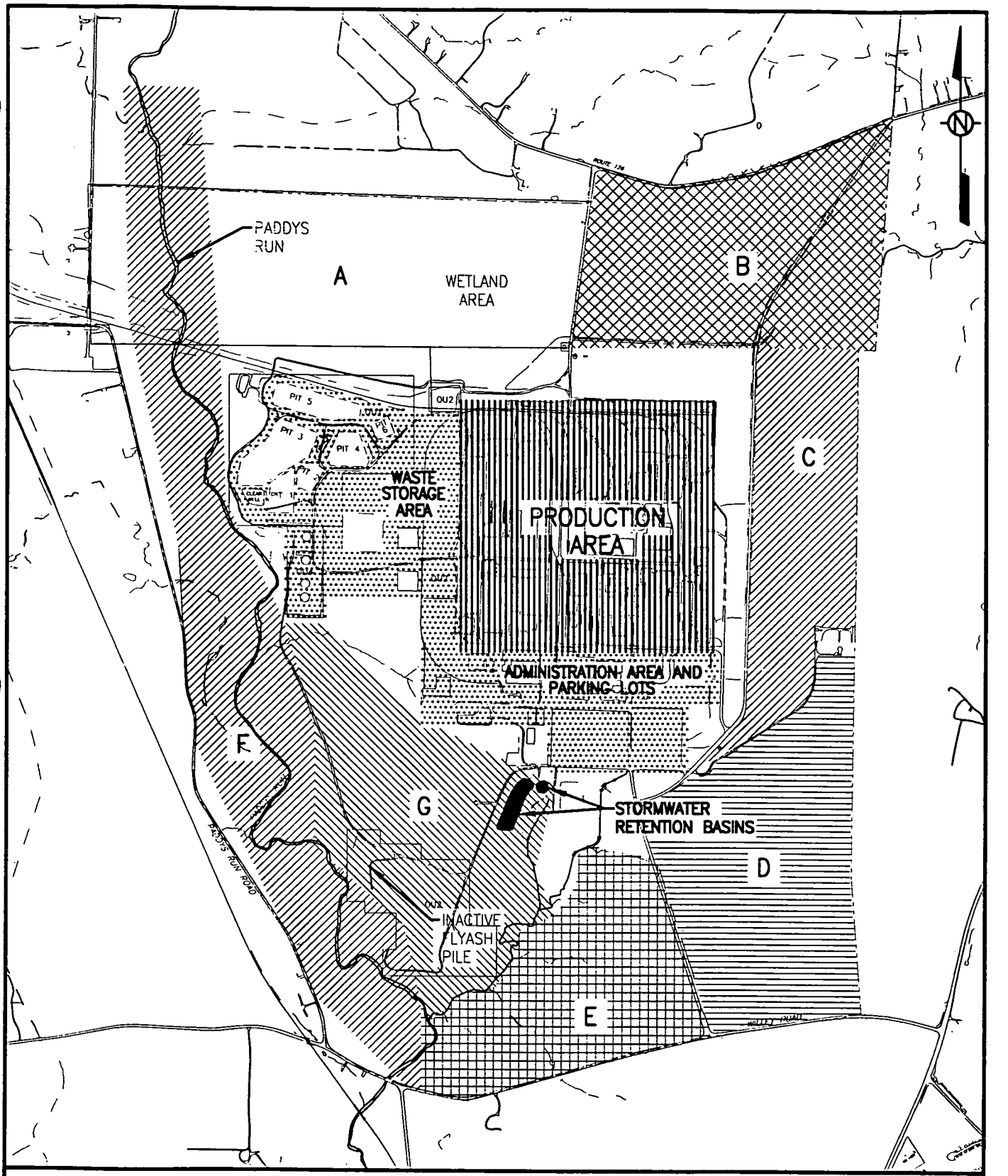
B.1.5 SUMMARY

As discussed in detail in Section 5.0 of the Operable Unit 5 RI Report and summarized above, surface water runoff from contaminated soils and, to a more limited extent, airborne emissions are the major transport mechanisms associated with Operable Unit 5 contaminated media. Presently, the site is well vegetated and relatively level, limiting the amount of run off to surface water. In addition, stormwater runoff control projects have reduced the area of the property draining to Paddys Run. Although contaminants have entered Paddys Run and on-property drainage ditches, it is unlikely that sediment represents a long-term sink for contaminants because of the dynamic environment of the stream.

Ecological receptors may come in contact with contaminants via a number of pathways. Terrestrial receptors may be exposed to direct radiation from contaminated soil, ingest radionuclides and other contaminants contained in water and various food items, or incidentally ingest contaminated soil during grooming or burrowing. Aquatic receptors may come in contact with contaminants that are dissolved in solution, adsorbed to sediment particles, or through consumption of contaminated prey. However, as summarized in Sections 1.0 through 3.0 of the Operable Unit 5 RI, previous studies and routine observations to date have not identified any evidence of major adverse impacts on the flora and fauna at the FEMP.

The next two sections of the Site-Wide Ecological Risk Assessment evaluate the potential risk to ecological receptors associated with nonradiological and radiological contaminants present in the study areas located on the FEMP as well as areas outside the FEMP boundaries.



LEGEND :

A WOODLOT / WETLAND
B PINE PLANTATION
C GRASSLAND
D GRASSLAND
E GRASSLAND
F PADDYS RUN
G PINE PLANTATION

SCALE IN FEET
0 1200 2,400

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FIGURE B.1-1. STUDY AREAS FOR THE SITE-WIDE ECOLOGICAL RISK ASSESSMENT

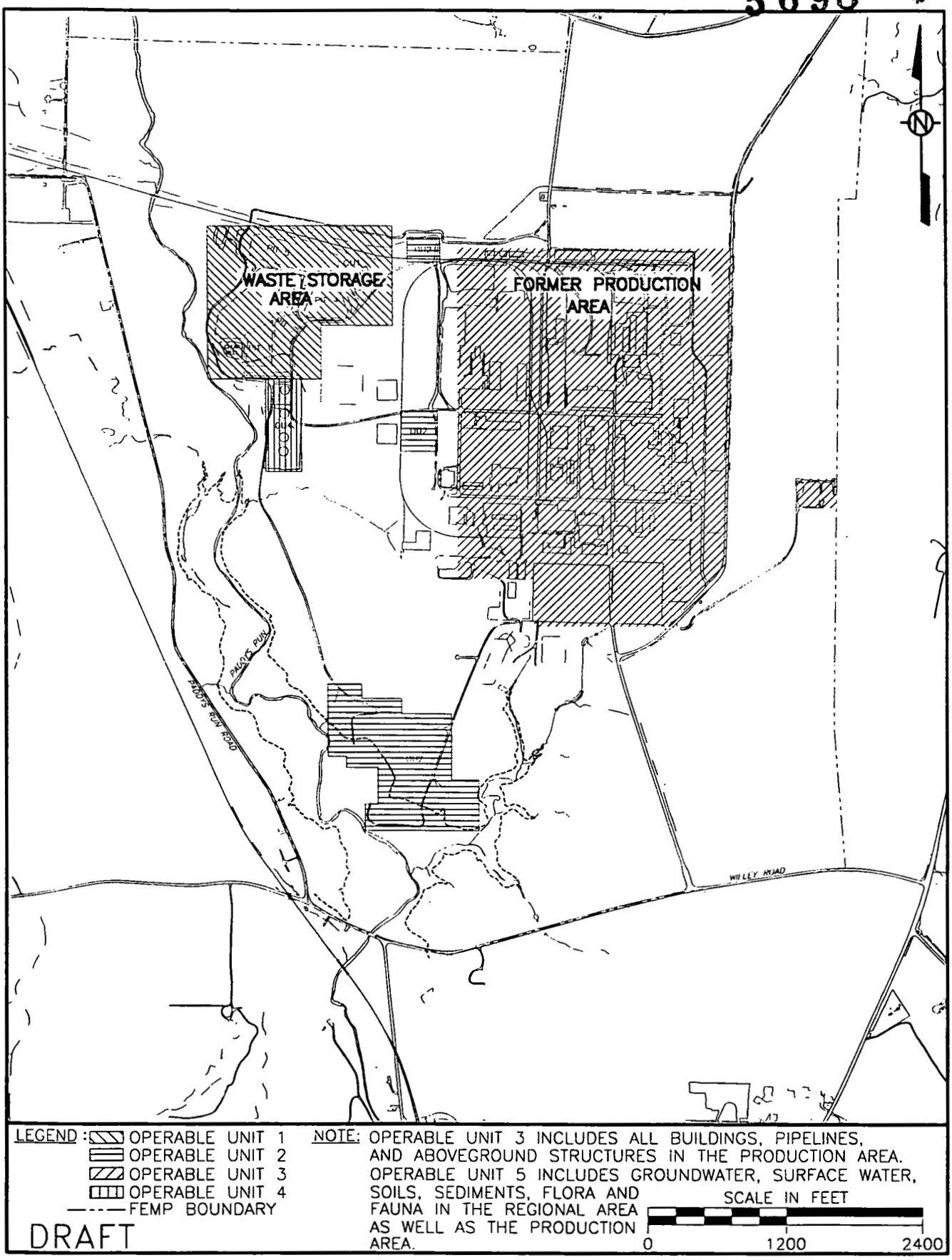

FIGURE B.1–2. OPERABLE UNITS FOR THE FEMP RI/FS

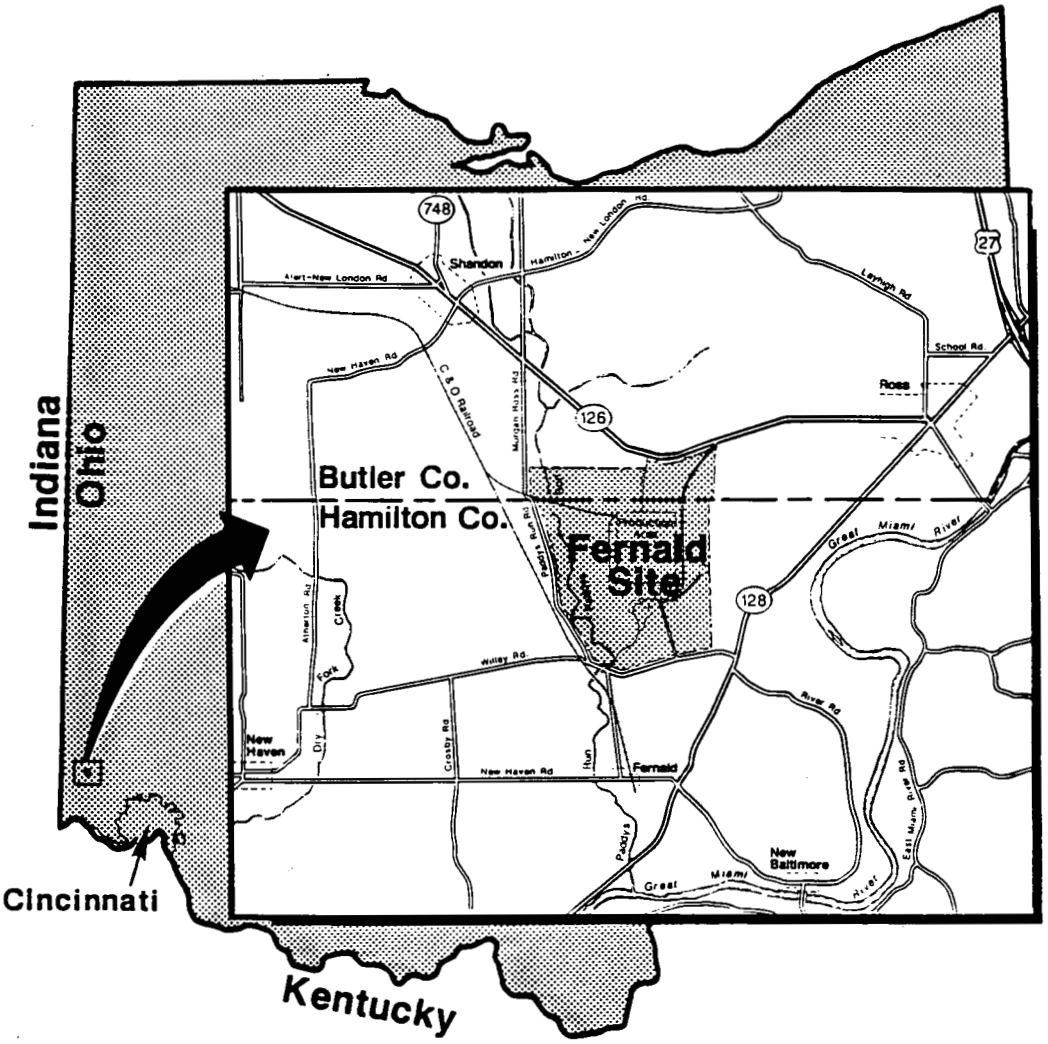

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FIGURE B.1–3. FEMP AND SURROUNDING AREA

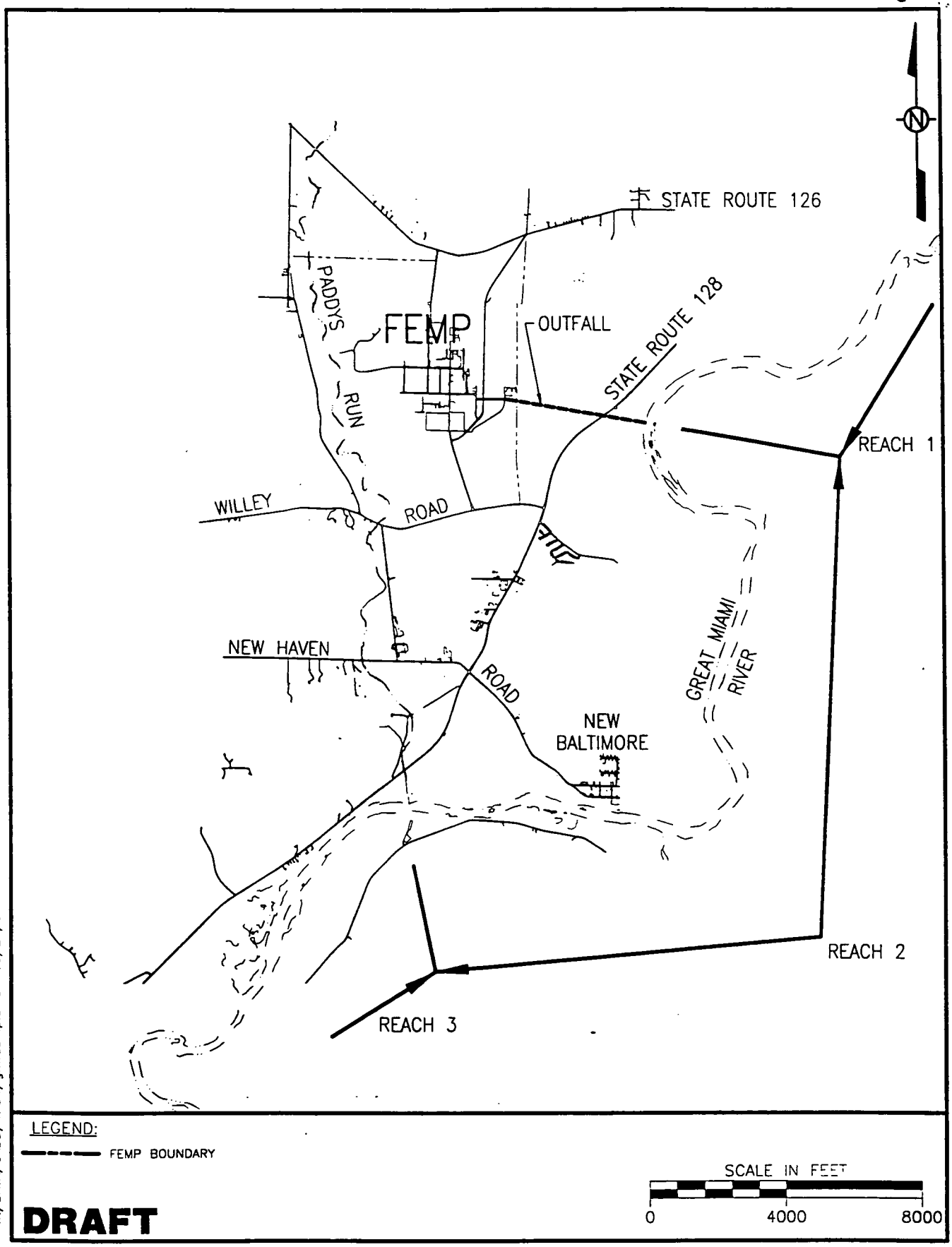

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FIGURE B.1–4. SAMPLING REACHES ALONG THE GREAT MIAMI RIVER

B.2.0 ASSESSMENT OF NONRADIOLOGICAL CONTAMINANTS

This section of the Site-Wide Ecological Risk Assessment evaluates the possible risks to ecological receptors resulting from exposure to nonradiological contaminants detected in FEMP on- and off-property study areas. Media-specific contaminants were compared to media-specific benchmark values that are protective of ecological receptors. Contaminants exceeding these values were regarded as final CPCs and their toxicological properties summarized. Finally, the relative risks that each of these final CPCs might pose to FEMP ecological receptors were evaluated.

B.2.1 EXPOSURE ASSESSMENT

As described in the EPA Region V guidelines, the major objective of the exposure assessment is to estimate, as accurately as possible, the media-specific chemical concentrations to which ecological receptors in each study area might be exposed. As discussed in Section B.1.0, the FEMP and off-property areas were subdivided into smaller study areas, based on habitat type and the size of the home ranges of receptor species used to quantify total potential radiation dose in Section B.3.0. Estimated environmental concentrations are most appropriately based on measured site-specific data, and should reflect the bioavailable, or potentially bioavailable, portion of the total media-specific chemical concentration. The bioavailable concentration of a chemical reflects that portion of a chemical that can be ingested, absorbed or assimilated by an organism.

As described in detail in Appendix A of the Operable Unit 5 RI Report, statistical procedures were used to identify representative concentrations for each CPC. The upper 95 percent confidence limit on the arithmetic mean was used when data for a contaminant followed a normal or lognormal distribution. When data did not follow normal or lognormal distributions, when the data contained fewer than 7 detectable samples (i.e., detects < 7), or contained a large portion of nondetects (>50 percent), the representative concentration equaled the 95th percentile detect. For data sets containing less than 20 samples, the 95th percentile detect is always the maximum detected concentration.

Appendix A also includes a detailed description of the statistical procedures used to compare the concentrations of naturally occurring radionuclides and metals to concentrations detected in background samples. Those radionuclides and metals present in concentrations significantly greater

than background concentrations were retained for further consideration as CPCs. These statistical comparisons were performed for all media except sediment; the limited number of samples in the background data set precluded the performance of statistical analyses.

B.2.1.1 Surface Water

This assessment evaluated the potential impact of surface water contaminants to both freshwater biota and terrestrial receptors that may inhabit these various bodies of water or use them as sources of drinking water. With the exception of the Great Miami River north of the effluent line, the surface water exposure assessment is based on representative concentrations of CPCs measured in surface water samples collected as part of the RI/FS sampling program in 1993. Samples collected prior to 1992 were used to determine the representative concentrations of CPCs present in the Great Miami River north of the effluent line; no samples were collected from this portion of the river in 1993. As described in Sections B.1.1.2.4 and B.1.1.2.5, samples collected from Paddys Run and the Great Miami River were grouped according to reach, with Reach 1 representing upstream areas in both instances. Sampling station W-5 on Paddys Run served as the background location for all surface water samples collected from this creek as well as other drainages located on the FEMP. W-1 represented the background station for all surface water samples collected from the Great Miami River.

Concentrations of metals present in surface water samples were reported in terms of total (unfiltered) and dissolved (filtered) metals, whenever both sets of data were available. As discussed in Section B.1.0, the potential impact of uranium and thorium on ecological receptors was examined from the standpoint of heavy metal toxicity (this section) and as radionuclides (Section B.3.0). For this portion of the Site-Wide Ecological Risk Assessment, the mass concentrations of thorium and uranium (mg/L) were determined by converting the activity concentrations (pCi/L) of the principal isotopes (DOE 1993a). The equations used for the conversion are presented in Attachment B.I.

The representative concentrations of the RI/FS surface water CPCs to which aquatic biota might be exposed are summarized in Attachment B.II, Tables B.II-1 through B.II-5. These values were compared directly to concentrations of these same chemicals that are known to be potentially hazardous to aquatic biota (Section B.2.2.1). These same contaminant concentrations were also evaluated to determine if they might pose a risk to ecological receptors drinking from various on- and

off-property bodies of water. These data are also discussed in Section B.2.2.1 and are summarized in Attachment B.III.

B.2.1.2 Sediment

The sediment exposure assessment is based on the representative concentrations of CPCs detected in RI/FS sediment samples collected in 1993. Exposures to sediment contaminants can be evaluated either by examining sediment concentrations (μg/kg, dry weight) or by employing partitioning coefficients to determine the concentrations of CPCs present in the interstitial water.

Interstitial water concentrations provide estimates of the bioavailable concentrations of chemicals associated with contaminated sediment. Most modeling methods for determining interstitial water concentrations (e.g., equilibrium partitioning [EP]) are limited to nonpolar organic chemicals and are not applicable to metals because of their complex partitioning behavior. Metal adsorption-desorption from sediment is the result of numerous interrelated processes that depend on ionic strength, pH, Eh, and, for some metals, the concentration of acid volatile sulfide present in the sediment (DiToro et al. 1986; 1989). Methods for estimating the interstitial water concentration of metals are still undergoing development.

Because of these limitations, this assessment employed separate methods for determining exposure concentrations for organic and inorganic sediment CPCs. For inorganic CPCs, exposures were simply based on concentrations of contaminants measured in sediment samples without extrapolation to interstitial water (i.e., bulk sediment concentration; μg/kg). The mass concentrations of thorium and uranium (μg/kg) present in sediments were determined by converting the activity concentrations (pCi/g) of the principal isotopes. The representative concentrations of inorganic CPCs present in sediment samples are summarized in Attachment B.IV, Tables B.IV-1, B.IV-3, B.IV-4, and B.IV-6.

For nonpolar organic CPCs, EP was used to extrapolate from contaminant concentrations in sediment (μg/kg, dry weight) to concentrations present in interstitial water (μg/L). Estimates of interstitial water concentrations are based on bulk sediment concentrations of CPCs and organic carbon in sediment. Partitioning coefficients used include f_{oc} (fraction organic carbon), K_{ow} (octanol/water partitioning coefficient), K_{oc} (organic carbon/chemical partitioning coefficient), and Kd (sediment/water partitioning coefficient). These coefficients are defined as follows (EPA 1988a):

$$Kd = K_{oc} \bullet f_{oc}$$

where

$$Kd = \frac{\text{concentration of chemical in soil or sediment}}{\text{concentration of chemical in water}}$$

and

K_{oc} = partitioning coefficient for chemical/organic carbon
f_{oc} = fraction of organic carbon in sediment/soil

Kd values are often estimated from published K_{oc} values and from site-specific f_{oc} values. Site-specific sediment organic carbon data were not present in the RI/FS database. Therefore, a value of 1.0 percent (f_{oc} = 0.01) was chosen to determine interstitial water concentrations of nonpolar organic CPCs. Although arbitrary, this value is believed to be a reasonable assumption based on previously published sediment organic carbon data (EPA 1989).

K_{oc} values were unavailable for the organic chemicals of potential concern and were instead estimated from the octanol/water partitioning coefficient, K_{ow}, as follows:

$$K_{ow} = \frac{\text{concentration of chemical in octanol}}{\text{concentration of chemical in water}}$$

Regression equations relate K_{ow} to K_{oc}, and are chemical-class specific. The following equations were used to estimate K_{oc} for the sediment nonpolar organic CPCs (EPA 1988a):

$$\text{Log } K_{oc} = 0.544 \log K_{ow} + 1.377 \text{ for nonpolycyclic aromatic hydrocarbons}$$
$$\text{Log } K_{oc} = 0.937 \log K_{ow} - 0.006 \text{ for polycyclic aromatic hydrocarbons (PAHs)}$$

Applying equilibrium partitioning, the representative interstitial water concentrations of sediment organic CPCs were estimated and summarized. These estimated concentrations were compared directly to aqueous concentrations of these same chemicals that are known to be potentially hazardous to aquatic biota (Section B.2.2.2).

Equilibrium partitioning was not applied to polar organic contaminants. Instead, contaminant concentrations measured in sediment samples were assumed to be completely dissolved in the

interstitial water (e.g., $\mu g/Kg = \mu g/L$). Like the nonpolar organics, these values were compared to aqueous benchmark concentrations.

B.2.1.3 Surface Soil

Surface soil samples collected from each study area between 1988 and 1993 were considered in the assessment. Samples collected from areas where removal actions have occurred (e.g., excavation of contaminated soil adjacent to the sewage treatment plant; Removal Action No. 14) were eliminated from further consideration. By eliminating these samples, the resulting soil contaminant concentrations more closely reflected current conditions at the FEMP.

Unlike surface water and some sediment CPCs, only limited data are available for evaluating the bioavailability of surface soil CPCs. Therefore, the concentrations of surface soil CPCs used in this exposure assessment were based on individual contaminant concentrations per unit of soil (mg CPC/kg, dry weight) without adjustment for bioavailability. These values are listed in Attachment B.V.

B.2.1.4 Uncertainty Associated with Exposure Assessment

General areas of potential concern that are expected to contribute to uncertainty are summarized in Table B.2-1.

B.2.2 TOXICITY SCREENING

The steps followed to identify media-specific final CPCs are summarized in Table B.2-2 and are discussed in greater detail in the sections that follow.

B.2.2.1 Identification of Final Surface Water CPCs

Inorganic contaminants present in concentrations statistically greater than background concentrations were considered surface water CPCs. All organic chemicals detected in surface water samples were also considered CPCs. The list of final surface water CPCs for each study area was compiled by comparing the representative contaminant concentrations of those inorganic CPCs greater than background and all organic CPCs to values that are protective of aquatic biota. The potential hazard to terrestrial organisms that may use the following bodies of water as a source of drinking water was also evaluated (Table B.2-2): the drainage ditch in Study Area A, north of the production area; drainageways in the Southfield Area that receive runoff from the active and inactive flyash piles

(Study Areas E and G); the pilot plant drainage ditch that drains into Paddys Run just south of the K-65 silos (Study Area F); and surface water in Paddys Run and the Great Miami River. Although other drainages exist on the FEMP, only those that are known to contain standing water for a large portion of the year, permitting repeated exposure, were considered. The process used to derive benchmark values and to select final surface water CPCs is described in the following paragraphs.

For this Site-Wide Ecological Risk Assessment, the benchmark values used to identify final surface water CPCs were chronic ambient water quality criteria (CAWQC). Actual exposures of FEMP aquatic receptors to CPCs are assumed to be primarily chronic (long-term) exposures, usually at sublethal concentrations. CAWQCs are developed to protect sensitive aquatic species from exposures to chronic, sublethal contaminant concentrations. These CAWQCs were selected as conservative and appropriate screening criteria. However, chronic toxicity data are not uniformly available. Surrogate chronic benchmark values were therefore estimated from acute toxicity data in some instances. Acute toxicity is generally expressed as the "LC50" which represents the aqueous concentration of contaminant lethal to 50 percent of the test population. For this risk assessment, CAWQC values were derived by dividing available LC50 values by 100. In a number of instances, "LOEC" values (lowest observable effect concentration) rather than LC50 values were available. These values were converted to surrogate CAWQCs by dividing by a factor of 10.

The use of LC50/100 is based on the assumption that this ratio provides a reasonable and adequate level of protection for sensitive, untested species. This ratio has been employed by the Office of Pesticide Programs of the EPA to protect sensitive wildlife species (Urban and Cook 1986). In the process of developing water quality criteria in 1972, the National Research Council suggested that the LC50 value be divided by factors of 10 or 100, depending on persistence and potential to bioaccumulate (National Research Council 1972). More recently, examination of the results of acute and chronic toxicity tests performed on effluents has indicated that the ratios of acute to chronic toxicity values seldom exceed 10 (i.e., LC50/10 = chronic value) and ratios above 20 (LC50/20) have not been observed (EPA 1991). The use of the LC50/100 value therefore provides a conservative estimate of CAWQCs.

Using LOEC/10 to derive NOEC (no observable effects concentrations; chronic toxicity values) has been extensively examined in aquatic toxicology and provides a conservative estimate of concentrations protective of sensitive aquatic species (Calabrese and Baldwin 1993).

Arithmetic average, study area-specific, surface water hardness values (mg $CaCO_3$/L) were used to calculate CAWQC for those metals whose toxicity is hardness-dependent. Average site-specific hardness values were calculated for each body of water using the equation provided in Method 314A of Standard Methods (APHA 1985). This formula is listed in Attachment B.I. All calcium and magnesium values reported in the RI/FS database for a given body of water were used to determine the concentrations. Calculated hardness values for the Great Miami River, Paddys Run, Study Area A, Study Area E, Study Area F, and Study Area G are 314.86, 315.65, 347.88, 405.11, 478.36, and 338.20 mg $CaCO_3$/L, respectively.

Parkhurst et al. (1984) determined that the toxicity of uranium was a function of both water hardness and alkalinity. The alkalinity values reported for Paddys Run and the Great Miami River were 235.3 and 217.9 mg/L $CaCO_3$, respectively. These alkalinity and study area specific hardness values were used in the equation provided by Parkhurst et al. (1984) to calculate site-specific CAWQC for uranium. This equation is listed in Attachment B.I.

A number of the chemicals under preliminary consideration as final surface water CPCs (e.g., calcium, magnesium, phosphorus, potassium, sodium, and silicon) are essential nutrients and usually considered to be nontoxic. These chemicals were therefore eliminated from further consideration as final surface water CPCs. The remaining chemicals detected in surface water samples were compared to background values; those chemicals that exceeded background concentrations were then compared to CAWQC (or surrogate values) and final surface water CPCs were identified. Mercury detected in the Great Miami River was an exception to this process. Concentrations of mercury measured in samples collected in the Great Miami River near the FEMP exceeded the benchmark value but were significantly lower than reported background values. However, this metal was retained for further consideration in this risk assessment. This screening process, summarized in Attachment B.I, identified the following contaminants as final surface water CPCs in Paddys Run with respect to aquatic biota:

- Aluminum
- Cadmium
- Lead
- Bis(2-ethylhexyl)phthalate
- Di-n-octyl phthalate
- Uranium

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Final surface water CPCs identified for aquatic biota inhabiting the Great Miami River are:

- Aluminum
- Ammonia
- Barium
- Bis(2-ethylhexyl)phthalate
- Cadmium
- Cyanide
- Lead
- Manganese
- Mercury

Exposure of terrestrial mammalian and avian receptors to surface water contaminants is primarily through ingestion of water. Currently, surface water criteria for the protection of terrestrial species are not available. Therefore, for this Site-wide Ecological Risk Assessment, the potential hazards for terrestrial species ingesting surface water contaminants were evaluated by comparing observed surface water contaminant concentrations to various benchmarks selected from the following:

- Available drinking water toxicity data for avian and mammalian species.
- OEPA's (1993) criteria for public water supplies.
- EPA Region III Risk Based Contaminant Tables, Second Quarter (EPA 1994).
- Benchmarks selected for assessment of risk to aquatic life.

Toxicity data for avian and terrestrial ecological receptors generated as a result of ingestion of contaminants in drinking water are summarized in Attachment B.III, Table B.III-1. This table includes the following information for each contaminant: the animal class and data type, exposure concentration, observed effect, species exposed, and exposure conditions under which the effect was observed. Data types characterize the reported contaminant levels as LOECs. A toxic effect can be expected in birds and mammals ingesting surface water containing contaminant concentrations exceeding LOECs. When multiple studies provide more than one LOEC, the lowest and highest LOECs are provided as a range (i.e., lowest LOEC-highest LOEC). Due to the limited amount of data on drinking water, only one LOEC is reported for some contaminants. In a few cases, contaminant concentrations reported to cause "no effect" in one species under a particular set of exposure conditions exceeded concentrations at which effects occurred in other species under similar exposure conditions, or in the same species under different exposure conditions. The wide range in LOECs reported in Table B.III-1 can be attributed to the differing sensitivities of exposed species or the endpoint evaluated by the investigator.

None of the LOECs listed in Table B.III-1 were lower than OEPA criteria. Therefore, as a conservative screening method for identifying drinking water CPCs, the OEPA criterion was selected as a DWB. Human health criteria such as the OEPA's criteria for public water supplies were

considered when selecting drinking water benchmarks (DWBs) because human health criteria are typically based on laboratory studies using animals (usually rodents). The OEPA's criteria for public water supplies are contaminant levels at which, after conventional treatment, a surface water will be suitable for human intake and will meet federal drinking water regulations. When no OEPA criteria were available for a given constituent, human health risk-based drinking water values calculated by Region III EPA were used. Finally, when no other "water ingestion" related values were available to serve as a DWB, benchmarks used in the assessment of risk to aquatic life were selected to identify potential CPCs.

As previously discussed, a number of substances included in the analyte list are generally regarded as being nontoxic and were therefore dropped from further consideration. Regulatory criteria have yet to be developed for 2-hexanone and 4-methyl-2-pentanone, which is indicative of their limited toxicity (e.g., CAWQC for 2-hexanone is estimated to be 50,000 μg/L) (Shell Chemie 1975). This suggests that these chemicals not be considered hazardous. These two chemicals were also eliminated as contaminants of potential concern for drinking water exposures.

Tables B.III-3 to B.III-11 summarize representative surface water contaminant concentrations for each study area and compare these concentrations to the DWB values selected for each contaminant. This screening process identified the following contaminants as final surface water CPCs terrestrial receptors exclusively relying on drainage ditches on the FEMP as sources of drinking water:

- Aluminum
- Di-n-octyl phthalate
- Mercury
- Uranium
- Trichloroethylene
- Tetrachloroethene

The following drinking water CPCs were identified in samples collected from Paddys Run:

- Aluminum
- Lead
- Uranium
- Bis(2-ethylhexyl)phthalate
- Di-n-octyl phthalate

Terrestrial and avian ecological receptors utilizing the Great Miami River as a source of drinking water were exposed to the following CPCs:

- Aluminum
- Mercury
- Cadmium
- Bis(2-ethylhexyl)phthalate

B.2.2.2 Identification of Final Sediment CPCs

As noted in Section B.2.1, the limited nature of the background database precluded the performance of statistical comparisons of contaminants present in sediments collected from various study areas to background concentrations. Therefore, unlike the other media, all inorganic and organic chemicals were considered CPCs and compared directly to appropriate benchmark values (Table B.2-2) and final sediment CPCs were identified. This process is described below in greater detail.

Unlike surface waters, national criteria have yet to be established for contaminants in sediments. The current lack of sediment criteria is largely a function of the difficulties associated with identifying biologically available concentrations of sediment contaminants. Adverse impacts associated with contaminated sediments is primarily related to the concentration of contaminant in interstitial (e.g., pore) water. The adsorption/desorption of contaminants from sediment particles into interstitial water is governed by complex, interrelated chemical and physical processes. Models have been developed to predict the concentration of non-polar organic contaminants that may be dissolved into interstitial water and therefore become biologically available. However, no equivalent, widely accepted models currently exist for predicting the partitioning of metals or polar organics between water and sediment particles. As a result of these factors, separate approaches were used to identify sediment benchmarks in this Site-Wide Ecological Risk Assessment.

As a preliminary step, several of the inorganic chemicals detected in sediment samples in concentrations exceeding background concentrations (e.g., calcium, magnesium, potassium, and sodium) are considered to be nontoxic and were eliminated from further consideration. The remaining inorganic and organic chemicals were then compared to benchmark values. Values developed by Long and Morgan (1991) served as benchmark values for potential inorganic sediment contaminants. Long and Morgan developed "apparent effects" data sets for various sediment toxicants by compiling biological effects data (e.g., reductions in benthic populations associated with the presence of a contaminant) for a specific toxicant. These data were then placed in ascending order (toxicant concentration producing no effect to toxicant concentration producing the greatest effect) and the 10th and 50th percentile of these ordered data were identified. Long and Morgan defined the 10th and 50th percentiles as the "Effects Range-Low" (ER-L) and the "Effects Range-Median" (ER-M), respectively, for each chemical considered. Although the apparent effects database is founded predominantly on the effects of toxic materials on marine organisms, ER-L and ER-M values have been adopted by various agencies (e.g., National Oceanic and Atmospheric Administration; Region IV

EPA) (L. Wellman, personal communication) as appropriate screening criteria for marine, estuarine, and freshwater sediments. Therefore, Long and Morgan's entire database (containing both freshwater and saltwater data) was considered appropriate for identifying sediment inorganic CPCs.

ER-L values have not been derived for several inorganic chemicals measured in RI/FS sediment samples. For these contaminants, surrogate values were selected, including sediment quality criteria established by various government agencies. In several other instances, sediment-specific criteria could not be identified; these inorganic sediment contaminants were therefore retained as CPCs (e.g., aluminum and uranium) or compared to published soil concentrations that are indicative of contamination (e.g., cobalt).

Chemicals measured in sediment at concentrations greater than the ER-L (or surrogate) values were considered to be inorganic sediment CPCs. Uranium was retained for consideration as CPCs, because toxicity-based benchmark values were not available to assess these inorganic sediment contaminants. The results of this screening process are summarized in Attachment B.IV. This screening process identified the following as final inorganic sediment CPCs for Paddys Run:

- Barium
- Cyanide
- Cadmium
- Manganese
- Uranium

The following represent final inorganic sediment CPCs identified in the Great Miami River:

- Barium
- Iron
- Lead
- Manganese
- Phenanthrene
- Uranium
- Zinc

As described in Section B.2.1.2, equilibrium partitioning (EP) models were used to convert concentrations of nonpolar organic contaminants present in the sediment (mg/Kg) to interstitial water concentrations (μg/L). The interstitial water concentrations were then compared to appropriate benchmark values (e.g., CAWQC).

As discussed previously, no widely recognized models have been developed to predict the concentration of polar organic contaminants present in interstitial water. Therefore, for the purposes of this Site-wide Ecological Risk Assessment, it was assumed that these contaminants were completely

dissolved in the interstitial water (e.g., $\mu g/Kg = \mu g/L$) and, like nonpolar organics, were then compared to CAWQC (or surrogate values). This screening process is summarized in Attachment B.IV.

None of the organic chemicals detected in samples collected in 1993 from Paddys Run exceeded benchmark values. Phenanthrene was the only organic contaminant present in sediment collected from the Great Miami River (downstream of the effluent outfall) identified as a final CPC.

B.2.2.3 Identification of Final Soil CPCs

Final surface soil CPCs were identified by statistically comparing inorganic CPCs to concentrations of inorganic chemicals present in background soil. Those inorganic chemicals that exceeded background concentrations and all organic CPCs were then compared to benchmark values (Table B.2-2). Those contaminants exceeding these values were considered final surface soil CPCs. This process is described below.

As described in Section B.2.1.3, sample locations impacted by removal actions were eliminated from the surface soil data base. Concentrations of inorganic chemicals detected in surface soil samples collected between 1988 and 1993 from a given study area were then statistically compared to background soil values. This represented the first step taken to identify final soil inorganic CPCs. All organic chemicals detected in soil were automatically considered CPCs.

Inorganic chemicals whose concentrations significantly exceeded background concentrations and all organic chemicals detected in soil were next compared to soil threshold values (concentrations considered to be protective of receptors). Contaminant threshold values were obtained from a number of sources, including:

- Those established by the Quebec Ministry of the Environment for soil (Direction des Substances Dangereuses 1988).
- Maximum allowable concentrations established by various regulatory agencies for amending farm soil with sewage sludge.
- Proposed action levels for contaminated soil at Resource Conservation and Recovery Act (RCRA) sites (EPA 1990).
- EPA Region III Risk-Based Contamination Tables, Second Quarter (EPA 1994).

Although these agencies have identified "safe" soil contaminant levels from a human health perspective, only a few have developed soil benchmark values that identify soil contaminant concentrations that are protective of ecological receptors. When possible, the Site-Wide Ecological Risk Assessment preferentially selected those benchmark values that considered impacts to ecological receptors. However, in many instances, surface soil benchmarks developed to be protective of human health had to be employed. To the extent possible, these values were checked against ecological toxicity data published in the literature to help insure that they were also protective of ecological receptors.

Chemicals generally considered nontoxic in soil include aluminum, barium, calcium, cobalt, iron, magnesium, manganese, potassium, sodium, and vanadium (Direction des Substances Dangereuses 1988). Calcium, iron, magnesium, potassium, sodium, and vanadium were eliminated from further consideration as surface soil CPCs. Although generally considered nontoxic, benchmark criteria were available for aluminum, barium, cobalt and manganese. These three contaminants were therefore retained for further assessment.

The only benchmark criterion identified for thorium was that established by the Quebec Ministry of the Environment. However, this value (3.0 mg thorium/kg) was less than the background soil concentration (9.7 mg thorium/kg) (DOE 1993b). In most instances, the maximum concentration of thorium detected in soil samples exceeded 9.7 mg thorium/kg. Because of the absence of an alternate criterion, thorium was retained as a final soil CPC and its toxicity summarized in Section B.2.3.15.

As summarized in Attachment B.V, the following inorganic chemicals passed both screens (e.g., were significantly greater than background concentrations and were greater than threshold values) and were identified as final surface soil inorganic CPCs for on-property locations:

- Aluminum
- Antimony
- Cadmium
- Lead
- Manganese
- Molybdenum
- Silver
- Thorium
- Uranium
- Zinc

Only concentrations of manganese in soil collected from the inner, and lead present in samples collected the outer off-property contours, exceeded soil benchmark values.

Although detected in soil collected from other study areas, Study Areas A, C, and E were the only ones with soil that contained organic chemicals with concentrations that exceeded benchmark criteria. As summarized in Attachment B.V, the following PAHs were identified as final CPCs:

- Benzo(a)anthracene
- Benzo(g,h,i)perylene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Chrysene
- Dibenzo(a,h)anthracene
- Indeno(1,2,3 cd)pyrene

B.2.2.4 Uncertainty Associated with Toxicity Screening

Because complete toxicological databases do not exist for most chemicals, there are many opportunities for uncertainty to impact the toxicological screening process. Specific areas of concern and methods used to reduce uncertainty are summarized in Table B.2-3.

B.2.3 TOXICOLOGICAL PROPERTIES OF FINAL CONTAMINANTS OF POTENTIAL CONCERN

Aluminum, antimony, arsenic, cadmium, lead, manganese, molybdenum, selenium, silver, uranium, zinc, and PAHs were all present in soil in concentrations that exceeded the soil benchmark criteria used in this Site-Wide Ecological Risk Assessment. Thorium was retained as a CPC and its toxicological properties are evaluated in this section. Sediment contaminants present in concentrations exceeding benchmark criteria included barium, cyanide, iron, lead, manganese, phenanthrene, and zinc. Barium, cyanide, and cadmium also exceeded surface water benchmark criteria, as did aluminum, ammonia, iron, lead, manganese, mercury, silver, and bis(2-ethylhexyl)phthalate. Aluminum, ammonia, cadmium, manganese, chromium, iron, lead, mercury, phthalates, 1,2-dichloroethylene, tetrachloroethylene, silver, vanadium, and zinc in surface water exceeded drinking water criteria. The toxicological properties of these contaminants are summarized below.

B.2.3.1 Aluminum

Although present in food in varying amounts, aluminum (Al) is not an essential element for mammals. The aluminum content of plants typically depends on the soil aluminum concentration and ranges from 10 to 30 mg/kg fresh weight; studies have indicated that this element stimulates the growth of several pasture plant species (Hackett 1962). As summarized in Venugopal and Luckey (1978), aluminum is not readily absorbed through the skin and gastrointestinal absorption of ingested aluminum is poor due to the transformation of aluminum salts into insoluble aluminum phosphate. The lack of accumulation of aluminum in animals with age or of any increase in tissue levels of

aluminum following fairly high dietary intake, suggests that mammals posses a homeostatic mechanism for this element. For most terrestrial organisms, aluminum compounds are generally not harmful and are considered to be toxicologically inert, except in cases of high experimental doses or prolonged inhalation (Venugopal and Luckey 1978).

Data on the toxicity of aluminum to aquatic organisms is somewhat limited. EPA (1988b) stated that freshwater organisms should not be adversely affected if aluminum concentrations do not exceed 87 μg/L when pH is between 6.5 and 9.0. Some studies have shown that the acute toxicity of aluminum increases with pH, whereas other studies found the opposite to be true (EPA 1988b). The occurrence of pH effects in fish depends on aluminum and calcium concentrations in the water. Laboratory studies have established that low pH is toxic to fish, that aluminum concentrations found in acidified waters (particularly inorganic monomeric aluminum) are toxic, and that calcium is ameliorative (Suter 1993).

Sublethal effects were also reviewed by EPA (1988b). It was found that 169 μg Al/L at a pH of 6.5 to 6.6 caused a 24 percent reduction in the growth of young brook trout (*Salvelinus fontinalis*). Cleveland et al. (1991) determined that brook trout accumulated significantly higher aluminum residues at pH 5.3 than at pH 6.1 or pH 7.2. They also determined that elimination of aluminum during depuration was more rapid at pH 5.3 than at pH 6.1 or pH 7.2. Data reported in EPA (1988b) indicated this metal does not bioconcentrate; bioconcentration factors range from 50 to 231 for brook trout (geometric mean value = 82).

B.2.3.2 Ammonia

The un-ionized species of ammonia is considered to be the form most toxic to aquatic organisms (EPA 1985a) with NH_4^+ being relatively less toxic (Thurston et al. 1981). Acute exposure of fish to high concentrations of ammonia results in an increase in the rate of gill ventilation, followed by hyperexcitability, convulsions, and then death (Russo 1985). Results of chronic exposures include deleterious histological effects (swelling and diminished numbers of erythrocytes; inflammation and degeneration of gills and kidneys [Reichenbach-Klinke 1967; Flis 1968; Smart 1976; Thurston et al. 1978]) and a decrease in reproductive capacity due to a reduction in egg production, egg viability, and/or a delay in spawning. Additional chronic effects include a decrease in growth and morphological development and increased susceptibility to disease (Russo 1985). Although research on the toxicity of ammonia to invertebrates is more limited than that performed on fish, test results

indicate that invertebrates, including insects, are also adversely affected by exposure to ammonia (EPA 1985a).

Aqueous ammonia solutions are typically composed of un-ionized ammonia (NH_3) in equilibrium with the ammonia and hydroxide ions. "Total ammonia" is the sum of the concentration of un-ionized and ionized (NH_4^+) forms present in solution (EPA 1985a). Aqueous ammonia equilibrium is mainly influenced by temperature and pH with the latter parameter exhibiting the greatest effect on concentrations of ammonia; increases in pH result in increased concentrations of NH_3 (EPA 1985a). Ionic strength is another important parameter influencing this equilibrium. Decreases in the percentage of un-ionized ammonia (NH_3) occur as the ionic strength increases in either hard or salt water (Messer et al. 1984; Whitfield 1974).

The effects of temperature on ammonia toxicity are varied. The concentration of NH_3 increases with increases in temperature and some authors have reported an effect of temperature on the toxicity of un-ionized ammonia, independent of the effect of temperature on the aqueous ammonia equilibrium (EPA 1985a). Numerous authors have reported that NH_3 toxicity increases with increasing temperature but several have reported greater NH_3 toxicity at lower ($<5°C$) temperatures than higher ($>22°C$) (e.g., Reinbold and Pescitelli 1982). The actual effects of temperature on ammonia toxicity are still not clearly understood and await further investigation (EPA 1985a).

B.2.3.3 Antimony

Antimony is frequently associated with nonferrous ore deposits and is commonly encountered in industrial environments, including smelters. It is considered a nonessential metal and is easily taken up by plants if present in a soluble form (K&K). There are no reports of plant toxicity resulting from uptake of antimony. Plants growing in soils contaminated by industrial emissions may be expected to contain elevated levels of antimony.

B.2.3.4 Barium

The concentration of barium (Ba) in natural waters is controlled by the solubility of barite ($BaSO_4$), a fairly common mineral. Other factors influencing barium solubility in natural waters include metal oxides or hydroxides (Hem 1970). Sulfates also govern the solubility of barium in soil as do carbonates, and it is strongly adsorbed to clays. Although commonly reported in plant tissues, it is apparently a nonessential component (Kabata-Pendias and Pendias 1992). While barium is readily

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taken up by plants in acidic soil, few reports exist regarding its toxicity to plants. Chaundry et al. (1977) reported 1 to 2 percent barium (dry weight) in plants as highly toxic while 220 mg Ba/kg (ash-free dry weight) has been reported to be moderately toxic (Shacklette et al. 1978). Calcium, magnesium, and sulfur appear to act antagonistically with barium, and may serve to reduce its toxicity (Kabata-Pendias and Pendias 1992).

B.2.3.5 Cadmium

To date, no evidence exists to suggest that cadmium (Cd) is either biologically essential or beneficial (Venugopal and Luckey 1978; FWS 1985a). Freshwater biota are particularly sensitive to this heavy metal; concentrations as low as 0.8 to 9.9 μg Cd/L produce lethality among insects, crustaceans, and fish (FWS 1985a; EPA 1985b). This heavy metal does not bioconcentrate to an appreciable extent; bioconcentration data listed in EPA (1985b) for freshwater species range from 3 (brook trout) to 4190 (caddisfly; *Hydropsyche betteni*) with a geometric mean value of 404.

Elemental cadmium (Cd) is insoluble in water, although its chloride and sulfate salts are freely soluble (FWS 1985a). The availability of cadmium to aquatic biota from their immediate physical and chemical environs depends on numerous factors, including adsorption and desorption rates of cadmium from terrigenous materials, pH, Eh, chemical speciation, and many other modifiers. Adsorption and desorption processes are likely to be major factors in controlling the concentration of cadmium in natural waters and tend to counteract changes in the concentration of cadmium ions in solution (FWS 1985a). Water hardness also alters the bioavailability of cadmium. Adsorption and desorption rates of cadmium are rapid on mud solids and particles of clay, silica, humic material, and other naturally occurring solids. It should be borne in mind that mobility and availability of cadmium, like most heavy metals, is a function of a large number of interrelated factors (e.g., CEC). Beyer et al. (1985) demonstrated that only a small portion of all metals measured in the soil become incorporated into plant foliage and suggested that most of the metal contamination detected in biota came from aerial deposition.

Compared to aquatic biota, mammals and birds are relatively less sensitive to cadmium exposure. Adult mallards fed a diet containing up to 200 mg Cd/kg survived and exhibited no loss in body weight, although egg production of laying hens was suppressed (White and Finely 1978). The lowest oral doses producing lethality among mammals were 250 and 150 mg Cd/kg body weight in rats and guinea pigs, respectively (EPA 1985b).

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B.2.3.6 Hydrogen Cyanide

Hydrocyanic acid (HCN) is very reactive and occurs only rarely in nature. The cyanide ion (CN^-) is highly water soluble and readily forms complexes with a variety of metal ions, especially those of the transition series. Compounds containing cyanide are often associated with steel, petroleum, plastics, synthetic fibers, metal plating, and chemical industries (EPA 1980). The toxicity to aquatic organisms of most simple cyanides and metallocyanide complexes is due mostly to the presence of HCN as derived from ionization, dissociation, and photodecomposition of cyanide-containing compounds, although the cyanide ion is also toxic. Cyanide appears to be more toxic to fish than to most invertebrates, although *Daphnia pulex* is apparently as sensitive to cyanide as are most fish. Concentrations as low as 50 μg/L can be fatal to sensitive fish species while exposure to concentrations much above 200 μg/L result in lethality to almost all fish species (EPA 1980).

B.2.3.7 Iron

The ferrous, or bivalent (Fe^{++}), and the ferric, or trivalent (Fe^{+++}) forms of iron are of primary concern in the aquatic environment. Iron can exist in natural organometallic or humic compounds and colloidal forms. The national criterion for the protection of aquatic life is 1.0 mg Fe/L (EPA 1986).

B.2.3.8 Lead

As summarized in FWS (1988), research to date has determined that lead (Pb) is neither essential nor beneficial and that all measured effects are adverse. Invertebrates exhibit a wide range of sensitivities to lead, and the toxicity of lead to fish has been found to be greater in soft water than in hard water. Organolead compounds are typically more toxic than inorganic compounds, food chain biomagnification is generally negligible, and younger organisms tend to be more sensitive to lead exposure than older individuals (FWS 1988). Reported bioconcentration factors are relatively low, ranging from 42 for brook trout to 1700 for a gastropod (*Lymnaea palustris*); the geometric mean value of data listed in EPA (1985c) for freshwater species is 403.

As with a number of other metals, hardness has a major effect on the bioavailability of lead, although the observed effect is probably due to the presence of one or more interrelated ions such as hydroxide, carbonate, calcium, or magnesium (EPA 1985c).

B.2.3.9 Manganese

Manganese (Mn) does not occur naturally as a metal but is found in various salts and minerals, frequently in association with iron compounds (EPA 1986). Manganese is a vital micronutrient for both plants and animals. McKee and Wolfe (1963) summarized the data concerning the toxicity of manganese to freshwater life. Manganese ions rarely occur in concentrations above 1 mg/L. The reported tolerance values for freshwater organisms range from 1.5 to >1000 mg Mn/L.

B.2.3.10 Mercury

In a recent review of the hazards of mercury (Hg) to fish, wildlife, and invertebrates, FWS (1987a) noted that mercury and its compounds have no known biological function; its presence is regarded as undesirable and potentially hazardous, and it is a mutagen, teratogen, and carcinogen. Forms of mercury with relatively low toxicity can be transformed into forms with very high toxicity through biological and other processes. Methylmercury can be bioconcentrated in organisms and biomagnified through food chains, returning mercury to upper trophic level consumers in a concentrated form. Bioconcentration factors for methylmercury range from 10,000 for brook trout to 81,670 for fathead minnows (*Pimephales promelas*); the geometric mean value of bioconcentration values listed in EPA (1985d) for freshwater organisms is 25,400. For all organisms tested, early developmental stages were the most sensitive, and organomercury compounds — especially methylmercury — were more toxic than inorganic forms. Numerous biotic and abiotic factors modify the toxicity of mercury compounds, sometimes by an order of magnitude or more, but mechanisms of action are unclear (FWS 1987a).

The chemical speciation of mercury (Hg) is probably the most important variable influencing ecotoxicology of Hg, but Hg speciation is complicated, especially in natural environments (Boudou and Ribeyre 1983; FWS 1987a). Most mercury entering aquatic systems is inorganic (Hg II) although recent studies have measured methylated mercury (CH_3HgH^+) in rain and surface runoff (Bloom and Watras 1989; Lee and Hultberg 1990). Methyl mercury is the major form of mercury in fish; methylation of inorganic mercury takes place in the terrestrial environment, the water column, and in sediment. The net amount of methyl mercury in an aquatic system is the result not only of its rate of formation, but also the result of the rates of those processes that alter the availability of inorganic mercury for methylation, and methyl mercury decomposition (demethylation) (Winfrey and Rudd 1990).

Inorganic mercury readily adsorbs to inorganic and organic particles as well as dissolved organic carbon (DOC) (Benes and Havelik 1979; Rudd and Turner 1983; Rogers et al. 1984). The degree and extent of this binding, while not well understood, will affect the availability of mercury for methylation. Methylation of mercury in most aquatic systems is thought to be primarily a function of microbiological activity in the sediment (Winfrey and Rudd 1990). Rates of methylation peak at the sediment-water interface and decrease in the overlying water and subsurface sediment (Korthals and Winfrey 1987). Reduced pH also appears to increase the availability of methylated mercury by expediting its release from sediment into the water column.

B.2.3.11 Molybdenum

Molybdenum (Mo) is an essential micronutrient, involved primarily with flavin-based metalloenzyme (FWS 1989; Venugopal and Luckey 1978). Industrial use of molybdenum stems largely from the manufacture of steel alloys, fertilizers, pigments, and coatings for glass.

According to Venugopal and Luckey (1978), the toxicity of molybdenum is low compared to other industrially important chemicals and it is not generally regarded as an industrial hazard. The chemistry of molybdenum is complex and not well understood. Its toxicity to mammals, and ruminants in particular, is significantly impacted by interactions with copper and sulfur. Cattle are prone to molybdenum poisoning when copper and inorganic sulfate are deficient (FWS 1989). Molybdenum is less toxic to monogastric animals than to ruminants; the resistance of other mammals, including domestic nonruminants and laboratory animals, is at least 10 times that of cattle (Venugopal and Luckey 1978; FWS 1989). Data on the sensitivity of avian and mammalian wildlife to molybdenum are limited. Aquatic species are not particularly sensitive to molybdenum and concentrations of this element are usually lower in fish and wildlife than in macrophytes (FWS 1989).

B.2.3.12 Phthalate

Phthalates, or phthalate esters, represent a large family of chemicals widely used as plasticizers. For the most part, these are colorless liquids with low volatility, and are poorly water soluble (EPA 1980; Verschueren 1983). Available data indicate that the toxicity of phthalate varies widely. However, acute toxicity values reported by EPA (1980) all exceed 1000 μg/L while chronic values as low as 3 μg/L had been determined for di(2-ethylhexyl)phthalate. Reported bioconcentration values ranged from 14 to 2680 (EPA 1980).

B.2.3.13 PAHs

Some PAHs are of environmental concern because they are known to be carcinogens and/or mutagens. An increase in fossil fuel consumption in the United States has resulted in an increase in emissions of PAHs to the environment. Sorption of PAHs onto solids in the water column and subsequent settling, as well as partitioning onto organic materials in the sediment, can significantly affect PAH transport.

Because of their complex chemical composition, the toxicity of PAHs is variable and not well understood (NAS 1985). In addition, research has demonstrated that different organisms and different life stages for a given species can vary widely in sensitivity to PAHs (FWS 1987b; NAS 1985; Neff and Anderson 1981). However, it is generally agreed that in aquatic ecosystems, the toxicity of PAHs is correlated with water solubility (Neff and Anderson 1981) and molecular weight, with high molecular weight PAHs exhibiting low acute toxicity (due to low water solubility) (FWS 1987b). In all but a few cases, PAH concentrations that are acutely toxic to aquatic organisms are several orders of magnitude higher than concentrations found in even the most heavily polluted waters. Sediment from polluted areas, however, may contain PAHs in concentrations approaching those similar to those which are acutely toxic, but their limited bioavailability would probably render them substantially less toxic than PAHs in solution (FWS 1987b).

Patton and Dieter (1980) fed mallards a diet that contained 4000 mg PAHs/kg (primarily naphthalenes, naphthenes, and phenanthrene) for 7 months. No mortality or visible signs of toxicity were noted but both liver weight and hepatic blood flow were significantly greater than that of the controls. However, the authors concluded that these modifications in the liver did not represent an adverse effect and that adult mallards could tolerate long-term exposures to relatively high concentrations of PAHs. Mammalian toxicity data are limited for PAHs but the ability of some PAHs to induce tumor formation is well documented (FWS 1987b). Bioaccumulated PAHs with a four-ring structure or less are rapidly metabolized. Therefore, long-term partitioning into biota is not considered a significant fate process (FWS 1987b; EPA 1993c).

B.2.3.14 Silver

Numerous studies have indicated that free soluble silver (Ag) is among the most toxic metals to freshwater organisms. In most natural waters, the monovalent form of silver is of greatest concern. Silver may exist as a simple hydrated monovalent ion, or it may exist in various degrees of

association with inorganic ions such as sulfate, bicarbonate, or nitrate (EPA 1980b). Silver is more toxic in soft water than in hard water (EPA 1980b). The sorption of silver by manganese dioxide, various ferric compounds, and clay minerals, and its subsequent partitioning by the sediment layer is strongly pH-dependent (Dyck 1968).

Silver exhibits a limited ability to bioconcentrate. Bioconcentration factors for freshwater species reported by EPA (1980b) ranged from < 1 for bluegill sunfish (*Lepomis macrochirus*) to 240 for a mayfly (*Ephemeralla grandis)* with a geometric mean bioconcentration factor of 57.

B.2.3.15 Thorium

Venugopal and Luckey (1978) provide the following synopsis on the bioavailability and toxicity of thorium (Th):

> *Although the metabolism of thorium is not well studied, current information suggests that its metabolic behavior is not analogous to any normal body constituent. Thorium and its isotopes are toxic radiologically, but the chemical toxicity of Th is low and depends on the nature of the Th salt. Reports about the chemical toxicity of Th compounds and their involvement in any physiological and biochemical functions in living tissues are scarce and fragmentary. It is known that gastrointestinal absorption of Th salts is very poor, owing to olation of Th salts in the intestine, and depends upon Th solubility and dose of the compound. Poor gastrointestinal absorption and the formation of particulate or colloidal forms of Th following absorption, and their subsequent removal through phagocytosis by the reticuloendothelial system, may partially account for the comparatively low chemical toxicity of Th salts.*

Thorium (Th) is ubiquitous in nature, and minute quantities are presumed to be present in food and the environment (Venugopal and Luckey 1978). Shacklette and Boerngen (1984) reported that thorium concentrations in surface soil collected in the United States averaged 9.4 mg Th/kg (range = 2.2 to 31 mg Th/kg). Hem (1970) reported that the chemistry of thorium apparently causes the element to be deposited in the hydrolyzable sediments and not to be carried extensively in solution in water. This chemical behavior may account for the absence of detectable thorium in water samples collected during this study. In addition, the lack of detectable thorium in the sediment samples may

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be the combined result of minimal runoff and periodic scouring of on-property surface bodies, particularly Paddys Run.

According to Venugopal and Luckey (1978), chronic subcutaneous administration, prolonged feeding, or inhalation of thorium compounds such as ThO_2 at low levels, has no adverse effects in animals. Reported thorium nitrate LD50s for mice ranged from 620 to 1680 mg Th/kg (method of exposure = gavage).

As discussed in Section B.2.2.3, thorium was retained as a final soil CPC because the representative thorium soil concentrations exceeded background soil concentration in all study areas except A and G (DOE 1993b). However, given the bioavailability and low toxicity associated with this contaminant, thorium was excluded from further consideration as a nonradiological CPC. The contribution of thorium-contaminated media to total radiological dose is considered in Section B.3.0.

B.2.3.16 Uranium

Uranium (U) is ubiquitous in the environment. Average values for U.S. surface soil equal 2.7 mg U/kg (range = 0.29 - 11 mg U/kg) (Shacklette and Boerngen 1984). Uranium is present in most natural waters in concentrations ranging between 0.1 and 10 μg/L but the element is not soluble enough to be present in large amounts in the ocean (Hem 1970).

Venugopal and Luckey (1978) provided the following summary of mammalian uranium toxicity:

> *Gastrointestinal absorption of soluble uranyl salts is about 10 percent; insoluble salts are poorly absorbed. Approximately 60 percent of absorbed uranyl compounds deposited in the kidneys is excreted in about 24 hours; uranyl compounds bound in skeletal material are mobilized much more slowly.*
>
> *The comparative acute toxicity of some uranium salts is as follows:*
> $UF_2 > UO_2F_2 > UCl_4 > UO_2(NO_3)_2$; UO_2 *and* U_3O_8 *are the least toxic uranium salts. The toxicity of orally ingested uranium salts is low because they are poorly absorbed. Insoluble salts are the least toxic chemically. When given orally to cats and dogs in the form of soluble uranyl nitrate, LD100s were 100 and 600 mg U/kg body weight, respectively.*

Sheppard et al. (1992) performed a series of tests to determine the toxicity of uranium in soil to three species of plants and the earthworm, *Lumbricus sp*. The authors concluded that toxic effects were not consistently observed below 1000 mg U/kg and that none of the measurements indicated that detrimental effects were occurring below 300 mg U/kg. Sheppard et al. (1992) also demonstrated that the bioavailability and toxicity of uranium in soil is a function of the soil's sorptive capacity and that uranium does not bioaccumulate.

Sheppard and Evenden (1992) performed a series of tests to determine the toxicity of uranium in 11 different soil types. Three plant species (*Phaseolus vulgaris*, *Lactuca sativa*, and *Brassica rapa*), and the earthworm (*Lumbricus sp.*) served as test species. A wide array of endpoints (e.g., seed germination, number of pods produced, earthworm survival) were used to assess the results of exposure. Concentrations ranged from background to 10,000 mg U/kg. The authors concluded that toxic effects were not consistently observed at concentrations below 1000 mg U/kg, that none of the measurements indicated that detrimental effects were occurring below 300 mg U/kg, and that phytotoxicity due to uranium occurred at concentrations 8- and 3-fold higher than phytotoxic concentrations of arsenic and zinc, respectively. Although Sheppard and Evenden (1992) did not test soil identical to that found on the FEMP, two of the soils tested did possess physical properties similar to those that predominate at the FEMP. The primary differences between the two Sheppard and Evenden (1992) test soils and those found at the FEMP were that FEMP soil generally had higher clay contents and greater ion exchange capacity (sorptive capacity) than did Sheppard soils. This suggests that the elevated concentrations of uranium present in FEMP soils are also associated with low toxicity, particularly when Sheppard and Eveden (1992) were able to demonstrate that uranium bioavailability and the sorptive capacity of a soil are negatively correlated.

Studies by Swanson (1983, 1985) on aquatic food chains documented decreasing radionuclide content with successive trophic level, suggesting that actual assimilation of these nuclides (natural U, radium-226, and polonium-210) into tissue at each trophic level is small. Swanson (1985) reported that most ingested radionuclides simply passed through the gut and cycled back into the sediment. Mahon (1982) examined the transfer of uranium through three different food chains, one aquatic and two terrestrial. Data examined during this study indicated that uranium is not accumulated to any great extent by terrestrial herbivores, that there was no indication of biomagnification in top predators, and that the movement of "naturally occurring radionuclides from undisturbed ore bodies to aquatic systems does not appear to result in high levels of contamination in fish." According to

Mahon, study results indicated that a drop in body burden of one order of magnitude occurred at each successive trophic level.

Studies completed by Parkhurst et al. (1984) also indicate that uranium is not readily absorbed by aquatic organisms; bioconcentration factors calculated during the 1984 study were low, ranging from 1.9 to 4.3. Based on the results of acute and chronic (embryo-larval) toxicity tests conducted on brook trout, Parkhurst et al. (1984) calculated a 48-hour LC50 of 59,000 μg U/L and chronically toxic concentrations were estimated to exceed 9000 μg U/L. Studies performed by Tarzwell and Henderson (1960) and Holdway (1992) documented the relationship between increasing water hardness and decreasing acute toxicity of uranium. Although EPA has not developed ambient water quality criteria for uranium, the Canadian government has adopted 300 μg total U/L as a guideline value for the protection of aquatic life and wildlife (Inland Waters Directorate 1987).

B.2.3.17 Vanadium

Vanadium (V) is an ubiquitous element, frequently associated with petroleum refining and products. It is also used in the hardening of steel, production of pigments, and the manufacture of insecticides. It is common in many foods, particularly milk, cereals, and vegetables. While the majority of vanadium encountered in mammals is stored in fatty tissue, bone and teeth contribute to the body burden (Klassen et al. 1986). It has been postulated that homeostatic processes exist for this element in that normal tissue levels can be maintained in the face of excessive uptake. The toxic action of vanadium in mammals is largely confined to the respiratory tract. Acute vanadium poisoning via ingestion is characterized by effects on the nervous system, hemorrhage, and respiratory distress (Klassen et al. 1986). No reports exist regarding vanadium phytoxicity under field conditions. However, experimental greenhouse studies have indicated that concentrations of 140 mg/kg in the soil and 0.5 mg/kg in the nutrient solution may be toxic to plants (Kabata-Pendias and Pendias 1992).

B.2.3.18 Zinc

Zinc is the fourth most widely used metal in the world and its major uses are for galvanizing steel, producing alloys, and as an ingredient in paints and rubber. Zinc occurs in many forms in natural waters and sediment. At pH 6.0, the dominant forms of dissolved zinc are the free ion (98 percent) and zinc sulfate, whereas at pH 9.0, the dominant forms are the mono-hydroxide ion (78 percent), zinc carbonate (16 percent), and the free ion (6 percent). Like many other cationic metals, the concentration of dissolved zinc is a function of both water hardness and pH (EPA 1987).

Although zinc is an essential micronutrient for all living organisms, acute values for freshwater invertebrates range from 32 to 40,930 μg/L and those for fish range from 66 to 40,900 μg/L. Chronic values for invertebrates have been reported at concentrations as low as 46.7 μg/L while exposure of fish to 36.4 μg/L has resulted in chronic toxicity. Acute and chronic toxicity of this metal is a function of water hardness (EPA 1987).

B.2.4 RISK CHARACTERIZATION OF FINAL CPCS

Risk characterization relates exposure concentrations of final CPCs to concentrations of CPCs that are known to cause adverse effects; it is essentially the integration of exposure and toxicity. The "toxicity quotient method" was selected to characterize risks associated with the final CPCs. Toxicity quotient values are derived by dividing the representative estimated environmental concentrations for each final CPC by the same benchmark toxicity values used to identify media-specific CPCs. For this Site-Wide Ecological Risk Assessment, a toxicity quotient value of less than 1.0 is considered to be associated with insignificant risk. The resulting toxicity quotients for media- and study area-specific final CPCs are listed in Attachments B.II - B.V and all quotient values >1.0 are summarized in Tables B.2-4 to B.2-6.

The toxicity quotient method is probably the most common method for risk characterization used in ecological risk assessments. Advantages of this method, according to Barnthouse et al. (1986), include the following:

- The toxicity quotient method is relatively easy to implement, is generally accepted, and can be applied to any data.
- This method is useful when a large number of chemicals must be screened.

The toxicity quotient method has some inherent limitations. One primary limitation is that it is a "yes/no" method for relating toxicity to exposure. That is, it uses single values for exposure concentrations and toxicity values (TVs) and does not account for incremental or cumulative toxicity. However, cumulative toxicity can be evaluated by employing the method of Barnthouse et al. (1986). This method simply sums the individual representative concentration/TV quotients for various CPCs. Although all final surface water CPCs with toxicity quotient values >1.0 were assumed to pose a potential risk to ecological receptors, those contaminants with quotient values >0.3 (see Attachment B.II) were included in this assessment of cumulative risk because they may contribute to

chronic effects resulting from additivity or synergism (Cardwell et al. 1993). Toxicant additivity best describes the majority of toxicant interactions, and therefore is consistent with this approach for estimating cumulative toxicity. Other types of interactions, including synergistic and antagonistic interactions, have been insufficiently documented for most of the chemical mixtures studied. This method for determining cumulative risk values is intended only for aquatic systems; at present, no equivalent method exists for estimating cumulative toxicity for terrestrial or avian biota. The cumulative risk values calculated for surface waters examined in this study are summarized in Table B.2-4.

The following sections summarize estimated risks based on media-specific representative exposure concentrations. It should be emphasized that the individual toxicity quotient values presented do not represent the absolute probability of risk in themselves, but are representative of the *relative* probability of risk; that is, the greater the toxicity quotient value the greater the likelihood that ecological receptors coming in contact with a given contaminant may be adversely affected.

B.2.4.1 Risk Associated with Final Surface Water CPCs

The toxicity quotient values of the following contaminants collected in surface waters from on-property locations on Paddys Run exceeded 1.0: aluminum, bis(2-ethylhexyl)phthalate, cadmium, lead, and di-n-octyl phthalate. CPCs present in surface water samples collected from off-property Paddys Run sampling stations with quotient values greater than 1.0 were lead, uranium, bis(2-ethyl-hexyl)phthalate, and di-n-octyl phthalate. Water samples collected from the Great Miami River upstream of the FEMP NPDES outfall contained elevated concentrations (i.e., quotient values >1.0) of ammonia and mercury while samples collected between the outfall and the mouth of Paddys Run only contained aluminum in concentrations greater than the CAWQC. The following CPCs were present in concentrations greater than CAWQCs in samples collected from the Great Miami River downstream of its confluence with Paddys Run: aluminum, barium, cadmium, cyanide, lead, manganese, and bis(2-ethylhexyl)phthalate (Table B.2-4).

Although the quotient value determined for aluminum present in water samples collected from Paddys Run on-property locations exceeded 1.0, the representative concentration of unfiltered aluminum measured in samples was less than background concentrations. This indicates that the concentrations of aluminum present in surface water samples collected from on-property locations on Paddys Run are a function of local geochemistry.

Quotient values for aluminum exceeding 1.0 were detected in samples collected Reaches 1 and 2 on the Great Miami River, downstream from the effluent line. This contaminant presented the highest single source of risk to aquatic biota inhabiting this section of the river (Table B.2-4).

The only location on the Great Miami River where the quotient value for ammonia was determined to exceed 1.0 was upstream of the FEMP NPDES outfall (quotient value = 1.9; Table B.2-4). Aquatic biota inhabiting this portion of the river are therefore at risk due to exposure to ammonia.

The Great Miami River downstream from the mouth of Paddys Run was the only location where surface water samples were collected containing barium with a quotient value that exceeded 1.0 (Table B.2-4). Aquatic biota inhabiting this portion of the river are therefore at risk due to exposure to this metal.

The quotient value determined for bis(2-ethylhexyl)phthalate exceeded 1.0 in samples collected from both on- and off-property sections of Paddys Run as well as the Great Miami River, downstream of its confluence with Paddys Run. Quotient values for di-n-octyl phthalate exceeding 1.0 were only found on Paddys Run (Table B.2.4). These contaminants represent a potential risk to aquatic organisms inhabiting these water bodies.

Cadmium measured in surface water samples collected from on-property sections of Paddys Run had a quotient value that exceeded 1.0 (quotient value = 1.47; Table B.2-4). This metal represents a greater risk to aquatic biota inhabiting the Great Miami River between the FEMP NPDES outfall and the river's confluence with Paddys Run; quotient values calculated for cadmium present in these samples was 5.29 (Table B.2-4).

A quotient value for cyanide exceeding 1.0 was only present in samples collected in the Great Miami River downstream of its confluence with Paddys Run, contributing to the risk posed to aquatic biota inhabiting this portion of the river.

Quotient values for lead measured in samples of surface water collected from both on- and off-property sections of Paddys Run exceeded 1.0. Although the representative quotient values determined for total lead measured in samples from on-property and off-property locations on Paddys Run exceeded 1.0, filtered concentrations of this metal were relatively low, suggesting that the actual

risk to aquatic biota exposed to this metal in this section of Paddys Run was less than that indicated by the quotient value calculated using the total lead concentrations.

Lead quotient values determined for samples collected from the Great Miami River upstream of the FEMP NPDES outfall were less than 1.0 and therefore pose no significant risk to aquatic biota. However, quotient values calculated for lead present in samples collected downstream from its confluence with Paddys Run were greater than 1.0 (Table B.2-4), suggesting that aquatic biota inhabiting this section of river were at risk as a result of exposure to this metal. As was the case for Paddys Run, the concentrations of dissolved lead in these samples was much less than the concentration of total lead; less lead may be biologically available to aquatic biota in these two bodies of water, effectively lowering the risk indicated by the toxicity quotient values.

Quotient values greater than 1.0 for manganese and mercury were only detected in the Great Miami River (Table B.2-4). Although mercury quotient values exceeded 1.0, the concentrations measured in Reach 1 were less than background concentrations, indicating that concentrations of mercury are relatively high throughout this section of river. On the other hand, the manganese concentrations measured in samples collected downstream of the confluence of Paddys Run were much higher than background values.

Only samples collected from off-property sections of Paddys Run contained concentrations of uranium that produced quotient values greater than 1.0. The quotient value for this metal equalled 9.82, indicating that uranium contributed significantly to the cumulative risk posed to aquatic biota inhabiting this portion of Paddys Run.

As described in Section B.2.4, the sum of final surface water CPCs quotient values >0.3 represented the potential cumulative risk posed to aquatic biota inhabiting the water bodies examined in this study. The highest cumulative risk values for Paddys Run were calculated for off-property locations. Uranium accounted for the single largest source of risk associated with Paddys Run off-property, followed by bis(2-ethylhexyl)phthalate. Cumulative risks determined for on-property sections of Paddys Run were largely associated with lead (Table B.2-4).

The greatest cumulative risk value was calculated for that portion of the Great Miami River downstream from its confluence with Paddys Run (Table B.2-4). Aluminum accounted for almost all

of the risk posed to aquatic biota inhabiting this section of the river, followed by bis(2-ethyl-hexyl)phthalate (Table B.2-4).

As discussed in Section B.2.2.1, exposure of terrestrial mammalian and avian receptors to surface water contaminants is primarily through ingestion of water. In addition to ingestion of water from Paddys Run and the Great Miami River, these receptors may be potentially at risk as a result of ingesting water from various drainageways on the FEMP. Drainageways examined in this Site-Wide Ecological Risk Assessment include the drainage ditch in Study Area A, drainageways in the Southfield Area that receive runoff from the active and inactive flyash piles (Study Areas E and G) and the pilot plant drainage ditch in Study Area F. This assessment of risk posed to ecological receptors by consuming surface water was very conservative in that it was assumed that a given body of water represented the only drinking water source available. In addition, this risk assessment assumed that ecological receptors had year-round access to these various water bodies. However, with the exception of the Great Miami River and the upper sections of Paddys Run, the other water bodies examined in this portion of the Site-wide Risk Assessment only contain water intermittently, thereby limiting potential exposure (and risk) to ecological receptors.

Comparisons are presented in the form of risk quotients, which are calculated by dividing the representative concentration of a contaminant detected in unfiltered water samples by the DWB for that contaminant.

Contaminants detected in Study Area A at concentrations exceeding DWBs were aluminum, with a quotient of 2.67, mercury (quotient value of 2.2) and uranium with a quotient value of 1.04 (Table B.III-3). The DWB used to screen aluminum and uranium were based on values for protecting aquatic biota; DWB based on toxicity to homeothermic vertebrates could not be identified for these two metals. As discussed in Section 2.3, neither of these metals is generally considered toxic when ingested. Therefore, of the three metals that exceeded DWB, only mercury poses a significant risk to terrestrial ecological receptors ingesting water from this area.

No contaminants were detected in concentrations greater than the DWBs in water samples collected from the Southfield (Study Areas E and G; Table B.III-4).

Contaminants detected in Study Area F (Table B.III-5) at concentrations approaching or exceeding DWBs were:

- Aluminum
- Uranium
- 1,2-dichloroethylene
- Trichloroethylene

Neither aluminum nor uranium are believed to represent a significant risk to terrestrial receptors ingesting water from these drainages ways. Instead, the concentrations of 1,2-dichloroethylene and trichloroethylene in water from this area both exceeded the human-health based values used to screen these CPCs, indicating that these two organic contaminants may pose a risk to terrestrial receptors.

Contaminants exceeding benchmark criteria for samples collected from Paddys Run on-property (Table B.III-11) are as follows:

- Aluminum
- Lead
- Bis(2-ethylhexyl)phthalate
- Di-n-octyl phthalate

Of these contaminants, lead represents the greatest risk to terrestrial ecological receptors utilizing this section of stream as a source of drinking water; both aluminum and di-n-octyl phthalate were screened using benchmark values developed to protect aquatic biota.

Contaminants contributing to risk (i.e., were present in concentrations greater than the DWB) associated with ingesting water from Paddys Run off-property are as follows (Table B.III-10):

- Lead
- Bis(2-ethylhexyl)phthalate
- Di-n-octyl phthalate

Both lead and bis(2-ethylhexyl)phthalate represent a risk to terrestrial receptors.

Terrestrial organisms may also consume water from Great Miami River. Only concentrations of mercury present in water samples collected from the Great Miami River upstream from the FEMP

NPDES outfall exceeded the DWB. Aluminum was the only CPC detected in samples collected from the section of river between the outfall and the mouth of Paddys Run; this CPC is not likely to represent a significant risk to terrestrial receptors. Although aluminum, cadmium, and bis(2-ethyl-hexyl)phthalate were detected in concentrations greater than the DWB, only cadmium and bis(2-ethyl-hexyl)phthalate represent a risk to terrestrial ecological receptors utilizing this portion of the river as a source of drinking water (Table B.III-7).

B.2.4.2 Risk Associated with Final Sediment CPCs

As summarized in Table B.2-5, the following final sediment CPCs had quotient values greater than 1.0; barium, cadmium, cyanide, and manganese (on-property Paddys Run locations), manganese (off-property Paddys Run sediment), and barium, iron, lead, manganese, phenanthrene, and zinc in sediment collected from the Great Miami River.

Barium measured in sediment samples collected from on-property locations on Paddys Run and in sediment samples collected from the Great Miami River downstream of the FEMP NPDES outfall exceeded the benchmark criterion, indicating that this metal poses a risk to benthic organisms inhabiting these water bodies.

Cyanide was only found in sediment samples collected from on-property locations on Paddys Run (Table B.2-5) and the presence of this contaminant may represent a hazard to ecological receptors (quotient value = 4.90).

Representative concentrations of iron, lead and zinc present in sediment collected from Reach 2 on the Great Miami River all exceeded benchmark criteria and indicate that benthic organisms inhabiting this section of the river may be adversely impacted by these three heavy metals (Table B.2-5).

Phenanthrene was only found in sediment samples collected from the Great Miami River downstream of the FEMP NPDES effluent Outfall. Concentrations of this organic contaminant exceeded the sediment benchmark, generating a quotient value of 2.33 (Table B.2-5).

Concentrations of manganese measured in sediment samples collected from both on- and off-property locations on Paddys Run as well as locations downstream from the FEMP NPDES outfall exceeded all

the benchmark criterion (Table B.2-5). Concentrations of this metal therefore poses a risk to benthic organisms inhabiting both Paddys Run and the Great Miami River.

Although no specific benchmark values were available to assess the risk posed by uranium in sediment, this contaminant was retained for consideration as a final sediment CPC. Uranium was not detected in sediment collected from the Great Miami River downstream from the mouth of Paddys Run but was not found in sediments collected from both on-property and off-property sections of Paddys Run as well as Reach 2 on the Great Miami River. As summarized in Section B.2.3.16, studies conducted on various uranium-contaminated aquatic systems suggest that this metal does not biomagnify and that it is not generally bioavailable. Although detectable concentrations of uranium were present in sediment samples collected from these water bodies, it is probable that the risk posed to benthic organisms in this location is limited as a result of the low bioavailability associated with this metal.

B.2.4.3 Risk Associated with Final Soil CPCs

Quotient values derived from the surface soil concentration/Quebec threshold values (or other soil threshold values) for surface soil can only be applied in a broad sense (i.e., potentially hazardous or nonhazardous) because information on the effects of contaminated soil on ecological receptors is limited. Although specific effects to soil-dwelling species cannot be predicted from these quotient values, values less than 1.0 are associated with relatively little risk.

In contrast, quotient values that substantially exceed 1.0 imply that a given soil contaminant may represent a risk for at least some species. Table B.2-6 lists values ≥ 1.0 for final surface soil CPCs. Quotient values for uranium exceeded 1.0 in Study Areas C and F. Other inorganic soil contaminants with quotient values ≥ 1.0 were aluminum in Study Areas B, C and E; antimony in Study Areas C, D, E, and G; cadmium in Study Areas A and G; lead in Study Areas C, D, and the outer contour; manganese in Study Areas B, C< and the inner contour; molybdenum in Study Areas A, B, and E; silver in Study Area G; and zinc in Study Area A. Organic soil contaminants exceeding soil benchmark criteria included the PAHs benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene in Study Area A; these three PAHs and chrysene were found in soils collected from Study Area B. Five PAHs were present in soil samples collected from Study Area C, while analyses of samples collected from Study Area F detected the presence of 7 PAHs (Table B.2-6). No PAHs were present in soil samples collected from areas outside the FEMP.

The representative concentration of aluminum present in soil samples collected from Study Areas B, C, and E exceeded both the background soil concentration and the benchmark value (quotient values = 1.06, 2.54 and 1.61, respectively) (Table B.2-6). These values suggest that aluminum represents a potential risk to terrestrial ecological receptors inhabiting these three areas.

Concentrations of cadmium present in soil samples collected from Study Areas A and G exceeded the benchmark value used to screen for this contaminant in soil (quotient value = 1.18 and 1.16) (Table B.2-6). These results indicate that exposure to soil contaminated with this metal may cause an adverse impact to ecological receptors inhabiting these two study areas.

Lead present in samples collected from Study Areas C, D, and the outer contour exceeded the benchmark values for this CPC. Lead concentrations present in samples collected Study Area D were associated with a former firing range that had been located in this area. Activities responsible for the elevated lead concentrations detected in soil samples collected from the other study areas have not been identified. Nonetheless, exposure of ecological receptors to lead found in these soil samples may place these organisms at risk.

Representative concentrations of manganese present in soil collected from Study Areas B, C, and the outer contour exceeded the benchmark criterion used to screen these data (Table B.2-6). Based on the benchmark value used to screen this soil contaminant, manganese concentrations present in soil collected from these three areas may pose a risk to terrestrial ecological receptors.

Molybdenum was present in concentrations that exceeded the benchmark value in soil samples collected from Study Areas A, B, and E (quotient values = 1.17, 1.24, and 1.45, respectively) (Table B.2-6). Although molybdenum concentrations in soil collected from these study areas exceeded the benchmark criterion selected for this Site-Wide Ecological Risk Assessment, its limited toxicity suggest that this element does not represent a significant hazard to ecological receptors.

Concentrations of silver greater than benchmark criteria were only measured in soil samples collected from Study Area G (quotient values = 1.03) (Table B.2-6). Terrestrial ecological receptors exposed to soil containing this heavy metal are therefore at risk. The quotient value for zinc measured in soil collected from Study Area A also exceeded 1.0 (quotient value = 1.41), indicating that this heavy metal may pose a risk to ecological receptors that come in contact with this soil.

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Surface soil uranium (U) concentrations determined for the Study Areas C and F exceeded the benchmark criterion used to screen these data (230 mg soluble uranium salts/kg) (EPA 1994). The uranium quotient values determined for these areas were 15.7 and 1.10, respectively (Table B.2-6). While the criterion used to evaluate the risk associated with this contaminant is conservative (human health resident receptor), it is probable that uranium concentrations in this area of the FEMP represent a risk to ecological receptors. The representative concentration determined for Study Area C (3620 mg/kg) is far greater than concentrations (300 mg U/kg) that Sheppard et al. (1992) associated with phytotoxicity and reduced earthworm survival. Concentrations present in surface soil collected from all other study areas, including Study Area F, were well below this value (see Attachment B.V). As discussed in Section B.2.3.16, the toxicity of uranium is associated with solubility; insoluble forms exhibit low toxicity in standard laboratory test animals (both aquatic and terrestrial animals). Uranium is not generally biologically available; transfer coefficients through various food chains indicate an order of magnitude decline at every trophic level. Based on the results of several recent studies (see Section B.2.3.16), concentrations of uranium present in all surface soil except those collected from Study Area C, are well below concentrations associated with adverse biological effects (e.g., phytotoxicity, decreased earthworm survival). This information indicates that concentrations of uranium outside of Study Area C, although greater than the background soil concentrations, are less than values reported to adversely impact terrestrial ecological receptors. Therefore, with the exception of Study Area C, it is not likely that uranium is adversely impacting organisms inhabiting most areas of the FEMP.

B.2.4.4 Uncertainty Associated with Risk Characterization

Because risk characterization is essentially the integration of the exposure assessment and toxicity screening, sources of uncertainty associated with either of these two processes should also contribute to uncertainty in the risk characterization. In addition, elements of the risk characterization procedure itself should contribute to overall uncertainty. The toxicity quotient method was selected to characterize risk. The advantages of this method, and one of the primary limitations, were previously addressed. Areas of uncertainty associated with this risk characterization, and efforts to reduce uncertainty, are summarized in Table B.2-7.

B.2.5 SUMMARY

The results of this assessment indicate that exposure to uranium in Study Area C soil represents the single greatest risk to terrestrial ecological receptors inhabiting the FEMP. Lead present in soil

collected from the former firing range located in Study Area D is the CPC contributing the second greatest risk to terrestrial receptors on the FEMP. Lead detected in samples collected from the outer contour also represents a significant risk to off-property ecological receptors. Although other soil contaminants are present, the contribution to overall risk is low compared to that associated with uranium in Study Area C soil.

The toxicity of uranium in sediment to benthic organisms is unknown. Uranium in sediment collected from off-property locations on Paddys Run was present in concentrations greater than background; uranium concentrations in sediment collected in 1993 from on-property locations on Paddys Run and the Great Miami River were much lower or were not detected. The low bioavailability of uranium suggests that uranium present in sediments represent little or no risk to aquatic biota. However, the potential toxicity of associated with these sediments can only be confirmed through toxicity testing.

With the exception of uranium, contaminants present in sediment collected from on-property locations on Paddys Run were greater than those detected in off-property Paddys Run sediment and in sediment collected from stations on the Great Miami River below its confluence with Paddys Run. More CPCs were present in concentrations greater than benchmark toxicity values in sediments collected from Reach 2 of the Great Miami River than from other sample locations. A somewhat different pattern was established for aquatic biota and surface water. Quotient values indicate that aquatic biota inhabiting Paddys Run and the Great Miami River are at risk and that potential risks to aquatic biota are to be greater for organisms inhabiting off-property sections of Paddys Run. However, aquatic organisms inhabiting the Great Miami River below its confluence with Paddys Run were at greater risk from CPCs associated with the water column than were biota inhabiting upstream areas. The majority of this risk is associated with aluminum.

Ingestion of surface waters may also pose a risk to terrestrial ecological receptors. Mercury, 1,2-dichloroethylene, and trichloroethylene were present in samples collected from drainageways on the FEMP in concentrations greater than benchmark values. Lead and bis (2-ethylhexyl) phthalate were present in samples collected from both on-property and off-property locations on Paddys Run and may pose a risk to terrestrial receptors ingesting these waters. Di-n-octyl phthalate present in on-property samples may also contribute to risk. Of the CPCs present in samples collected from the Great Miami River, mercury, cadmium, and bis (2-ethylhexyl) phthalate represent the greatest potential risk to terrestrial receptors relying on this water body as a source of drinking water.

TABLE B.2-1

FACTORS THAT ARE EXPECTED TO CONTRIBUTE TO UNCERTAINTY IN EXPOSURE ASSESSMENT

General Factors Contributing to Uncertainty	Site-Specific Factors That May Have Contributed to Uncertainty
1. Sufficient quantities of environmental samples should be collected using appropriate sampling design.	In general, sufficient quantities of radiological samples were collected for this assessment; however, number of nonradiological samples is limited, increasing uncertainty associated with interpreting these data.
2. Methods selected for analyzing environmental samples should be appropriate to the analyte and sufficiently sensitive and specific for the needs of the assessment.	In-laboratory quality control (QC) and quality assurance (QA) programs are expected to limit uncertainty associated with sample analysis. Detection limits (DLs) for a number of water constituents (DDT, Aroclor, endrin, heptachlor, heptachlor epoxide, hexachlorobenzene, hexachlorobutadiene, mercury, methoxychlor, phenanthrene, silver, and toxaphene) exceeded chronic ambient water quality criteria; the effect of DLs on interpreting contamination in other media unknown.
3. Appropriate and reasonable assumptions should be made concerning exposure pathways (sources, points, routes).	All major pathways were considered for the ecological resources potentially at risk. Minor pathways were not considered if they were associated with insignificant contributions to overall exposure.
4. Selection of CPCs for each media should not eliminate potentially hazardous chemicals from consideration for full assessment.	Chemicals that were eliminated from further consideration were those that were considered to be nontoxic or occurred in concentrations considered to be nontoxic, and those that did not exceed background concentrations. Concentrations of uranium, thorium and radiological isotopes were based on RI/FS samples collected at depths up to 2 feet. These data were compared to background samples collected at 0 - 6 inch depths; impact of this comparison on assessment unknown.
5. Appropriate and accepted sources of physical and chemical data should be used for evaluating fate and transport of CPCs.	Organic carbon content of sediment assumed to be 1 percent due to unavailability of site-specific K_{oc} values, thereby increasing the uncertainty of exposure assessments based on this parameter. Physical and chemical data used for this exposure assessment were primarily from sources such as the U.S. Environmental Protection Agency, National Oceanic and Atmospheric Administration, and the U.S. Fish and Wildlife Service. Insufficient data from these sources was supplemented with data from peer-reviewed journals and books in the specific subject areas, where possible.

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TABLE B.2-2

STEPS FOLLOWED TO IDENTIFY MEDIA-SPECIFIC FINAL CONTAMINANTS OF POTENTIAL CONCERN

Media	Steps Followed to Select Media-Specific Final CPCs
Surface water	Inorganic contaminants greater than background concentrations, chronic ambient water quality criteria or surrogate values to protect aquatic biota; review of available data on toxicity in drinking water for terrestrial fauna
Sediment	Inorganic contaminants greater than background concentrations Long and Morgan's apparent effects data base (ER-L) for inorganics; equilibrium partitioning and toxicity data for organics
Soil	Inorganic contaminants significantly greater than background concentrations Comparisons to soil threshold values

TABLE B.2-3

FACTORS THAT ARE EXPECTED TO CONTRIBUTE TO UNCERTAINTY IN TOXICITY SCREENING AND METHODS USED TO REDUCE THAT UNCERTAINTY

General Factors Contributing to Uncertainty	Approach Used to Reduce UncertaintyUncertainty
1. Species tested should be representative of site species.	EPA considers tested aquatic species used to derive water quality criteria to be representative of species found throughout the nation. Site-specific species are not expected to be more or less sensitive to contaminants than those comprising the national aquatic data base.
2. Laboratory toxicity tests should be representative of the site (field) environment.	In general, laboratory-to-field extrapolations of toxicity data are considered to be acceptable under most conditions.
3. Extrapolations (acute-to-chronic, species-to-species, chemical-to-chemical) should be reasonable and appropriate for the chemicals and species selected.	Direct testing with local species and site-specific CPCs is the best approach for defining potential toxicities of CPCs at a given site. However, such data are generally unavailable or incomplete; this document provides equations or other support for extrapolations, where appropriate.
4. Single-point toxicity values such as LC50s, compared to dose/response relationships (e.g., describing the entire toxicity curve), might or might not adequately depict potential toxicity.	Although considered to be a limitation, the use of single-point toxicity values is still expected to provide an adequate description of the relative toxicity between chemicals and between test species.
5. Accepted toxicity data should be based on standardized, accepted test protocols.	All aquatic toxicity data used throughout this assessment were based on tests that followed acceptable experimental designs, conditions, and endpoints as defined by EPA.

TABLE B.2-4

SURFACE WATER TOXICITY QUOTIENT VALUES FOR STUDY AREAS ON THE FEMP

	Final Contaminants of Potential Concern Based on Representative Concentration											
Location	Aluminum	Ammonia	Barium	Bis(2-ethylhexyl) phthalate	Cadmium	Cyanide	Di-n-octyl phthatlate	Lead	Manganese	Mercury	Uranium	Cumulative Risk[a]
Paddys Run												
On Property	1.66			4.76	1.47		1.09	5.20				15.5
Off Property				2.62			1.87	2.32			9.89	18.0
Great Miami River												
Reach 1[b]		1.90								3.50		9.04
Reach 2[b]	7.68											10.5
Reach 3[b]	220		1.57	19.0	5.29	1.78		1.47	5.72			257

[a]Cumulative Risk = sum of Quotient Values >0.3. Quotient values >0.3 are reported in Attachment II. This determination is restricted to surface water CPCs; no equivalent method exists for determining cumulative risks associated with contaminated soils or sediments.
[b]Reach 1 = Upstream of the effluent line
Reach 2 = Between effluent line and confluence of Paddys Run
Reach 3 = Downstream of the confluence of Paddys Run

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TABLE B.2-5

SEDIMENT TOXICITY QUOTIENT VALUES FOR STUDY AREAS ON THE FEMP

	Final Contaminants of Potential Concern Based on Representative Concentration							
Location	Barium	Cadmium	Cyanide	Iron	Lead	Manganese	Phenanthrene	Zinc
Paddys Run								
On Property	1.47	1.10	4.90			3.57		
Off Property						1.66		
Great Miami River								
Reach 1[a]								
Reach 2[a]	3.25			1.16	1.13	2.43	2.33	
Reach 3[a]	2.23					2.22		1.43

[a]Reach 1 = Upstream of the effluent line
Reach 2 = Between effluent line and confluence of Paddys Run
Reach 3 = Downstream of the confluence of Paddys Run

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TABLE B.2-6

SOIL TOXICITY QUOTIENT VALUES FOR STUDY AREAS ON AND OFF PROPERTY STUDY AREAS ON THE FEMP

	Final Inorganic Contaminants of Potential Concern Based on Representative Concentration								
Location	Aluminum	Antimony	Cadmium	Lead	Manganese	Molybdenum	Silver	Uranium	Zinc
Area A			1.18			1.17			1.41
Area B	1.06				1.02	1.24			
Area C	2.54	2.15		2.85	1.40			15.7	
Area D		1.06		10.9					
Area E	1.61	1.02				1.45			
Area F								1.10	
Area G		2.95	1.16				1.03		
Outer Contour				5.75					
Inner Contour					2.28				

	Final Organic Contaminants of Potential Concern Based on Representative Concentration				
Location	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene
Area A	2.10	1.60	2.10		
Area B					
Area C			1.80	1.10	1.30
Area D					
Area E		1.15	3.70	3.10	3.30
Area F					
Area G					
Outer Contour					
Inner Contour					

TABLE B.2-6 (Continued)

	Final Organic Contaminants of Potential Concern Based on Representative Concentration		
	Chrysene	Dibenzo(a,h) anthracene	Indendo(1,2,3-cd) pyrene
Area A	2.10		
Area B			
Area C		4.54	1.50
Area D			
Area E	3.20	12.5	3.00
Area F			
Area G			
Outer Contour			
Inner Contour			

TABLE B.2-7

FACTORS THAT ARE EXPECTED TO CONTRIBUTE TO UNCERTAINTY IN THE RISK CHARACTERIZATION AND METHODS USED TO DECREASE THAT UNCERTAINTY

General Factors Contributing to Uncertainty	Approach Used to Reduce Uncertainty
1. EPA-reviewed toxicity data are available for only a limited number of chemicals	The use of acceptable chemical quantitative structure activity relationships should provide reasonable estimates of toxicity data for untested chemicals.
2. Chronic toxicity endpoint data can be inconsistent	Chronic toxicity test results based only on appropriate endpoints (e.g., effects on mortality, growth, and reproduction); test design and test durations should decrease the uncertainty associated with chronic test results.
3. Toxicity data are sparse for media other than surface waters	Sufficient toxicity data for media other than surface waters generally exist; when combined with extrapolations based on chemical structure activity relationships or interspecies correlations, reasonable estimates of required data are possible.
4. Analytical detection limits commonly exceed toxicity benchmark values (i.e., criteria)	Relatively high detection limits were noted for several analyses in water samples. Benchmark criteria employed for other media believed to be reasonably conservative, reducing influence of detection limit method.

B.3.0 ASSESSMENT OF RADIOLOGICAL CONTAMINANTS

This section of the Site-Wide Ecological Risk Assessment evaluates the potential risks to ecological receptors due to chronic exposure to low-levels of radiological contaminants present in the FEMP study areas. To calculate the internal and external doses, media- and site-specific data are evaluated in a model, and the results are compared to a target level dose published in 1992 by the International Atomic Energy Agency (IAEA). The basis for the target level dose is presented in the publication, *Effects of Ionizing Radiation on Plants and Animals at Levels Implied by Current Radiation Protection Standards*. Among the conclusions reached in the report is that there is no convincing evidence from the scientific literature that chronic radiation dose rates below 1 mGy/day (36.5 rad/year) will harm animal or plant populations.

The methods and assumptions used to model the available RI/FS data indicate that the absorbed doses to receptor organisms fall below the target level dose (36.5 rad/year). It can be concluded that, based on the measured levels of radioactivity on and around the FEMP site, there is no threat of severe radiation effects to populations of terrestrial or aquatic biota. The methods, assumptions, and calculations used in this determination are presented in the following sections.

B.3.1 METHODS AND ASSUMPTIONS

This section presents information on the selection of receptor organisms (mammals, plant, and fish), the most likely pathways by which radiological contaminants could reach the receptor organisms, and the parameters (e.g., ingestion and inhalation rates) used in the calculations.

B.3.1.1 Selection of Receptor Organisms

White-footed deer mice (*Peromyscus leucopus noveborensis*) and western meadow voles (*Microtus pennsylvanicus*) were selected as the reference mammals for several reasons. First, they are known to occur on the FEMP, and the small size of their home ranges makes it likely that individuals would spend their entire life on the site. These mammals live in direct contact with the soil, increasing the probability that they will come in contact with contaminants in this particular medium. In addition, mice and meadow voles are potential prey for a number of species that feed at the FEMP. Finally, studies have documented that they are sensitive to radioactivity (IAEA 1992).

The white-footed deer mouse is common to the eastern and central United States. It is the only subspecies of deer mouse known to occur in Ohio (Gottschang 1981; Facemire et al. 1990 and references therein). Deer mice comprised 60 percent of the animals trapped in the Butler County, Ohio woodlots in July and August, 1986 (Facemire et al. 1990). These mice reach the highest densities in brushy fields and in woodlots dominated by deciduous trees, and their average home range size is approximately 0.1 hectares (Lackey et al. 1985). Their diet generally consists of insects, fruit, starchy matter, green vegetation, and seeds. The frequency of each of these items in the diet is season-dependent, due to availability (Brown 1964).

The meadow vole is primarily a northern species whose range extends down the Atlantic Coast into South Carolina. This microtine rodent is most commonly found in grasslands, preferring moister areas, but also may be found in woodlands (Reich 1981 and references therein). Meadow voles comprised approximately six percent of the animals trapped in Butler County in July and August 1986 (Facemire et al. 1990). The home range for the meadow vole ranges from 0.04 to 0.47 hectares and 0.016 to 0.31 hectares for males and females, respectively (Reich 1981 and references therein). This species is herbivorous with a diet of fresh stems and leaves, shifting to seeds, stembases, and roots as plants age (Batzli 1977). Insects and animal remains also comprise part of this species' diet (Reich 1981).

A generic pine was selected as the indicator plant for two reasons. First, studies of terrestrial vegetation have shown that pine trees are among the most sensitive plant species to radiation and secondly, because of the large number of white pines (*Pinus strobus*) and Austrian pines (*Pinus nigra*) on the FEMP. Some Norway spruce (*Picea excelsa*) also occur on site.

Shiners (*Notropis* sp.) were selected as the indicator fish species because the genus is common in the Great Miami River and comprises more than 50 percent of the fish community in Paddys Run. In addition, there is adequate information in the literature to characterize their sensitivity to radiation. Although most species grow to a maximum of 2 to 5 inches, a few species do reach up to 8 inches in length. Shiner diets commonly include insects and plankton, but some consume plant material (Tomelleri and Eberle 1990). Usually two or more species of *Notropis* occur in the same area, but occupy slightly different niches. Niche differences include feeding in different microhabitats or consuming different sizes or types of food (Moyle and Cech 1982).

B.3.1.2 Selection of Pathways

This section lists the exposure pathways used for calculating absorbed dose to the receptor organisms in the appropriate study areas. For mammals inhabiting each of the terrestrial study areas, including the two off-property locations, the exposure pathways are:

- Direct irradiation from soil
- Inhalation of resuspended soil
- Ingestion of insects
- Incidental ingestion of soil (e.g., through grooming)
- Ingestion of vegetation
- Ingestion of water (only for study areas where water monitoring results were available).

For aquatic animals in Paddys Run and the Great Miami River, the exposure pathways are:

- Direct irradiation from sediment
- Uptake of contaminants from water (all pathways)
- Direct irradiation from submersion in water
- Ingestion of benthic macroinvertebrates

For pine trees in all study areas, the exposure pathways are:

- Direct irradiation from soil
- Uptake of contaminants from soil

Several additional pathways were considered for evaluation, but were eliminated for a number of reasons:

- Pine tree uptake of contaminants from groundwater
- Soil resuspension — interception (pine tree) — direct irradiation
- Air — interception (pine tree) — direct irradiation

The groundwater pathway was eliminated because available information indicate that the groundwater at the FEMP is deeper than the depth of pine tree tap root penetration. The interception pathways were eliminated because there are no active mechanisms for transport of contaminants (other than carbon-14 or tritium, which are not present in the FEMP environment) from the tree needles to the tree core.

In addition, for mammalian pathways, the soil-skin-ingestion and water-skin-ingestion pathways were not separately determined because it was assumed that the soil and vegetation ingestion rate values included contributions from indirect ingestion. The sediment ingestion pathway for aquatic animal exposure was not calculated because the sediment ingestion rate for shiners is negligible.

The selected pathways include the internal pathways described in the Risk Assessment Work Plan Addendum, as amended (DOE 1992b), as well as additional external pathways to ensure that the actual dose received by the organisms would not exceed the calculated values. Mathematical equations used to calculate absorbed dose through each of these pathways are provided in Attachment B.VI.

B.3.1.3 Selection of Calculation Parameters

Parameters used in the calculations and their source(s) are listed in Tables B.3-1 through B.3-3. Plant to soil concentration ratios for grasses were used to calculate uptake of contaminants by pine trees due to the lack of tree-specific data (Till and Meyer 1983). Soil to insect concentration factors were assumed to be equal to 0.1 in the absence of radionuclide-specific data. This should be a conservative assumption, as the only published soil to insect value which could be located was a 0.01 established for radium (Clulow et al. 1988).

Soil to air transfer factors (T_{sa}) were calculated by the methods provided in NUREG/CR-4370 (Oztunali and Roles 1986), using the average wind velocity and percent silt in soil values listed in the tables, and the precipitation-evaporation index of 103 provided in Figure C-16 of NUREG/CR-4370. These T_{sa} values are presented in Table B.3-4.

The ingestion rate of benthic macroinvertebrates by shiners (IR_{bm}) was calculated assuming that benthic macroinvertebrates constitute 20 percent (by mass) of a shiner's diet and that the shiner consumes 10 percent of its body weight per day (Carlander 1969; Lagler et al. 1977).

B.3.2 CALCULATION OF ABSORBED DOSE DUE TO EXTERNAL EXPOSURE

The representative concentration values for each radionuclide and medium in each study area were derived from the RI/FS database and are presented in Appendix VII. The calculations for absorbed dose to the white-footed deer mouse, the meadow vole, pine trees, and shiners were performed using the computer program MicroShield™ (Grove Engineering 1988). While this program is designed

primarily for use as a shielding calculational tool, it provides estimates for external exposure scenarios where attenuating media are involved. Following the entry of data regarding source and shield materials and geometry, the program determines the exposure rate in milliroentgens per hour, which is converted to milliroentgens per year.

B.3.2.1 White-footed Deer Mouse/Meadow Vole

It was assumed that both of these mammals reside at a height of 3 centimeters above ground level for their entire lives. This is a conservative estimate for the mouse, which nests in any available hidden location and less so for the vole, which prefers to nest in burrows. The ground beneath the animals was represented as a cylinder with a radius of 100 meters and a thickness of approximately 5 feet. The choice of 5 feet as the depth is based on the degree of gamma-ray attenuation provided by soil, and will approximate a semi-infinite soil thickness. The animal was assumed to be placed along the central axis of the cylinder. The soil along the entire distance between source and dose point was assumed to be composed solely of carbon with a density of 1.3 grams per cubic centimeter. While natural soil would contain other elements, most of these elements would have a higher atomic number, resulting in a greater shielding effect, particularly at low photon energies. Therefore, choosing pure carbon as the source volume while maintaining the appropriate measured density of soil surrounding the FEMP site is conservative. The photon flux is taken into account via the geometric progression approximation that is incorporated into MicroShield™.

Following standard assumptions, both animals are considered equivalent in tissue composition to humans, such that the approximation of 1 roentgen leading to an absorbed dose of 1 rad is valid over the photon energies of interest. In addition, the absorbed dose from the soil is assumed to be attributable only to gamma rays from the isotopes in the soil. The dose from beta particles and alpha particles is assumed to be zero, since both particle types would be fully attenuated by the soil before reaching the animal.

Both animals' diets are composed predominantly of green vegetation, particularly grasses and clover. Therefore, only above-ground vegetation radionuclide data were used for the terrestrial mammalian pathways. Radionuclide concentrations in plant roots, cattails, and mosses were not considered. If the radionuclide was not detectable in vegetation samples in a given study area, it was assumed to be present and at one-half the detection limit when calculating dose values. If the study area results included radionuclide concentrations in above-ground portions of more than one plant type (i.e., for

leaves and grass leaves) a weighted average of values for all plant types was used for calculation of dose values.

The data set provided radionuclide concentrations for both "filtered" and "unfiltered" water. A weighted average of both values was used to calculate "maximum" and "average" water concentrations since neither the filtered nor the unfiltered water had consistently higher concentrations.

B.3.2.2 Pine Trees

The absorbed dose to pine trees is calculated in much the same manner as that for the mouse and vole: hat is, the pine tree is assumed to be irradiated by a cylindrical slab of material with a radius of 100 meters and a thickness of 5 feet. The composition of the ground is the same as before, and the absorbed dose is assumed again to be due entirely to photon radiation. All pertinent calculations were carried out using MicroShield™.

Calculation of the absorbed dose to the pine tree is complicated by several factors, such as its height above the ground, the composition of the tree material, and the attenuating effects of the outer layers of the tree itself. For purposes of this calculation and to maintain the approximation that 1 roentgen leads to an absorbed dose of 1 rad, the assumption is made that the tree has a similar isotopic makeup as mammalian tissue. In addition, attenuation of photons in the outer layers of the tree is neglected, and the reported doses are calculated at a height of 3 cm above the ground just as for the mouse and vole, since this would represent a conservative absorbed dose. This absorbed dose is assumed to be the same at all points within the tree, regardless of position, again resulting in an overestimate of the true absorbed dose rate.

B.3.2.3 Shiners

The external dose to shiners in streams is assumed to result from two sources: the water surrounding the shiner and the sediment beneath the shiner. For purposes of the submersion dose calculation, the shiner is assumed to be surrounded by an infinite body of water with a uniform distribution of radioactive material at all times in its lifespan. As with the external dose calculations for the terrestrial animals, the external dose is assumed to arise entirely from photon radiation. In addition, the physical dimensions of the shiner are such that it can be represented in water as a point receptor; that is, its presence in the water does not affect the ambient photon radiation field. While this may seem to oversimplify the problem, the effective radius of the shiner (0.7 cm) (Scott and

Crossman 1978) is less than 1/8 of the mean free path of a 100-keV photon. Thus, assuming the shiner to be a point receptor will tend to overestimate the dose slightly. Under this assumption, the absorbed dose received by the shiner would be equal to the absorbed dose received by any other mass of water in the waterway. Since an infinite body of water is assumed, radiation equilibrium exists, and the energy deposited in any mass is equal to the energy emitted in the same mass. Thus, the absorbed dose to the shiner is assumed to be equal to the photon energy emitted per unit mass of water.

For calculating the absorbed dose to the shiner as a result of exposure to sediment on the bottom of the waterway, the shiner is assumed to reside 3 cm above the sediment at all times. As with the soil, the sediment is assumed to be composed solely of carbon with a density of 1.3 grams per cubic centimeter. The shiner is presumably irradiated by a cylinder of sediment measuring 10 meters in radius and 30.5 centimeters in thickness. The choice of 10 meters for the radius is sufficient since the photons will be attenuated severely by water so that less than 1E-26 of primary gamma rays originating from distances greater than 10 meters will penetrate to the dose point. Attenuation is taken into account in the intervening water medium, and, as for terrestrial animals, the geometric progression calculation technique is used to estimate the effect of buildup within the medium.

B.3.3 CALCULATION OF ABSORBED DOSE DUE TO INTERNAL EXPOSURE

To calculate absorbed dose due to ingested or inhaled radioactive contaminants, dose conversion factors (DCFs) were derived using methods similar to that in Sections 7.4.2 and 7.4.3 of the Risk Assessment Work Plan Addendum as amended (DOE 1992b). Doses were calculated for representative environmental concentrations to represent representative doses to individual organisms in each study area.. Data used in the calculation of DCFs are listed in Tables B.3-5 through B.3-7.

B.3.3.1 White-footed Deer Mouse/Meadow Vole

The calculation of DCFs for inhalation and ingestion for both of these mammals is similar (Table B.3-8). For purposes of these calculations, the animals are assumed to have the same metabolic processes as humans with regard to retention and excretion of radioisotopes, and the chemistry of radioisotopes in the animals' bodies is assumed to be the same as that of humans. The metabolisms of these small mammals is more rapid than that of humans; thus they can eliminate radioisotopes from their systems more quickly than can humans. Equations from the International Commission on Radiological Protection (ICRP) Publication 2 (1959) were used to predict the uptake

rate and body burden of radioactive material over the lifespan of the animals, which is assumed to be one year. This is a conservative estimate for a small mammal's life span. Although physiologically capable of living more than a year, most small mammals die within a year of their birth due to predation, weather, competition or other factors that control small mammal populations. All isotopes were assumed to be uniformly distributed throughout the body of the animal.

The overwhelming majority of the absorbed dose due to the internal emitters is due to particulate radiation (i.e., beta and alpha particles). For purposes of this calculation, the entire alpha and beta particle energies are assumed to be absorbed within the body of the animals. Although only a small fraction of the energy emitted by the isotopes of concern is due to gamma rays, their contribution to the absorbed dose is taken into account by assuming both animals to have an effective radius of 3 centimeters. Tabulated values of absorbed energy per disintegration were used. The mass of the meadow vole is assumed to be 45 grams (Reich 1981), and the white-footed deer mouse is assumed to have a mass of 23 grams (Deavers and Hudson 1981). The formulas used to calculate the dose conversion factors for inhalation and ingestion are listed in Attachment VIII of this document.

B.3.3.2 Pine Trees

Dose conversion factors for pine trees are calculated by assuming a steady-state concentration of radioactive material within the tree (Table B.3-8). As with the vole and mouse, almost all of the absorbed dose is due to particulate radiation. Because of its negligible contribution to the overall absorbed dose, the absorbed fraction for photon radiation is assumed to be unity. This results in a slight overestimation that is virtually unnoticeable in the presence of the relatively large absorbed dose from particulate radiation. As was the base for the terrestrial animals, the absorbed fractions for particulate radiation are assumed to be unity. The formula for the dose conversion factor is provided in Attachment VIII of this document.

B.3.3.3 Shiners

Dose conversion factors for shiners are calculated by assuming a steady-state concentration of radioactive material within the tissues of the animal (Table B.3-8). The absorbed dose due to particulate radiation is calculated as described for the pine tree, mouse, and vole. For photon radiation, however, the small physical dimensions of the shiner (effective radius of 0.7 cm) (Scott and Crossman 1973) are such that very little of the energy would be absorbed in the tissues of the shiner. However, for conservatism, the absorbed fractions are assumed to be equal to that for a sphere of

water with an effective radius of 1.4 cm (Baker and Soldat 1992). The uptake dose conversion factor is provided in Attachment VIII of this document.

B.3.4 ANALYSIS OF RESULTS

Calculated absorbed (internal and external) doses to the receptor organisms in each on- and off-property study area, the Great Miami River, and Paddys Run are provided in Table B.3-9. The results of the intermediate calculations are presented in Attachment VII. The final calculated absorbed doses to the receptor organisms were compared to the trigger level dose of 36.5 rad/year, which was selected after review of the literature relating to the effects of ionizing radiation on plants and animals (IAEA 1992). The IAEA (1992) has concluded that, There is no convincing evidence from the scientific literature that chronic radiation dose rates below 1 mGy/day (36.5 rad/year) will harm animal or plant populations.

All calculated doses are below the trigger level dose of 36.5 rad per year. It can be concluded that, based on the measured levels of radioactivity on the FEMP site, there is no threat of severe radiation effects to populations of terrestrial plants or terrestrial or aquatic animals.

TABLE B.3-1

GENERAL CALCULATION PARAMETERS FOR RADIATION DOSE EXPOSURE PATHWAYS FOR TERRESTRIAL AND AQUATIC ORGANISMS

Parameter	Symbol	Value (units)	Source
Average wind velocity	v	4.02 (m/s)	DOE 1992b
Precipitation-Evaporation Index	PE	103 (unitless)	Oztunali and Roles 1986
Deer mouse inhalation rate	R_m	1.93 (m^3/yr)	Hill 1975
Deer mouse soil ingestion rate	IR_{ms}	0.01825 (kg/yr)	Beyer 1993
Soil to grub concentration factors	BF_g	0.1 (unitless)	Assumed value (see text)
Deer mouse insect ingestion rate	IR_{mg}	0.292 (kg/yr)	Brown 1964
Deer mouse vegetation ingestion rate	IR_{mv}	0.675 (kg/yr)	Brown 1964
Deer mouse water ingestion rate	IR_{mw}	1.504 (L/yr)	Brown 1964
Deer mouse mass	m_m	0.023 (kg)	Deavers and Hudson 1981
Deer mouse effective radius	r_m	0.0314 (m)	Lackey et al. 1985
Meadow vole inhalation rate	R_v	5.753 (m^3/yr)	Reich 1981
Meadow vole soil ingestion rate	IR_{vs}	0.0767 (kg/yr)	Beyer 1993
Meadow vole insect ingestion rate	IR_{vg}	0.062 (kg/yr)	Batzli 1977
Meadow vole vegetation ingestion rate	IR_{vv}	2.905 (kg/yr)	Batzli 1977
Meadow vole water ingestion rate	IR_{vw}	3.45 (L/yr)	Ernst 1968
Meadow vole mass	m_v	0.045 (kg)	Reich 1981
Meadow vole effective radius	r_v	0.0309 (m)	Reich 1981
Shiner mass	m_{mi}	0.0206 (kg)	Scott and Crossman 1973
Shiner effective radius	r_{mi}	0.0070 (m)	Scott and Crossman 1973
Shiner benthic macroinvertebrate ingestion rate	IR_{bm}	0.15 (kg/yr)	Carlander 1969; Lagler et al. 1977

TABLE B.3-2

ELEMENT-SPECIFIC CALCULATION PARAMETERS FOR RADIATION DOSE EXPOSURE PATHWAYS FOR TERRESTRIAL AND AQUATIC ORGANISMS

Parameter	Element	Value	Reference
Plant to soil concentration ratio (B_s) (unitless)	Strontium	1.25	Till and Meyer 1983
	Technetium	0.25	Till and Meyer 1983
	Cesium	0.048	NRC 1977
	Radium	0.04	Till and Meyer 1983
	Thorium	0.002	Till and Meyer 1983
	Uranium	0.005	Till and Meyer 1983
	Actinium	0.04	Till and Meyer 1983
	Protactinium	0.04	Till and Meyer 1983
	Plutonium	0.000092	Till and Meyer 1983
Shiner bioconcentration factor (BF_s) (liter/kg)	Strontium	40	Jorgenson et al. 1991
	Technetium	3.206	Jorgenson et al. 1991
	Radium	322.5	Swanson 1985
	Thorium	190	Jorgenson et al. 1991
	Uranium	2.06	Parkhurst et al. 1984

TABLE B.3-3

STUDY AREA-SPECIFIC CALCULATION PARAMETERS FOR RADIATION DOSE EXPOSURE PATHWAYS FOR TERRESTRIAL AND AQUATIC ORGANISMS

Parameter	Symbol	Study Area	Value	Source
Percent silt in soil (%)	s	A	81	USDA 1976 and USDA 1980
		B	85	USDA 1976 and USDA 1980
		C	88	USDA 1976 and USDA 1980
		D	87	USDA 1976 and USDA 1980
		E	85	USDA 1976 and USDA 1980
		F	69	USDA 1976 and USDA 1980
		G	87	USDA 1976 and USDA 1980
		Off-property	83	Average of all on-property study areas
Soil density (km^{-3})	ρ	A	1430	Average value from USDA 1976 and USDA 1980
		B	1455	Average value from USDA 1976 and USDA 1980
		C	1470	Average value from USDA 1976 and USDA 1980
		D	1460	Average value from USDA 1976 and USDA 1980
		E	1395	Average value from USDA 1976 and USDA 1980
		F	1379	Average value from USDA 1976 and USDA 1980
		G	1320	Average value from USDA 1976 and USDA 1980
		Off-property	1416	Average of all on-property study areas

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TABLE B.3-4

SOIL-TO-AIR TRANSFER FACTOR (T_{sa}) FOR RADIATION DOSE EXPOSURE PATHWAY

Study Area	(T_{sa})	Study Area	(T_{sa})
A	4.01E-10	E	4.21E-10
B	4.21E-10	F	3.41E-10
C	4.35E-10	G	4.31E-10
D	4.31E-10	Off-property areas	4.11E-10

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TABLE B.3-5

TERRESTRIAL MAMMAL DATA USED TO CALCULATE DOSE CONVERSION FACTORS

Isotope	Inhalation uptake fraction (f_a)[a]	Ingestion uptake fraction (f_w)[a]	Average Energy per decay (ϵ)(MeV)[b]	Biological half-life T_b (d)	Effective half-life (T_r)(d)[c]
Strontium-90/ yttrium-90	4.00E-01	3.00E-01	1.14E+00	1.30E+04	1.06E+04
Technetium-99	5.00E-01	5.00E-01	8.40E-02	1.00E+00	7.77E+07
Cesium-137	7.50E-01	1.00E+00	2.84E-01	7.00E+01	1.10E+04
Radium-224	4.00E-01	3.00E-01	5.79E+00[d]	8.10E+03	3.66E+00
Radium-226	4.00E-01	3.00E-01	4.87E+00[d]	8.10E+03	5.84E+05
Radium-228	4.00E-01	3.00E-01	1.69E-02[d]	8.10E+03	2.10E+03
Thorium-228	2.50E-01	1.00E-04	5.52E+00[d]	5.70E+04	6.98E+02
Thorium-230	2.50E-01	1.00E-04	4.76E+00[d]	5.70E+04	2.75E+07
Thorium-232	2.50E-01	1.00E-04	4.08E+00[d]	5.70E+04	5.11E+12
Uranium-234	2.50E-01	5.00E-02[e]	4.90E+00	1.00E+02	8.98E+07
Uranium-235	2.50E-01	5.00E-02[e]	4.60E+00	1.00E+02	2.57E+11
Uranium-238	2.50E-01	5.00E-02[e]	4.30E+00	1.00E+02	1.63E+12
Plutonium-238	2.50E-01	3.00E-05	5.51E+00		2.20E+04
Plutonium-239/240	2.50E-01	3.00E-05	5.15E+00		6.40E+04
Neptunium-237	2.50E-01	1.00E-04	4.94E+00		3.90E+04
Thorium-234	2.50E-01	1.00E-04	2.41E+01		6.86E-02
Actinium-227	2.50E-01	1.00E-04	8.49E-02		6.00E+03
Protactinium-231	2.50E-01	1.00E-04	5.15E+00		4.10E+04
Ruthenium-106	2.70E-01	3.00E-02	1.45E+00		7.20E+00

[a]ICRP 1959
[b]Baker and Soldat 1992
[c]GE 1989
[d]ICRP 1983
[e]ICRP 1978

TABLE B.3-6

SHINER DATA USED TO CALCULATE DOSE CONVERSION FACTORS[a]

Isotope	Internal energy per disintegration (ϵ_i) (MeV)	Submersion energy per disintegration (ϵ_i) (MeV)
Strontium-90/yttrium-90	1.14E+00	0.00E+00
Technetium-99	8.40E-02	0.00E+00
Cesium-137	2.57E-01	5.68E-01
Radium-224	5.79E+00	1.00E-02
Radium-226	4.87E+00	6.75E-03
Radium-228	1.69E-02	0.00E+00
Thorium-228	5.52E+00	3.07E-03
Thorium-230	4.76E+00	1.40E-03
Thorium-232	4.08E+00	1.19E-03
Uranium-234	4.90E+00	1.47E-03
Uranium-235	4.60E+00	1.53E-01
Uranium-238	4.30E+00	1.20E-03

[a]Baker and Soldat 1992 and ICRP 1983

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TABLE B.3-7

PINE TREE DATA USED TO CALCULATE DOSE CONVERSION FACTORS

Isotope	Particulate energy per disintegration (ϵ) (MeV)[a]
Stronium-90/yttrium-90	1.13E+00
Technetium-99	1.01E-01
Cesium-137	8.15E-01
Radium-224	5.79E+00
Radium-226	4.87E+00
Radium-228	1.69E-02
Thorium-228	5.52E+00
Thorium-230	4.76E+00
Thorium-232	4.08E+00
Uranium-234	4.86E+00
Uranium-235	4.67E+00
Uranium-238	4.28E+00
Plutonium-238	5.59E+00
Plutonium-239/240	5.23E+00
Neptunium-237	4.94E+00
Thorium-234	6.86E-02
Actinium-227	8.49E-02
Protactinium-231	5.15E+00
Ruthenium-106	1.45E+00

[a]ICRP 1983

TABLE B.3-8

DOSE CONVERSION FACTORS (DCF) (mrad/pCi)

Receptor		Isotope						
		Strontium-90/ yttrium-90	Technetium-99	Cesium-137	Radium-224	Radium-226	Radium-228	Thorium-228
Deer mouse	Inhalation ($DCF_{m,in}$)	0.362	1.35×10^{-4}	4.65×10^{-2}	2.68×10^{-2}	1.56	5.13×10^{-3}	0.938
	Ingestion (DCF_{mi})	0.271	1.35×10^{-4}	6.21×10^{-2}	2.01×10^{-2}	1.17	3.85×10^{-3}	3.75×10^{-4}
Meadow vole	Inhalation ($DCF_{v,in}$)	0.185	6.89×10^{-5}	2.38×10^{-2}	1.37×10^{-2}	0.795	2.62×10^{-3}	0.479
	Ingestion (DCF_{vi})	0.139	6.89×10^{-5}	3.17×10^{-2}	1.03×10^{-2}	0.597	1.97×10^{-3}	1.92×10^{-4}
Pine tree[a]	Uptake (DCF_{tu})	2.11×10^{-2}	1.89×10^{-3}	1.52×10^{-2}	0.108	9.10×10^{-2}	3.16×10^{-4}	0.103
Shiner[a] uptake (DCF_{su})	Uptake (DCF_{su})	2.13×10^{-2}	1.57×10^{-3}	4.80×10^{-3}	0.108	9.10×10^{-2}	3.16×10^{-4}	0.103
Receptor		Thorium-230	Thorium-232	Uranium-234	Uranium-235	Uranium-238	Plutonium-238	Plutonium-239/240
Deer mouse	Inhalation ($DCF_{m,in}$)	0.964	0.826	0.362	0.340	0.317	1.11	1.04
	Ingestion (DCF_{mi})	3.85×10^{-4}	3.30×10^{-4}	7.23×10^{-2}	6.79×10^{-2}	6.35×10^{-2}	1.33×10^{-4}	1.25×10^{-4}
Meadow vole	Inhalation ($DCF_{v,in}$)	0.439	0.422	0.185	0.174	0.162	0.568	0.533
	Ingestion (DCF_{vi})	1.97×10^{-4}	1.69×10^{-4}	3.70×10^{-2}	3.47×10^{-2}	3.24×10^{-2}	6.82×10^{-5}	6.4×10^{-5}
Pine tree[a]	Uptake (DCF_{tu})	8.89×10^{-2}	7.62×10^{-2}	9.08×10^{-2}	8.72×10^{-2}	8.00×10^{-2}	0.104	9.76×10^{-2}
Shiner[a] uptake (DCF_{su})	Uptake (DCF_{su})	8.89×10^{-2}	7.62×10^{-2}	9.15×10^{-2}	8.59×10^{-2}	8.03×10^{-2}	b	b

TABLE B.3-8 (Continued)

Receptor		Isotope				
		Thorium-234	Actinium-227	Protactinium-231	Neptunium-237	Ruthenium-106
Deer mouse	Inhalation ($DCF_{m,in}$)	1.33 x 10-3	1.69×10^{-2}	1.04	0.999	9.04 x 10-3
	Ingestion (DCF_{mi})	5.31 x 10-7	6.75×10^{-8}	4.17×10^{-4}	4.00×10^{-4}	1.01 x 10-3
Meadow vole	Inhalation ($DCF_{v,in}$)	6.78 x 10-4	8.62×10^{-3}	0.568	0.511	4.62 x 10-3
	Ingestion (DCF_{vi})	2.71 x 10-7	3.45×10^{-6}	2.13×10^{-4}	2.04×10^{-4}	5.14 x 10-4
Pine tree[a]	Uptake (DCF_{tu})	9.16×10^{-2}	1.59×10^{-3}	9.62×10^{-2}	9.22×10^{-2}	2.71×10^{-2}
Shiner[a] uptake (DCF_{su})	Uptake (DCF_{su})	b	b	b	b	b

[a]mrad kg/pCi yr
[b]An empty cell indicates that there was no appropriate data

TABLE B.3-9

DOSE ABSORBED BY RECEPTOR ORGANISMS IN EACH APPROPRIATE STUDY AREA BASED ON THE REPRESENTATIVE CONCENTRATION (RAD/YR)[a]

	Study Areas						
Receptor	A	B	C	D	E	F	G
Mouse	0.578	0.636	2.39	0.358	1.17	0.669	0.455
Vole	0.991	1.19	3.12	0.617	1.22	1.03	0.770
Pine Tree	0.0701	0.0738	0.420	0.0547	0.198	0.0558	0.0851
Shiner	b	b	b	b	b	0.0928	b

	Study Areas					
Receptor	Paddys Run Offsite	Great Miami River[c]	Great Miami River[d]	Great Miami River[e]	Offsite Inner Contour	Offsite Outer Contour
Mouse	b	b	b	b	0.130	0.0232
Vole	b	b	b	b	0.117	0.0102
Pine Tree	b	b	b	b	0.0312	0.00384
Shiner	0.0812	0.133	0.0338	0.0873	b	b

[a]Benchmark Criterion = 3.65E+01
[b]An empty cell indicates that there was no appropriate data
[c]The Great Miami River Above the Effluent Line
[d]The Great Miami River Between the Effluent Line and the Confluence with Paddys Run
[e]The Great Miami River at the Confluence with Paddys Run

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B.4.0 SUMMARY AND CONCLUSIONS

The primary purpose of the Site-Wide Ecological Risk Assessment was to determine if radiological and nonradiological contaminants associated with actions at the FEMP represent a current or future risk to ecological receptors inhabiting this facility and nearby off-property areas, including the Great Miami River. These receptors include all organisms, exclusive of humans and domestic animals, that may be potentially exposed to FEMP contaminants. This document was prepared by following guidance provided by EPA Region V and guidance provided in other EPA documents (e.g., EPA 1989; EPA 1991).

The Site Wide Ecological Risk Assessment focused on those on- and off-property areas not likely to be remediated, based on human-health concerns. On-property study areas were defined by habitat type (for example, grassland) and the size of the home range of receptor species used in the models developed to quantify total radiation doses. In addition to these study areas, hazards associated with contaminant concentrations in soil in off-property areas, as well as sediment and surface water contaminant concentrations from the Great Miami River, were assessed. Uranium represented the major contaminant at the FEMP. Other contaminants associated with the activities that supported uranium production included various metals and organic materials.

This section of the Site-wide Ecological Risk Assessment summarizes the results of several biological studies conducted on and near the FEMP and the results of the ecological risk assessment.

B.4.1 BIOLOGICAL STUDIES

As noted in Section B.1.1.1 and discussed in Sections 2.0 and 3.0 of the Operable Unit 5 RI Report, a number of studies have been conducted to characterize the biota both on and off the FEMP. This section of the Site Wide Ecological Risk Assessment will focus on studies performed on birds inhabiting the FEMP and aquatic biota inhabiting Paddys Run. The results of studies conducted on aquatic biota inhabiting the Great Miami River (see Figure 2-46 for sampling locations) are summarized in Sections 2 and 3 of the Operable Unit 5 RI Report and will not be discussed in this section. To date, the studies performed by Miami University and summarized by Facemire et al. (1990) remain the broadest in scope. Facemire et al. (1990) summarized the results of several biological surveys and studies designed and conducted in 1986 and 1987 to:

- Identify habitats and biota
- Determine species abundance and distribution and
- Identify, if possible, "stress-induced" differences between on-property and off-property biota.

Although the data were limited, the authors did suggest that apparent differences observed in on- and off-property populations of birds, macroinvertebrates, and fish may have been attributable to activities at the FEMP. The following discussion examines the data upon which these conclusions were based, compares these data to results of other surveys performed on or near the FEMP, and concludes by reviewing these data in the context of the RI/FS analytical results examined in Sections B.2 and B.3.

Samples were collected on two separate occasions by Miami University to characterize the macroinvertebrate community in Paddys Run; 10 riffle/pool locations were sampled between 20 November and 18 December 1986 and a second set of samples was collected from four locations on 26 - 27 February 1987. These sampling locations on Paddys Run are indicated on Figure 2-47.

Despite the fact that most of the stream bed downstream of Site 4 was dry from late June through October 1986, forty one taxa were collected from Paddys Run during the 1986 sampling effort. Riffles and pools at Sites 1-4 generally contained more taxa and had higher densities of benthic macroinvertebrates than did Sites 5-10. The authors suggested that the reduction in macroinvertebrate density and taxa at locations downstream from Site 4 could be attributed to either runoff from the FEMP into Paddys Run or to the prolonged dry period (approximately 5 months) preceding sample collection. Facemire et al. (1990) suggested that the "most probable cause of the observed changes in the macroinvertebrate communities downstream of Site 4 was the dry period preceding sampling. The majority of macroinvertebrates, either in the active or egg stage, are killed by extended dry periods (Hynes 1970). The dry period during the summer and autumn (1986) probably eliminated the organisms that had been present in Paddys Run below Site 4." Once water was present, recolonization of these areas began. It is probable that most of the colonization was a result of macroinvertebrate drift from upstream locations, thus accounting for the strong similarities in community composition. However, as it generally requires several months for a barren area of a stream bed to be completely recolonized by drifting organisms (Hynes 1970), macroinvertebrate densities and the number of taxa remained low when collections were made in November and December 1986. As discussed throughout Appendix B and elsewhere in the Operable Unit 5 RI Report, this period of dryness documented by Facemire et al. (1990) is typical of Paddys Run.

These 1986 macroinvertebrate data were compared to data from similar studies conducted on streams in southwestern Ohio. The authors concluded that "the type and number of macroinvertebrates collected from Paddys Run (in 1986) are typical of streams in southwest Ohio." They also concluded that the range of macroinvertebrate diversity values calculated for these samples was "also typical of macroinvertebrate community values for area streams" (Facemire et al. 1990.)

A second set of macroinvertebrate samples was collected in February 1987. A preliminary summary of these results was included in Section III of the Facemire report. Unlike the samples collected in 1986, the macroinvertebrate taxonomic resolution was only to family, rather than genus, as had been the case for the samples collected in 1986. A total of 47 families were identified in the samples collected in February 1987. When diversity values were calculated for the February samples, the resulting values were lower than those calculated for the 1986 samples. The lower diversity values can be at least partially attributed to the loss of information resulting from confining the taxonomic identification to the family level. The authors did note that the relatively low values appeared to be related to "the high number of Chironomids present" and acknowledged that they would have expected "some 60 to 100 taxa to have been identified" if the samples had been sorted to genus or species, rather than to family. The authors preliminarily concluded that the data collected in February 1987 "supported those reported in Section II" (e.g., the results of the 1986 sampling effort).

Final interpretation of the data collected in February 1987 occurred in Section IV of the Facemire report. In Section IV, the authors examined the results of several community similarity analyses performed on the samples collected in February but acknowledged that interpretation of these results is "somewhat dependent on the index used." Based on the results of Whitaker's Percent Similarity and Morisita's Index, the authors felt that a "clear trend was evident as one progressed downstream" with each successive site less similar to the upstream station, which "we believe to be a clear indication of increasing environmental impact with distance from the stream source". However, when the results of Jaccard's Index and Whittaker's Coefficient of Similarity were compared, no pattern in the data was apparent. The authors felt that these confounding results were probably a function of the calculation used to generate the different indices and acknowledged that substrate analysis might have added to the overall understanding of benthic community structure" in Paddys Run.

The authors also briefly discussed the presence of a number of different taxa found at the various sampling stations. Several of these taxa are often associated with unpolluted streams. In particular,

they noted that the caddisfly *Helicopsyche* sp. was only found at the upstream station (Site 1), thereby suggesting that this station was the least stressed of the sites sampled on Paddy Run. Furthermore, the authors noted that, during preliminary observations made in May 1986, the presence of this species was confined to the section of stream north of the K65 silos. The authors do not mention that the stream south of the silos was dry during this period. Nor was the presence of *Helicopsyche sp.* in samples collected from Sites 1, 2, and 3 in 1986 mentioned in this section of the report.

The authors concluded that while the macroinvertebrate fauna in Paddys Run was relatively diverse, "some data indicate moderate to severe environmental stress in the stream below Paddys Run Site 1 with perhaps some recovery at Paddys Run Site 11. It is probable that the low water table leading to a dry stream bed below Paddys Run Site 5 could account for part of these phenomena during the period." (Section IV; Facemire et al. 1990.) Based on these limited data, the authors concluded that Paddys Run was "stressed".

In addition to the samples collected from Paddys Run by Miami University, macroinvertebrate samples were also collected from this stream by Pomeroy (1977) and during the RI/FS Biological Resources Sampling Program in 1989 and 1990. Sampling locations used in each program are indicated in Figure 2-47. Data collected in these programs, along with those collected by Facemire, are summarized in Table B.4.1. Although the sum of these data by no means represents an intensive sampling program, results from all three sampling programs provides some indication of potential trends over a period spanning 13 years.

Data collected in each study was organized by location, from upstream to downstream. Direct comparisons between these data are possible because all three programs used the same standard sampling device (Surber sampler) to collect samples. All taxonomic data were summarized at the family level (the lowest taxonomic level used by Facemire to identify samples collected in February 1987) and five different biological metrics calculated (Table B.4.1).

Although variability within stations is evident, it is limited. However, these data strongly suggest that the data collected in February 1987 represent an anomaly; metrics calculated from data collected before and after this period are generally higher than those based on the February samples (Table B.4.1). Data collected in 1977, 1989, and 1990 are similar to those collected in 1986 by Facemire et al. (1990) and appear to support the authors' original conclusion that, despite the fact that

large sections of Paddys Run are typically dry during the summer and fall, the stream supports a relatively stable, diverse benthic population.

This interpretation is further reinforced by the results of analyses performed on macroinvertebrate samples collected in 1989 and 1990 using Hester-Dendy samplers. Like the Surber samples discussed above, these samples were collected as part of the RI Biological Resources Sampling Program (see Sections 2 and 3 of the Operable Unit 5 RI Report). The Hester-Dendy samples were from the same locations used to collect the Surber samples.

Taxonomic data generated from the Hester-Dendy samples were used to calculate Invertebrate Community Indices (ICI) developed by the Ohio Environmental Protection Agency (OEPA 1988). Analyses of the Hester-Dendy data collected in 1989 and 1990 indicated that the presence and operations of the FEMP resulted in nothing more than minor enrichment of the waters of Paddys Run. No deleterious effects on the benthic macroinvertebrate communities were demonstrated. The ICI values estimated for Paddys Run are consistent with ranges considered by OEPA (1988) to represent fair to good water quality. According to the author, factors unrelated to operations of the FEMP exert a significant controlling influence on the benthic communities. These factors include the seasonal, intermittent nature of Paddys Run that acts to reduce the quality of Paddys Run as a habitat for macroinvertebrates (DOE 1990). The conclusion that the intermittent flow in Paddys Run was a major factor in determining structure and composition of the macroinvertebrate community in Paddys Run is consistent with similar statements made by Facemire et al. (1990).

In addition to macroinvertebrates, Facemire et al. (1990) also collected several sets of samples to characterize the fish community in Paddys Run. Samples were collected in June 1986, March 1987 and June 1987. Although the stream was dry below the K65 silos, thirteen species were collected in June 1986; the authors felt that both the number of taxa and the species composition was comparable to the results of studies performed on other small streams in southwestern Ohio. The authors compared the results of the June 1986 survey to the study performed by Tarzwell on Paddys Run in 1951, prior to the operation of the FEMP (see Sections 1, 2, and 3 of the Operable Unit 5 RI Report). The list of species collected in 1951 was generally comparable to that generated in June 1986. Apparent differences between the 1951 and 1986 data sets (e.g., the absence of centrarchids and several other species in the 1986 collection) were attributable to the low flow in the stream when

sampling took place in 1986. It was concluded that "Paddys Run appears to have a relatively diverse icthyofauna in the area of stream above the K-65 storage tanks." (Facemire et al. 1990.)

Samples were also collected in March 1987 from sites 1,2,3,5,9, and 11 on Paddys Run (Figure 2-47). Modified Shannon Weaver indices calculated for the samples collected at each site indicated that a large amount of variability existed in the species diversity in Paddys Run. Of the sites sampled during this period, the diversity of the fish community at Paddys Run Sites 3 and 9 was very low relative to other sites. Paddys Run Site 3 and Paddys Run Site 9 were located a short distance downstream from the drainage ditch north of the railroad trestle and the storm sewer outfall, respectively. "Overall, a greater number of species were present in the March 1987 collection as compared to the June 1986 collection. The increased number of species in the spring collection may be attributed to the increased ability of fish to move between sites resulting from the resumption of water flow along the entire reach of Paddys Run." (Facemire et al. 1990.)

Samples were also collected in June 1987 from six sites on Paddys Run (1, 2, 3, 5, and 10). As was the case in June 1986, water levels were very low. Modified Shannon Weaver indices calculated for the individual sites suggested that, like the samples collected in March, species diversity in Paddys Run was highly variable. The highest diversity values were calculated for samples collected from Paddys Run Site 2; the community at Paddys Run Site 11 exhibited the least diversity. The results of this sampling effort also indicated that the species diversity at Site 3 increased dramatically as compared to indices generated from the March data. The authors felt that the increased diversity observed in June at Site 3 may have been the result of low water levels, forcing fish to congregate at this location. The reasons for the low species diversity observed at Sites 3 and 9 in March "were not known" but may have been attributable to runoff "or some other factors affecting habitat quality." Nonetheless, it was concluded that "Paddys Run appears to support a diverse ichthyofauna." (Facemire et. al 1990.)

Lists of fish species generated by studies conducted on Paddys Run over a 35 year period were summarized in Table B.4.2 so that major shifts in species composition could be identified. These data were collected from the period prior to uranium processing to the completion of the first structure designed to control runoff into Paddys Run (the storm water retention basin). On balance, the data summarized in this table suggest that the fish community in Paddys Run can be characterized as being diverse and stable. Species present in 1951, prior to operations, were present in the surveys

performed in 1986 and 1987. Although some variability exists in the data, much of the variability could be accounted for by seasonal fluctuations in flow in this intermittent stream.

Avifauna inhabiting the FEMP have been surveyed several times. Pomeroy (1977) conducted a survey in June 1977, while Facemire et al. (1990) conducted three separate surveys: June to July 1986, December 1986 to March 1987, and April to May 1987. Data from these surveys are summarized and compared to a list of species typically found in the Cincinnati area in Table B.4.3 (Cincinnati Nature Conservancy; CNC 1978). Facemire et al. (1990) also compared the results of their surveys to the same list of bird species (e.g., CNC 1978) found in the Cincinnati area.

As indicated in Table B.4.3, a large percentage of the birds on this list can be categorized as insectivorous and foliage gleaners. Contrary to observations made by Facemire et al. (1990), a relatively large number of insectivorous birds included on the CNC list were observed on the FEMP. The common night hawk was one of the insectivorous species Facemire et al. (1990) had expected, but failed to observe on the FEMP. However, Pomeroy (1977) did observe this species, specifically noting that the number of observations would probably have been greater had the survey been conducted either at dusk or before sunrise. Facemire et al. (1990) conducted their surveys 0.5 to 3 hours after sunrise and completed by 1100 hours.

The data summarized in Table B.4.3 indicates that the many of the species observed by Pomeroy in 1977 were also observed almost 10 years later, during the survey conducted by Miami University. This data summary also suggests that, contrary to the concerns expressed by Facemire et al. (1990), a relatively large number of insectivorous birds commonly observed in the Cincinnati area were observed in these surveys. In summary, these data support the original conclusions drawn by Facemire et al. (1990) that a diverse avifauna exists at the FEMP.

In addition to conducting species surveys, Facemire et al. (1990) also investigated the growth and reproductive success of robins and doves from both on-property and off-property locations. This study was performed in spring 1987. The authors reported statistically significant differences in the fledgling success of doves nesting in the northern pine plantation and robins nesting in the southern pine plantation when compared to off-property populations. In addition, growth of robins on the FEMP was more suppressed as compared to that of doves from on-site locations. According to the authors, "species differences in suppressed growth could be attributable to species specific differences

in diet or to potential on site physiological stressors, including differences in accumulating radiological or chemical loads."

Osborne and Jones (1991) conducted a second study in 1990 determine if the pattern of suppressed growth and reproduction of robins observed during the 1987 investigation still existed. This study was restricted to robins because they appeared to be more severely affected in the 1987 study.

The results of this second study indicated that, although FEMP robins (northern and southern populations combined) produced normal-sized clutches, normal-sized eggs and fledged a normal percentage of young, FEMP robin nestlings were small when compared to off-property populations. Robin nestlings exhibited suppressed growth in four of five pre-fledging growth parameters, a pattern similar to that reported for FEMP robins in 1987.

According to the authors, "neither direct acute or chronic radiation exposure, sibling competition, nor crowding appear to be suppressing FEMP nestling growth. Other factors associated with diet quality seem more important. They include the possibility of heavy metal or pesticide stress operating through earthworm-robin food chains, food abundance, the availability of food to foraging adults for feeding the young." (Osborne and Jones 1991.)

The authors recommended that additional studies be performed in order to elucidate factors responsible for the pattern of suppressed growth and reproductive fitness in FEMP robins. Recommended studies included an examination of food quality, including a determination of the levels of both heavy metals and herbicides/pesticides in soil and earthworms. "Such information is essential to clarify further the pattern of stunting in FEMP robins, possible dietary stress through earthworm quality of the FEMP since the termination of production."

As a results of these recommendations, a third study was conducted in 1991 to determine if suppressed growth still existed, and if so, "the possible relationship of FEMP land management practices and soil contaminants through food chains to growth and reproductive fitness." (Osborne et al. 1992.)

This third study included five off-site sampling sites, as well as analysis of soils and earthworms collected near the nest sites for uranium, pesticides/herbicides, and heavy metals. Study results

indicated that clutch sizes, egg weights and nesting success were similar for FEMP and for off-property robin populations. FEMP robins also fledged a normal percentage of young. However, FEMP robin nestlings still exhibited suppressed growth in two of four growth parameters measured.

Total uranium and herbicides/pesticides were not detected in most soil samples and were not detected in earthworms. The authors concluded that the possibility of uranium or pesticides affecting growth through earthworm-robin foodchains was "not a factor in this study." nor was there conclusive evidence of bioaccumulation of heavy metals through robin food chains (Osborne et al. 1992). The authors interpreted these results to indicate that current growth suppression in nestling American robins is related to land management practices on the FEMP that affect both food availability and the quality of the diet.

Although the results of this study suggest that contaminants in soil and the potential food items taken from these soils were not responsible for the growth suppression observed in these nestlings, the study was not designed to exclude possibility that reductions in nestling growth was the result of ingesting earthworms collected from distant, contaminated soils. As summarized in Sections B.2 and B.3, a number of the areas studied in the Site-wide Ecological Risk Assessment contain soil CPCs that exceeded the soil benchmark values. Planned (or completed) remedial actions, such as capping contaminated soils or other related activities will reduce the potential risk to ecological receptors such as the American robin by interrupting the soil-food item (earthworm) exposure pathway.

B.4.2 SUMMARY OF ECOLOGICAL RISK ASSESSMENT RESULTS

The representative concentrations of media-specific nonradiological contaminants were compared to media-specific benchmark values that are protective of ecological receptors. Contaminants exceeding these values were regarded as final CPCs and their toxicological properties summarized. The relative risks that each of these final CPCs might pose to FEMP ecological receptors were then evaluated.

Potential risks to ecological receptors due to chronic exposure to low-levels of radiological contaminants present in the FEMP study areas were also addressed. To calculate the internal and external doses, media- and site-specific data were evaluated in a model, and the results were compared to a target level dose (36.5 rad/year) published in 1992 by the IAEA.

The results of this assessment determined that surface soil contamination by uranium in Study Area C represented the single greatest source of risk to terrestrial ecological receptors, but only in terms of heavy metal toxicity; calculations indicate that exposure to radiological contaminants associated with surface soils in this part of the FEMP does not result in a total dose that exceeds the target of 36.5 rad/year. Soil concentrations of uranium and other radionuclides outside this area also resulted in absorbed doses below the target level dose.

Uranium, although detected in off-property soil samples, does not represent a risk to terrestrial ecological receptors inhabiting these areas.

Other soil contaminants were present in various on-property locations, but appeared to be relatively limited in distribution. Comparisons of the following soil contaminants to benchmark criteria indicate that ecological receptors that come in contact with these inorganic soil contaminants may be at risk: aluminum, antimony, cadmium, lead, manganese, molybdenum, silver, and zinc. Lead and manganese were also present in off-property soil samples in concentrations that may represent a risk to ecological receptors coming in contact with these contaminants. Organic soil contaminants present in concentrations that may represent a risk to ecological receptors were detected in Study Areas A, C and E and included benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo (g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h) anthracene, and indeno (1,2,3-cd) pyrene. No organic contaminants were detected in off-property soils in concentrations greater than benchmark values.

No toxicologically based criterion could be identified for uranium in sediments. Although a review of the literature suggests that this contaminant is characterized by limited biological availability, the concentrations present in sediment collected from off-property locations on Paddys Run exceeded background concentrations and may pose a risk to benthic organisms inhabiting this portion of the creek. Sediment uranium concentrations were low or undetected in samples collected from on-property locations and the Great Miami River.

Sediment collected from on-property Paddys Run locations also contained barium, cadmium, cyanide and manganese in concentrations that exceeded sediment benchmark criteria. Benthic organisms associated with this portion of Paddys Run are at risk as a result of exposure to these sediment contaminants. Manganese in off-property Paddys Run sediment was present in concentrations that may adversely impact aquatic biota. This contaminant was also present in sediment collected from

the Great Miami River downstream from the FEMP NPDES outfall as were barium, phenanthrene, iron, lead and zinc.

The representative concentrations of aluminum, bis(2-ethylhexyl) phthalate, cadmium, di-n-octyl phthalate, and lead measured in surface water samples collected from on-property locations on Paddys Run exceeded benchmark criteria. Of these contaminants, lead contributed the most to the cumulative risk posed to aquatic biota inhabiting this portion of the stream.

Concentrations of bis(2-ethylhexyl) phthalate greater than the benchmark criterion were also measured in surface water samples collected from off-property locations on Paddys Run. In addition to this contaminant, the concentrations of lead, di-n-octyl phthalate and uranium also exceeded benchmark criteria. The majority of risk posed to aquatic biota inhabiting this section of the creek was associated with elevated concentrations of uranium.

Representative concentrations of ammonia and mercury exceeding the benchmark criterion were only detected in surface water samples collected from the Great Miami River upstream of the FEMP NPDES effluent outfall. Aluminum was the single greatest contributor to risk associated with water samples collected from Reach 2 on the Great Miami River. Aluminum, barium, bis(2-ethylhexyl) phthalate, cadmium, cyanide, lead, and manganese were identified as contaminants that may be adversely impacting aquatic biota inhabiting the Great Miami River downstream from its confluence with Paddys Run. More contaminants were present in concentrations exceeding benchmark criteria in surface water samples collected from the Great Miami River downstream from its confluence with Paddys Run than were present in samples collected from upstream locations on the river or from sampling areas on Paddys Run. Of these contaminants, aluminum contributed significantly to the cumulative risk posed to aquatic biota inhabiting this portion of the river.

Terrestrial organisms exclusively using drainageways in Study Areas A, E/G, and F as a source of drinking water may be at risk as a result of the presence of mercury, trichloroethylene, and 1,2-dichloroethylene. Lead and bis(2-ethylhexyl) phthalate present in surface water samples collected from on-property and off-property locations on Paddys Run represent a potential risk to terrestrial biota. Di-n-ocytl phthalate was also present in concentrations exceeding benchmark values for these receptors in samples collected from on-property locations of Paddys Run. Of the contaminants detected in samples collected from the Great Miami River, concentrations of mercury, cadmium and

bis(2-ethylhexyl) phthalate exceeded benchmark values for terrestrial ecological receptors; organisms exclusively relying on the Great Miami River for drinking water may be at risk.

The results of a number of biological studies conducted over a 35 year period suggest that biological communities have apparently remained stable over the period of operations at the FEMP. A series of studies conducted on the American robin indicate that FEMP nestlings consistently exhibit stunted growth. Although these studies have indicated that contaminants in food items collected from soils near the nest do not appear to be the cause for the suppressed growth, the study design did not preclude the possibility that contaminated food items may be collected from soils distant to the nests. At present, the possibility that stunted growth may be the result of ingestion of contaminated food items has not been entirely eliminated.

The results of the Site-Wide Ecological Risk Assessment indicate that a number of contaminants are present in soil, surface water and sediment in concentrations that may pose a risk to ecological receptors. These contaminants include uranium and a number of other heavy metals. Not only do these contaminants pose a current risk to ecological receptors but, because they do not degrade, continued release of these contaminants may result in a long-term risk to ecological receptors. Continued efforts to reduce and control the release of contaminants into areas inhabited by ecological receptors will reduce the current and long-term risks associated with these contaminants.

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TABLE B.4.1

BENTHIC MACROINVERTEBRATE COMMUNITY INDICES

Station	Study						
	Pomeroy July 1977[a]	Facemire June 1986[b]	Facemire Mar./June 1987[b]	RI/FS May/June 1989[c]	RI/FS Nov./Dec. 1989[c]	RI/FS Mar./May 1990[c]	RI/FS June/Aug. 1990[c]
SHANNON DIVERSITY							
PR1		3.2	0.97				
PR2	1.39	2.06		2.29	3.24	3.5	3.3
PR3		2.4	0.43	2.54	2.43	2.99	2.81
PR4		1.9					
PR5		1.69	0.21	1.06	1.06	3.01	3.11
PR6		2.68		0.55	1.04	3.31	no data
PR7		2.02					
PR8		1.8					
PR9		2.63		1.43	NA	3.33	no data
PR10		1.96					
PR11			0.66				
SIMPSON DIVERSITY							
PR1	0.4	0.844	0.744				
PR2		0.653		0.75	0.86	0.88	0.87
PR3		0.677	0.114	0.77	0.77	0.81	0.8
PR4		0.591					
PR5		0.599	0.043	0.28	0.31	0.8	0.85
PR6		0.777		0.15	0.36	0.87	no data
PR7		0.6					
PR8		0.474					
PR9		0.794		0.5	NA	0.85	no data
PR10		0.623					
PR11			0.156				

TABLE B.4.1 (Continued)

Station	Study						
	Pomeroy July 1977[a]	Facemire June 1986[b]	Facemire Mar./June 1987[b]	RI/FS May/June 1989[c]	RI/FS Nov./Dec. 1989[c]	RI/FS Mar./May 1990[c]	RI/FS June/Aug. 1990[c]
SIMPSON DOMINANCE							
PR1	0.6	0.156	0.256				
PR2		0.347		0.25	0.14	0.12	0.13
PR3		0.323	0.886	0.23	0.22	0.19	0.2
PR4		0.409					
PR5		0.401	0.956	0.71	0.69	0.2	0.15
PR6		0.222		0.84	0.64	0.13	no data
PR7		0.399					
PR8		0.526					
PR9		0.206		0.5	NA	0.15	no data
PR10		0.377					
PR11			0.844				
PIELOU'S EVENESS							
PR1	0.37	0.741	0.218				
PR2		0.484		0.82	0.8	0.81	0.79
PR3		0.556	0.114	0.8	0.73	0.66	0.72
PR4		0.499					
PR5		0.729	0.062	0.33	0.35	0.7	0.79
PR6		0.725		0.24	0.52	0.75	no data
PR7		0.583					
PR8		0.431					
PR9		0.76		0.55	NA	0.77	no data

TABLE B.4.1 (Continued)

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Station	Study						
	Pomeroy July 1977[a]	Facemire June 1986[b]	Facemire Mar./June 1987[b]	RI/FS May/June 1989[c]	RI/FS Nov./Dec. 1989[c]	RI/FS Mar./May 1990[c]	RI/FS June/Aug. 1990[c]
DENSITY							
PR1		2939.5	4846.1				
PR2	4339.16	5023.5		100	240	568.9	577.2
PR3		5184.7	9077.6	151.1	184.4	773.3	586.7
PR4		3391.7					
PR5		55.1	6138.6	173.3	217.8	457.8	542.2
PR6		623.3		295.6	33.3	557.8	no data
PR7		308.1					
PR8		4158					
PR9		351.1		162.2	2.2	955.6	no data
PR10		330.1					
PR11			9163.1				

[a]Pomeroy 1977
[b]Facemire et al. 1990
[c]DOE 1992a

TABLE B.4.2

FISH SPECIES COLLECTED FROM PADDY'S RUN

		Area[f]				
Scientific Name	Common Name	1	2	3	4	5
Clupeidae (Herring Family)						
Dorosoma cepedianum	gizzard shad					c
Cyprinidae (Minnow Family)						
Campostoma anomalum	central stoneroller	c	a,b,c,d,e	a,b	b,c,d	b,d,c
Cyprinella spiloptera	spotfin shiner	c	b,c	b	c	b,c
Cyprinella whipplei	steelcolor shiner			a		
Luxilus chrysocephalus	striped shiner		b,e	a,b		
Luxilus cornutus	common shiner	c	c,d		c,d	d,c
Lythrusus ardens	rosefin shiner	c	a,b,c	a,b		b
Lythrurus umbratilis	redfin shiner		d		d	d
Notropis atherinoides	emerald shiner		b			c
Notropis boops	bigeye shiner					c
Notropis buccattus	silverjaw minnow	c	a,b,c,d,e	a,b		b,d
Notropis stramineus	sand shiner		b,c			
Phenacobius mirabilis	suckermouth minnow					b
Phoxinus erythrogaster	southern redbelly dace		c,d	b	d	d
Pimephales notatus	bluntnose minnow		a,b,c,d,e	a,b	c,d	b,c,d
Pimephales promelas	fathead minnow	c	c,d		d	
Rhinichthys atratulus	blacknose dace		a,b,c,d	b	d	b,d
Semotilus atromaculatus	creek chub		a,b,d,e	a,b	b,d	b,d
Catastomidae (Sucker Family)						
Catastomus commersoni	white sucker		a,b,c,d,e	a	d	b,d
Centrarchidae (Sunfish Family)						
Lepomis cyanellus	green sunfish	c	c,d		d	d
Lepomis macrochirus	bluegill	c	c			c
Lepomis megalotis	longear sunfish		c,d			
Lepomis spp.	sunfish hybrid			b	b	b

TABLE B.4.2 (Continued)

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Scientific Name	Common Name	Area[f] 1	2	3	4	5
Micropterus salmoides	largemouth bass	c	c			
Micropterus dolomieui	smallmouth bass					d
Ictaluridae (Catfish Family)						
Ameiurus natalis	yellow bullhead		d			
Percidae (Darter Family)						
Etheostoma caeruleum	rainbow darter					b
Etheostoma flabellare	fantail darter	c	a,b,c,d,e	a,b	d	b
Etheostoma nigrum	johnny darter		a,b,c,d,e	a,b	d	b,d
Etheostoma spectabile	orangethroat darter		a,b,c,d,e	a,b	b,d	b,d
Cottidae (Sculpin Family)						
Cottus bairdi	mottled sculpin		d		d	d
Number of Species Observed (All Reports)		10	24	15	16	24

a: Facemire June-August 1986
b: Facemire January-March 1987
c: Bauer December 1972 - October 1973
d: Tarzwell 1952
e: Pomeroy 1977

[f]Locations sampled in various studies were grouped by "Area" on Paddy's Run. These sampling locations were grouped as follows:

Area 1 = Bauer's station 1
Area 2 = Bauer's stations 2 and 3, Tarzwell's station 1, Facemire's stations 1 and 2, and Pomeroy's only sampling station
Area 3 = Facemire's stations 3, 4, 5, 6, 7 (Flow typically intermittent)
Area 4 = Facemire's station 8, 9, 10; Bauer's station 4; and Tarzwell's station 2 (Flow typically intermittent)
Area 5 = Bauer's stations 5 and 6, Facemire's station 11, and Tarzwell's station 3 (Flow typically intermittent)

TABLE B.4.3

BIRDS OBSERVED DURING VARIOUS STUDIES AT THE FEMP AS COMPARED TO THOSE EXPECTED DURING THE WINTER MONTHS AND THOSE WHICH REGULARLY NEST WITHIN THE AREA

Species[a]		Insectivorous (I) or Foliage Gleaning (FG)	Study Dates			
			Summer 1977[b]	Summer 1986[c]	Winter 1986[d]	Spring 1987[e]
Blue-winged Warbler	C[f]	I and FG				x
Northern Parula Warbler	U	I and FG				
Yellow Warbler	C	I and FG		x		
Cerulean Warbler	C	I and FG				
Yellow-rumped Warbler	U	I and FG				x
Black-throated Green Warbler	C	I and FG				x
Yellow-throated Warbler	U	I and FG				
Blackpoll Warbler	R	I and FG				x
Prairie Warbler	U	I and FG				
Ovenbird	U					
Louisiana Waterthrush	C	I		x		
Northern Waterthrush	R	I				x
Kentucky Warbler	C	I				
Mourning Warbler	R	I				x
Common Yellowthroat	C	I and FG	x	x		
Yellow-breasted Chat	C	I and FG	x	x		
Hooded Warbler	R	I and FG				
American Redstart	U	I and FG				x
House Sparrow	A		x	x	x	
Eastern Meadowlark	A		x	x	x	
Red-winged Blackbird	A		x	x	x	
Common Grackle	A		x	x		
Brown-headed Cowbird	C		x	x		
Orchard Oriole	U	I and FG	x	x		

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TABLE B.4.3 (Continued)

Species[a]		Insectivorous (I) or Foliage Gleaning (FG)	Study Dates			
			Summer 1977[b]	Summer 1986[c]	Winter 1986[d]	Spring 1987[e]
Northern Oriole	C	I and FG		x		
Scarlet Tanager	U	I and FG	x	x		
Summer Tanager	U	I and FG		x		
Cardinal	A		x	x	x	
Rose-breasted Grosbeak	U			x		x
Indigo Bunting	A		x	x		
Evening Grosbeak	I					
Purple Finch	U					
Pine Siskin	I					
American Goldfinch	A		x	x	x	
Red Crossbill	I					
Rufous-sided Towhee	C		x	x	x	
Savannah Sparrow	U		x	x		
Grasshopper Sparrow	U		x	x		
Henslow's Sparrow	R					
Dark-eyed Junco	A				x	
Tree Sparrow	U				x	
Chipping Sparrow	C			x		
Field Sparrow	A		x	x		
White-crowned Sparrow	U					
White-throated Sparrow	A				x	
Fox Sparrow	R					
Swamp Sparrow	U					x
Song Sparrow	C		x	x	x	
Great blue heron	U			x		
Green Heron	C		x	x		
Canada Goose	C					
Mallard	C			x		

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TABLE B.4.3 (Continued)

Species[a]		Insectivorous (I) or Foliage Gleaning (FG)	Study Dates			
			Summer 1977[b]	Summer 1986[c]	Winter 1986[d]	Spring 1987[e]
Black Duck	C					
Wood Duck	C			x		
Common Goldeneye	U					
Oldsquaw	R					
Turkey Vulture	C			x		
Black Vulture	R					
Sharp-shinned Hawk	R					
Cooper's Hawk	U			x	x	
Red-tailed Hawk	C		x	x	x	
Red-shouldered Hawk	U				x	
Broad-winged Hawk	U					
Rough-legged Hawk	R					
Marsh Hawk	U			x		
American Kestrel	C			x	x	
Bobwhite	C		x	x	x	
Killdeer	C	I	x	x	x	
American Woodcock	U			x		
Spotted Sandpiper	C			x		
Solitary Sandpiper	U			x		x
Herring Gull	C					
Ring-billed Gull	U					
Rock Dove	A			x		
Mourning Dove	A		x	x	x	
Yellow-billed Cuckoo	C	I and FG	x	x		
Black-billed Cuckoo	U	I and FG		x		
Barn Owl	R					
Screech Owl	C			x	x	
Great Horned Owl	C			x	x	

TABLE B.4.3 (Continued)

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Species[a]		Insectivorous (I) or Foliage Gleaning (FG)	Study Dates: Summer 1977[b]	Summer 1986[c]	Winter 1986[d]	Spring 1987[e]
Snowy Owl	I					
Barred Owl	C					
Long-eared Owl	R					
Short-eared Owl	R					
Saw-whet Owl	U					
Common Nighthawk	C	I	x			
Chimney Swift	A	I	x	x		
Belted Kingfisher	C		x	x	x	
Ruby-throated Hummingbird	C	I		x		
Common Flicker	C	I	x	x	x	
Pileated Woodpecker	U	I		x	x	
Red-bellied Woodpecker	C	I	x	x	x	
Red-headed Woodpecker	R	I		x		
Yellow-bellied Sapsucker	U	I				
Hairy Woodpecker	U	I		x	x	
Downy Woodpecker	A	I	x	x	x	
Eastern Kingbird	U	I		x		
Great Crested Flycatcher	C	I		x		
Eastern Phoebe	C	I		x		
Willow Flycatcher		I		x		
Arcadian Flycatcher	C	I		x		
Alder Flycatcher	U	I				
Eastern wood Pewee	C	I	x	x		
Horned Lark	U	I				
Bank Swallow	U	I				
Rough-winged Swallow	U	I	x	x		
Barn Swallow	C	I	x	x		

TABLE B.4.3 (Continued)

Species[a]		Insectivorous (I) or Foliage Gleaning (FG)	Study Dates			
			Summer 1977[b]	Summer 1986[c]	Winter 1986[d]	Spring 1987[e]
Purple Martin	C	I		x		
Blue Jay	A		x	x	x	
Common Crow	A		x	x	x	
Carolina Chickadee	A	I and FG	x	x	x	
Tufted Titmouse	A	I and FG	x	x	x	
White-breasted Nuthatch	C	I		x	x	
Red-breasted Nuthatch	R	I				
Brown Creeper	U	I			x	
House Wren	C	I		x		
Winter Wren	R	I				
Carolina Wren	C	I		x	x	
Mockingbird	C	I	x	x	x	
Gray Catbird	C	I	x	x		
Brown Thrasher	C	I		x		
American Robin	A		x	x	x	
Wood Thrush	C	I	x	x		
Eastern Bluebird	U	I		x	x	
Blue-gray Gnatcatcher	C	I and FG	x	x		
Golden-crowned Kinglet	C	I and FG			x	
Ruby-crowned Kinglet	U	I and FG				
Cedar Waxwing	U			x		
Loggerhead Shrike	R					
Starling	A		x	x	x	
White-eyed Vireo	C	I and FG		x		
Yellow-throated Vireo	U	I and FG				
Solitary Vireo	U	I and FG				x
Red-eyed Vireo	A	I and FG	x	x		
Philadelphia Vireo	R	I and FG		x		

TABLE B.4.3 (Continued)

Species[a]		Insectivorous (I) or Foliage Gleaning (FG)	Study Dates			
			Summer 1977[b]	Summer 1986[c]	Winter 1986[d]	Spring 1987[e]
Warbling Vireo	U	I and FG		x		
Prothonotary Warbler	R	I and FG				
Black-and-white Warbler	C	I		x		
Tennessee Warbler	C	I and FG		x		x
Worm-eating Warbler	R					

[a]Species list derived from CNC (1978) and includes birds which regularly nest within the area and those expected during the winter months. The list also includes several unexpected species observed during one or more of the studies.

[b]Observed June 27 - 28, 1977 (Pomeroy et al. 1977).
[c]Observed June 25 - July 25, 1986 (Facemire et al. 1990).
[d]Observed December 5, 1986 - March 6, 1987 (Facemire et al. 1990).
[e]Observed April - May 1987 (Facemire et al. 1990).

[f]Abbreviations:
A = Abundant (may be seen more than 75% of the time in the proper habitat and at the right time of the year)
C = Common (may be seen more than 50% of the time)
U = Uncommon (may be seen between 10% and 50% of the time)
R = Rare (may be seen 10% or less of the time)
I = Irregular (occur in varying numbers from year to year, and in some years may not appear at all) (CNC 1978)

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B.I CALCULATIONS USED IN THIS STUDY

5698

B.I.1.0 HARDNESS

Hardness (mg $CaCO_3$/L) = 2.497 [Ca mg/L] + 4.118 [Mg mg/L]

B.I.2.0 CONVERSION OF URANIUM ISOTOPIC ACTIVITY TO MASS CONCENTRATIONS

$$M_U = \frac{A_{U\text{-}238}}{SpA_{U\text{-}238}} + \frac{A_{U\text{-}235}}{SpA_{U\text{-}235}} + \frac{A_{U\text{-}234}}{SpA_{U\text{-}234}}$$

where:

M_U is the mass concentrations of uranium in the soil in units of micrograms of uranium per gram (μg/g) of soil.

$A_{U\text{-}238}$ is the activity of U-238 in the sample by isotopic analysis in units of picoCuries per gram (pCi/g) of soil.

$SpA_{U\text{-}238}$ is the specific activity of U-238 (0.336 picoCuries per microgram [pCi/μg] of U-238).

$A_{U\text{-}235}$ is the activity of U-235 in the sample by isotopic analysis in units of pCi/g of soil.

$SpA_{U\text{-}235}$ is the specific activity of U-235 (2.16 pCi/μg of U-235).

$A_{U\text{-}234}$ is the activity of U-234 in the sample by isotopic analysis in units of pCi/g of soil.

$SpA_{U\text{-}234}$ is the specific activity of U-234 (6.25×10^3 pCi/μg of U-234).

B.I.3.0 CONVERSION OF THORIUM ISOTOPIC ACTIVITY CONCENTRATIONS TO MASS CONCENTRATIONS

$$M_{Th} = \frac{A_{Th\text{-}232}}{SpA_{Th\text{-}232}} + \frac{A_{Th\text{-}230}}{SpA_{Th\text{-}230}} + \frac{A_{Th\text{-}228}}{SpA_{Th\text{-}228}}$$

Where:

M_{Th} is the mass concentrations of thorium in the soil in units of micrograms of thorium per gram (μg/g) of soil.

$A_{Th\text{-}232}$ is the activity of Th-232 in the sample by isotopic analysis in units of picoCuries per gram (pCi/g) of soil.

$SpA_{Th\text{-}232}$ is the specific activity of Th-232 (0.11 picoCuries per microgram [pCi/μg] of Th-232).

$A_{Th\text{-}230}$ is the activity of Th-230 in the sample by isotopic analysis in units of pCi/g of soil.

$SpA_{Th\text{-}230}$ is the specific activity of Th-230 (20,200 pCi/μg of Th-230).

$A_{Th\text{-}228}$ is the activity of Th-228 in the sample by isotopic analysis in units of pCi/g of soil.

$SpA_{Th\text{-}228}$ is the specific activity of Th-228 (8.2×10^8 pCi/μg of Th-228).

B.I.4.0 CALCULATION OF THE LC50 FOR URANIUM

LC50 = -2.84 + 0.337 * (Alkalinity, mg $CaCO_3$/L) + 0.0406 * (Hardness, mg $CaCO_3$/L)

B.I.5.0 CALCULATION OF COMMUNITY PARAMETERS

The Shannon Diversity Index (H') was used to characterize diversity and was calculated as follows:

$$H' = \frac{[(N \log N - \Sigma\, ni \log ni) * 3.321928]}{N}$$

Where:

N = the total density of all families collected
3.321928 = conversion to log base 2

000133

In order to calculate Simpson Diversity (D_s), community dominace is initially calculated: 5698

$$L = \frac{\Sigma\, n_i(n_i - 1)}{N(N - 1)}$$

then:

$$D_s = 1 - L$$

To calculate Pielou's Eveness (J'):

$$J' = \frac{H'}{H'_{max}}$$

Where:

H' = Shannon diversity
H_{max}' = log (number of families)

000134

TABLE B.II-1

IDENTIFYING FINAL CONTAMINANTS OF CONCERN (CPCs) IN SURFACE WATER OF PADDYS RUN ON-PROPERTY BASED ON TOXICITY

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Benchmark Toxicity Value (BTV) (μg/L)	Notes[a]	Data Range (μg/L)	Based on Representative SW Concentration: Rep.SW Conc. (μg/L)	Greater than Back-ground	Conc./BTV Ratio	Toxic SW CPC
Aluminum	U	5	40	87	1	136 - 145	145		1.66	Y
	F	6	33			47.8 - 185	185	Y		
Antimony	U	5	0	190	2					
	F	6	0							
Ammonia	U	6	33	1000	2	0.100 - 72.0	72.0	Y	0.0720	
	F									
Arsenic	U	5	0	190	2					
	F	6	0							
Barium	U	5	100	145	3	36.6 - 47.8	47.8		0.330	
	F	6	100			42.0 - 45.7	45.7			
Beryllium[b]	U	5	0	150	2					
	F	6	0							
Cadmium[b]	U	5	20	3.4	2	5.00	5.00	Y	1.47	Y
	F	6	0							
Chromium[b]	U	5	0	530	2					
	F	6	0							
Copper[b]	U	5	0	34	2					
	F	6	0							
Cyanide	U	6	17	12	2	3.80	3.80	Y	0.317	
	F	4	0							
Fluoride	U	6	100	980	4	0.200 - 230	230	Y	0.235	
	F									

TABLE B.II-1 (Continued)

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Benchmark Toxicity Value (BTV) (μg/L)	Notes[a]	Data Range (μg/L)	Based on Representative SW Concentration: Rep.SW Conc. (μg/L)	Greater than Back-ground	Conc./BTV Ratio	Toxic SW CPC
Lead[b]	U	4	25	30	2	156	156	Y	5.20	Y
	F	5	20			10.7	10.7			
Magnesium	U	5	100			22500 - 27100	27100			
	F	6	100			22700 - 27600	27600			
Manganese	U	5	100	98	5	7.50 - 30.4	30.4		0.310	
	F	6	83			7.20 - 28.6	28.6			
Mercury	U	5	0	0.2	2					
	F	6	0							
Nickel[b]	U	5	20	470	2	14.1	14.1	Y	0.0300	
	F									
Nitrate	U	1	100			16400	16400	Y		
	F									
Nitrite	U	1	100			1500	1500	Y		
	F									
Silicon	U									
	F									
Silver	U	3	0	1.3	2					
	F	4	25			4.00	4.00			
Sulfate	U	4	100			62500 - 77400	77400	Y		
	F									
Thallium	U	5	0	16	2					
	F	6	0							
Thorium	U	2	0							
	F	1	0							
Uranium[b]	U	8	100	890	6	3.60 - 26.1	17.0			
	F	6	100			8.24 - 3.42	34.2			

TABLE B.II-1 (Continued)

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Benchmark Toxicity Value (BTV) (μg/L)	Notes[a]	Data Range (μg/L)	Based on Representative SW Concentration: Rep.SW Conc. (μg/L)	Greater than Back-ground	Conc./BTV Ratio	Toxic SW CPC
Zinc[b]	U	5	20	280	2	14.9 - 14.9	14.9	Y	0.0530	
	F	6	17			3.80	3.80			
Bis(2-ethylhexyl)phthalate	U	4	50	8.4	2	11.0 - 40.0	40.0		4.76	Y
	F									
Di-n-butyl phthalate	U	4	0	190	2					
	F									
Di-n-octyl phthalate	U	4	20	47.7	7	52.0	52.0	NA	1.09	Y
	F									
Trichloroethylene	U			75	2					
	F									
Cumulative Risk					8				15.5	

[a]1: BTV = Chronic Ambient Water Quality Criteria (EPA 1988b,c)
2: Warmwater (OEPA 1993)
3: BTV = Water quality advisory concentration (EPA 1988d)
4: 48-H LC50/100 (Dave 1984)
5: Lowest 48-H LC50/100 (Jorgensen et al., 1990)
6: Parkhurst et al. (1984)
7: Geometric mean of the 72-H LC 50/100 (EPA 1980)
8: Cumulative risk = sum of all conc./BTV ratios > 0.3

[b]Hardness-Dependent Criteria Equations:
BERYLLIUM: e (1.609 [ln (HARDNESS mg $CaCO_3$)]-4.266)
CADMIUM: e (0.7852 [ln (HARDNESS mg $CaCO_3$)]-3.283)
CHROMIUM: e (0.8190 [ln (HARDNESS mg $CaCO_3$)]+1.561)
COPPER: e (0.9231 [ln (HARDNESS mg $CaCO_3$)]-1.784)
LEAD: e (1.279 [ln (HARDNESS mg $CaCO_3$)]-3.965)
NICKEL: e (0.8710 [ln (HARDNESS mg $CaCO_3$)]+1.144)
URANIUM: (-2.84+[0.337(ALK)+0.0406(HARD)])/100)1000
ZINC: e (0.8432 [ln (HARDNESS mg $CaCO_3$)]+0.7799)
Hardness value of 315.65 mg $CaCO_3$/L was based on the average of on- and off-property Ca and Mg concentrations in Paddys Run. Paddys Run Alkalinity = 235.3 mg $CaCO_3$/L

TABLE B.II-2

IDENTIFYING FINAL CONTAMINANTS OF CONCERN (CPCs) IN SURFACE WATER OF PADDYS RUN OFF-PROPERTY BASED ON TOXICITY

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Benchmark Toxicity Value (BTV) (μg/L)	Notes[a]	Data Range (μg/L)	Based on Representative SW Concentration: Rep.SW Conc. (μg/L)	Greater than Back-ground	Conc./BTV Ratio	Toxic SW CPC
Aluminum	U	3	0	87	1					
	F	3	0							
Antimony	U	3	0	190	2					
	F	3	33			14.6	14.6	Y		
Ammonia	U	3	67	1000	2	71.0 - 154	154	Y	0.154	
	F									
Arsenic	U	3	33	190	2	3.00	3.00	Y	0.0158	
	F	3	33			2.40	2.40	Y		
Barium	U	3	100	145	3	42.6 - 50.1	50.1	Y	0.346	
	F	3	0							
Beryllium[b]	U	3	0	150	2					
	F	3	0							
Cadmium[b]	U	3	0	3.4	2					
	F	3	0							
Chromium[b]	U			530	2					
	F									
Copper[b]	U	3	0	34	2					
	F	3	0							
Cyanide	U	3	0	12	2					
	F	3	0							
Fluoride	U	3	100	980	4	180 - 190	190		0.194	
	F									

TABLE B.II-2 (Continued)

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Benchmark Toxicity Value (BTV) (µg/L)	Notes[a]	Data Range (µg/L)	Based on Representative SW Concentration: Rep.SW Conc. (µg/L)	Greater than Back-ground	Conc./BTV Ratio	Toxic SW CPC
Lead[b]	U	3	67	30	2	4.40 - 69.7	69.7	Y	2.32	Y
	F	3	33			4.30	4.30	Y		
Magnesium	U	3	100			17.1 - 25.7	25.7			
	F	3	100			17.4 - 26.7	26.7			
Manganese	U	3	100	98	5	10.8 - 54.5	54.5	Y	0.566	
	F	3	100			8.20 - 56.5	56.5	Y		
Mercury	U	3	0	0.2	2					
	F	3	0							
Nickel[b]	U	3	0	470	2					
	F	3	0							
Nitrate	U									
	F									
Nitrate/Nitrite	U									
	F									
Silicon	U	3	100			2720 - 2970	2970			
	F	3	100			2640 - 2900	2900			
Silver	U	2	0	1.3	2					
	F	2	0							
Sulfate	U	3	100			42300 - 58800	58800	Y		
	F									
Thallium	U	2	0	16	2					
	F	3	33			1.40	1.40	Y		
Thorium	U									
	F	3	33			3190	3190	Y		
Uranium[b]	U	2	100	890	6	4100 - 8800	8800		9.89	Y
	F	6	100			2800 - 8700	8700	Y		

TABLE B.II-2 (Continued)

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Benchmark Toxicity Value (BTV) (μg/L)	Notes[a]	Data Range (μg/L)	Based on Representative SW Concentration: Rep.SW Conc. (μg/L)	Greater than Back-ground	Conc./BTV Ratio	Toxic SW CPC
Zinc[b]	U	3	0	280	2					
	F	3	0							
Bis(2-ethylhexyl)phthalate	U	3	33	8.4	2	22.0	22.0	Y	2.62	Y
	F									
Di-n-butyl phthalate	U	3	0	190	2					
	F									
Di-n-octyl phthalate	U	3	33	47.7	7	89.0	89.0	Y	1.87	Y
	F									
Trichloroethylene	U	3	67	75	2	2.00	2.00	Y	0.0267	
	F									
Cumulative Risk					8				18.0	

[a]1: BTV = Chronic Ambient Water Quality Criteria (EPA 1988b,c)
2: Warmwater (OEPA 1993)
3: BTV = Water quality advisory concentration (EPA 1988d)
4: 48-H LC50/100 (Dave 1984)
5: Lowest 48-H LC50/100 (Jorgensen et al., 1990)
6: Parkhurst et al. (1984)
7: Geometric mean of the 72-H LC 50/100 (EPA 1980)
8: Cumulative risk = sum of all conc./BTV ratios > 0.3

[b]Hardness-Dependent Criteria Equations:
BERYLLIUM: e (1.609 [ln (HARDNESS mg $CaCO_3$)]-4.266)
CADMIUM: e (0.7852 [ln (HARDNESS mg $CaCO_3$)]-3.283)
CHROMIUM: e (0.8190 [ln (HARDNESS mg $CaCO_3$)]+1.561)
COPPER: e (0.9231 [ln (HARDNESS mg $CaCO_3$)]-1.784)
LEAD: e (1.279 [ln (HARDNESS mg $CaCO_3$)]-3.965)
NICKEL: e (0.8710 [ln (HARDNESS mg $CaCO_3$)]+1.144)
URANIUM: (-2.84+[0.337(ALK)+0.0406(HARD)])/100)1000
ZINC: e (0.8432 [ln (HARDNESS mg $CaCO_3$)]+0.7799)
Hardness value of 315.65 mg $CaCO_3$/L was based on the average of on- and off-property Ca and Mg concentrations in Paddys Run. Paddys Run Alkalinity = 235.3 mg $CaCO_3$/L

TABLE B.II-3

IDENTIFYING FINAL CONTAMINANTS OF CONCERN (CPCs) IN SURFACE WATER OF THE GREAT MIAMI RIVER UPSTREAM OF THE EFFLUENT LINE BASED ON TOXICITY

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Benchmark Toxicity Value (BTV) (μg/L)	Notes[a]	Data Range (μg/L)	Based on Representative SW Concentration: Rep.SW Conc. (μg/L)	Greater than Back-ground	Conc./BTV Ratio	Toxic SW CPC
Aluminum	U			87	1					
	F									
Antimony	U			190	2					
	F									
Ammonia	U	1	100	1000	2	1900	1900		1.90	Y
	F									
Arsenic	U	1	0	190	2					
	F	1	0							
Barium	U	1	100	145	3	100	100	Y	0.690	
	F	1	100			100	100	Y		
Beryllium[b]	U			150	2					
	F									
Cadmium[b]	U	1	100	3.4	2	3.10	3.10		0.912	
	F	1	0							
Chromium[b]	U	1	100	530	2	6.10	6.10		0.0120	
	F	1	0							
Copper[b]	U	1	100	34	2	11.9	11.9	Y	0.350	
	F	1	0							

TABLE B.II-3 (Continued)

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Benchmark Toxicity Value (BTV) (µg/L)	Notes[a]	Data Range (µg/L)	Based on Representative SW Concentration: Rep.SW Conc. (µg/L)	Greater than Back-ground	Conc./BTV Ratio	Toxic SW CPC
Cyanide	U			12	2					
	F									
Fluoride	U	1	100	980	4	900	900		0.918	
	F									
Lead[b]	U	1	100	30	2	2.10	2.10		0.0700	
	F	1	0							
Magnesium	U	1	100			33000	33000			
	F	1	100			33600	33600			
Manganese	U	1	100	98	5	60.0	60.0		0.632	
	F	1	0							
Mercury	U	1	100	0.2	2	0.700	0.700		3.50	Y
	F									
Molybdenum	U			700	6	20.0	20.0	Y	0.0286	
	F					60.0	60.0			
Nickel[b]	U			470	2	13.1	13.1		0.0279	
	F									
Nitrate	U	1	100			8270	8270			
	F									
Nitrate/Nitrite	U									
	F									
Silicon	U									
	F									

TABLE B.II-3 (Continued)

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Benchmark Toxicity Value (BTV) (μg/L)	Notes[a]	Data Range (μg/L)	Based on Representative SW Concentration: Rep.SW Conc. (μg/L)	Greater than Back-ground	Conc./BTV Ratio	Toxic SW CPC
Silver	U	1	0	1.3	2					
	F	1	0							
Sulfate	U	1	100			14800	14800			
	F									
Thallium	U			16	2					
	F									
Thorium	U									
	F	4	0							
Uranium[b]	U	1	100	890	6	2.00	2.00	Y	0.00225	
	F	5	0							
Zinc[b]	U			280	2					
	F									
Bis(2-ethylhexyl)phthalate	U			8.4	2					
	F									
Di-n-butyl phthalate	U			190	2					
	F									
Di-n-octyl phthalate	U			47.7	7					
	F									

TABLE B.II-3 (Continued)

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Benchmark Toxicity Value (BTV) (μg/L)	Notes[a]	Data Range (μg/L)	Based on Representative SW Concentration: Rep.SW Conc. (μg/L)	Greater than Back-ground	Conc./BTV Ratio	Toxic SW CPC
Trichloroethylene	U			75	2					
	F									
Cumulative Risk					8				9.04	

[a]1: BTV = Chronic Ambient Water Quality Criteria (EPA 1988b,c)
2: Warmwater (OEPA 1993)
3: BTV = Water quality advisory concentration (EPA 1988d)
4: 48-H LC50/100 (Dave 1984)
5: Lowest 48-H LC50/100 (Jorgensen et al., 1990)
6: Parkhurst et al. (1984)
7: Geometric mean of the 72-H LC 50/100 (EPA 1980)
8: Cumulative risk = sum of all conc./BTV ratios > 0.3

[b]Hardness-Dependent Criteria Equations:
BERYLLIUM: e (1.609 [ln (HARDNESS mg $CaCO_3$)]-4.266)
CADMIUM: e (0.7852 [ln (HARDNESS mg $CaCO_3$)]-3.283)
CHROMIUM: e (0.8190 [ln (HARDNESS mg $CaCO_3$)]+1.561)
COPPER: e (0.9231 [ln (HARDNESS mg $CaCO_3$)]-1.784)
LEAD: e (1.279 [ln (HARDNESS mg $CaCO_3$)]-3.965)
NICKEL: e (0.8710 [ln (HARDNESS mg $CaCO_3$)]+1.144)
URANIUM: (-2.84+[0.337(ALK)+0.0406(HARD)])/100)1000
ZINC: e (0.8432 [ln (HARDNESS mg $CaCO_3$)]+0.7799)
Hardness value of 315.65 mg $CaCO_3$/L was based on the average of on- and off-property Ca and Mg concentrations in Paddys Run. Paddys Run Alkalinity = 235.3 mg $CaCO_3$/L

TABLE B.II-4

IDENTIFYING FINAL CONTAMINANTS OF CONCERN (CPCs) IN SURFACE WATER OF THE GREAT MIAMI RIVER BETWEEN THE EFFLUENT LINE AND THE CONFLUENCE WITH PADDYS RUN BASED ON TOXICITY

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Benchmark Toxicity Value (BTV) (µg/L)	Notes[a]	Data Range (µg/L)	Based on Representative SW Concentration: Rep.SW Conc. (µg/L)	Greater than Background	Conc./BTV Ratio	Toxic SW CPC
Aluminum	U	2	50	87	1	668	668		7.68	Y
	F	2	0							
Antimony	U	2	0	190	2					
	F	2	0							
Ammonia	U	2	50	1000	2	39.4	39.4		0.0394	
	F									
Arsenic	U	2	50	190	2	2.90	2.90		0.0153	
	F	2	50			2.40	2.40			
Barium	U	2	100	145	3	89.0 - 101	101	Y	0.697	
	F	2	100			31.5 - 98.0	98.0			
Beryllium[b]	U	2	50	150	2	7.70	7.70		0.0513	
	F	2	0							
Cadmium[b]	U	2	0	3.4	2					
	F	2	50			5.30	5.30			
Chromium[b]	U	2	0	530	2					
	F	2	0							
Copper[b]	U	2	0	34	2					
	F	2	0							

TABLE B.II-4 (Continued)

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Benchmark Toxicity Value (BTV) (µg/L)	Notes[a]	Data Range (µg/L)	Based on Representative SW Concentration: Rep.SW Conc. (µg/L)	Greater than Background	Conc./BTV Ratio	Toxic SW CPC
Cyanide	U	1	100	12	2	6.10	6.10	Y	0.508	
	F	1	0							
Fluoride	U	2	100	980	4	250 - 300	300		0.306	
	F									
Lead[b]	U	2	100	30	2	6.90 - 7.80	7.80		0.260	
	F	2	50			1.40	1.40			
Magnesium	U	2	100			27200 - 32400	32400			
	F	2	100			7600 - 32200	32200			
Manganese	U	2	100	98	5	64.9 - 89.5	89.5	Y	0.913	
	F	2	100			49.1	49.1			
Mercury	U	2	0	0.2	2					
	F	2	0							
Nickel[b]	U	2	0	470	2					
	F	2	0							
Nitrate	U	1	100			3.68	3.68			
	F									
Nitrate/Nitrite	U									
	F									
Silicon	U									
	F	2	100			2410 - 3330	3330	Y		
Silver	U	2	0	1.3	2					
	F	2	0							

TABLE B.II-4 (Continued)

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Benchmark Toxicity Value (BTV) (µg/L)	Notes[a]	Data Range (µg/L)	Based on Representative SW Concentration: Rep.SW Conc. (µg/L)	Greater than Background	Conc./BTV Ratio	Toxic SW CPC
Sulfate	U	2	100			61000 - 61100	61100			
	F									
Thallium	U	2	0	16	2					
	F	2	0							
Thorium	U									
	F									
Uranium[b]	U	2	100	890	6	1.50 - 2.10	2.10		0.00236	
	F	2	100			2.10 - 2.50	2.50			
Zinc[b]	U	2	0	280	2					
	F	2	0							
Bis(2-ethylhexyl)phthalate	U	2	0	8.4	2					
	F									
Di-n-butyl phthalate	U	2	0	190	2					
	F									
Di-n-octyl phthalate	U	2	0	47.7	7					
	F									

TABLE B.II-4 (Continued)

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Benchmark Toxicity Value (BTV) (μg/L)	Notes[a]	Data Range (μg/L)	Based on Representative SW Concentration: Rep.SW Conc. (μg/L)	Greater than Background	Conc./BTV Ratio	Toxic SW CPC
Trichloroethylene	U			75	2					
	F									
Cumulative Risk					8				10.5	

[a]1: BTV = Chronic Ambient Water Quality Criteria (EPA 1988b,c)
2: Warmwater (OEPA 1993)
3: BTV = Water quality advisory concentration (EPA 1988d)
4: 48-H LC50/100 (Dave 1984)
5: Lowest 48-H LC50/100 (Jorgensen et al., 1990)
6: Parkhurst et al. (1984)
7: Geometric mean of the 72-H LC 50/100 (EPA 1980)
8: Cumulative risk = sum of all conc./BTV ratios > 0.3

[b]Hardness-Dependent Criteria Equations:
BERYLLIUM: e (1.609 [ln (HARDNESS mg $CaCO_3$)]-4.266)
CADMIUM: e (0.7852 [ln (HARDNESS mg $CaCO_3$)]-3.283)
CHROMIUM: e (0.8190 [ln (HARDNESS mg $CaCO_3$)]+1.561)
COPPER: e (0.9231 [ln (HARDNESS mg $CaCO_3$)]-1.784)
LEAD: e (1.279 [ln (HARDNESS mg $CaCO_3$)]-3.965)
NICKEL: e (0.8710 [ln (HARDNESS mg $CaCO_3$)]+1.144)
URANIUM: (-2.84+[0.337(ALK)+0.0406(HARD)])/100)1000
ZINC: e (0.8432 [ln (HARDNESS mg $CaCO_3$)]+0.7799)
Hardness value of 315.65 mg $CaCO_3$/L was based on the average of on- and off-property Ca and Mg concentrations in Paddys Run. Paddys Run Alkalinity = 235.3 mg $CaCO_3$/L

TABLE B.II-5

IDENTIFYING FINAL CONTAMINANTS OF CONCERN (CPCs) IN SURFACE WATER OF THE GREAT MIAMI RIVER AT THE CONFLUENCE WITH PADDYS RUN BASED ON TOXICITY

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Benchmark Toxicity Value (BTV) (μg/L)	Notes[a]	Data Range (μg/L)	Based on Representative SW Concentration: Rep.SW Conc. (μg/L)	Greater than Back-ground	Conc./BTV Ratio	Toxic SW CPC
Aluminum	U	2	100	87	1	818 - 19100	19100	Y	220	Y
	F	1	0							
Antimony	U	2	0	190	2					
	F	1	0							
Ammonia	U	2	50	1000	2	32.2	32.2		0.0320	
	F									
Arsenic	U	2	50	190	2	6.00	6.00	Y	0.0316	
	F	1	100			1.00	1.00			
Barium	U	2	100	145	3	94.0 - 228	228	Y	1.57	Y
	F	1	100			94.1	94.1			
Beryllium[b]	U	2	0	150	2					
	F	1	0							
Cadmium[b]	U	2	50	3.4	2	18.0	18.0	Y	5.29	Y
	F	1	0							
Chromium[b]	U	2	50	530	2	26.4	26.4		0.0498	
	F	1	0							
Copper[b]	U	2	50	34	2	30.8	30.8	Y	0.906	
	F	1	0							

TABLE B.II-5 (Continued)

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Benchmark Toxicity Value (BTV) (µg/L)	Notes[a]	Data Range (µg/L)	Based on Representative SW Concentration: Rep.SW Conc. (µg/L)	Greater than Back-ground	Conc./BTV Ratio	Toxic SW CPC
Cyanide	U	2	50	12	2	21.4	21.4	Y	1.78	Y
	F	2	0							
Fluoride	U	2	100	980	4	310 - 340	340	Y	0.347	
	F									
Lead[b]	U	2	100	30	2	15.1 - 44.2	44.2	Y	1.47	Y
	F	1	0							
Magnesium	U	2	100			31600 - 47500	47500	Y		
	F	1	100			31100	31100			
Manganese	U	2	100	98	5	79.0 - 561	561	Y	5.72	Y
	F	1	0							
Mercury	U	2	0	0.2	2					
	F	1	0							
Nickel[b]	U	2	50	470	2	25.9	25.9	Y	0.0551	
	F	1	0							
Nitrate	U									
	F									
Nitrate/Nitrite	U									
	F									
Silicon	U	2	100			2810 - 51700	51700	Y		
	F									
Silver	U	2	0	1.3	2					
	F	1	0							

TABLE B.II-5 (Continued)

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Benchmark Toxicity Value (BTV) (µg/L)	Notes[a]	Data Range (µg/L)	Based on Representative SW Concentration: Rep.SW Conc. (µg/L)	Greater than Back-ground	Conc./BTV Ratio	Toxic SW CPC
Sulfate	U	2	100			61600 - 66800	66800	Y		
	F									
Thallium	U	2	0	16	2					
	F	1	0							
Thorium	U									
	F									
Uranium[b]	U	2	100	890	6	1.30 - 2.10	2.10	Y	0.0236	
	F	2	100			2.20 - 2.80	2.80	Y		
Zinc[b]	U	2	50	280	2	112	112	Y	0.400	
	F	1	0							
Bis(2-ethylhexyl)phthalate	U	2	100	8.4	2	2.00 - 160	160	Y	19.0	Y
	F									
Di-n-butyl phthalate	U	2	50	190	2	3.00	3.00	Y	0.0158	
	F									
Di-n-octyl phthalate	U	2	50	47.7	7	3.00	3.00	Y	0.0629	
	F									

TABLE B.II-5 (Continued)

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Benchmark Toxicity Value (BTV) (μg/L)	Notes[a]	Data Range (μg/L)	Based on Representative SW Concentration: Rep.SW Conc. (μg/L)	Greater than Back-ground	Conc./BTV Ratio	Toxic SW CPC
Trichloroethylene	U	2	50	75	2	2.00	2.00		0.0267	
	F									
Cumulative Risk					8				257	

[a]1: BTV = Chronic Ambient Water Quality Criteria (EPA 1988b,c)
2: Warmwater (OEPA 1993)
3: BTV = Water quality advisory concentration (EPA 1988d)
4: 48-H LC50/100 (Dave 1984)
5: Lowest 48-H LC50/100 (Jorgensen et al., 1990)
6: Parkhurst et al. (1984)
7: Geometric mean of the 72-H LC 50/100 (EPA 1980)
8: Cumulative risk = sum of all conc./BTV ratios > 0.3

[b]Hardness-Dependent Criteria Equations:
BERYLLIUM: e (1.609 [ln (HARDNESS mg $CaCO_3$)]-4.266)
CADMIUM: e (0.7852 [ln (HARDNESS mg $CaCO_3$)]-3.283)
CHROMIUM: e (0.8190 [ln (HARDNESS mg $CaCO_3$)]+1.561)
COPPER: e (0.9231 [ln (HARDNESS mg $CaCO_3$)]-1.784)
LEAD: e (1.279 [ln (HARDNESS mg $CaCO_3$)]-3.965)
NICKEL: e (0.8710 [ln (HARDNESS mg $CaCO_3$)]+1.144)
URANIUM: (-2.84+[0.337(ALK)+0.0406(HARD)])/100)1000
ZINC: e (0.8432 [ln (HARDNESS mg $CaCO_3$)]+0.7799)
Hardness value of 315.65 mg $CaCO_3$/L was based on the average of on- and off-property Ca and Mg concentrations in Paddys Run. Paddys Run Alkalinity = 235.3 mg $CaCO_3$/L

TABLE B.III-1

EXISTING DRINKING WATER TOXICITY DATA FOR CONTAMINANTS DETECTED IN SURFACE WATER

Contaminant	Animal Class & Data Type[a]	Exposure Concentration (μg/L)	Observed Effect	Species and Exposure Condition	Notes[b]
Aluminum	c				
Ammonia					
Antimony					
Arsenic	Mammalian LOEC	500,000 as sodium arsenite	Lethal 100 to 200 mg/kg body weight	Pig *Sus* sp.	1
Barium	Mammalian No Effect	5,000	No measurable effects	Mouse *Mus* sp. long-term feeding studies	2
Beryllium					
Cadmium	Avian LOEC	600	Cardiovascular disease	Domestic pigeons *Columbia livia*	3
	Mammalian LOEC	10,000	No symptoms; reduced longevity	Rat *Rattus* sp. lifetime exposure	4
Chromium	Mammalian No Effect	11,200	Not lethal	Dog *Canis familiaris* exposed to Cr^{+6} over 4 years	5
		134,000	Not lethal	Rat *Rattus* sp. exposed to Cr^{+6} over 3 months	5
	Mammalian LOEC	5,000	Slight growth retardation; formation of malignant tumors	Mouse *Mus* sp. lifetime exposure	6, 7
Cobalt					
Copper					

TABLE B.III-1 (Continued)

Contaminant	Animal Class & Data Type[a]	Exposure Concentration (μg/L)	Observed Effect	Species and Exposure Condition	Notes[b]
Cyanide					
Fluoride					
Iron					
Lead	Avian LOEC	100	Reduced testicle weight	Ringed turtle-dove *Streptopelia risoria* 2 weeks before pairing and during breeding cycle	8
	Mammalian No Effect	1000,000	No effect on survival or fertility	Mouse *Mus* sp. 9 months	9
	Mammalian LOEC	1,500 - 4,000,000	Disturbed sleep patterns	Rat *Rattus* sp. several days	10
			Depressed serum testosterone, Leydig cell lesions	Rat *Rattus* sp. 130 days	11
Manganese	Mammalian No Effect	about 1,000,000	Tolerate	Mice, rats, and rabbits	12
Mercury	Avian LOEC	500,000	Mortality, decreased growth rate	Chicken *Gallus domesticus* exposed to inorganic mercury for 3 days	13
	Mammalian LOEC	6,000	Growth reduction	Mouse *Mus* sp.	14

TABLE B.III-1 (Continued)

Contaminant	Animal Class & Data Type[a]	Exposure Concentration (μg/L)	Observed Effect	Species and Exposure Condition	Notes[b]
Molybdenum	Mammalian No Effect	1,000 or 10,000	No significant effect observed	Cattle *Bos* sp. exposed to ammonium molybdenate for 21 days	15
	Mammalian LOEC	10,000 - 1,000,000	Decreased survival of F2 and F3 generations	Mouse *Mus* sp. breeding mice	16
			Stunted sterile offspring with behavioral abnormalities	Rats *Rattus* sp. (adults and offspring) lifetime exposure	17
Nickel					
Selenium	Mammalian LOEC	3,000 as selenite	Reduced litter numbers and reproductive capacity	F3 Mice *Mus* sp.	18
Silver					
Thorium					
Uranium					
Vanadium					
Zinc					
1,1-Dichloroethane					
1,1,1-Trichloro-ethane					
1,2,-Dichloro-ethylene					
2-Hexanone					
4-Methyl-2-Pentanone					
Bis(2-ethylhexyl) phthalate					

TABLE B.III-1 (Continued)

Contaminant	Animal Class & Data Type[a]	Exposure Concentration (μg/L)	Observed Effect	Species and Exposure Condition	Notes[b]
Diethyl phthalate					
Di-n-butyl phthalate					
Di-n-octyl phthalate					
Tetrachloroethylene					
Trichloroethylene					

[a]LOEC = Lowest Observed Effect Concentration, sometimes an LOEC range is reported to indicate the lowest and highest LOECs and respective exposure conditions reported for an animal class group exposed to a given contaminant

[b]1:National Academy of Science (1977)
2:Schroeder and Mitchener (1975)
3:Revis et al., (1981)
4:Schroeder et al., (1963)
5:Steven et al., (1976)
6:Schroeder and Mitchener (1971)
7:Schroeder et al., (1965)
8:Kendall and Scanlon (1982)
9:Demayo et al., (1982)
10:Nraigu (1978)
11:Zirkin et al., (1985)
12:Venugopal and Luckey (1978)
13:Grissom and Thaxon (1985)
14:Schroeder (1973
15:Kinkaid (1980)
16:Earl and Vish (1979))
17:Chappell et al., (1979)
18:Schroeder and Mitchener (1972)

[c]An empty cell indicates that no appropriate data are available

TABLE B.III-2

COMPARISON OF POTENTIAL BENCHMARKS FOR USE IN IDENTIFYING APPROPRIATE SURFACE WATER (SW) BENCHMARK VALUES FOR DRINKING WATER EXPOSURES

(all values in $\mu g/L$)

Surface Water (SW) CPCs	Ohio EPA, 1993		LOEC Range for Avian and Mammalian Drinking Water Exposures (from Table B.III-1)	Benchmark value used in aquatic life assessment (from Table B.II-1)	Notes[a]
	Human Health Public Water Supply	Warm Water Aquatic Life Criteria			
Aluminum	b			87	1
Antimony	14	190		190	2
Ammonia		1000		1000	2
Arsenic	50	190	500000	190	2
Barium	1000			145	3
Beryllium[c]		≈156.6-330.99[c]		≈157-331[c]	2
Cadmium[c]	10	≈3-5[c]	600-10000	≈3-5[c]	2
Calcium					
Chromium[c]	50	≈450-800[c]	5000	≈450-800[c]	2
Cobalt					
Copper[c]	1000	≈34-55[c]		≈34-55[c]	2
Cyanide	200	12		12	2
Iron	300 (dissolved)	1000(total)		1000	2
Lead[c]	50	≈31-57[c]	100-4000000	≈31-57[c]	2

TABLE B.III-2 (Continued)

Surface Water (SW) CPCs	Ohio EPA, 1993		LOEC Range for Avian and Mammalian Drinking Water Exposures (from Table B.III-1)	Benchmark value used in aquatic life assessment (from Table B.II-1)	Notes[a]
	Human Health Public Water Supply	Warm Water Aquatic Life Criteria			
Manganese	50000			98	4
Mercury		0.2	6000-500000	0.2	2
Molybdenum			10000-1000000	700	5
Nickel[c]	610	≈487-730[c]		≈487-730[c]	2
Selenium	10	5	3000	5	2
Silver	50	1.3		1.3	2
Vanadium				40.6	6
Zinc[c]	5000	≈288-426[c]		280	2
Bis(2-ethylhexyl) phthalate	18	8.4		8.4	2
Di-n-butyl phthalate	2700	190		190	2
Di-n-octyl phthalate				47.7	7
Diethyl phthalate	23000	120		120	2
1,1,1-Trichloroethane	200	88			
1,1-Dichloroethane					
1,2-Dichloroethylene		310			
2-Hexanone					
4-Methyl-2-Pentanone					

TABLE B.III-2 (Continued)

Surface Water (SW) CPCs	Ohio EPA, 1993		LOEC Range for Avian and Mammalian Drinking Water Exposures (from Table B.III-1)	Benchmark value used in aquatic life assessment (from Table B.II-1)	Notes[a]
	Human Health Public Water Supply	Warm Water Aquatic Life Criteria			
Trichloroethylene		75		75	2
Tetrachloroethylene		73			

[a]1: BTV = Chronic Ambient Water Quality Criteria (EPA 1988a, b)
2: Warmwater (OEPA 1993)
3: BTV = Water quality advisory concentration (EPA 1988c)
4: Lowest 48-H LC50/100 (Jorgensen et al., 1990)
5: Lowest 960H LC50/100 (McConnell 1977)
6: 48-H LC50/100 (Buesen and Neven 1987)
7: Verschuen (1983)

[b]An empty cell indicates no criterion, LOEC or benchmark value is available

[c]Hardness-Dependent Criteria Equations - applicable to filtered samples only:
BERYLLIUM: e (1.609 [ln (HARDNESS mg $CaCO_3$)]-4.266)
CADMIUM: e (0.7852 [ln (HARDNESS mg $CaCO_3$)]-3.283)
CHROMIUM: e (0.8190 [ln (HARDNESS mg $CaCO_3$)]+1.561)
COPPER: e (0.9231 [ln (HARDNESS mg $CaCO_3$)]-1.784)
LEAD: e (1.279 [ln (HARDNESS mg $CaCO_3$)]-3.965)
NICKEL: e (0.8710 [ln (HARDNESS mg $CaCO_3$)]+1.144)
URANIUM: (-2.84+[0.337(ALK)+0.0406(HARD)])/100)1000
ZINC: e (0.8432 [ln (HARDNESS mg $CaCO_3$)]+0.7799)

TABLE B.III-3

IDENTIFYING FINAL CONTAMINANTS OF CONCERN (CPCs) FOR DRINKING WATER EXPOSURE OF THE DRAINAGE DITCH NORTH OF THE PRODUCTION AREA (AREA A) BASED ON TOXICITY

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Drinking Water Benchmark (DWB) (µg/L)	Notes[a]	Data Range (µg/L)	Based on Representative SW Concentration: Rep.SW Conc. (µg/L)	Greater than Background	Conc./DWBR atio	Toxic SW CPC
Aluminum	U	2	100	87	1	161 - 232	232		2.67	Y
	F									
Antimony	U	2	0	14	2					
	F									
Arsenic	U	2	0	50	2					
	F									
Barium	U	2	100	1000	2	47.2 - 63.3	63.3	Y	0.0630	
	F									
Beryllium[b]	U	2	50	150	3	1.50	1.50	Y	0.0100	
	F									
Cadmium	U	2	50	10	2	6.30	6.30	Y	0.630	
	F									
Chromium	U	2	50	50	2	17.5	17.5	Y	0.350	
	F									
Cobalt	U	2	50	6600	4	13.6	13.6	Y	0.00206	
	F									
Copper	U	2	50	500	5	15.6	15.6	Y	0.0310	
	F									
Cyanide	U	2	0	200	2					
	F									

TABLE B.III-3 (Continued)

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Drinking Water Benchmark (DWB) (µg/L)	Notes[a]	Data Range (µg/L)	Based on Representative SW Concentration: Rep.SW Conc. (µg/L)	Greater than Background	Conc./DWBR atio	Toxic SW CPC
Fluoride	U			1800	2					
	F									
Lead	U	2	0	50	2					
	F									
Manganese	U	2	100	50000	2	24.2 - 65.1	65.1	Y	0.00130	
	F									
Mercury	U	2	50	0.2	3	0.600	0.600	Y	3.00	Y
	F									
Molybdenum	U	2	50	700	6	23.0	23.0	Y	0.0329	
	F									
Nickel	U	2	100	610	2	10.4 - 15.9	15.9	Y	0.0261	
	F									
Selenium	U	2	0	10	2					
	F									
Silver	U	2	0	50	2					
	F									
Thallium	U	2	0	13	2					
	F									
Thorium	U									
	F									
Uranium	U	5	100	890	3	26.0 - 930	930	Y	1.04	Y
	F	5	100			42.0 - 944	944	Y		
Vanadium	U	2	100	40.6	7	12.6 - 18.7	18.7		0.461	
	F									

TABLE B.III-3 (Continued)

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Drinking Water Benchmark (DWB) (μg/L)	Notes[a]	Data Range (μg/L)	Based on Representative SW Concentration: Rep.SW Conc. (μg/L)	Greater than Background	Conc./DWBR atio	Toxic SW CPC
Zinc	U	2	100	5000	2	14.7 - 32.5	32.5	Y	0.00650	
	F									
Bis(2-ethylhexyl)phthalate	U			18	2					
	F									
Di-n-butyl phthalate	U	2	50	2700	2	3.00	3.00	Y	0.00111	
	F									
Di-n-octyl phthalate	U	2	0	47.7	8					
	F									
Diethyl phthalate	U	2	50	23000	2	3.00	3.00	Y	1.30E-04	
	F									
Toluene	U			10000	2					
	F									
Trichloroethylene	U			5	2					
	F									

[a]1: BTV = Chronic Ambient Water Quality Criteria (EPA 1988b)
2: Public water supply (OEPA 1993)
3: Warmwater (OEPA 1993)
4: EPA (1994)
5: Agricultural water supply (OEPA 1993)
6: Lowest 96-H LC50/100 (McConnell 1977)
7: 48-H LC50/100 (Buesen and Neven 1987)
8: Geometric mean of the 72-H LC 50/100 (EPA 1980)

[b]Hardness-Dependent Criteria Equation: BERYLLIUM: e (1.609 [ln (HARDNESS mg $CaCO_3$)])-4.266
Hardness value of 314.8 mg $CaCO_3$/L was based on the mean calcium and magnesium concentrations in unfiltered water samples

TABLE B.III-4

IDENTIFYING FINAL CONTAMINANTS OF CONCERN (CPCs) FOR DRINKING WATER EXPOSURE OF DRAINAGEWAYS IN THE SOUTHFIELD AREAS (AREAS E AND G) BASED ON TOXICITY

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Drinking Water Benchmark (DWB) (μg/L)	Notes[a]	Data Range (μg/L)	Based on Representative SW Concentration: Rep.SW Conc. (μg/L)	Greater than Background	Conc./DWBR atio	Toxic SW CPC
Aluminum	U			87	1					
	F	7	86			48.0 - 1830	1830	Y		
Antimony	U			14	2					
	F									
Arsenic	U	2	50	50	2	5.00	5.00	Y	0.100	
	F	7	14			1.00	1.00	Y		
Barium	U			1000	2					
	F									
Beryllium[b]	U	7	100	150	3	38.0 - 66.0	66.0	Y	0.440	
	F									
Cadmium	U			10	2					
	F									
Chromium	U			50	2					
	F									
Cobalt	U			6600	4					
	F									
Copper	U			500	5					
	F									
Cyanide	U	6	33	200	2	1.00 - 4.00	4.00	Y	0.0200	
	F									

TABLE B.III-4 (Continued)

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Drinking Water Benchmark (DWB) (μg/L)	Notes[a]	Data Range (μg/L)	Based on Representative SW Concentration: Rep.SW Conc. (μg/L)	Greater than Background	Conc./DWBR atio	Toxic SW CPC
Fluoride	U			1800	2					
	F									
Lead	U			50	2					
	F									
Manganese	U			50000	2					
	F	7	71			13.0 - 29.0	29.0	Y		
Mercury	U			0.2	3					
	F									
Molybdenum	U			700	6					
	F									
Nickel	U			610	2					
	F									
Selenium	U	2	50	10	2	1.00	1.00	Y	0.100	
	F	7	14			4.00	4.00			
Silver	U			50	2					
	F									
Thallium	U			13	2					
	F									
Thorium	U									
	F									
Uranium	U	9	100	890	3	4.18 - 820	820	Y	0.921	
	F									
Vanadium	U			40.6	7					
	F									

TABLE B.III-4 (Continued)

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Drinking Water Benchmark (DWB) (μg/L)	Notes[a]	Data Range (μg/L)	Based on Representative SW Concentration: Rep.SW Conc. (μg/L)	Greater than Background	Conc./DWBR atio	Toxic SW CPC
Zinc	U	2	50	5000	2	15.0	15.0	Y	0.00300	
	F									
Bis(2-ethylhexyl)phthalate	U	9	11	18	2	1.00	1.00	Y	0.0556	
	F									
Di-n-butyl phthalate	U			2700	2					
	F									
Di-n-octyl phthalate	U			47.7	8					
	F									
Diethyl Phthalate	U			23000	2					
	F									
Toluene	U	9	11	10000	2	2.00	2.00	Y	2.00E-04	
	F									
Trichloroethylene	U			5	2					
	F									

[a]1: BTV = Chronic Ambient Water Quality Criteria (EPA 1988b)
2: Public water supply (OEPA 1993)
3: Warmwater (OEPA 1993)
4: EPA (1994)
5: Agricultural water supply (OEPA 1993)
6: Lowest 96-H LC50/100 (McConnell 1977)
7: 48-H LC50/100 (Buesen and Neven 1987)
8: Geometric mean of the 72-H LC 50/100 (EPA 1980)

[b]Hardness-Dependent Criteria Equation: BERYLLIUM: e (1.609 [ln (HARDNESS mg $CaCO_3$)])-4.266
Hardness value of 314.8 mg $CaCO_3$/L was based on the mean calcium and magnesium concentrations in unfiltered water samples

TABLE B.III-5

IDENTIFYING FINAL CONTAMINANTS OF CONCERN (CPCs) FOR DRINKING WATER EXPOSURE OF THE PILOT PLANT DRAINAGE DITCH (AREA F) BASED ON TOXICITY

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Drinking Water Benchmark (DWB) (µg/L)	Notes [a]	Data Range (µg/L)	Based on Representative SW Concentration			
							Rep.SW Conc. (µg/L)	Greater than Back-ground	Conc./DWB Ratio	Toxic SW CPC
Aluminum	U	5	80	87	1	182 - 14400	14400	Y	166	Y
	F	4	75			140 - 201	201	Y		
Antimony	U	5	0	14	2					
	F	4	0							
Arsenic	U	5	20	50	2	3.40	3.40	Y	0.0680	
	F	4	0							
Barium	U	5	100	1000	2	60.0 - 223	223	Y	0.223	
	F	4	100			57.6 - 71.1	71.1	Y		
Beryllium[b]	U	5	0	150	3					
	F	4	0							
Cadmium	U	5	0	10	2					
	F	4	0							
Chromium	U	5	20	50	2	11.4	11.4	Y	0.228	
	F	4	0							

TABLE B.III-5 (Continued)

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Drinking Water Benchmark (DWB) (μg/L)	Notes [a]	Data Range (μg/L)	Based on Representative SW Concentration: Rep.SW Conc. (μg/L)	Greater than Back-ground	Conc./DWB Ratio	Toxic SW CPC
Cobalt	U	5	0	6600	4					
	F	4	0							
Copper	U	5	20	500	5	20.2	20.2	Y	0.0404	
	F	4	0							
Cyanide	U	5	20	200	2	2.80	2.80	Y	0.0140	
	F	3	33			2.40	2.40	Y		
Fluoride	U	5	100	1800	2	290 - 560	560	Y	0.311	
	F									
Lead	U	5	20	50	2	9.10	9.10	Y	0.182	
	F	4	0							
Manganese	U	5	100	50000	2	14.7 - 825	825	Y	0.0165	
	F	4	100			8.00 - 344	344	Y		
Mercury	U	5	0	0.2	3					
	F	4	0							
Molybdenum	U	5	0	700	6					
	F	4	0							

TABLE B.III-5 (Continued)

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Drinking Water Benchmark (DWB) (µg/L)	Notes [a]	Data Range (µg/L)	Based on Representative SW Concentration: Rep.SW Conc. (µg/L)	Greater than Back-ground	Conc./DWB Ratio	Toxic SW CPC
Nickel	U	5	20	610	2	27.0	27.0	Y	0.0443	
	F	4	0							
Selenium	U	5	0	10	2					
	F	4	25			4.60	4.60	Y		
Silver	U	5	0	50	2					
	F	4	0							
Thallium	U	5	0	13	2					
	F	4	0							
Thorium	U	3	33			1.08	1.08	Y		
	F	3	33			0.870	0.870			
Uranium	U	4	100	890	3	71.2 - 2890	1360	Y	1.52	Y
	F	4	100			77.4 - 2360	1240	Y		
Vanadium	U	5	20	40.6	7	31.7	31.7	Y	0.781	
	F	4	0							
Zinc	U	5	80	5000	2	19.2 - 73.0	73.0	Y	0.0146	
	F	4	25			38.4	38.4	Y		

TABLE B.III-5 (Continued)

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Drinking Water Benchmark (DWB) (µg/L)	Notes [a]	Data Range (µg/L)	Based on Representative SW Concentration: Rep.SW Conc. (µg/L)	Greater than Back-ground	Conc./DWB Ratio	Toxic SW CPC
1,1,1-Trichloroethane	U	5	20	1300	4	4.00	4.00	Y	0.00308	
	F									
1,1-Dichloroethane	U	5	20	810	4	10.0	10.0	Y	0.0123	
	F									
1,2-Dichloroethene	U	5	20	55	4	67.0	67.0	Y	1.22	Y
	F									
2-Hexanone	U	5	20			19.0	19.0	Y		
	F									
4-Methyl-2-pentanone	U	5	20	2900	4	16.0	16.0	Y		
	F									
Bis(2-ethylhexyl)phthalate	U	5	0	18	2					
	F									
Di-n-butyl phthalate	U	5	0	2700	2					
	F									
Di-n-octyl phthalate	U	5	0	47.7	8					
	F									

TABLE B.III-5 (Continued)

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Drinking Water Benchmark (DWB) (µg/L)	Notes [a]	Data Range (µg/L)	Based on Representative SW Concentration: Rep.SW Conc. (µg/L)	Greater than Back-ground	Conc./DWB Ratio	Toxic SW CPC
Diethyl Phthalate	U	5	0	23000	2					
	F									
Tetrachloroethene	U	5	60			1.00 - 240	240	Y		
	F									
Trichloroethylene	U	5	40	5	2	2.00 - 18.0	18.0	Y	3.60	Y
	F									

[a]1: BTV = Chronic Ambient Water Quality Criteria (EPA 1988b)
2: Public water supply (OEPA 1993)
3: Warmwater (OEPA 1993)
4: EPA (1994)
5: Agricultural water supply (OEPA 1993)
6: Lowest 96-H LC50/100 (McConnell 1977)
7: 48-H LC50/100 (Buesen and Neven 1987)
8: Geometric mean of the 72-H LC 50/100 (EPA 1980)

[b]Hardness-Dependent Criteria Equation: BERYLLIUM: e (1.609 [ln (HARDNESS mg $CaCO_3$)])-4.266
Hardness value of 314.8 mg $CaCO_3$/L was based on the mean calcium and magnesium concentrations in unfiltered water samples

TABLE B.III-6

IDENTIFYING FINAL CONTAMINANTS OF CONCERN (CPCs) FOR DRINKING WATER EXPOSURE OF PADDYS RUN ON-PROPERTY BASED ON TOXICITY

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Drinking Water Benchmark (DWB) (µg/L)	Notes[a]	Data Range (µg/L)	Based on Representative SW Concentration: Rep.SW Conc. (µg/L)	Greater than Background	Conc./DWBR atio	Toxic SW CPC
Aluminum	U	5	40	87	1	136 - 145	145		1.67	Y
	F	6	33			47.8 - 185	185	Y		
Antimony	U	5	0	14	2					
	F	6	0							
Arsenic	U	5	0	50	2					
	F	6	0							
Barium	U	5	100	1000	2	36.6 - 47.8	47.8		0.0478	
	F	6	100			42.0 - 45.7	45.7			
Beryllium[b]	U	5	0	150	3					
	F	6	0							
Cadmium	U	5	20	10	2	5.00	5.00	Y	0.500	
	F	6	0							
Chromium	U	5	0	50	2					
	F	6	0							
Copper	U	5	0	500	4					
	F	6	0							
Cyanide	U	6	17	200	2	3.80	3.80	Y	0.0190	
	F	4	0							
Fluoride	U	6	100	1800	2	0.200 - 230	230	Y	0.128	
	F									

TABLE B.III-6 (Continued)

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Drinking Water Benchmark (DWB) (μg/L)	Notes[a]	Data Range (μg/L)	Based on Representative SW Concentration: Rep.SW Conc. (μg/L)	Greater than Background	Conc./DWBR atio	Toxic SW CPC
Lead	U	4	25	50	2	156 - 156	156	Y	3.12	Y
	F	5	20			10.7	10.7			
Manganese	U	5	100	50000	2	7.50 - 30.4	30.4		6.08E-04	
	F	6	83			7.20 - 28.6	28.6			
Mercury	U	5	0	0.2	3					
	F	6	0							
Molybdenum	U	5	0	700	5					
	F	6	0							
Nickel	U	5	20	610	2	14.1 - 14.1	14.1	Y	0.0231	
	F									
Selenium	U	3	0	10	2					
	F	4	0							
Silver	U	3	0	50	2					
	F	4	25			4.00	4.00			
Thallium	U	5	0	13	2					
	F	6	0							
Thorium	U	2	0							
	F	1	0							
Uranium	U	8	100	890	3	3.60 - 26.1	17.0		0.0191	
	F	6	100			8.24 - 3.42	34.2			
Vanadium	U	5	0	40.6	6					
	F	6	0							
Zinc	U	5	20	5000	2	14.9 - 14.9	14.9	Y	0.00298	
	F	6	17			3.80	3.80			

TABLE B.III-6 (Continued)

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Drinking Water Benchmark (DWB) (µg/L)	Notes[a]	Data Range (µg/L)	Based on Representative SW Concentration: Rep.SW Conc. (µg/L)	Greater than Background	Conc./DWBR atio	Toxic SW CPC
Bis(2-ethylhexyl)phthalate	U	4	50	18	2	11.0 - 40.0	40.0		2.22	Y
	F									
Di-n-butyl phthalate	U	4	0	2700	2					
	F									
Di-n-octyl phthalate	U	4	20	47.7	7	52.0 - 52.0	52.0		1.09	Y
	F									
Trichloroethylene	U			5	2					
	F									

[a]1: BTV = Chronic Ambient Water Quality Criteria (EPA 1988b)
2: Public water supply (OEPA 1993)
3: Warmwater (OEPA 1993)
4: Agricultural water supply (OEPA 1993)
5: Lowest 96-H LC50/100 (McConnell 1977)
6: 48-H LC50/100 (Buesen and Neven 1987)
7: Geometric mean of the 72-H LC 50/100 (EPA 1980)

[b]Hardness-Dependent Criteria Equation: BERYLLIUM: e (1.609 [ln (HARDNESS mg $CaCO_3$)])-4.266
Hardness value of 314.8 mg $CaCO_3$/L was based on the mean calcium and magnesium concentrations in unfiltered water samples

TABLE B.III-7

IDENTIFYING FINAL CONTAMINANTS OF CONCERN (CPCs) FOR DRINKING WATER EXPOSURE OF PADDYS RUN OFF-PROPERTY BASED ON TOXICITY

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Drinking Water Benchmark (DWB) (μg/L)	Notes[a]	Data Range (μg/L)	Based on Representative SW Concentration: Rep.SW Conc. (μg/L)	Greater than Background	Conc./DWBR atio	Toxic SW CPC
Aluminum	U	3	0	87	1					
	F	3	0							
Antimony	U	3	0	14	2					
	F	3	33			14.6	14.6	Y		
Arsenic	U	3	33	50	2	3.00	3.00	Y	0.0600	
	F	3	33			2.40	2.40	Y		
Barium	U	3	100	1000	2	42.6 - 50.1	50.1	Y	0.0501	
	F	3	0							
Beryllium[b]	U	3	0	150	3					
	F	3	0							
Cadmium	U	3	0	10	2					
	F	3	0							
Chromium	U			50	2					
	F									
Copper	U	3	0	500	4					
	F	3	0							
Cyanide	U	3	0	200	2					
	F	3	0							
Fluoride	U	3	100	1800	2	180 - 190	190		0.106	
	F									

TABLE B.III-7 (Continued)

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Drinking Water Benchmark (DWB) (µg/L)	Notes[a]	Data Range (µg/L)	Based on Representative SW Concentration: Rep.SW Conc. (µg/L)	Greater than Background	Conc./DWBR atio	Toxic SW CPC
Lead	U	3	67	50	2	4.40 - 69.7	69.7	Y	1.39	Y
	F	3	33			4.30	4.30	Y		
Manganese	U	3	100	50000	2	10.8 - 54.5	54.5	Y	0.00110	
	F	3	100			8.20 - 56.5	56.5	Y		
Mercury	U	3	0	0.2	3					
	F	3	0							
Molybdenum	U	3	0	700	5					
	F	3	0							
Nickel	U	3	0	610	2					
	F	3	0							
Selenium	U	2	0	10	2					
	F	2	0							
Silver	U	2	0	50	2					
	F	2	0							
Thallium	U	2	0	13	2					
	F	3	33			1.40	1.40	Y		
Thorium	U									
	F	3	33			3190	3190	Y		
Uranium	U	2	100	890	3	4100 - 8800	8800	Y	2.14	Y
	F	6	100			2800 - 8700	8700	Y		
Vanadium	U	2	0	40.6	6					
	F	3	0							
Zinc	U	3	0	5000	2					
	F	3	0							

TABLE B.III-7 (Continued)

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Drinking Water Benchmark (DWB) (μg/L)	Notes[a]	Data Range (μg/L)	Based on Representative SW Concentration: Rep.SW Conc. (μg/L)	Greater than Background	Conc./DWBR atio	Toxic SW CPC
Bis(2-ethylhexyl)phthalate	U	3	33	18	2	22.0	22.0	Y	1.22	Y
	F									
Di-n-butyl phthalate	U	3	0	2700	2					
	F									
Di-n-octyl phthalate	U	3	33	47.7	7	89.0	89.0	Y	1.87	Y
	F									
Trichloroethylene	U	3	67	5	2	2.00	2.00	Y	0.400	
	F									

[a]1: BTV = Chronic Ambient Water Quality Criteria (EPA 1988b)
2: Public water supply (OEPA 1993)
3: Warmwater (OEPA 1993)
4: Agricultural water supply (OEPA 1993)
5: Lowest 96-H LC50/100 (McConnell 1977)
6: 48-H LC50/100 (Buesen and Neven 1987)
7: Geometric mean of the 72-H LC 50/100 (EPA 1980)

[b]Hardness-Dependent Criteria Equation: BERYLLIUM: e (1.609 [ln (HARDNESS mg $CaCO_3$)])-4.266
Hardness value of 314.8 mg $CaCO_3$/L was based on the mean calcium and magnesium concentrations in unfiltered water samples

TABLE B.III-8

IDENTIFYING FINAL CONTAMINANTS OF CONCERN (CPCs) FOR DRINKING WATER EXPOSURE OF THE GREAT MIAMI RIVER UPSTEAM OF THE EFFLUENT LINE BASED ON TOXICITY

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Drinking Water Benchmark (DWB) (µg/L)	Notes[a]	Data Range (µg/L)	Based on Representative SW Concentration: Rep.SW Conc. (µg/L)	Greater than Background	Conc./DWBR atio	Toxic SW CPC
Aluminum	U			87	1					
	F									
Antimony	U			14	2					
	F									
Arsenic	U	1	0	50	2					
	F	1	0							
Barium	U	1	100	1000	2	100	100	Y	0.100	
	F	1	100			100	100			
Beryllium[b]	U			150	3					
	F									
Cadmium	U	1	100	10	2	3.10	3.10		0.310	
	F	1	0							
Chromium	U	1	100	50	2	6.10	6.10		0.122	
	F	1	0							
Cobalt	U			6600	4					
	F									
Copper	U	1	100	500	5	11.9	11.9	Y	0.0240	
	F	1	0							
Cyanide	U			200	2					
	F									

TABLE B.III-8 (Continued)

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Drinking Water Benchmark (DWB) (μg/L)	Notes[a]	Data Range (μg/L)	Based on Representative SW Concentration: Rep.SW Conc. (μg/L)	Greater than Background	Conc./DWBR atio	Toxic SW CPC
Fluoride	U	1	100	1800	2	90.0	90.0		0.0500	
	F									
Lead	U	1	100	50	2	2.10	2.10		0.0420	
	F	1	0							
Manganese	U	1	100	50000	2	60.0	60.0		0.00120	
	F	1	0							
Mercury	U	1	100	0.2	3	0.700	0.700		3.50	Y
	F	1	100			0.200	0.200			
Molybdenum	U	1	100	700	6	20.0	20.0	Y	0.0290	
	F	1	100			60.0	60.0			
Nickel	U	1	100	610	2	13.1	13.1		0.0210	
	F	1	0							
Selenium	U	1	0	10	2					
	F	1	0							
Silver	U	1	0	50	2					
	F	1	0							
Thallium	U			13	2					
	F									
Thorium	U									
	F									
Uranium	U	1	100	890	3	2.00	2.00	Y	0.00225	
	F									
Vanadium	U			40.6	7					
	F									

TABLE B.III-8 (Continued)

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Drinking Water Benchmark (DWB) (µg/L)	Notes[a]	Data Range (µg/L)	Based on Representative SW Concentration: Rep.SW Conc. (µg/L)	Greater than Background	Conc./DWBR atio	Toxic SW CPC
Zinc	U			5000	2					
	F									
Bis(2-ethylhexyl)phthalate	U			18	2					
	F									
Di-n-butyl phthalate	U			2700	2					
	F									
Di-n-octyl phthalate	U			47.7	8					
	F									
Diethyl Phthalate	U			23000	2					
	F									
Trichloroethylene	U			5	2					
	F									

[a]1: BTV = Chronic Ambient Water Quality Criteria (EPA 1988b)
2: Public water supply (OEPA 1993)
3: Warmwater (OEPA 1993)
4: EPA (1994)
5: Agricultural water supply (OEPA 1993)
6: Lowest 96-H LC50/100 (McConnell 1977)
7: 48-H LC50/100 (Buesen and Neven 1987)
8: Geometric mean of the 72-H LC 50/100 (EPA 1980)

[b]Hardness-Dependent Criteria Equation: BERYLLIUM: e (1.609 [ln (HARDNESS mg $CaCO_3$)])-4.266
Hardness value of 314.8 mg $CaCO_3$/L was based on the mean calcium and magnesium concentrations in unfiltered water samples

TABLE B.III-9

IDENTIFYING FINAL CONTAMINANTS OF CONCERN (CPCs) FOR DRINKING WATER EXPOSURE BETWEEN THE CONFLUENCE OF THE GREAT MIAMI RIVER AND PADDYS RUN, BASED ON TOXICITY

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Drinking Water Benchmark (DWB) (μg/L)	Notes[a]	Data Range (μg/L)	Based on Representative SW Concentration: Rep.SW Conc. (μg/L)	Greater than Background	Conc./DWB BTV Ratio	Toxic SW CPC
Aluminum	U	2	50	87	1	668	668		7.68	Y
	F	2	0							
Antimony	U	2	0	14	2					
	F	2	0							
Arsenic	U	2	50	50	2	2.90	2.90		0.0580	
	F	2	50			2.40	2.40			
Barium	U	2	100	1000	2	89.0 - 101	101	Y	0.101	
	F	2	100			31.5 - 98.0	98.0			
Beryllium[b]	U	2	50	150	3	7.70	7.70		0.0513	
	F	2	0							
Cadmium	U	2	0	10	2					
	F	2	50			5.30	5.30			
Chromium	U	2	0	50	2					
	F	2	0							
Copper	U	2	0	500	4					
	F	2	0							
Cyanide	U	1	100	200	2	6.10	6.10	Y	0.0305	
	F	1	0							
Fluoride	U	2	100	1800	2	250 - 300	300		0.167	
	F									

TABLE B.III-9 (Continued)

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Drinking Water Benchmark (DWB) (µg/L)	Notes[a]	Data Range (µg/L)	Based on Representative SW Concentration: Rep.SW Conc. (µg/L)	Greater than Background	Conc./DWB BTV Ratio	Toxic SW CPC
Lead	U	2	100	50	2	6.90 - 7.80	7.80		0.156	
	F	2	50			1.40	1.40			
Manganese	U	2	100	50000	2	64.9 - 89.5	89.5	Y	0.00179	
	F	2	100			49.1	49.1			
Mercury	U	2	0	0.2	3					
	F	2	0							
Molybdenum	U	2	0	700	5					
	F	2	0							
Nickel	U	2	0	610	2					
	F	2	0							
Selenium	U	2	0	10	2					
	F	2	0							
Silver	U	2	0	50	2					
	F	2	0							
Thallium	U	2	0	13	2					
	F	2	0							
Thorium	U									
	F									
Uranium	U	2	100	890	3	1.50 - 2.10	2.10	Y	0.00240	
	F	2	100			2.10 - 2.50	2.50	Y		
Vanadium	U	2	0	40.6	6					
	F	2	0							
Zinc	U	2	0	5000	2					
	F	2	0							

TABLE B.III-9 (Continued)

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Drinking Water Benchmark (DWB) (μg/L)	Notes[a]	Data Range (μg/L)	Based on Representative SW Concentration: Rep.SW Conc. (μg/L)	Greater than Background	Conc./DWB BTV Ratio	Toxic SW CPC
Bis(2-ethylhexyl)phthalate	U	2	0	18	2					
	F									
Di-n-butyl phthalate	U	2	0	2700	2					
	F									
Di-n-octyl phthalate	U	2	0	47.7	7					
	F									
Trichloroethylene	U			5	2					
	F									

[a]1: BTV = Chronic Ambient Water Quality Criteria (EPA 1988b)
2: Public water supply (OEPA 1993)
3: Warmwater (OEPA 1993)
4: Agricultural water supply (OEPA 1993)
5: Lowest 96-H LC50/100 (McConnell 1977)
6: 48-H LC50/100 (Buesen and Neven 1987)
7: Geometric mean of the 72-H LC 50/100 (EPA 1980)

[b]Hardness-Dependent Criteria Equation: BERYLLIUM: e (1.609 [ln (HARDNESS mg $CaCO_3$)])-4.266
Hardness value of 314.8 mg $CaCO_3$/L was based on the mean calcium and magnesium concentrations in unfiltered water samples

TABLE B.III-10

IDENTIFYING FINAL CONTAMINANTS OF CONCERN (CPCs) FOR DRINKING WATER EXPOSURE OF THE GREAT MIAMI RIVER AT THE CONFLUENCE WITH PADDYS RUN BASED ON TOXICITY

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Drinking Water Benchmark (DWB) (μg/L)	Notes[a]	Data Range (μg/L)	Based on Representative SW Concentration: Rep.SW Conc. (μg/L)	Greater than Background	Conc./DWB Ratio	Toxic SW CPC
Aluminum	U	2	100	87	1	818 - 19100	19100	Y	220	Y
	F	1	0							
Antimony	U	2	0	14	2					
	F	1	0							
Arsenic	U	2	50	50	2	6.00	6.00	Y	0.120	
	F	1	100			1.00	1.00			
Barium	U	2	100	1000	2	94.0 - 228	228	Y	0.228	
	F	1	100			94.1	94.1			
Beryllium[b]	U	2	0	150	3					
	F	1	0							
Cadmium	U	2	50	10	2	18.0	18.0	Y	1.80	Y
	F	1	0							
Chromium	U	2	50	50	2	26.4	26.4		0.528	
	F	1	0							
Copper	U	2	50	500	4	30.8	30.8	Y	0.0616	
	F	1	0							
Cyanide	U	2	50	200	2	21.4	21.4	Y	0.107	
	F	2	0							
Fluoride	U	2	100	1800	2	310 - 340	340	Y	0.189	
	F									

TABLE B.III-10 (Continued)

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Drinking Water Benchmark (DWB) (μg/L)	Notes[a]	Data Range (μg/L)	Based on Representative SW Concentration: Rep.SW Conc. (μg/L)	Greater than Background	Conc./DWB Ratio	Toxic SW CPC
Lead	U	2	100	50	2	15.1 - 44.2	44.2	Y	0.884	
	F	1	0							
Manganese	U	2	100	50000	2	79.0 - 561	561	Y	0.0112	
	F	1	0							
Mercury	U	2	0	0.2	3					
	F	1	0							
Molybdenum	U	2	0	700	5					
	F	1	0							
Nickel	U	2	50	610	2	25.9	25.9	Y	0.0425	
	F	1	0							
Selenium	U	2	0	10	2					
	F	1	0							
Silver	U	2	0	50	2					
	F	1	0							
Thallium	U	2	0	13	2					
	F	1	0							
Thorium	U									
	F									
Uranium	U	2	100	890	3	1.30 - 2.10	2.10	Y	0.00236	
	F	2	100			2.20 - 2.80	2.80	Y		
Vanadium	U			40.6	6					
	F	1	0							
Zinc	U	2	50	5000	2	112	112	Y	0.0224	
	F	1	0							

TABLE B.III-10 (Continued)

Surface Water (SW) CPCs		Number of SW Samples	Percent Detection	Drinking Water Benchmark (DWB) (μg/L)	Notes[a]	Data Range (μg/L)	Based on Representative SW Concentration: Rep.SW Conc. (μg/L)	Greater than Background	Conc./DWB Ratio	Toxic SW CPC
Bis(2-ethylhexyl)phthalate	U	2	100	18	2	2.00 - 160	160	Y	8.89	Y
	F									
Di-n-butyl phthalate	U	2	50	2700	2	3.00	3.00	Y	0.00111	
	F									
Di-n-octyl phthalate	U	2	50	47.7	7	3.00	3.00	Y	0.0629	
	F									
Trichloroethylene	U	2	50	5	2	2.00	2.00		0.400	
	F									

[a]1: BTV = Chronic Ambient Water Quality Criteria (EPA 1988a, b)
2: Public water supply (OEPA 1993)
3: Warmwater (OEPA 1993)
4: Agricultural water supply (OEPA 1993)
5: Lowest 96-H LC50/100 (McConnell 1977)
6: 48-H LC50/100 (Buesen and Neven 1987)
7: Geometric mean of the 72-H LC 50/100 (EPA 1980)

[b]Hardness-Dependent Criteria Equation: BERYLLIUM: e (1.609 [ln (HARDNESS mg $CaCO_3$)])-4.266
Hardness value of 314.8 mg $CaCO_3$/L was based on the mean calcium and magnesium concentrations in unfiltered water samples

TABLE B.IV-1

IDENTIFYING FINAL CONTAMINANTS OF CONCERN IN SEDIMENT OF PADDYS RUN ON-PROPERTY BASED ON TOXICITY

Sediment CPCs	Number of Samples	Percent Detection	ER-L or Surrogate (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Concentration/ ER-L Ratio	Toxic CPC
Aluminum	9	100	NA		9250		
Arsenic	9	100	33	1	6.47	0.196	
Barium	9	100	40	2	58.7	1.47	Y
Beryllium	9	78	NA		3.50		
Cadmium	7	43	5	1	5.50	1.10	Y
Calcium	9	100			257000		
Chromium	9	100	80	1	18.4	0.230	
Cobalt	9	78	50	3	7.60	0.152	
Copper	9	100	70	1	14.5	0.207	
Cyanide	9	11	0.10	2	0.490	4.90	Y
Iron	9	100	17000	2	15500	0.912	
Lead	6	83	35	1	15.2	0.434	
Magnesium	9	100			158000		
Manganese	9	100	300	2	1070	3.57	Y
Mercury	9	11	0.15	1	0.0700	0.467	
Nickel	9	89	30	1	19.5	0.650	
Potassium	9	100			1620		
Selenium			NA				

TABLE B.IV-1 (Continued)

Sediment CPCs	Number of Samples	Percent Detection	ER-L or Surrogate (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Concentration/ ER-L Ratio	Toxic CPC
Aluminum	9	100	NA		9250		
Silicon	6	100			603		
Sodium	9	56			188		
Thorium			NA				
Uranium	8	80			3.00		
Vanadium	9	100	NA		27.0		
Zinc	9	89	120	1	85.0	0.708	

[a]1: Long and Morgan (1991)
2: Baudo et al. (1990)
3: TV = threshold level for contaminated soils (Direction des Substances Dangereuses 1988)

[b]An empty cell indicates that the contaminant was below the detection limit or that a sample was not analyzed for the contaminant.

TABLE B.IV-2

IDENTIFYING FINAL ORGANIC CONTAMINANTS OF CONCERN IN SEDIMENT OF PADDYS RUN ON PROPERTY BASED ON TOXICITY

Sediment CPCs	Number of Samples	Percent Detection	AWQC (µg/L)	Notes[a]	Representative Concentration (µg/kg)	Representative IW Concentration (µg/L)	Concentration/ AWQC Ratio	Toxic CPC
Benzo(a)anthracene	7	29	10	1	140	0.080	0.00800	
Benzo(a)pyrene	7	14	10	2	130	0.033	0.00330	
Benzo(b)fluoranthene	7	29	15	3	240	0.0170	0.00113	
Benzo(g,h,i)perylene	7	14	15	3	100	0.00170	0.113	
Benzo(k)fluoranthene	7	29	15	3	300	0.0119	7.93E-04	
Chrysene	7	29	10	2	150	0.0857	0.00857	
Di-n-butyl phthalate	7	43	190	4	80.0	0.500	0.00263	
Ethyl benzene	9	11	62	4	1.00	0.0830	0.00133	
Fluoranthene	7	43	8.9	4	300	0.308	0.0346	
2-hexanone	9	11	5000	5	11.0	11.0	0.00220	
Indeno(1,2,3-cd)pyrene	7	14	15	3	100	6.74E-04	0.449	
Phenanthrene	7	29	6.3	5	190	1.27	0.202	
Pyrene	7	43	15	3	260	0.370	0.0247	
Toluene	9	22	1700	4	2.00	2.00[b]	0.00118	
Methylene chloride	9	22	629000	6	7.00	7.00[b]	1.11E-05	

[a]1: LC87/100 (FWS 1987b)
2: Lowest 96-H LC50/100 (FWS 1987b)
3: Lowest 96-H LC50/100 for PAHs (FWS 1987b)
4: Warmwater (OEPA 1993)
5: Shell Chemie 1975
6: Geometric mean of LC50's/100 (Jorgensen et al., 1991)
[b]Assuming 100% dissolved in interstitial water

TABLE B.IV-3

IDENTIFYING FINAL CONTAMINANTS OF CONCERN IN SEDIMENT OF PADDYS RUN OFF PROPERTY BASED ON TOXICITY

Sediment CPCs	Number of Samples	Percent Detection	ER-L or Surrogate (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Concentration/ ER-L Ratio	Toxic CPC
Aluminum	3	100	NA		2250		
Arsenic	3	100	33	1	4.80	0.146	
Barium	3	100	40	2	3.16	0.0790	
Beryllium	3	67	NA		1.80		
Calcium	3	100			123000		
Chromium	3	100	80	1	5.50	0.0688	
Cobalt	3	0	50	3			
Copper	3	100	70	1	7.60	0.107	
Cyanide	3	0	0.10	2			
Iron	3	100	17000	2	7280	0.428	
Lead	3	100	35	1	9.60	0.274	
Magnesium	3	100			27300		
Manganese	3	100	300	2	499	1.66	Y
Mercury	3	0	0.15	1			
Nickel	3	67	30	1	6.10	0.203	
Potassium	3	67			303		
Silicon	3	100			626		
Silver	1	100	1	1	0.250	0.250	

TABLE B.IV-3 (Continued)

Sediment CPCs	Number of Samples	Percent Detection	ER-L or Surrogate (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Concentration/ ER-L Ratio	Toxic CPC
Aluminum	3	100	NA		2250		
Sodium	3	33			111		
Uranium	7	100			11.0		
Vanadium	3	100	NA		16.8		
Zinc	2	100	120	1	49.7	0.414	
Methylene chloride	3	33	629	4	6.00	0.00953	

[a]1: Long and Morgan (1991)
2: Baudo et al. (1990)
3: TV = threshold level for contaminated soils (Direction des Substances Dangereuses 1988)
4: Geometric mean of LC50's/100 expressed in mg/L (Jorgensen et al. 1991) and assuming 100% dissolved in interstitial water

TABLE B.IV-4

IDENTIFYING FINAL CONTAMINANTS OF CONCERN IN SEDIMENT OF THE GREAT MIAMI RIVER BETWEEN THE EFFLUENT LINE AND THE CONFLUENCE WITH PADDYS RUN BASED ON TOXICITY

Sediment CPCs	Number of Samples	Percent Detection	ER-L or Surrogate (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Concentration/ ER-L Ratio	Toxic CPC
Aluminum	1	100	NA		11600		
Arsenic	1	100	33	1	1.70	0.0515	
Barium	1	100	40	2	130	3.25	Y
Beryllium	1	0	NA				
Cadmium	1	0	5	1			
Calcium	1	100			44700		
Chromium	1	100	80	1	15.9	0.199	
Cobalt	1	100	50	3	6.00	0.120	
Copper	1	100	70	1	36.9	0.527	
Cyanide	1	0	0.10	2			
Iron	1	100	17000	2	19800	1.16	Y
Lead	1	100	35	1	39.7	1.13	Y
Magnesium	1	100			12300		
Manganese	1	100	300	2	729	2.43	Y
Mercury	1	0	0.15	1			
Nickel	1	100	30	1	19.8	0.660	
Potassium	1	100			1410		

TABLE B.IV-4 (Continued)

Sediment CPCs	Number of Samples	Percent Detection	ER-L or Surrogate (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Concentration/ ER-L Ratio	Toxic CPC
Aluminum	1	100	NA		11600		
Selenium	1	100	NA		0.75		
Silicon	1	100			308		
Sodium	1	100			91.1		
Thorium	1	0	NA		3.00		
Uranium	1	100			2.00		
Vanadium	1	100	NA		22.1		
Zinc	1	100	120	1	96.9	0.808	

[a]1: Long and Morgan (1991)
2: Baudo et al. (1990)
3: TV = threshold level for contaminated soils (Direction des Substances Dangereuses 1988)

TABLE B.IV-5

IDENTIFYING FINAL ORGANIC CONTAMINANTS OF CONCERN IN SEDIMENT OF THE GREAT MIAMI RIVER BETWEEN THE EFFLUENT LINE AND THE CONFLUENCE WITH PADDYS RUN BASED ON TOXICITY

Sediment CPCs	Numer of Samples	Percent Detection	AWQC (μg/L)	Notes[a]	Representative Concentration (μg/kg)	Representative IW Concentration (μg/L)	Concentration/ AWQC Ratio	Toxic CPC
Acenaphthene	1	100	23	1	120	2.61	0.114	
Anthracene	1	100	15	2	470	3.24	0.216	
Benzo(a)anthracene	1	100	10	3	2600	1.48	0.148	
Benzo(a)pyrene	1	100	10	4	2100	0.531	0.0531	
Benzo(b)fluoranthene	1	100	15	2	2700	0.191	0.0127	
Benzo(g,h,i)perylene	1	100	15	2	1300	0.0221	0.00147	
Benzo(k)fluoranthene	1	100	15	2	2100	0.0830	0.00553	
Chrysene	1	100	10	4	2700	1.54	0.154	
Dibenzo(a,h)anthracene	1	100	10	2	580	0.150	0.0150	
Dibenzofuran	1	100	15	2	63	1.15	0.0767	
Fluoranthene	1	100	8.9	5	5500	5.65	0.635	
Fluorene	1	100	3.2	4	130	1.60	0.500	
Indeno(1,2,3-cd)pyrene	1	100	15	2	1600	0.0108	7.20E-04	
Phenanthrene	1	100	6.3	6	2200	14.7	2.33	Y
Pyrene	1	100	15	2	4400	6.26	0.417	

[a]1: EPA (1993b)
2: Lowest 96-H LC50/100 for PAHs (FWS 1987b)
3: LC87/100 (FWS 1987b)
4: Lowest 96-H LC50/100 (FWS 1987b)
5: Warmwater (OEPA 1993)
6: EPA (1993c)

TABLE B.IV-6

IDENTIFYING FINAL CONTAMINANTS OF CONCERN IN SEDIMENT OF THE GREAT MIAMI RIVER AT THE CONFLUENCE WITH PADDYS RUN BASED ON TOXICITY

Sediment CPCs	Number of Samples	Percent Detection	ER-L or Surrogate (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Concentration/ ER-L Ratio	Toxic CPC
Aluminum	2	100	NA		7600		
Arsenic	2	100	33	1	4.00	0.121	
Barium	2	100	40	2	89	2.23	Y
Beryllium	1	100	NA		1.00		
Calcium	2	100			79300		
Chromium	2	100	80	1	14	0.175	
Cobalt	2	100	50	3	13.0	0.260	
Copper	2	100	70	1	18.0	0.257	
Iron	2	100	17000	2	16800	0.988	
Lead	2	100	35	1	21.0	0.600	
Magnesium	2	100			21500		
Manganese	2	100	300	2	667	2.22	Y

TABLE B.IV-6 (Continued)

Sediment CPCs	Number of Samples	Percent Detection	ER-L or Surrogate (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Concentration/ ER-L Ratio	Toxic CPC
Aluminum	2	100	NA		7600		
Nickel	2	100	30	1	18.0	0.600	
Potassium	2	100			1060		
Silicon	2	100			813		
Uranium	1	100			3		
Vanadium	2	100	NA		18		
Zinc	2	100	120	1	171	1.43	Y

[a]1: Long and Morgan (1991)
2: Baudo et al. (1990)
3: TV = threshold level for contaminated soils (Direction des Substances Dangereuses 1988)

TABLE B.IV-7

IDENTIFYING FINAL ORGANIC CONTAMINANTS OF CONCERN IN SEDIMENT OF THE GREAT MIAMI RIVER AT THE CONFLUENCE WITH PADDYS RUN BASED ON TOXICITY

Sediment CPCs	Number of Samples	Percent Detection	AWQC (µg/L)	Notes[a]	Representative Concentration (µg/kg)	Representative IW Concentration (µg/L)	Concentration/ AWQC Ratio	Toxic CPC
Benzo(a)anthracene	2	100	10	1	93.0	0.0551	0.00551	
Benzo(a)pyrene	2	100	10	2	78.0	0.0197	0.00197	
Benzo(b)fluoranthene	2	100	15	3	130	9.19E-03	0.613	
Benzo(k)fluoranthene	1	100	15	3	120	4.74E-03	0.316	
Chlorobenzene	1	100	391	4	2.00	0.400	0.00102	
Chrysene	2	100	10	2	130	0.0742	0.00742	
Fluoranthene	2	100	8.9	5	260	0.267	0.0300	
Indeno(1,2,3-cd)pyrene	1	100	15	3	58.0	3.91E-04	0.261	
Phenanthrene	2	100	6.3	6	130	0.867	0.138	
Pyrene	2	100	15	3	220	0.313	0.0209	
Acetone	1	100	78000	5	37.0	37.0[b]	4.74E-04	
Benzoic Acid	1	100	14600	7	65.0	65.0[b]	0.00452	
Toluene	1	100	1700	5	2.00	2.00[b]	0.00118	

[a]1: LC87/100 (FWS 1987b)
2: Lowest 96-H LC50/100 (FWS 1987b)
3: Lowest 96-H LC50/100 for PAHs (FWS 1987b)
4: Geometric mean of LC50s (Jorgensen et al., 1991)
5: Warmwater (OEPA 1993)
6: EPA (1993c)
7: LOEL/10 (Jorgensen et al., 1991)

TABLE B.V-1

IDENTIFYING FINAL CONTAMINANTS OF CONCERN (CPCs) IN SURFACE SOIL OF STUDY AREA A BASED ON TOXICITY

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Aluminum	24	100	10103	1	8860		0.877	
Antimony	18	11	10	2	3.20	Y	0.320	
Arsenic	24	96	30	3	3.91	Y	0.130	
Barium	24	100	500	3	97.6	Y	0.195	
Beryllium	24	46	56	1	0.860	Y	0.0154	
Boron			7000	4				
Cadmium	24	46	5	3	5.90	Y	1.18	Y
Calcium	24	88	NA		122000	Y		
Chromium	24	96	250	3	14.9	Y	0.0596	
Cobalt	24	100	50	3	11.7	Y	0.233	
Copper	24	100	100	3	23.6	Y	0.236	
Cyanide	24	54	50	5	1.20	Y	0.0240	
Iron	24	100	NA		16600			
Lead	24	100	200	3	60.9	Y	0.305	
Magnesium	24	100	NA		34400	Y		
Manganese	24	100	1500	2	874		0.583	
Mercury	24	0	5	2				

TABLE B.V-1 (Continued)

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Molybdenum	24	42	10	3	11.7	Y	1.17	Y
Nickel	24	100	100	3	19.3	Y	0.193	
Potassium	24	100	NA		1120			
Selenium	24	25	3	3	0.770	Y	0.257	
Silver	24	25	10	3	7.60	Y	0.760	
Silicon	18	100	NA		1120	Y		
Sodium	24	88	NA		102	Y		
Thallium	24	0	6.3	4				
Thorium	20	75			11.2	Y		
Uranium	47	100	230	4	75.7	Y	0.330	
Vanadium	24	100	150	6	21.3		0.142	
Zinc	24	100	500	3	707	Y	1.41	Y
4,4'-DDE	16	0	0.1	6				
4,4'-DDT	17	12	0.1	6	0.0190	Y	0.190	
2-butanone	20	15	47000	4	0.0130	Y	2.77E-07	
2-methylnaphthalene	21	0						
4-methyl-2-pentanone	21	5	3900	4	0.0140	Y	3.59E-06	
4-methylphenol	21	0	390	4				
1,1,1-trichloroethane	21	0	7000	4				

TABLE B.V-1 (Continued)

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Aroclor-1254	16	13	1	3	0.0450	Y	0.0450	
Aroclor-1260	16	0	1	3				
Acetone	21	0	8000	7				
Acenapthene	21	0	4700	4				
Acenaphthylene	21	0						
Anthracene	22	5	10	3	9.80	Y	0.980	
Benzo(a)anthracene	22	14	1	3	2.10	Y	2.10	Y
Benzo(a)pyrene	22	5	1	3	1.60	Y	1.60	Y
Benzo(b)fluoranthene	22	9	1	3	2.10	Y	2.10	Y
Benzo(g,h,i)perylene	22	0	1	3				
Benzo(k)fluoranthene	22	5	1	3	0.0600	Y	0.0600	
Benzoic acid	21	0	310000	4				
Bis(2-ethylhexyl) phthalate	21	24	70	5	0.570	Y	0.00814	
Bromodichlormethane	21	0	10	4				
Butyl benzyl phthalate	22	0	1600	4				
Carbazole			32	4				
Carbon disulfide	21	14	7800	4	0.00700	Y	8.97E-07	
α-chlordane	16	0	0.49	4				
γ-chlordane	16	0	0.49	4				
Chlorobenzene	21	0	1600	4				

TABLE B.V-1 (Continued)

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Chloroform	21	0	100	4				
Chrysene	22	9	1	3	2.10	Y	2.10	Y
Dibenzofuran	21	0						
Dieldrin	16	0	0.04	4				
Diethyl phthalate	21	0	63000	4				
Di-n-butyl phthalate	22	5			0.0820	Y		
Di-n-octyl phthalate	22	5	1600	4	0.280	Y	1.75E-04	
Dibenzo(a,h)anthracene	22	0	0.088	4				
Endrin ketone	16	0	23	4				
Fluoranthene	22	27	10	3	2.10	Y	0.210	
Fluorene	21	0	3100	4				
Indeno(1,2,3-cd)pyrene	22	0	1	3				
Methylene chloride	21	5	85	4	0.220	Y	0.00260	
Naphthalene	21	0	3100	4				
Octachlorodibenzo-p-dioxin			4	8				
Phenanthrene	22	14	5	3	2.10	Y	0.420	
Phenol	21	5	1	5	0.0440	Y	0.0440	
Pyrene	22	32	10	5	2.10	Y	0.210	
Tetrachloroethene	21	10	25	4	0.00700	Y	2.80E-04	
Trichloroethene	21	0	58	4				

TABLE B.V-1 (Continued)

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Toluene	21	24	3	5	0.00400	Y	0.00133	
Xylenes, Total	21	0	160000	4				

[a]1: Missouri DNR (1988; Maximum Cumulative Addition)
2: Kabata-Pendias and Pendias (1992)
3: BTV = Threshold level for contaminated soils (Direction des Substances Dangereuses 1988)
4: EPA (1994)
5: Richardson (1987)
6: USSR (1984; Maximum Allowable Concentration)
7: EPA (1990)
8: EPA (1994); BTV = Value reported for 2,3,7,8-tetrachlorodibenzo-p-dioxin

TABLE B.V-2

IDENTIFYING FINAL CONTAMINANTS OF CONCERN (CPCs) IN SURFACE SOIL OF STUDY AREA B BASED ON TOXICITY

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Aluminum	10	100	10103	1	10700		1.06	Y
Antimony	10	18	10	2	2.80	Y	0.280	
Arsenic	10	80	30	3	6.06		0.202	
Barium	10	100	500	3	100	Y	0.201	
Beryllium	10	30	56	1	1.50	Y	0.0268	
Boron			7000	4				
Cadmium	10	20	5	3	1.60	Y	0.320	
Calcium	10	100	NA		124000	Y		
Chromium	10	90	250	3	15.7		0.0628	
Cobalt	10	90	50	3	13.7		0.274	
Copper	10	100	100	3	21.1	Y	0.211	
Cyanide	10	70	50	5	0.578	Y	0.0116	
Iron	10	100	NA		21400	Y		
Lead	8	100	200	3	27.6	Y	0.138	
Magnesium	10	100	NA		59100	Y		

TABLE B.V-2 (Continued)

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Manganese	8	100	1500	2	1530	Y	1.02	Y
Mercury	10	0	5	2				
Molybdenum	10	40	10	3	12.4	Y	1.24	Y
Nickel	10	100	100	3	29.5	Y	0.295	
Potassium	10	100	NA		2180	Y		
Selenium	8	13	3	3	0.510		0.170	
Silver	10	10	10	3	0.480	Y	0.0480	
Silicon	10	100	NA		577	Y		
Sodium	10	100	NA		78.5	Y		
Thallium	10	0	6.3	4				
Thorium	5	80			10.4	Y		
Uranium	25	100	230	4	27.5	Y	0.120	
Vanadium	10	100	150	6	30.2	Y	0.201	
Zinc	10	100	500	3	58.2	Y	0.116	
4,4'-DDE	9	0	0.1	6				
4,4'-DDT	9	0	0.1	6				
2-butanone	8	0	47000	4				

TABLE B.V-2 (Continued)

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
2-methylnaphthalene	8	0						
4-methyl-2-pentanone	8	0	3900	4				
4-methylphenol	8	0	390	4				
1,1,1-trichloroethane	8	0	7000	4				
Aroclor-1254	9	0	1	3				
Aroclor-1260	9	0	1	3				
Acetone	8	13	8000	7	0.011	Y	1.38E-06	
Acenapthene	8	0	4700	4				
Acenaphthylene	8	0						
Anthracene	8	0	10	3				
Benzo(a)anthracene	8	25	1	3	0.048	Y	0.0480	
Benzo(a)pyrene	8	13	1	3	0.051	Y	0.0510	
Benzo(b)fluoranthene	8	25	1	3	0.050	Y	0.0500	
Benzo(g,h,i)perylene	8	0	1	3				
Benzo(k)fluoranthene	8	25	1	3	0.059	Y	0.0590	
Benzoic acid	8	0	310000	4				
Bis(2-ethylhexyl) phthalate	8	13	70	5	0.045	Y	6.43E-04	

TABLE B.V-2 (Continued)

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Bromodichlormethane	8	0	10	4				
Butyl benzyl phthalate	8	0	1600	4				
Carbazole			32	4				
Carbon disulfide	8	0	7800	4				
α-chlordane	9	0	0.49	4				
γ-chlordane	9	0	0.49	4				
Chlorobenzene	8	0	1600	4				
Chloroform	8	0	100	4				
Chrysene	8	25	1	3	0.059	Y	0.0590	
Dibenzofuran	8	0						
Dieldrin	9	0	0.04	4				
Diethyl phthalate	8	0	63000	4				
Di-n-butyl phthalate	8	0						
Di-n-octyl phthalate	8	0	1600	4				
Dibenzo(a,h)anthracene	8	0	0.088	4				
Endrin ketone	9	0	23	4				
Fluoranthene	8	38	10	3	0.100	Y	0.0100	
Fluorene	8	0	3100	4				

TABLE B.V-2 (Continued)

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Indeno(1,2,3-cd)pyrene	8	0	1	3				
Methylene chloride	8	13	85	4	0.011	Y	1.29E-04	
Naphthalene	8	0	3100	4				
Octachlorodibenzo-p-dioxin			4	8				
Phenanthrene	8	13	5	3	0.041	Y	0.00820	
Phenol	8	0	1	5				
Pyrene	8	50	10	5	0.100	Y	0.0100	
Tetrachloroethene	8	0	25	4				
Trichloroethene	8	0	58	4				
Toluene	8	13	3	5	0.00100	Y	1.33E-04	
Xylenes, Total	8	0	160000	4				

[a]1: Missouri DNR (1988; Maximum Cumulative Addition)
2: Kabata-Pendias and Pendias (1992)
3: BTV = Threshold level for contaminated soils (Direction des Substances Dangereuses 1988)
4: EPA (1994)
5: Richardson (1987)
6: USSR (1984; Maximum Allowable Concentration)
7: EPA (1990)
8: EPA (1994); BTV = value reported for 2,3,7,8-tetrachlorodibenzo-p-dioxin

TABLE B.V-3

IDENTIFYING FINAL CONTAMINANTS OF CONCERN (CPCs) IN SURFACE SOIL OF STUDY AREA C BASED ON TOXICITY

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Aluminum	15	100	10103	1	25700	Y	2.54	Y
Antimony	14	29	10	2	21.5	Y	2.15	Y
Arsenic	12	100	30	3	5.77		0.192	
Barium	15	100	500	3	158	Y	0.316	
Beryllium	15	73	56	1	1.05	Y	0.0188	
Boron			7000	4				
Cadmium	15	7	5	3	1.90	Y	0.380	
Calcium	15	87	NA		34915	Y		
Chromium	15	93	250	3	19.8	Y	0.0792	
Cobalt	15	100	50	3	17.4	Y	0.348	
Copper	15	93	100	3	15.7	Y	0.157	
Cyanide	15	53	50	5	0.554	Y	0.0111	
Iron	15	100	NA		24300	Y		
Lead	15	100	200	3	570	Y	2.85	Y
Magnesium	15	100	NA		21300	Y		
Manganese	15	100	1500	2	2100	Y	1.40	Y
Mercury	15	20	5	2	0.120	Y	0.0240	
Molybdenum	15	27	10	3	8.50	Y	0.850	
Nickel	15	100	100	3	19.3	Y	0.193	
Potassium	15	100	NA		1430	Y		

TABLE B.V-3 (Continued)

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Selenium	15	13	3	3	0.550		0.183	
Silver	15	7	10	3	1.80		0.180	
Silicon	15	100	NA		5480	Y		
Sodium	15	80	NA		95.7	Y		
Thallium	15	20	6.3	4	0.750	Y	0.119	
Thorium	9	78			10.6	Y		
Uranium	71	100	230	4	3620	Y	15.7	Y
Vanadium	15	100	150	6	35.5	Y	0.237	
Zinc	15	100	500	3	432	Y	0.864	
4,4'-DDE	9	0	0.1	6				
4,4'-DDT	9	0	0.1	6				
2-butanone	15	0	47000	4				
2-methylnaphthalene	14	7			0.0250	Y		
4-methyl-2-pentanone	15	0	3900	4				
4-methylphenol	14	0	390	4				
1,1,1-trichloroethane	15	0	7000	4				
Aroclor-1254	9	11	1	3	0.120	Y	0.120	
Aroclor-1260	9	0	1	3				
Acetone	15	13	8000	7	0.0120	Y	1.53E-06	
Acenapthene	14	0	4700	4				
Acenaphthylene	14	7			0.620	Y		
Anthracene	14	7	10	3	0.170	Y	0.0170	
Benzo(a)anthracene	14	14	1	3	0.590	Y	0.590	

TABLE B.V-3 (Continued)

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Benzo(a)pyrene	14	14	1	3	0.940	Y	0.940	
Benzo(b)fluoranthene	14	14	1	3	1.80	Y	1.80	Y
Benzo(g,h,i)perylene	14	7	1	3	1.10	Y	1.10	Y
Benzo(k)fluoranthene	14	14	1	3	1.30	Y	1.30	Y
Benzoic acid	10	30	310000	4	0.0890	Y	2.87E-07	
Bis(2-ethylhexyl)phthalate	14	7	70	5	0.0460	Y	6.57E-04	
Bromodichlormethane	15	0	10	4				
Butyl benzyl phthalate	14	0	1600	4				
Carbazole	4	0	32	4				
Carbon disulfide	15	0	7800	4				
α-chlordane	9	0	0.49	4				
γ-chlordane	9	0	0.49	4				
Chlorobenzene	15	0	1600	4				
Chloroform	15	0	100	4				
Chrysene	14	21	1	3	0.590	Y	0.590	
Dibenzo(a,h)anthracene	14	7	0.088	4	0.400	Y	4.54	Y
Dibenzofuran	14	0						
Dieldrin	9	0	0.04	4				
Diethyl phthalate	14	0	63000	4				
Di-n-butyl phthalate	14	14			0.0660	Y		
Di-n-octyl phthalate	14	0	1600	4				
Endrin ketone	9	0	23	4				
Fluoranthene	14	36	10	3	0.210	Y	0.0210	
Fluorene	14	7	3100	4	0.0170	Y	5.48E-06	

TABLE B.V-3 (Continued)

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Indeno(1,2,3-cd)pyrene	14	7	1	3	1.50	Y	1.50	Y
Methylene chloride	15	33	85	4	0.0130	Y	1.53E-04	
Naphthalene	14	7	3100	4	0.0390	Y	1.26E-06	
Octachlorodibenzo-p-dioxin			4	8				
Phenanthrene	14	21	5	3	0.0590	Y	0.0118	
Phenol	14	0	1	5				
Pyrene	14	29	10	5	0.290	Y	0.0290	
Tetrachloroethane	15	0	25	4				
Trichloroethene	15	0	58	4				
Toluene	15	33	3	5	0.00700	Y	0.00233	
Xylenes, Total	15	0	160000	4				
Total Organic Carbon								

[a]1: Missouri DNR (1988; Maximum Cumulative Addition)
2: Kabata-Pendias and Pendias (1992)
3: BTV = Threshold level for contaminated soils (Direction des Substances Dangereuses 1988)
4: EPA (1994)
5: Richardson (1987)
6: USSR (1984; Maximum Allowable Concentration)
7: EPA (1990)
8: EPA (1994); BTV = Value reported for 2,3,7,8-tetrachlorodibenzo-p-dioxin

TABLE B.V-4

IDENTIFYING FINAL CONTAMINANTS OF CONCERN (CPCs) IN SURFACE SOIL OF STUDY AREA D BASED ON TOXICITY

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Aluminum	13	100	10103	1	7470	Y	0.740	
Antimony	3	33	10	2	10.6	Y	1.06	Y
Arsenic	13	92	30	3	17.0	Y	0.567	
Barium	13	100	500	3	89.3	Y	0.179	
Beryllium	13	69	56	1	0.558	Y	0.0100	
Boron			7000	4				
Cadmium	13	15	5	3	2.80	Y	0.560	
Calcium	13	100	NA		35100	Y		
Chromium	13	100	250	3	12.6		0.0504	
Cobalt	13	100	50	3	10.9		0.218	
Copper	13	100	100	3	12.3	Y	0.123	
Cyanide	7	86	50	5	0.910	Y	0.0182	
Iron	13	100	NA		15100			
Lead	13	100	200	3	2180	Y	10.9	Y
Magnesium	13	100	NA		14500	Y		
Manganese	13	100	1500	2	1020		0.683	
Mercury	13	8	5	2	0.060		0.0120	
Molybdenum	13	54	10	3	6.23	Y	0.623	
Nickel	13	100	100	3	13.1		0.131	
Potassium	13	69	NA		828			

TABLE B.V-4 (Continued)

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Selenium	13	31	3	3	0.250	Y	0.0833	
Silver	13	8	10	3	8.70	Y	0.870	
Silicon	13	100	NA		525			
Sodium	13	100	NA		65.0	Y		
Thallium	13	0	6.3	4				
Thorium	7	100			9.12	Y		
Uranium	20	100	230	4	14.8	Y	0.0640	
Vanadium	13	100	150	6	21.6		0.144	
Zinc	13	100	500	3	54.2		0.108	
4,4'-DDE	7	0	0.1	6				
4,4'-DDT	7	0	0.1	6				
2-butanone	7	14	47000	4	0.00200	Y	4.25E-08	
2-methylnaphthalene	7	0						
4-methyl-2-pentanone	7	0	3900	4				
4-methylphenol	7	0	390	4				
1,1,1-trichloroethane	7	0	7000	4				
Aroclor-1254	7	0	1	3				
Aroclor-1260	7	0	1	3				
Acetone	7	0	8000	7				
Acenapthene	7	0	4700	4				
Acenaphthylene	7	0						
Anthracene	7	0	10	3				
Benzo(a)anthracene	7	0	1	3				

TABLE B.V-4 (Continued)

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Benzo(a)pyrene	7	0	1	3				
Benzo(b)fluoranthene	7	0	1	3				
Benzo(g,h,i)perylene	7	0	1	3				
Benzo(k)fluoranthene	7	0	1	3				
Benzoic acid	7	14	310000	4	0.0550	Y	1.77E-07	
Bis(2-ethylhexyl)phthalate	7	14	70	5	0.0620	Y	8.86E-04	
Bromodichlormethane	7	0	10	4				
Butyl benzyl phthalate	7	0	1600	4				
Carbazole			32	4				
Carbon disulfide	7	0	7800	4				
α-chlordane	7	0	0.49	4				
γ-chlordane	7	0	0.49	4				
Chlorobenzene	7	0	1600	4				
Chloroform	7	0	100	4				
Chrysene	7	0	1	3				
Dibenzo(a,h)anthracene	7	0	0.088	4				
Dibenzofuran	7	0						
Dieldrin	7	0	0.04	4				
Diethyl phthalate	7	0	63000	4				
Di-n-butyl phthalate	7	0						
Di-n-octyl phthalate	7	0	1600	4				
Endrin ketone	7	0	23	4				
Fluoranthene	7	0	10	3				
Fluorene	7	0	3100	4				

TABLE B.V-4 (Continued)

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Indeno(1,2,3-cd)pyrene	7		1	3				
Methylene chloride	7	0	85	4				
Naphthalene	7	0	3100	4				
Octachlorodibenzo-p-dioxin	7	0	4	8				
Phenanthrene	7	0	5	3				
Phenol	7	0	1	5				
Pyrene	7	14	10	5	0.0590	Y	0.00590	
Tetrachloroethane	7	0	25	4				
Trichloroethene	7	0	58	4				
Toluene	7	14	3	5	0.00300	Y	0.00100	
Xylenes, Total	7	0	160000	4				
Total Organic Carbon								

[a]1: Missouri DNR (1988; Maximum Cumulative Addition)
2: Kabata-Pendias and Pendias (1992)
3: BTV = Threshold level for contaminated soils (Direction des Substances Dangereuses 1988)
4: EPA (1994)
5: Richardson (1987)
6: USSR (1984; Maximum Allowable Concentration)
7: EPA (1990)
8: EPA (1994); Value reported for 2,3,7,8-tetrachlorodibenzo-p-dioxin

TABLE B.V-5

IDENTIFYING FINAL CONTAMINANTS OF CONCERN (CPCs) IN SURFACE SOIL OF STUDY AREA E BASED ON TOXICITY

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Aluminum	29	100	10103	1	16300	Y	1.613	Y
Antimony	20	20	10	2	10.2		1.02	Y
Arsenic	29	100	30	3	7.45	Y	0.248	
Barium	29	100	500	3	93.1	Y	0.186	
Beryllium	29	79	56	1	0.965		0.0172	
Boron	1	0	7000	4				
Cadmium	29	10	5	3	1.50	Y	0.300	
Calcium	29	97	NA		77800	Y		
Chromium	29	97	250	3	14.9	Y	0.0596	
Cobalt	29	100	50	3	9.29	Y	0.186	
Copper	29	100	100	3	16.2	Y	0.162	
Cyanide	29	45	50	5	0.180	Y	0.00360	
Iron	24	100	NA		18000			
Lead	24	100	200	3	26.7	Y	0.134	
Magnesium	29	100	NA		20500	Y		
Manganese	28	100	1500	2	896	Y	0.597	
Mercury	29	3	5	2	0.140		0.0280	
Molybdenum	29	62	10	3	14.5	Y	1.45	Y
Nickel	29	93	100	3	17.2	Y	0.172	
Potassium	29	100	NA		1380	Y		

TABLE B.V-5 (Continued)

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Selenium	24	17	3	3	0.620	Y	0.207	
Silver	29	83	10	3	4.94	Y	0.494	
Silicon	28	100	NA		779			
Sodium	29	83	NA		167	Y		
Thallium	29	0	6.3	4				
Thorium	35	89			403	Y		
Uranium	38	90	230	4	157	Y	0.683	
Vanadium	29	100	150	6	25.7	Y	0.171	
Zinc	29	86	500	3	48.4	Y	0.0968	
4,4'-DDE	29	0	0.1	6				
4,4'-DDT	29	0	0.1	6				
2-butanone	26	0	47000	4				
2-methylnaphthalene	29	3			0.0910	Y		
4-methyl-2-pentanone	26	0	3900	4				
4-methylphenol	29	0	390	4				
1,1,1-trichloroethane	30	0	7000	4				
Aroclor-1254	29	24	1	3	0.0793	Y	0.0793	
Aroclor-1260	29	7	1	3	0.0890	Y	0.0890	
Acetone	30	23	8000	7	0.0205	Y	2.56E-06	
Acenapthene	28	4	4700	4	0.140	Y	2.98E-05	
Acenaphthylene	29	17			0.590	Y		
Anthracene	29	21	10	3	0.560	Y	0.0560	
Benzo(a)anthracene	29	52	1	3	0.575	Y	0.575	

TABLE B.V-5 (Continued)

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Benzo(a)pyrene	29	55	1	3	1.15	Y	1.15	Y
Benzo(b)fluoranthene	29	45	1	3	3.70	Y	3.70	Y
Benzo(g,h,i)perylene	29	48	1	3	3.10	Y	3.10	Y
Benzo(k)fluoranthene	29	48	1	3	3.30	Y	3.30	Y
Benzoic acid	26	42	310000	4	0.270	Y	2.70E-05	
Bis(2-ethylhexyl)phthalate	29	72	70	5	0.280	Y	0.00400	
Bromodichlormethane	30	42	10	4	0.270	Y	0.0270	
Butylbenzyl phthalate	29	0	1600	4				
Carbazole	22	18	32	4	0.170	Y	0.00530	
Carbon disulfide	30	0	7800	4				
α-chlordane	29	3	0.49	4	0.00800	Y	0.0163	
γ-chlordane	29	0	0.49	4				
Chlorobenzene	30	0	1600	4				
Chloroform	30	3	100	4	0.0320	Y	3.20E-04	
Chrysene	29	55	1	3	3.20	Y	3.20	Y
Dibenzo(a,h)anthracene	29	21	0.088	4	1.10	Y	12.5	Y
Dibenzofuran	28	4			0.130	Y		
Dieldrin	29	7	0.04	4	0.0160	Y	0.400	
Diethyl phthalate	29	0						
Di-n-butyl phthalate	29	0	63000	4				
Di-n-octyl phthalate	29	0	1600	4				
Endrin ketone	29	7	23	4	0.00590	Y	2.57E-04	
Fluoranthene	29	69	10	3	0.878	Y	0.0878	
Fluorene	29	3	3100	4	0.220	Y	7.10E-05	

TABLE B.V-5 (Continued)

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Indeno(1,2,3-cd)pyrene	29	38	1	3	3.00	Y	3.00	Y
Methylene chloride	30	7	85	4	0.00500	Y	5.88E-05	
Naphthalene	29	3	3100	4	0.061	Y	1.97E-05	
Octachlorodibenzo-p-dioxin	2	100	4	8	2.90	Y	0.725	
Phenanthrene	29	52	5	3	0.386	Y	0.0772	
Phenol	29	0	1	5				
Pyrene	29	62	10	5	3.50	Y	0.350	
Tetrachloroethane	30	0	25	4				
Trichloroethene	30	0	58	4				
Toluene	30	3	3	5	0.001	Y	3.33E-04	
Xylenes, Total	30	0	160000	4				
Total Organic Carbon	2	100			86.9	Y		

[a]1: Missouri DNR (1988; Maximum Cumulative Addition)
2: Kabata-Pendias and Pendias (1992)
3: BTV = Threshold level for contaminated soils (Direction des Substances Dangereuses 1988)
4: EPA (1994)
5: Richardson (1987)
6: USSR (1984; Maximum Allowable Concentration)
7: EPA (1990)
8: EPA (1994); BTV = value reported for 2,3,7,8-tetrachlorodibenzo-p-dioxin

TABLE B.V-6

IDENTIFYING FINAL CONTAMINANTS OF CONCERN (CPCs) IN SURFACE SOIL OF STUDY AREA F BASED ON TOXICITY

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Aluminum	5	100	10103	1	11600		0.938	
Antimony	5	0	10	2				
Arsenic	5	100	30	3	8.70		0.290	
Barium	5	100	500	3	81.5		0.163	
Beryllium	5	20	56	1	1.40	Y	0.0250	
Boron			7000	4				
Cadmium	5	0	5	3				
Calcium	5	40	NA		37500	Y		
Chromium	5	100	250	3	15.9	Y	0.0636	
Cobalt	5	100	50	3	11.8		0.236	
Copper	5	100	100	3	18.0	Y	0.180	
Cyanide	5	60	50	5	0.430	Y	0.00860	
Iron	5	100	NA		22300			
Lead	3	100	200	3	23.1		0.116	
Magnesium	5	100	NA		17700	Y		
Manganese	3	100	1500	2	619		0.413	
Mercury	5	0	5	2				
Molybdenum	5	0	10	3				
Nickel	5	82	100	3	21.0		0.210	
Potassium	5	100	NA		990			

TABLE B.V-6 (Continued)

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Selenium	3	100	3	3	0.800	Y	0.267	
Silver	5	0	10	3				
Silicon	5	100	NA		1300			
Sodium	5	40	NA		78.0	Y		
Thallium	5	0	6.3	4				
Thorium	4	100			12.5			
Uranium	12	100	230	4	254	Y	1.10	Y
Vanadium	5	100	150	6	27.5		0.183	
Zinc	5	100	500	3	63.1	Y	0.126	
4,4'-DDE	3	0	0.1	6				
4,4'-DDT	3	0	0.1	6				
2-butanone	5	0	47000	4				
2-methylnaphthalene	5	0						
4-methyl-2-pentanone	5	0	3900	4				
4-methylphenol	5	0	390	4				
1,1,1-trichloroethane	5	0	7000	4				
Aroclor-1254	3	0	1	3				
Aroclor-1260	3	0	1	3				
Acetone	5	20	8000	7	0.0120	Y	1.50E-06	
Acenapthene	5	0	4700	4				
Acenaphthylene	5	0						
Anthracene	5	0	10	3				
Benzo(a)anthracene	5	0	1	3				

TABLE B.V-6 (Continued)

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Benzo(a)pyrene	5	0	1	3				
Benzo(b)fluoranthene	5	0	1	3				
Benzo(g,h,i)perylene	5	0	1	3				
Benzo(k)fluoranthene	5	0	1	3				
Benzoic acid	5	0	310000	4				
Bis(2-ethylhexyl)phthalate	5	20	70	5	0.0510	Y	7.29E-04	
Bromodichlormethane	5	0	10	4				
Butyl benzyl phthalate	5	0	1600	4				
Carbazole	5	0	32	4				
Carbon disulfide	5	0	7800	4				
α-chlordane	3	0	0.49	4				
γ-chlordane	3	0	0.49	4				
Chlorobenzene	5	20	1600	4	0.00200	Y	1.25E-06	
Chloroform	5	0	100	4				
Chrysene	5	0	1	3				
Dibenzofuran	5	0						
Dieldrin	3	0	0.04	4				
Diethyl phthalate	5	0	63000	4				
Di-n-butyl phthalate	5	0						
Di-n-octyl phthalate	5	0	1600	4				
Dibenzo(a,h)anthracene	5	0	0.088	4				
Endrin ketone	3	0	23	4				
Fluoranthene	5	0	10	3				
Fluorene	5	0	3100	4				

TABLE B.V-6 (Continued)

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Indeno(1,2,3-cd)pyrene	5	0	1	3				
Methylene chloride	5	0	85	4				
Naphthalene	5	0	3100	4				
Octachlorodibenzo-p-dioxin			4	8				
Phenanthrene	5	0	5	3				
Phenol	5	0	1	5				
Pyrene	5	0	10	5				
Tetrachloroethene	5	20	25	4	0.00300	Y	1.20E-04	
Trichloroethene	5	20	58	4	0.00200	Y	3.44E-05	
Toluene	5	0	3	5				
Xylenes, Total	9	0	160000	4				

[a]1: Missouri DNR (1988; Maximum Cumulative Addition)
2: Kabata-Pendias and Pendias (1992)
3: BTV = Threshold level for contaminated soils (Direction des Substances Dangereuses 1988)
4: EPA (1994)
5: Richardson (1987)
6: USSR (1984; Maximum Allowable Concentration)
7: EPA (1990)
8: EPA (1994); BTV = value reported for 2,3,7,8-tetrachlorodibenzo-p-dioxin

TABLE B.V-7

IDENTIFYING FINAL CONTAMINANTS OF CONCERN (CPCs) IN SURFACE SOIL OF STUDY AREA G BASED ON TOXICITY

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Aluminum	22	100	10103	1	8004		0.792	
Antimony	16	31	10	2	29.5	Y	2.95	Y
Arsenic	22	91	30	3	6.20	Y	0.207	
Barium	22	100	500	3	59.1		0.118	
Beryllium	22	50	56	1	0.870	Y	0.0155	
Boron	1	100	7000	4	14.3	Y	0.00200	
Cadmium	22	36	5	3	5.80	Y	1.16	Y
Calcium	22	100	NA		84700	Y		
Chromium	22	100	250	3	12.3		0.0492	
Cobalt	22	96	50	3	8.59		0.172	
Copper	22	100	100	3	14.5	Y	0.145	
Cyanide	22	18	50	5	0.200	Y	0.00400	
Iron	22	100	NA		15300			
Lead	22	100	200	3	17.1		0.0853	
Magnesium	22	100	NA		19100	Y		
Manganese	22	100	1500	2	1320		0.880	
Mercury	22	0	5	2				
Molybdenum	22	23	10	3	4.95	Y	0.495	
Nickel	22	100	100	3	18.8	Y	0.188	
Potassium	22	100	NA		1140	Y		

TABLE B.V-7 (Continued)

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Selenium	18	11	3	3	0.550		0.183	
Silver	22	46	10	3	10.3	Y	1.03	Y
Silicon	17	100	NA		1780			
Sodium	22	68	NA		128	Y		
Thallium	22	5	6.3	4	0.670	Y	0.106	
Thorium	15	73			14.6	Y		
Uranium	34	100	230	4	22.3	Y	0.0970	
Vanadium	22	100	150	6	19.6		0.131	
Zinc	22	82	500	3	51.0	Y	0.102	
4,4'-DDE	16	6	0.1	6	0.0200	Y	0.200	
4,4'-DDT	16	0	0.1	6				
2-butanone	13	8	47000	4	0.0740	Y	1.57E-06	
2-methylnaphthalene	17	0						
4-methyl-2-pentanone	13	0	3900	4				
4-methylphenol	17	6	390	4	0.190	Y	4.87E-04	
1,1,1-trichloroethane	17	0	7000	4				
Aroclor-1254	16	6	1	3	0.0640	Y	0.0640	
Aroclor-1260	16	0	1	3				
Acetone	17	18	8000	7	0.160	Y	2.00E-05	
Acenapthene	17	0	4700	4				
Acenaphthylene	17	0						
Anthracene	17	6	10	3	0.0670	Y	0.00670	
Benzo(a)anthracene	17	12	1	3	0.0570	Y	0.0570	

TABLE B.V-7 (Continued)

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Benzo(a)pyrene	17	12	1	3	0.0600	Y	0.0600	
Benzo(b)fluoranthene	17	18	1	3	0.0550	Y	0.0550	
Benzo(g,h,i)perylene	17	6	1	3	0.0380	Y	0.0380	
Benzo(k)fluoranthene	17	12	1	3	0.0610	Y	0.0610	
Benzoic acid	16	0	310000	4				
Bis(2-ethylhexyl)phthalate	17	24	70	5	0.700	Y	0.0100	
Bromodichlormethane	17	0	10	4				
Butyl benzyl phthalate	17	0	1600	4				
Carbazole	6	33	32	4	0.0400	Y	0.00130	
Carbon disulfide	12	0	7800	4				
α-chlordane	16	0	0.49	4				
γ-chlordane	16	0	0.49	4				
Chlorobenzene	17	0	1600	4				
Chloroform	17	0	100	4				
Chrysene	17	18	1	3	0.0750	Y	0.0750	
Dibenzo(a,h)anthracene	17	0	0.088	4				
Dibenzofuran	17	0						
Dieldrin	16	6	0.04	4	0.0200	Y	0.500	
Diethyl phthalate	17	6	63000	4	0.0140	Y	2.22E-07	
Di-n-butyl phthalate	17	0						
Di-n-octyl phthalate	17	6	1600	4	0.00700	Y	4.38E-06	
Endrin ketone	16	0	23	4				
Fluoranthene	17	29	10	3	0.160	Y	0.0160	
Fluorene	17	6	3100	4	0.00700	Y	2.26E-05	

TABLE B.V-7 (Continued)

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Indeno(1,2,3-cd)pyrene	17	12	1	3	0.0400	Y	0.0400	
Methylene chloride	17	0	85	4				
Naphthalene	17	0	3100	4				
Octachlorodibenzo-p-dioxin	5	20	4	8	0.240	Y	0.0600	
Phenanthrene	17	24	5	3	0.0710	Y	0.0142	
Phenol	17	6	1	5	0.0420	Y	0.0420	
Pyrene	17	29	10	5	0.120	Y	0.0120	
Tetrachloroethane	17	6	25	4	0.00200	Y	8.00E-05	
Trichloroethene	17	6	58	4	0.00400	Y	6.59E-05	
Toluene	17	24	3	5	0.0140	Y	0.00470	
Xylenes, Total	17	12	160000	4	0.00200	Y	1.25E-8	
Total Organic Carbon								

[a]1: Missouri DNR (1988; Maximum Cumulative Addition)
2: Kabata-Pendias and Pendias (1992)
3: BTV = Threshold level for contaminated soils (Direction des Substances Dangereuses 1988)
4: EPA (1994)
5: Richardson (1987)
6: USSR (1984; Maximum Allowable Concentration)
7: EPA (1990)
8: EPA (1994); BTV = Value reported for 2,3,7,8-tetrachlorodibenzo-p-dioxin

TABLE B.V-8

IDENTIFYING FINAL CONTAMINANTS OF CONCERN (CPCs) IN SURFACE SOIL OF THE INNER CONTOUR BASED ON TOXICITY

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Aluminum	3	100	10103	1	9590		0.949	
Antimony	3	0	10	2				
Arsenic	3	100	30	3	5.30		0.177	
Barium	3	3	500	3	237	Y	0.474	
Beryllium	3	0	56	1				
Boron			7000	4				
Cadmium	3	0	5	3				
Calcium			NA					
Chromium	3	100	250	3	12.1		0.0484	
Cobalt	3	100	50	3	36.1	Y	0.722	
Copper	3	100	100	3	16.8	Y	0.168	
Cyanide	3	100	50	5	0.490	Y	0.00980	
Iron			NA					
Lead	3	100	200	3	28.5	Y	0.143	
Magnesium			NA					
Manganese	3	100	1500	2	3420	Y	2.28	Y
Mercury	3	0	5	2				
Molybdenum	2	0	10	3				
Nickel	3	100	100	3	11.7		0.117	
Potassium			NA					

TABLE B.V-8 (Continued)

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Selenium	3	0	3	3				
Silver	3	0	10	3				
Silicon	3	100	NA		1290			
Sodium			NA					
Thallium	3	33	6.3	4	0.320		0.0508	
Thorium	7	100			8.84			
Uranium	259	82	230	4	31.1	Y	0.135	
Vanadium	3	100	150	6	33.4	Y	0.223	
Zinc	3	100	500	3	115	Y	0.230	
4,4'-DDE	5	0	0.1	6				
4,4'-DDT	5	0	0.1	6				
2-butanone	2	0	47000	4				
2-methylnaphthalene								
4-methyl-2-pentanone			3900	4				
4-methylphenol			390	4				
1,1,1-trichloroethane	3	0	7000	4				
Aroclor-1254	5	0	1	3				
Aroclor-1260	5	0	1	3				
Acetone	3	67	8000	7	0.00800	Y	1.00E-06	
Acenapthene			4700	4				
Acenaphthylene								
Anthracene			10	3				
Benzo(a)anthracene	3	33	1	3	0.110	Y	0.110	

TABLE B.V-8 (Continued)

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Benzo(a)pyrene	3	33	1	3	0.110	Y	0.110	
Benzo(b)fluoranthene	3	33	1	3	0.110	Y	0.110	
Benzo(g,h,i)perylene			1	3				
Benzo(k)fluoranthene	3	33	1	3	0.150	Y	0.150	
Benzoic acid			310000	4				
Bis(2-ethylhexyl)phthalate	3	67	70	5	0.0750	Y	0.00107	
Bromodichlormethane	3	0	10	4				
Butyl benzyl phthalate			1600	4				
Carbazole	1	0	32	4				
Carbon disulfide			7800	4				
α-chlordane	5	20	0.49	4	0.00970	Y	0.0198	
γ-chlordane	5	20	0.49	4	0.0530	Y	0.108	
Chlorobenzene			1600	4				
Chloroform	3	0	100	4				
Chrysene	3	33	1	3	0.160	Y	0.160	
Dibenzo(a,h)anthracene	3	0	0.088	4				
Dibenzofuran								
Dieldrin			0.04	4				
Diethyl phthalate			63000	4				
Di-n-butyl phthalate								
Di-n-octyl phthalate			1600	4				
Endrin ketone			23	4				
Fluoranthene	3	33	10	3	0.390	Y	0.0390	
Fluorene			3100	4				

TABLE B.V-8 (Continued)

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Indeno(1,2,3-cd)pyrene	3	33	1	3	0.0670	Y	0.0670	
Methylene chloride	3	0	85	4				
Naphthalene			3100	4				
Octachlorodibenzo-p-dioxin			4	8				
Phenanthrene	3	33	5	3	0.270	Y	0.0540	
Phenol			1	5				
Pyrene	3	33	10	5	0.280	Y	0.0280	
Tetrachloroethane	3	33	25	4	0.001	Y	4.00E-05	
Trichloroethene	3	0	58	4				
Toluene	3	0	3	5				
Xylenes, Total	3	0	160000	4				
Total Organic Carbon								

[a]1: Missouri DNR (1988; Maximum Cumulative Addition)
2: Kabata-Pendias and Pendias (1992)
3: BTV = Threshold level for contaminated soils (Direction des Substances Dangereuses 1988)
4: EPA (1994)
5: Richardson (1987)
6: USSR (1984; Maximum Allowable Concentration)
7: EPA (1990)
8: EPA (1994); BTV = Value reported for 2,3,7,8-tetrachlorodibenzo-p-dioxin

TABLE B.V-9

IDENTIFYING FINAL CONTAMINANTS OF CONCERN (CPCs) IN SURFACE SOIL OF THE OUTER CONTOUR BASED ON TOXICITY

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Aluminum	1	100	10103	1	8840		0.875	
Antimony			10	2				
Arsenic	1	100	30	3	14.1	Y	0.470	
Barium	1	100	500	3	45.4		0.0908	
Beryllium	1	100	56	1	0.320	Y	0.00571	
Boron			7000	4				
Cadmium	1	0	5	3				
Calcium			NA					
Chromium	1	100	250	3	12.6		0.0288	
Cobalt	1	100	50	3	7.20		0.144	
Copper	1	100	100	3	14.1	Y	0.141	
Cyanide			50	5				
Iron			NA					
Lead	1	100	200	3	1150	Y	5.75	Y
Magnesium	1	100	NA		1720			
Manganese	1	100	1500	2	363		0.242	
Mercury	1	0	5	2				
Molybdenum	1	0	10	3				
Nickel	1	100	100	3	15.2	Y	0.152	
Potassium			NA					

TABLE B.V-9 (Continued)

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Selenium	1	0	3	3				
Silver	1	0	10	3				
Silicon	1	100	NA		35.2	Y		
Sodium			NA					
Thallium	1	100	6.3	4	0.600	Y	0.995	
Thorium								
Uranium	187	100	230	4	8.30	Y	0.0361	
Vanadium	1	100	150	6	18.5		0.123	
Zinc	1	100	500	3	44.1		0.0882	
4,4'-DDE			0.1	6				
4,4'-DDT			0.1	6				
2-butanone			47000	4				
2-methylnaphthalene								
4-methyl-2-pentanone			3900	4				
4-methylphenol			390	4				
1,1,1-trichloroethane			7000	4				
Aroclor-1254			1	3				
Aroclor-1260			1	3				
Acetone			8000	7				
Acenapthene			4700	4				
Acenaphthylene								
Anthracene			10	3				
Benzo(a)anthracene			1	3				

TABLE B.V-9 (Continued)

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Benzo(a)pyrene			1	3				
Benzo(b)fluoranthene			1	3				
Benzo(g,h,i)perylene			1	3				
Benzo(k)fluoranthene			1	3				
Benzoic acid			310000	4				
Bis(2-ethylhexyl)phthalate			70	5				
Bromodichlormethane			10	4				
Butyl benzyl phthalate			1600	4				
Carbazole			32	4				
Carbon disulfide			7800	4				
α-chlordane			0.49	4				
γ-chlordane			0.49	4				
Chlorobenzene			1600	4				
Chloroform			100	4				
Chrysene			1	3				
Dibenzo(a,h)anthracene			0.088	4				
Dibenzofuran								
Dieldrin			0.04	4				
Diethyl phthalate			63000	4				
Di-n-butyl phthalate								
Di-n-octyl phthalate			1600	4				
Endrin ketone			23	4				
Fluoranthene			10	3				
Fluorene			3100	4				

TABLE B.V-9 (Continued)

CPCs	Number of Samples	Percent Detection	Benchmark Toxicity Value (BTV) (mg/kg)	Notes[a]	Representative Concentration (mg/kg)	Significantly Greater than Background	Concentration/ BTV Ratio	Toxic CPC
Indeno(1,2,3-cd)pyrene			1	3				
Methylene chloride			85	4				
Naphthalene			3100	4				
Octachlorodibenzo-p-dioxin			4	8				
Phenanthrene			5	3				
Phenol			1	5				
Pyrene			10	5				
Tetrachloroethane			25	4				
Trichloroethene			58	4				
Toluene			3	5				
Xylenes, Total			160000	4				
Total Organic Carbon								

[a]1: Missouri DNR (1988; Maximum Cumulative Addition)
2: Kabata-Pendias and Pendias (1992)
3: BTV = Threshold level for contaminated soils (Direction des Substances Dangereuses 1988)
4: EPA (1994)
5: Richardson (1987)
6: USSR (1984; Maximum Allowable Concentration)
7: EPA (1990)
8: EPA (1994); BTV = Value reported for 2,3,7,8-tetrachlorodibenzo-p-dioxin

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B.VI EXPOSURE PATHWAYS

B.VI.1.0 MOUSE EXPOSURE PATHWAYS

B.VI.1.1 Direct Irradiation From Soil

Calculated using the MicroShield™ code

B.VI.1.2 Inhalation of Resuspended Soil

$$D_{s\rightarrow in} = C_s \bullet T_{sa} \bullet \rho \bullet R \bullet DCF_{min}$$

$D_{s\rightarrow in}$	=	absorbed dose [mrad/yr]
C_s	=	radionuclide concentration in soil [pCi/kg]
T_{sa}	=	soil to air transfer factor [unitless]
ρ	=	soil density [kg/m^3]
R_m	=	mouse inhalation rate [m^3/yr]
DCF_{min}	=	dose conversion factor for inhaled radioactivity [mrad/pCi]

where:

$$T_{sa} = T_{sa0} \bullet 10/v \bullet s/30 \bullet (50/PE)^2$$

T_{sa0}	=	2.53×10^{-10}
v	=	average wind speed [m/sec]
s	=	% silt in soil
PE	=	precipitation - evaporation index

(from Oztunali and Roles 1986)

B.VI.1.3 Ingestion of Soil

$$D_{s\rightarrow i} = C_s \bullet IR_{ms} \bullet DCF_{mi}$$

$D_{s\rightarrow i}$	=	absorbed dose [mrad/yr]
C_s	=	radionuclide concentration in soil [pCi/kg]
IR_{ms}	=	soil ingestion rate [kg/yr]
DCF_{mi}	=	dose conversion factor for ingested radioactivity [mrad/pCi]

B.VI.1.4 Soil/Insect Ingestion

$$D_{s \to g \to i} = C_s \bullet BF_g \bullet IR_{mg} \bullet DCF_{mi}$$

$D_{s \to g \to i}$ = absorbed dose [mrad/yr]
C_s = radionuclide concentration in soil [pCi/kg]
BF_g = insect : soil bioaccumulation factor
IR_{mg} = insect ingestion rate [kg/yr]
DCF_{mi} = dose conversion factor for ingested radioactivity [mrad/pCi]

B.VI.1.5 Ingestion of Vegetation

$$D_{v \to i} = C_v \bullet IR_{mv} \bullet DCF_{mi}$$

$D_{v \to i}$ = absorbed dose [mrad/yr]
C_v = radionuclide concentration in vegetation [pCi/kg]
IR_{mv} = vegetation ingestion rate [kg/yr]
DCF_{mi} = dose conversion factor for ingested radioactivity [mrad/pCi]

B.VI.1.6 Ingestion of Water

$$D_{w \to i} = C_w \bullet IR_{mv} \bullet DCF_{mi}$$

$D_{w \to i}$ = absorbed dose [mrad/yr]
C_w = radionuclide concentration in water [pCi/L]
IR_{mw} = water ingestion rate [L/yr]
DCF_{mi} = dose conversion factor for ingested radioactivity [mrad/pCi]

B.VI.2.0 MEADOW VOLE EXPOSURE PATHWAYS

B.VI.2.1 Direct Irradiation From Soil

Calculated using the MicroShield™ code

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B.VI.2.2 Inhalation of Resuspended Soil

$$D_{s\rightarrow in} = C_s \bullet T_{sa} \bullet \rho \bullet R \bullet DCF_{vin}$$

$D_{s\rightarrow in}$	=	absorbed dose [mrad/yr]
C_s	=	radionuclide concentration in soil [pCi/kg]
T_{sa}	=	soil to air transfer factor [unitless]
ρ	=	soil density [kg/m^3]
R_v	=	vole inhalation rate [m^3/yr]
DCF_{vin}	=	dose conversion factor for inhaled radioactivity [mrad/pCi]

where

$$T_{sa} = T_{sa0} \bullet 10/v \bullet s/30 \bullet (50/PE)^2$$

T_{sa0}	=	2.53×10^{-10}
v	=	average wind speed [m/sec]
s	=	% silt in soil
PE	=	precipitation - evaporation index

(from NUREG/CR-4370, vol 1)

B.VI.2.3 Ingestion of Soil

$$D_{s\rightarrow i} = C_s \bullet IR_{vs} \bullet DCF_{vi}$$

$D_{s\rightarrow i}$	=	absorbed dose [mrad/yr]
C_s	=	radionuclide concentration in soil [pCi/kg]
IR_{vs}	=	soil ingestion rate [kg/yr]
DCF_{vi}	=	dose conversion factor for ingested radioactivity [mrad/pCi]

B.VI.2.4 Soil/Insect Ingestion

$$D_{s\rightarrow g\rightarrow i} = C_s \bullet BF_g \bullet IR_{vg} \bullet DCF_{vi}$$

$D_{s\rightarrow g\rightarrow i}$	=	absorbed dose [mrad/yr]
C_s	=	radionuclide concentration in soil [pCi/kg]
BF_g	=	insect : soil bioaccumulation factor
IR_{vg}	=	insect ingestion rate [kg/yr]
DCF_{vi}	=	dose conversion factor for ingested radioactivity [mrad/pCi]

000237

B.VI.2.5 Ingestion of Vegetation

$$D_{v \to i} = C_v \bullet IR_{vv} \bullet DCF_{vi}$$

$D_{v \to i}$ = absorbed dose [mrad/yr]
C_v = radionuclide concentration in vegetation [pCi/kg]
IR_{vv} = vegetation ingestion rate [kg/yr]
DCF_{vi} = dose conversion factor for ingested radioactivity [mrad/pCi]

B.VI.2.6 Ingestion of Water

$$D_{w \to i} = C_w \bullet IR_{vw} \bullet DCF_{vi}$$

$D_{w \to i}$ = absorbed dose [mrad/yr]
C_w = radionuclide concentration in water [pCi/L]
IR_{vw} = water ingestion rate [L/yr]
DCF_{vi} = dose conversion factor for ingested radioactivity [mrad/pCi]

B.VI.3.0 PINE TREE EXPOSURE PATHWAYS

B.VI.3.1 Direct Irradiation From Soil

Calculated using the MicroShield™ code

B.VI.3.2 Uptake of Contaminants From Soil

$$D_{s \to u} = C_s \bullet B_s \bullet DCF_{tu}$$

$D_{s \to u}$ = absorbed dose [mrad/yr]
C_s = radionuclide concentration in soil [pCi/kg]
B_s = element transfer coefficient [unitless]
DCF_{tu} = dose conversion factor [mrad kg/pCi yr]

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B.VI.4.0 SHINER EXPOSURE PATHWAYS

B.VI.4.1 Direct Irradiation From Sediment

Calculated using the MicroShield™ code

B.VI.4.2 Uptake of Contaminants (All Pathways)

$$D_{a\to s} = C_w \bullet BF_s \bullet DCF_{si}$$

$D_{a\to s}$ = absorbed dose [mrad/yr]
C_w = radionuclide concentration in water [pCi/L]
BF_s = bioconcentration factor [L/kg]
DCF_{si} = dose conversion factor [mrad kg/pCi yr]

B.VI.4.3 Direct Irradiation From Water

$$D_{w\to s} = C_w \bullet DCF_{sw}$$

$D_{w\to s}$ = absorbed dose [mrad/yr]
C_w = radionuclide concentration in water [pCi/L]
DCF_{sw} = dose conversion factor [mrad L/pCi yr]

B.VI.4.4 Uptake of Contaminants Through Ingestion of Benthic Macroinvertebrates

$$D_{i\to s} = C_i \bullet IR_{bm} \bullet DCF_{si}$$

$D_{i\to s}$ = absorbed dose [mrad/yr]
C_i = radionuclide concentration in benthic macroinvertebrate [pCi/kg]
IR_{bm} = shiner benthic macroinvertebrate ingestion rate [pCi/kg]
DCF_{si} = dose conversion factor [mrad kg/pCi yr]

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TABLE B.VII-1

REPRESENTATIVE CONCENTRATION OF RADIONUCLIDES MEASURED IN VARIOUS MEDIA COLLECTED FROM STUDY AREA A

	Radionuclide (pCi/g)										
Sample Type	Cs-137	Ra-226	Ra-228	Sr-90	Th-228	Th-230	Th-232	U-234	U-235/236	U-238	Tc-99
Soil	1.00	1.20	1.30	1.40	1.56	1.85	0.995	11.0	1.60	2.65	1.60
Vegetation	0.400	a		0.350				2.97	0.300	1.65	
Surface Water[b,c]								72.6	56.0	364	83.8

[a]An empty cell indicates no appropriate data was collected.
[b]Surface water available in study area for mammalian pathways.
[c]Concentration in pCi/L.

TABLE B.VII-2

REPRESENTATIVE CONCENTRATION OF RADIONUCLIDES MEASURED IN VARIOUS MEDIA COLLECTED FROM STUDY AREA B

	Radionuclide (pCi/g)										
Sample Type	Cs-137	Ra-226	Ra-228	Sr-90	Tc-99	Th-228	Th-230	Th-232	U-234	U-235/236	U-238
Soil	0.762	1.20	1.12	1.95	1.30	1.58	2.08	1.17	8.93	1.00	9.56
Vegetation	0.400	a		0.700					3.40	0.300	3.46
Surface Water[b,c]											

[a]An empty cell indicates no appropriate data was collected.
[b]Surface water available in study area for mammalian pathways.
[c]Concentration in pCi/L.

TABLE B.VII-3

REPRESENTATIVE CONCENTRATION OF RADIONUCLIDES MEASURED IN VARIOUS MEDIA COLLECTED FROM STUDY AREA C

	Radionuclide (pCi/g)												
Sample Type	Cs-137	Ra-224	Ra-226	Ra-228	Sr-90	Tc-99	Th-228	Th-230	Th-232	Th-234	U-234	U-235/236	U-238
Soil	0.611	5.02	5.61	5.13	1.78	13.1	5.10	67.6	6.60	666	50.4	67.9	259
Vegetation	0.150	a			0.900						6.03	0.300	6.25
Surface Water[b,c]													
	Ac-227	Pa-231	Pu-238	Pu-239/240									
Soil	2.80	5.04	1.50	0.300									

[a]An empty cell indicates no appropriate data was collected.
[b]Surface water available in study area for mammalian pathways.
[c]Concentration in pCi/L.

TABLE B.VII-4

REPRESENTATIVE CONCENTRATION OF RADIONUCLIDES MEASURED IN VARIOUS MEDIA COLLECTED FROM STUDY AREA D

	Radionuclide (pCi/g)									
Sample Type	Cs-137	Ra-226	Ra-228	Sr-90	Th-228	Th-230	Th-232	U-234	U-235/236	U-238
Soil	0.520	1.20	1.06	1.46	1.48	2.20	1.05	4.25	0.800	7.10
Vegetation	0.200	a		0.400				1.30	0.300	1.60
Surface Water[b,c]										

[a]An empty cell indicates no appropriate data was collected.
[b]Surface water available in study area for mammalian pathways.
[c]Concentration in pCi/L.

TABLE B.VII-5

REPRESENTATIVE CONCENTRATION OF RADIONUCLIDES MEASURED IN VARIOUS MEDIA COLLECTED FROM STUDY AREA E

	Radionuclide (pCi/g)												
Sample Type	Cs-137	Ra-226	Ra-228	Sr-90	Tc-99	Th-228	Th-230	Th-232	U-234	U-235/236	U-238	Ru-106	Pu-238
Soil	0.826	3.24	2.23	0.942	a	4.80	32.4	5.33	117	1.66	94.1	23.8	0.341
Vegetation	0.100	a		0.400					0.300	0.300	0.300		
Surface Water[b,c]									135	7.44	155		

[a]An empty cell indicates no appropriate data was collected.
[b]Surface water available in study area for mammalian pathways.
[c]Concentration in pCi/L.

TABLE B.VII-6

REPRESENTATIVE CONCENTRATION OF RADIONUCLIDES MEASURED IN VARIOUS MEDIA COLLECTED FROM STUDY AREA G

	Radionuclide (pCi/g)												
Sample Type	Cs-137	Ra-226	Ra-228	Sr-90	Tc-99	Th-228	Th-230	Th-232	U-234	U-235/236	U-238	Np-237	Pu-238
Soil	0.800	0.890	0.904	2.50	1.30	3.28	8.21	1.11	5.43	0.128	8.70	0.810	0.285
Vegetation	0.400	a		0.060					1.95	0.030	3.30		
Surface Water[b,c]									48.0	2.77	46.7		0.840

[a]An empty cell indicates no appropriate data was collected.
[b]Surface water available in study area for mammalian pathways.
[c]Concentration in pCi/L.

TABLE B.VII-7

REPRESENTATIVE CONCENTRATION OF RADIONUCLIDES MEASURED IN VARIOUS MEDIA COLLECTED FROM STUDY AREA F

	Radionuclide (pCi/g)											
Sample Type	Cs-137	Ra-226	Ra-228	Sr-90	Th-228	Th-230	Th-232	Np-237	U-234	U-235/236	U-238	Pu-239/240
Soil	1.10	1.12	0.940	1.20	2.33	14.8	0.847	a	35.0	2.46	149	0.600
Surface Water[b,c]						0.500		0.750	1170	38.4	1210	
Paddys Run Water[c,d]						0.433	0.400		10.9		14.1	
Sediments		1.26	0.800		0.700	1.00	0.600		3.60	0.200	3.10	
Benthic Macro-invertebrates									3.57		2.17	
Vegetation	0.030			0.750					1.28	0.300	1.53	

[a]An empty cell indicates no appropriate data was collected.
[b]Surface water available in study area for mammalian pathways.
[c]Concentration in pCi/L.
[d]Paddys Run water available for fish pathways.

TABLE B.VII-8

REPRESENTATIVE CONCENTRATION OF RADIONUCLIDES MEASURED IN VARIOUS MEDIA COLLECTED FROM PADDYS RUN OFFSITE

	Radionuclide (pCi/g)							
Sample Type	Ra-226	Ra-228	Th-228	Th-230	Th-232	U-234	U-235/236	U-238
Water[b]	a			0.300		3.00		2.70
Sediment	1.10	0.600	0.400	0.800	0.400	0.800		0.700
Benthic Macroin-vertebrates						3.57	2.17	

[a]An empty cell indicates no appropriate data was collected.
[b]Concentrations in pCi/L.

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TABLE B.VII-9

REPRESENTATIVE CONCENTRATION OF RADIONUCLIDES MEASURED IN VARIOUS MEDIA COLLECTED FROM THE GREAT MIAMI RIVER UPSTEAM OF THE EFFLUENT LINE

	Radionuclide (pCi/g)							
Sample Type	Ra-226	Ra-228	Th-228	Th-230	Th-232	U-234	U-235/236	U-238
Water[b]	2.4	a	1.5					
Sediment	0.400			1.90				0.600
Benthic Macroin-vertebrates						1.80		0.900

[a]An empty cell indicates no appropriate data was collected.
[b]Concentrations in pCi/L.

TABLE B.VII-10

REPRESENTATIVE CONCENTRATION OF RADIONUCLIDES MEASURED IN VARIOUS MEDIA COLLECTED FROM THE GREAT MIAMI RIVER BETWEEN THE EFFLUENT LINE AND THE CONFLUENCE WITH PADDYS RUN

	Radionuclide (pCi/g)								
Sample Type	Ra-226	Ra-228	Sr-90	Th-228	Th-230	Th-232	U-234	U-235/236	U-238
Water[b]	a						0.500		0.800
Sediment	0.500	0.400	0.800		2.30	0.400	1.40		1.10
Benthic Macroin-vertebrates							1.80		0.900

[a]An empty cell indicates no appropriate data was collected.
[b]Concentrations in pCi/L.

TABLE B.VII-11

REPRESENTATIVE CONCENTRATION OF RADIONUCLIDES MEASURED IN VARIOUS MEDIA COLLECTED FROM THE GREAT MIAMI RIVER AT THE CONFLUENCE WITH PADDYS RUN

	Radionuclide (pCi/g)							
Sample Type	Ra-226	Ra-228	Th-228	Th-230	Th-232	U-234	U-235/236	U-238
Water[b]	1.60			0.400		0.700		0.500
Sediment	0.400			1.10		0.700		
Benthic Macroinvertebrates						1.80		0.900

[a]An empty cell indicates no appropriate data was collected.
[b]Concentrations in pCi/L.

TABLE B.VII-12

REPRESENTATIVE CONCENTRATION OF RADIONUCLIDES MEASURED IN VARIOUS MEDIA COLLECTED FROM OFFSITE STUDY AREAS INNER CONTOUR

Sample Type	Radionuclide (pCi/g)											
	Cs-137	Ra-226	Ra-228	Sr-90	Tc-99	Th-228	Th-230	Th-232	U-234	U-235/236	Pu-239/240	U-238
Soil	0.500	1.25	0.809	0.510	1.80	1.00	1.88	0.965	7.10	0.640	0.600	7.60

[a]An empty cell indicates no appropriate data was collected.
[b]Concentrations in pCi/L.

TABLE B.VII-13

REPRESENTATIVE CONCENTRATION OF RADIONUCLIDES MEASURED IN VARIOUS MEDIA COLLECTED FROM OFFSITE STUDY AREAS OUTER CONTOUR

Sample Type	Radionuclide (pCi/g)										
	Cs-137	Ra-226	Ra-228	Sr-90	Tc-99	Th-228	Th-230	Th-232	U-234	U-235/236	U-238
Soil	[a]								1.20	0.410	1.80

[a]A blank space indicates that no appropriate data was collected.

B.VIII CALCULATION OF DOSE CONVERSION FACTORS FOR INTERNAL EXPOSURE

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B.VIII.1.0 MEADOW VOLE/WHITE-FOOTED DEER MOUSE

The dose conversion factor for inhalation is then determined by

$$DCF_{in} = \frac{(1\ pCi) \bullet (3.7 \times 10^{-2}) \bullet (8.64 \times 10^{4}) \bullet f_a \bullet e \bullet (1.6 \times 10^{-13}) \bullet (1-e^{-\lambda_{eff} \bullet t})}{m \bullet (1.0 \times 10^{-5}) \bullet (1.0 \times 10^{-3}) \bullet \lambda_{eff}}$$

Where:

DCF_{in}	=	Inhalation dose conversion factor (mrad/pCi)
f_a	=	Uptake fraction by inhalation
3.7×10^{-2}	=	Conversion factor (disintegrations per second/pCi)
8.64×10^{4}	=	Conversion factor (seconds/day)
ϵ	=	Mean energy absorbed per disintegration
1.6×10^{-13}	=	Conversion factor (joule/MeV)
λ_{eff}	=	Effective elimination constant (day^{-1})
t	=	Exposure time (365 days)
m	=	Mass of organism (gram)
1.0×10^{-5}	=	Conversion factor (J/gram per rad)
1.0×10^{-3}	=	Conversion factor (rad/mrad)

The dose conversion factor for ingestion is similarly determined by:

$$DCF_{i} = \frac{(1\ pCi) \bullet (3.7 \times 10^{-2}) \bullet (8.64 \times 10^{4}) \bullet f_w \bullet e \bullet (1.6 \times 10^{-13}) \bullet (1-e^{-\lambda_{eff} \bullet t})}{m \bullet (1.0 \times 10^{-5}) \bullet (1.0 \times 10^{-3}) \bullet \lambda_{eff}}$$

Where:

DCF_i	=	Ingestion dose conversion factor (mrad/pCi)
f_w	=	Uptake fraction by ingestion
3.7×10^{-2}	=	Conversion factor (disintegrations per second/pCi)
8.64×10^{4}	=	Conversion factor (seconds/day)
ϵ	=	Mean energy absorbed per disintegration (MeV/disintegration)
1.6×10^{-13}	=	Conversion factor (joule/MeV)
λ_{eff}	=	Effective elimination constant (day^{-1})
t	=	Exposure time (365 days)
m	=	Mass of organism (gram)
1.0×10^{-5}	=	Conversion factor (J/gram per rad)
1.0×10^{-3}	=	Conversion factor (rad/mrad)

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B.VIII.2.0 PINE TREES

The dose conversion factor is then determined by:

$$DCF_{tu} = \frac{(1\ pCi/kg) \bullet (3.7 \times 10^{-2}) \bullet (3.154 \times 10^{7}) \bullet e \bullet (1.6 \times 10^{-13})}{(1.0 \times 10^{3}) \bullet (1.0 \times 10^{-5}) \bullet (1 \times 10^{-3})}$$

where:

DCF_{tu}	=	Uptake dose conversion factor (mrad/year per pCi/kg)
3.7×10^{-2}	=	Conversion factor (disintegrations per second/pCi)
3.154×10^{7}	=	Conversion factor (second/year)
ϵ	=	Energy absorbed per disintegration (MeV/disintegration)
1.6×10^{-13}	=	Conversion factor (joule/MeV)
(1.0×10^{3})	=	Conversion factor (g/kg)
(1.0×10^{-5})	=	Conversion factor (J/gram per rad)
(1.0×10^{-3})	=	Conversion factor (rad/mrad)

B.VIII.3.0 SHINERS

The uptake dose conversion factor is then determined by:

$$DCF_{si} = \frac{(1\ pCi/kg) \bullet (3.7 \times 10^{-2}) \bullet (3.154 \times 10^{7}) \bullet e_i \bullet (1.6 \times 10^{-13})}{(1.0 \times 10^{3}) \bullet (1.0 \times 10^{-5}) \bullet (1 \times 10^{-3})}$$

where:

DCF_{si}	=	Uptake dose conversion factor (mrad/year per pCi/kg)
3.7×10^{-2}	=	Conversion factor (disintegrations per second/pCi)
3.154×10^{7}	=	Conversion factor (second/year)
ϵ_i	=	Internal energy absorbed per disintegration (MeV/disintegration)
1.6×10^{-13}	=	Conversion factor (joule/MeV)
(1.0×10^{3})	=	Conversion factor (g/kg)
(1.0×10^{-5})	=	Conversion factor (J/gram per rad)
(1.0×10^{-3})	=	Conversion factor (rad/mrad)

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TABLE B.IX-1

SUMMATION OF ABSORBED DOSE BY AREA AND PATHWAY

Species	Dose (mrad/year)	Pathway 1[a]	Pathway 2	Pathway 3	Pathway 4	Pathway 5	Pathway 6	Total[b] (mrad/y)
Area A								
Mouse	Maximum	10.8	2.35×10^{-2}	91.8	1.47×10^{3}	4.32×10^{2}	3.93	2×10^{3}
	Mean	8.35	1.43×10^{-2}	62.6	1×10^{3}	3.10×10^{2}	3.83	1.39×10^{3}
Vole	Maximum	10.8	3.58×10^{-2}	1.97×10^{2}	1.59×10^{2}	9.50×10^{2}	9.02	1.33×10^{3}
	Mean	8.35	2.17×10^{-2}	1.34×10^{2}	1.09×10^{2}	6.83×10^{2}	8.79	9.43×10^{2}
Pine Tree	Maximum	10.8	1.59×10^{2}	n/a	n/a	n/a	n/a	1.70×10^{2}
	Mean	8.35	1.35×10^{2}	n/a	n/a	n/a	n/a	1.43×10^{2}
Area B								
Mouse	Maximum	47.1	0.305	9.55×10^{2}	1.53×10^{4}	6.51×10^{2}	n/a	1.69×10^{4}
	Mean	11.5	2.26×10^{-2}	80.6	1.29×10^{3}	4.73×10^{2}	n/a	1.85×10^{3}
Vole	Maximum	47.1	0.465	2.05×10^{3}	1.66×10^{3}	1.43×10^{3}	n/a	5.19×10^{3}
	Mean	11.5	3.45×10^{-2}	1.73×10^{2}	1.40×10^{2}	1.04×10^{3}	n/a	1.37×10^{3}
Pine Tree	Maximum	47.1	4.58×10^{2}	n/a	n/a	n/a	n/a	5.05×10^{2}
	Mean	11.5	60.1	n/a	n/a	n/a	n/a	71.6
Area C								
Mouse	Maximum	3.21×10^{3}	15.6	4.63×10^{4}	7.40×10^{5}	1.26×10^{3}	n/a	7.91×10^{5}
	Mean	2.52×10^{2}	1.66	4.70×10^{3}	7.53×10^{4}	7.48×10^{2}	n/a	8.10×10^{4}
Vole	Maximum	3.21×10^{3}	23.8	9.93×10^{4}	8.04×10^{4}	2.77×10^{3}	n/a	1.86×10^{5}
	Mean	2.52×10^{2}	2.52	1.01×10^{4}	8.17×10^{3}	1.64×10^{3}	n/a	2.02×10^{4}
Pine Tree	Maximum	3.21×10^{3}	1.58×10^{4}	n/a	n/a	n/a	n/a	1.90×10^{4}
	Mean	2.52×10^{2}	1.68×10^{3}	n/a	n/a	n/a	n/a	1.93×10^{3}
Area D								
Mouse	Maximum	7.21	1.80×10^{-2}	65.1	1.04×10^{3}	3.23×10^{2}	n/a	1.44×10^{3}
	Mean	5.22	1.30×10^{-2}	47.8	7.65×10^{2}	2.28×10^{2}	n/a	1.05×10^{3}

TABLE B.IX-1 (Continued)

Species	Dose (mrad/year)	Pathway 1[a]	Pathway 2	Pathway 3	Pathway 4	Pathway 5	Pathway 6	Total[b] (mrad/y)
Vole	Maximum	7.21	2.75×10^{-2}	1.40×10^{2}	1.13×10^{2}	7.10×10^{2}	n/a	9.70×10^{2}
	Mean	5.22	1.98×10^{-2}	1.03×10^{2}	83.1	5×10^{2}	n/a	6.92×10^{2}
Pine Tree	Maximum	7.21	94.3	n/a	n/a	n/a	n/a	1.02×10^{2}
	Mean	5.22	49.8	n/a	n/a	n/a	n/a	55
Area E								
Mouse	Maximum	10.8	3.54×10^{-2}	87.9	1.41×10^{3}	2.38×10^{2}	34.7	1.78×10^{3}
	Mean	92.3	3.11×10^{-2}	82.5	1.32×10^{3}	1.19×10^{2}	30.2	1.56×10^{3}
Vole	Maximum	10.8	5.39×10^{-2}	1.89×10^{2}	1.53×10^{2}	5.04×10^{2}	40.6	8.97×10^{2}
	Mean	9.23	4.73×10^{-2}	1.77×10^{2}	1.43×10^{2}	2.61×10^{2}	35.5	6.26×10^{2}
Pine Tree	Maximum	10.8	56.1	n/a	n/a	n/a	n/a	66.9
	Mean	9.23	53.9	n/a	n/a	n/a	n/a	63.1
Area F								
Mouse	Maximum	8	1.04×10^{-2}	50.6	8.09×10^{2}	5.65×10^{2}	2.29×10^{2}	1.66×10^{3}
	Mean	7.99	9.55×10^{-3}	49.5	7.92×10^{2}	2.81×10^{2}	63.9	1.19×10^{3}
Vole	Maximum	8	1.58×10^{-2}	1.09×10^{2}	87.9	1.24×10^{3}	2.68×10^{2}	1.45×10^{3}
	Mean	7.99	1.46×10^{-2}	1.06×10^{2}	86	6.17×10^{2}	74.9	8.92×10^{2}
Pine Tree	Maximum	8	43.6	n/a	n/a	n/a	n/a	51.6
	Mean	7.99	43.2	n/a	n/a	n/a	n/a	51.2
Shiner	Maximum	awaiting	76.6	1.24×10^{-3}	83.2	n/a	n/a	1.60×10^{2}
	Mean	awaiting	42.7	5.89×10^{-4}	75.2	n/a	n/a	1.18×10^{2}
Area G								
Mouse	Maximum	38.9	4.49×10^{-2}	1.24×10^{2}	1.99×10^{3}	4.64×10^{2}	54.8	2.67×10^{3}
	Mean	5.62	1.10×10^{-2}	39.7	6.36×10^{2}	2.66×10^{2}	9.96	9.57×10^{2}
Vole	Maximum	38.9	6.84×10^{-2}	2.67×10^{2}	2.16×10^{2}	1.02×10^{3}	64.2	1.61×10^{3}
	Mean	5.62	1.68×10^{-2}	85.3	69	5.85×10^{2}	11.7	7.56×10^{2}

TABLE B.IX-1 (Continued)

Species	Dose (mrad/year)	Pathway 1[a]	Pathway 2	Pathway 3	Pathway 4	Pathway 5	Pathway 6	Total[b] (mrad/y)
Pine Tree	Maximum	38.9	1.33×10^{2}	n/a	n/a	n/a	n/a	1.72×10^{2}
	Mean	5.62	41.1	n/a	n/a	n/a	n/a	46.7
Great Miami River								
Shiner	Maximum	5.69×10^{-2}	15.8	3.54×10^{-4}	35.6	n/a	n/a	51.4
	Mean	4.45×10^{-2}	9.89	2.79×10^{-4}	33.5	n/a	n/a	43.4
Off Property Areas								
Mouse	Maximum	awaiting	3.13×10^{-2}	1.26×10^{2}	1.61×10^{3}	n/a	n/a	1.74×10^{3}
	Mean	awaiting	9.75×10^{-3}	37.9	6.07×10^{2}	n/a	n/a	6.45×10^{2}
Vole	Maximum	awaiting	4.77×10^{-2}	2.71×10^{2}	2.20×10^{2}	n/a	n/a	4.91×10^{2}
	Mean	awaiting	1.49×10^{-2}	81.4	65.9	n/a	n/a	1.47×10^{2}
Pine Tree	Maximum	awaiting	1.70×10^{2}	n/a	n/a	n/a	n/a	1.70×10^{2}
	Mean	awaiting	40.9	n/a	n/a	n/a	n/a	40.9

[a]Pathways:

Mouse & Vole
1. Direct irradiation from soil
2. Inhalation of resuspended soil
3. Ingestion of soil
4. Ingestion of insects/grubs
5. Ingestion of vegetation
6. Ingestion of water

Pine Tree
1. Direct irradiation from soil
2. Uptake from soil

Shiner
1. Direct irradiation from sediment
2. Uptake from water (all pathways)
3. Direct irradiation from immersion in water
4. Ingestion of benthic macroinvertebrates

[b]Trigger level is 3.65×10^{4} mrad/yr (IAEA, 1992).

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LIST OF ACRONYMS

AEC	U.S. Atomic Energy Commission
ARAR	applicable or relevant and appropriate requirement
ASL	analytical support level
ASTM	American Society for Testing Materials
AWWT	advanced wastewater treatment
BMP	best management practices
BSL	biodenitrification surge lagoon
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIS	Characterization Investigation Study
CLP	Contract Laboratory Program [U.S.EPA]
CMSA	Consolidated Metropolitan Statistical Area
COC	constituent of concern
COPC	constituent of potential concern
CPC	constituent of potential concern
CPID	closure plan information and data
CRDL	contract required detection limit
CWA	Clean Water Act
D&D	decontamination and decommissioning
DBH	diameter at breast height
DC	detected constituent
DFO	Director's Findings and Orders
DOE	U.S. Department of Energy
DOW	Division of Wildlife [Ohio]
DQO	data quality objective
EE/CA	engineering evaluation/cost analysis
EIS	environmental impact statement
EM	Environmental Monitoring [Program]
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act

LIST OF ACRONYMS
(continued)

ET	evapotranspiration
eV	electron volt
EWMF	Engineered Waste Management Facility
FEMP	Fernald Environmental Management Project
FERMCO	Fernald Environmental Restoration Management Corporation
FFCA	Federal Facility Compliance Agreement
FICWD	Federal Interagency Committee for Wetland Delineation
FIDLER	field instrument for detecting low energy radiation
FMPC	Feed Materials Production Center
FOC	fractional organic carbon
FR	Federal Register
FS	feasibility study
FWS	Fish and Wildlife Service
FY	fiscal year
GIS	geographical information system
GMP	groundwater monitoring plan
GO/UGMAS	glacial overburden/Great Miami Aquifer system
gpd	gallons per day
gpm	gallons per minute
HELP	Hydrolic Evaluation of Landfill Performance
HSL	Hazardous Substance List
HWMU	hazardous waste management unit
IAWWT	Interim Advanced Wastewater Treatment
IDW	investigation derived waste
ISA	Initial Screening of Alternatives
IT	IT Corporation
keV	kiloelectron volt
LRA	leading remedial alternative
MDC	minimum detectable concentration
MMI	Modified Mercalli Intensity
msl	mean sea level

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LIST OF ACRONYMS
(continued)

MUSLE	Modified Universal Soil Loss Equation
NAAQS	National Ambient Air Quality Standards
NBS	National Bureau of Standards
NEPA	National Environmental Policy Act
NFS	Nuclear Fuel Service
NISM	National Institute of Standard Measures
NLO	National Lead Company of Ohio
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPL	National Priority List
NRHP	National Register of Historic Places
NTS	Nevada Test Site
NTU	nephelometric turbidity unit
NWS	National Weather Service
OAC	Ohio Administrative Code
ODH	Ohio Department of Health
ODNR	Ohio Department of Natural Resources
OEPA	Ohio Environmental Protection Agency
ORAU	Oak Ridge Associated Universities
OSA	Ohio Administrative Code
OSP	Ohio State Planar
OU	operable unit
PAH	polynuclear aromatic hydrocarbon
PASA	Production and Additional Suspect Areas
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PET	potential evaporation transpiration
PIC	Pressurized Ionization Chamber
PP	proposed plan
PRRS	Paddys Run Road Site

LIST OF ACRONYMS
(continued)

PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
QAPP	Quality Assurance Project Plan
QC	quality control
RAGS	Risk Assessment Guidance for Superfund
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
RI/FS	Remedial Investigation/Feasibility Study
RM	river miles
RME	reasonable maximum exposure
RMI	Reactive Metals, Inc.
ROD	Record of Decision
S.R.	state route
SCQ	Sitewide CERCLA Quality Assurance Project Plan
SCS	Soil Conservation Service
SED	sitewide environmental database
SHPO	State Historic Preservation Officer
SOWC	Southwestern Ohio Water Company
SPIT	South Plume interim treatment [facility]
SSOD	storm sewer outfall ditch
STAR	stability array
SWIFT	Sandia Waste Isolation Flow and Transport
SWOAPCA	Southwestern Ohio Air Pollution Control Agency
SWRB	storm water retention basin
TAL	target analyte list
TCA	1,1,1-trichloroethane
TBC	to be considered
TCE	trichloroethene
TCLP	toxicity characteristic leaching procedure
TDS	total dissolved solid
TFV	threshold friction velocity

LIST OF ACRONYMS
(continued)

THQ	target hazard quotient
TKN	total Kjeldahl nitrogen
TLD	thermoluminescent dosimeter
TOC	total organic carbon
TON	total organic nitrogen
TOX	total organic halogens
TSIL	Task Sample Inventory List
TSS	total suspended solids
UCL	upper confidence limit
UNH	dilute uranyl/nitrate
USCS	Unified Soil Classification System
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
USLE	Universal Soil Loss Equation
UST	underground storage tank
VOC	volatile organic compound
WEMCO	Westinghouse Environmental Management Company of Ohio
WMCO	Westinghouse Materials Company of Ohio

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C.0 INTRODUCTION

Appendix C presents a detailed description of the nature and extent of contamination in surface water and sediment associated with runoff and other discharges from the Fernald Environmental Management Project (FEMP). Surface water runoff at the FEMP is grouped into two categories, controlled and uncontrolled. Controlled runoff is that which, through the completion of a series of runoff control projects, is presently collected, treated, and discharged (as FEMP effluent) to the Great Miami River through the outfall line (this process is explained in Section 1.3.1. Uncontrolled runoff is all runoff that is not collected and has the potential to flow to off-site receptors or infiltrate into the Great Miami Aquifer.

The primary uncontrolled drainage feature in the vicinity of the FEMP is the Great Miami River. All surface water runoff from FEMP property eventually flows into the Great Miami River, either as uncontrolled drainage or controlled FEMP effluent. Uncontrolled surface water flows from the FEMP through two drainages, Paddys Run and the northeast drainage ditch.

Paddys Run is the primary drainage feature on FEMP property, receiving surface water from every portion of the site except the northeast corner. Paddys Run is an intermittent stream that originates off property to the north and flows to the south along the western edge of the property, the waste storage area and the south field. Drainage sources to Paddys Run include the north drainage ditch, the pilot plant drainage ditch, the southwest drainage ditch, various drainage ditches in the South Field area, and the storm sewer outfall ditch (SSOD). After leaving the FEMP, Paddys Run flows approximately 1.5 miles south to the Great Miami River. The northeast drainage ditch originates in the northeast corner of the FEMP and flows east to the Great Miami River. It also receives runoff from the land immediately adjacent to the northeast corner of the FEMP. Details about surface water hydrology at the FEMP can be found in Section 3.3.

The nature and extent of surface water and sediment contamination will be described using data from three sources. The remedial investigation/feasibility study (RI/FS) data set, which has been validated to standards described in Section 2.1, will provide a look at the spacial distribution of a wide array of possible site-related contaminants including radionuclides, metals, and volatile and semivolatile organics. Although site Environmental Monitoring (EM) Program data are unvalidated; a large quantity of data exists and will provide a detailed illustration of temporal trends of uranium levels since 1986. Characterization Investigation Study (CIS) data are also unvalidated and will provide

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only limited data regarding uranium levels in sediment. Maximum detected values presented represent the highest value from all data sets.

The 95th percentile value calculated for the background data set is used in the following test as a benchmark for the comparison of contaminant concentrations to background in the FEMP study area, as referenced in *["CERCLA Background Soil Study" (DOE) 1993a) or "Characterization of Background Water Quality for Streams and Groundwater (DOE 1994a). Author select correct reference(s).]* The value is calculated as shown in Appendix A.II.0. Ninety-five percent of the background data set falls at or below this value. The value is often used in statistical analysis (e.g., the 95th Percentile Test) to determine whether any sample measurement from a study area exceeds background. The use of the 95th percentile background value does not constitute a formal, statistical comparison to background (e.g., the T-test or Wilcoxin Rank Sum Test), but is provided only as a point of reference. In the following discussions, for example, sampling results are frequently described as "below background" or "five times above background."

Nature and extent will be determined based on comparison to background concentrations for surface water and sediment. Data from the Great Miami River will be compared to background values established from samples collected at sampling location W-1, located approximately 1.5 miles upstream of the outfall line. Data from all other drainages will be compared to background values established from samples collected at Paddys Run sampling location W-5, located off FEMP property to the north. Determination of background concentrations is discussed in detail in Section 4.2.

C.1.0 CONTROLLED DRAINAGE AREAS

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To determine the nature and extent of contamination from surface water runoff, the RI/FS program collected surface water and sediment samples from several drainage ditches along the perimeter of the former production area and waste pit area (Figure C-1). Sediment samples were collected during July 1988, and since water was not present in the ditches at the time of the sediment sampling, surface water samples were collected during spring of 1989. Surface water and sediment samples were collected together at three locations in 1993, and sediment samples were collected at two other locations. These data are also presented in this section. Summary statistics are presented following the text; the complete data set for surface water and sediment is presented in Appendix G.

At the time of the initial sampling, many of the currently controlled sampling locations were uncontrolled; that is, surface water runoff was not collected in the storm water retention basin (SWRB) and discharged directly to the Great Miami River. Instead, it flowed to Paddys Run. Flow may have been lost to the aquifer along those drainage ditches having highly permeable channel bottoms. In the past few years, the FEMP has completed several major projects to control surface water runoff in additional areas of the site. These projects, listed below with approximate completion dates, are described in Section 1.3.4:

- Storm water retention basin: west chamber completed in 1986, east chamber completed in 1988
- Plant 1 Pad surface water control: completed in 1988
- Waste pit area runoff control — Removal Action 2: completed in July 1992
- Collect uncontrolled production area runoff — Removal Action 16: completed in August 1993

In addition, the advanced wastewater treatment facility will begin operation in 1995. This facility will use best available technology to remove uranium and other contaminants from FEMP wastewater and collected surface water runoff. This will reduce the concentration of contaminants in the FEMP effluent, which is discharged to the Great Miami River.

The following two sections summarize the RI/FS data (collected primarily in 1988 and 1989) in the former production area and waste storage area.

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C.1.1 FORMER PRODUCTION AREA

The 1988 and 1989 RI/FS sampling program collected surface water and sediment samples from drainage ditches in the following locations in the former production area:

- Southeast corner near the electrical substation
- Southwest corner near the pilot plant
- West perimeter of the Plant 1 Pad

Sampling locations ASIT-016 and ASIT-017 (southwest of the pilot plant) were controlled at the time of the RI/FS sampling in 1988. At location ASIT-015, surface water runoff was controlled by the Plant 1 pad project. The surface water flow to ASIT-014 was reduced by the Plant 1 pad project and was completely controlled by Removal Action 16. ASIT-013, ASIT-011, and ASIT-012 also became controlled locations with the completion of Removal Action 16.

C.1.1.1 Southeast Corner near the Electrical Substation

Sampling locations ASIT-011 and ASIT-012 were not in a controlled area when samples were collected in 1988 and 1989 to determine if the electrical substation was a source of contamination. The area immediately surrounding the electrical substation drained into a ditch located just south of the electrical substation. Prior to the completion of Removal Action 16 in August 1993, storm water runoff in this drainage ditch flowed east to the edge of the production area, then south, eventually entering the storm sewer outfall ditch and Paddys Run. Following the completion of Removal Action 16, the surface water runoff was directed west into the controlled storm water collection system.

Data Summary

The total uranium concentrations of the surface water and sediment samples were 555 and 517 μg/L for unfiltered surface water, and 230 and 105 mg/kg for sediment collected at ASIT-011 and ASIT-012.

C.1.1.2 Southwest Corner near the Pilot Plant

Although sampling locations ASIT-016 and ASIT-017 are located in a drainage ditch that collects runoff from the pilot plant area (Figure C-1), the surface water runoff in this area has been controlled since pre-1988 RI/FS sampling at these locations.

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Data Summary

The total uranium concentration in the unfiltered surface water sample collected in 1989 at ASIT-016 was 1464 μg/L. Sediment samples had consistent concentrations of total uranium collected at both locations in 1988 and again in 1993; levels ranged from 51.3 to 68 mg/kg. The surface water runoff from this area has been controlled, and the runoff is collected in the SWRB.

C.1.1.3 West Perimeter of Plant 1 Pad

Several drainage ditches exist immediately west of Plant 1 Pad. Prior to the completion of the Plant 1 Pad project in 1988, surface water runoff from the area flowed west over land through the waste storage area into Paddys Run. To control surface water runoff, several steps were taken: first, a curb was installed around the periphery of the pad; second, the flow in the drainage ditches was blocked or reversed; and third, new connections were made with the storm sewer system. Currently, the surface water runoff is directed to the SWRB.

Sampling point ASIT-015 was located in a drainage ditch at the northwest corner of the Plant 1 storage, and ASIT-013 and ASIT-014 were located at the western edge of the production area in drainage ditches to the south and north, respectively, of the waste storage area maintenance road. The Plant 1 pad project controlled surface water runoff at location ASIT-015, and reduced the flow to ASIT-14. Removal Action 16 completely controlled the surface water runoff at ASIT-014 and ASIT-013.

Sediment samples were collected from ASIT-013, ASIT-014 and ASIT-015 in 1988, and surface water samples were collected from the same locations in 1989. One round of surface water and sediment samples was collected from ASIT-013 and ASIT-014 in 1993.

Data Summary

The data from the surface water samples collected in 1989 from the drainage ditches west of Plant 1 pad had total uranium concentrations ranging from approximately 100 μg/L to more than 1600 μg/L. The maximum concentration of total uranium in 1993 was 540 μg/L. Total uranium concentrations in sediment, ranging from 34 to 154 mg/kg in 1988, were slightly lower in 1993 samples. Since the surface water runoff at these locations is controlled, all contaminated flow is directed to the SWRB.

C.1.1.4 Scrap Metal Pile

The scrap metal pile was located on a concrete pad in the northeast corner of the former production area. The surface water runoff from the pad was collected in a sump and flowed by gravity to the General Sump for treatment before it was discharged to the river through Manhole 175. The scrap metal was removed during 1992-1993 under Removal Action 15. One surface water sample and one sediment sample were collected downgradient of the former pile at station SMA-7 in 1993 to determine if contaminants were migrating from the area via surface water runoff.

Data Summary

The total uranium concentration in the filtered surface water sample collected in 1993 was 100 μg/L; the total uranium concentration in the sediment sample was 486 mg/kg.

C.1.2 WASTE STORAGE AREA

The waste storage area at the FEMP consists of several areas in which various types of waste are stored either in covered or open pits. Surface water runoff from the majority of the surface of Waste Pits 1, 2, and 3, as well as the entire surface of Waste Pit 5, was and continues to be collected in the clearwell. Surface water runoff from the remaining pit surfaces and the perimeter of the waste pit area flowed into Paddys Run. With the installation of ditches, curbs, and storm sewers as part of Removal Action 2, which was completed in July 1992, surface water runoff collected by Removal Action 2 is now directed to a sump located immediately south of the clearwell. The collected surface water runoff is pumped to the biodentrification surge lagoon (BSL).

In 1988 and 1989, surface water and sediment samples were collected from the various drainage ditches along the perimeter of the waste pit area to assess the amount of contamination in surface water runoff. None of the locations in the waste pit area shown on Figure C-1 were in controlled areas at the time of the sampling. Even with the completion of Removal Action 2, locations ASIT-020 and ASIT-025 are still in uncontrolled areas. However, the ditch leading to ASIT-020 was blocked by Removal Action 2, and the drainage area was collected, nearly eliminating the flow to the ASIT-020. Location ASIT-025 continues to receive surface water runoff from the eastern part of the waste pit area, but the concentrations of uranium and other contaminants are expected to be low since the Plant 1 pad project and Removal Action 2 have controlled surface water runoff from the source areas.

Data Summary

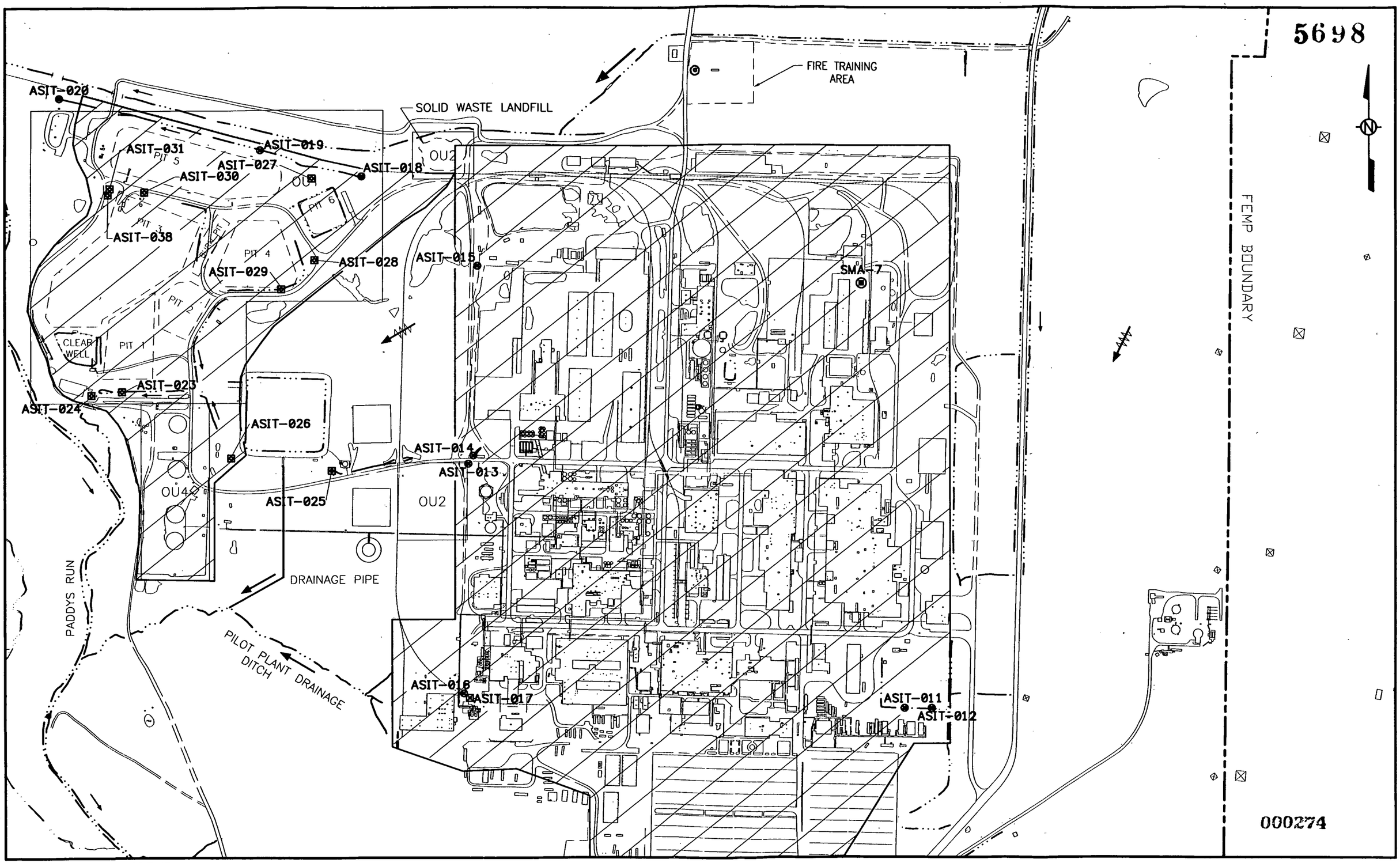
The surface water samples had concentrations of total uranium ranging from approximately 200 to over 9300 μg/L. The maximum concentration was at ASIT-027.

Sediment was collected in 1988 from just the three locations along the drainage ditch south of the railroad tracks (ASIT-018, ASIT-019, and ASIT-020). Concentrations of total uranium ranged from 20 to 135 mg/kg.

The data confirm previous sampling data (such as Best Management Practices) demonstrating that the surface water collected by Removal Action 2 contains concentrations of uranium and other contaminants which are well above background values. The complete data set is presented in Appendix G.

C.1.3 CONCLUSIONS

Data collected from the former production area and waste storage area confirmed the presence of high levels of total uranium in surface water. Although concentrations in sediment were much lower than in surface water, they were still approximately 10 to 100 times greater than background. Since this area now has controlled runoff, the amount of contamination reaching Paddys Run and the Great Miami Aquifer has been significantly reduced.



MAP2.SCR
ACAD: C:\94052010.DWG 05/25/94 RSG

LEGEND

- SURFACE WATER ONLY (RI/FS)
- SURFACE WATER AND SEDIMENT (RI/FS)
- SEDIMENT ONLY (RI/FS)
- DIRECTION OF SURFACE WATER
- GENERAL DIRECTION OF SURFACE RUNOFF
- CONTROLLED RUNOFF AREAS

SCALE
0 400 800 FEET

DRAFT

FIGURE C-1
SAMPLING LOCATIONS WITHIN THE FORMER PRODUCTION AND WASTE STORAGE AREAS

Controlled Drainage Areas

FORMER PRODUCTION AREA - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/L	2/2	2	2/2	112.00000-132.00000	122.00000			
URANIUM, TOTAL	UG/L	4/4	2	4/4	1.60000-71000.0000	433.50000			0.73
URANIUM-234	PCI/L	2/2	2	2/2	80.20000-131.00000	105.60000			1.1
THORIUM-230	PCI/L	0/1	1	0/1		0.10000	0.20000	0.20000	0.70
RADIUM-226	PCI/L	1/2	2	1/2	1.20000-1.20000	0.85000	1.00000	1.00000	ND
URANIUM-235/236	PCI/L	2/2	2	2/2	2.80000-9.70000	6.25000			0.35
THORIUM-232	PCI/L	0/1	1	0/1		0.10000	0.20000	0.20000	ND
THORIUM, TOTAL	UG/L	2/2	1	2/2	0.91200-1.34000	1.12600			ND
RADIUM-228	PCI/L	0/2	2	0/2		1.50000	3.00000	3.00000	2.1
THORIUM-228	PCI/L	0/1	1	0/1		0.15000	0.30000	0.30000	ND
GROSS ALPHA	PCI/L	2/3	0	2/3	111.00000-297.00000	111.00000	130.00000	130.00000	3.7
GROSS BETA	PCI/L	2/3	0	2/3	66.30000-185.00000	185.00000	410.00000	410.00000	6.8

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SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/L	3/3	3	2/3	0.09730-1.51000	0.76900			0.640
ANTIMONY	MG/L	1/3	3	1/3	0.00710-0.00710	0.00700	0.01400	0.01400	ND
ARSENIC	MG/L	0/3	3	0/3		0.00100	0.00200	0.00200	ND
BARIUM	MG/L	3/3	3	0/3	0.03260-0.04450	0.03490			0.0534
BERYLLIUM	MG/L	0/3	3	0/3		0.00250	0.00200	0.00500	ND
CADMIUM	MG/L	0/3	3	0/3		0.00250	0.00500	0.00500	ND
CALCIUM	MG/L	3/3	3	0/3	40.50000-50.40000	45.30000			107
CHROMIUM	MG/L	0/3	3	0/3		0.00300	0.00600	0.01000	ND
COBALT	MG/L	0/3	3	0/3		0.00850	0.01000	0.01700	ND
COPPER	MG/L	0/3	3	0/3		0.00450	0.00900	0.01000	ND
CYANIDE	MG/L	1/3	3	1/3	0.01340-0.01340	0.00250	0.00500	0.00500	ND
IRON	MG/L	2/3	3	2/3	0.77300-2.28000	0.77300	0.02000	0.02000	0.513
LEAD	MG/L	2/3	3	2/3	0.00440-0.03660	0.00440	0.00200	0.00200	ND
MAGNESIUM	MG/L	3/3	3	0/3	0.17100-8.45000	6.95000			27.8
MANGANESE	MG/L	2/3	3	1/3	0.03200-0.09240	0.03200	0.01000	0.01000	0.035
MERCURY	MG/L	0/3	3	0/3		0.00005	0.00010	0.00020	ND
MOLYBDENUM	MG/L	0/3	3	0/3		0.00850	0.01700	0.02000	ND
NICKEL	MG/L	0/3	3	0/3		0.00900	0.01800	0.02000	ND
POTASSIUM	MG/L	3/3	3	1/3	2.05000-9.36000	3.36000			3.58
SELENIUM	MG/L	0/1	1	0/1		0.00100	0.00200	0.00200	ND
SILICON	MG/L	3/3	3	3/3	4.80000-10.80000	5.82000			3.36
SILVER	MG/L	0/1	1	0/1		0.00500	0.01000	0.01000	ND

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FOR[illegible] PRODUCTION AREA - 1993
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Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
SODIUM	MG/L	3/3	3	2/3	11.50000-216.00000	29.40000			18.2
THALLIUM	MG/L	0/3	3	0/3		0.00050	0.00100	0.00200	ND
VANADIUM	MG/L	1/3	3	1/3	0.02590-0.02590	0.01200	0.01000	0.02400	ND
ZINC	MG/L	1/3	3	1/3	0.10300-0.10300	0.00300	0.00500	0.00600	ND

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FORMER PRODUCTION AREA - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
1,1,1-TRICHLOROETHANE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
1,1,2,2-TETRACHLOROETHANE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
1,1,2-TRICHLOROETHANE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
1,1-DICHLOROETHANE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
1,1-DICHLOROETHENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
1,2-DICHLOROETHANE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
1,2-DICHLOROETHENE (TOTAL)	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
1,2-DICHLOROPROPANE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
2-BUTANONE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
2-HEXANONE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
4-METHYL-2-PENTANONE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
ACETONE	UG/L	1/3	3	1/3	5.00000-5.00000	5.00000	10.00000	14.00000	
BENZENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
BROMODICHLOROMETHANE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
BROMOFORM		0/3	3	0/3		5.00000	10.00000	10.00000	
BROMOMETHANE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
CARBON DISULFIDE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
CARBON TETRACHLORIDE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
CHLOROBENZENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
CHLOROETHANE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
CHLOROFORM	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
CHLOROMETHANE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	

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FORMER PRODUCTION AREA - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
CIS-1,3-DICHLOROPROPENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
DIBROMOCHLOROMETHANE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
ETHYLBENZENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
METHYLENE CHLORIDE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
STYRENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
TETRACHLOROETHENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
TOLUENE	UG/L	1/3	3	1/3	2.00000-2.00000	5.00000	10.00000	10.00000	
TRANS-1,3-DICHLOROPROPENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
TRICHLOROETHENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
VINYL ACETATE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
VINYL CHLORIDE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
XYLENES, TOTAL	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	

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SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
1,2,4-TRICHLOROBENZENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
1,2-DICHLOROBENZENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
1,3-DICHLOROBENZENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
1,4-DICHLOROBENZENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
2,4,5-TRICHLOROPHENOL	UG/L	0/3	3	0/3		12.50000	25.00000	50.00000	
2,4,6-TRICHLOROPHENOL	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
2,4-DICHLOROPHENOL	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
2,4-DIMETHYLPHENOL	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
2,4-DINITROPHENOL	UG/L	0/3	3	0/3		12.50000	25.00000	50.00000	
2,4-DINITROTOLUENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
2,6-DINITROTOLUENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
2-CHLORONAPHTHALENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
2-CHLOROPHENOL	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
2-METHYLNAPHTHALENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
2-METHYLPHENOL	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
2-NITROANILINE	UG/L	0/3	3	0/3		12.50000	25.00000	50.00000	
2-NITROPHENOL	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
3,3'-DICHLOROBENZIDINE	UG/L	0/3	3	0/3		5.00000	10.00000	20.00000	
3-NITROANILINE	NONE	0/3	3	0/3		12.50000	25.00000	50.00000	
4,6-DINITRO-2-METHYLPHENOL	UG/L	0/3	3	0/3		12.50000	25.00000	50.00000	
4-BROMOPHENYL PHENYL ETHER	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
4-CHLORO-3-METHYLPHENOL	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	

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SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
4-CHLOROPHENYLPHENYL ETHER	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
4-METHYLPHENOL	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
4-NITROANILINE	UG/L	0/3	3	0/3		12.50000	25.00000	50.00000	
4-NITROPHENOL	UG/L	0/2	2	0/2		18.75000	25.00000	50.00000	
ACENAPHTHENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
ACENAPHTHYLENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
ANTHRACENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
BENZO(A)ANTHRACENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
BENZO(A)PYRENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
BENZO(B)FLUORANTHENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
BENZO(G,H,I)PERYLENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
BENZO(K)FLUORANTHENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
BENZOIC ACID	UG/L	0/1	1	0/1		25.00000	50.00000	50.00000	
BENZYL ALCOHOL	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
BIS(2-CHLOROETHOXY)METHANE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
BIS(2-CHLOROETHYL)ETHER	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
BIS(2-CHLOROISOPROPYL) ETHER	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
BIS(2-ETHYLHEXYL)PHTHALATE	UG/L	2/3	3	2/3	6.00000-18.00000	6.00000	10.00000	10.00000	
BUTYL BENZYL PHTHALATE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
CARBAZOLE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
CHRYSENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
DI-N-BUTYL PHTHALATE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	

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FORMER PRODUCTION AREA - 1993
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Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
DI-N-OCTYL PHTHALATE	UG/L	1/3	3	1/3	2.00000-2.00000	5.00000	10.00000	10.00000	
DIBENZO(A,H)ANTHRACENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
DIBENZOFURAN	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
DIETHYL PHTHALATE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
DIMETHYL PHTHALATE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
FLUORANTHENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
FLUORENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
HEXACHLOROBENZENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
HEXACHLOROBUTADIENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
HEXACHLOROCYCLOPENTADIENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
HEXACHLOROETHANE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
INDENO(1,2,3-CD)PYRENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
ISOPHORONE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
N-NITROSO-DI-N-PROPYLAMINE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
N-NITROSODIPHENYLAMINE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
NAPHTHALENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
NITROBENZENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
P-CHLOROANILINE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
PENTACHLOROPHENOL	UG/L	0/3	3	0/3		12.50000	25.00000	50.00000	
PHENANTHRENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
PHENOL	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
PYRENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	

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FORMER PRODUCTION AREA - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
TRIBUTYL PHOSPHATE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	

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FORMER PRODUCTION AREA - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
PESTICIDES									
4,4'-DDD	UG/L	0/1	1	0/1		0.05000	0.10000	0.10000	
4,4'-DDE	UG/L	0/1	1	0/1		0.05000	0.10000	0.10000	
4,4'-DDT	UG/L	0/1	1	0/1		0.05000	0.10000	0.10000	
ALDRIN	UG/L	0/1	1	0/1		0.02500	0.05000	0.05000	
ALPHA-BHC	UG/L	0/1	1	0/1		0.02500	0.05000	0.05000	
ALPHA-CHLORDANE	UG/L	0/1	1	0/1		0.25000	0.50000	0.50000	
AROCLOR-1016	UG/L	0/1	1	0/1		0.25000	0.50000	0.50000	
AROCLOR-1221	UG/L	0/1	1	0/1		0.25000	0.50000	0.50000	
AROCLOR-1232	UG/L	0/1	1	0/1		0.25000	0.50000	0.50000	
AROCLOR-1242	UG/L	0/1	1	0/1		0.25000	0.50000	0.50000	
AROCLOR-1248	UG/L	0/1	1	0/1		0.25000	0.50000	0.50000	
AROCLOR-1254	UG/L	0/1	1	0/1		0.50000	1.00000	1.00000	
AROCLOR-1260	UG/L	0/1	1	0/1		0.50000	1.00000	1.00000	
BETA-BHC	UG/L	0/1	1	0/1		0.02500	0.05000	0.05000	
DELTA-BHC	UG/L	0/1	1	0/1		0.02500	0.05000	0.05000	
DIELDRIN	UG/L	0/1	1	0/1		0.05000	0.10000	0.10000	
ENDOSULFAN II	UG/L	0/1	1	0/1		0.05000	0.10000	0.10000	
ENDOSULFAN SULFATE	UG/L	0/1	1	0/1		0.05000	0.10000	0.10000	
ENDOSULFAN-I	UG/L	0/1	1	0/1		0.02500	0.05000	0.05000	
ENDRIN	UG/L	0/1	1	0/1		0.05000	0.10000	0.10000	
ENDRIN KETONE	UG/L	0/1	1	0/1		0.05000	0.10000	0.10000	
GAMMA-BHC (LINDANE)	UG/L	0/1	1	0/1		0.02500	0.05000	0.05000	

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SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
PESTICIDES									
GAMMA-CHLORDANE	UG/L	0/1	1	0/1		0.25000	0.50000	0.50000	
HEPTACHLOR	UG/L	0/1	1	0/1		0.02500	0.05000	0.05000	
HEPTACHLOR EPOXIDE	UG/L	0/1	1	0/1		0.02500	0.05000	0.05000	
METHOXYCHLOR	UG/L	0/1	1	0/1		0.25000	0.50000	0.50000	
TOXAPHENE	UG/L	0/1	1	0/1		0.50000	1.00000	1.00000	

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SURFACE WATER DATA - UNFILTERED

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		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
GENERAL CHEMISTRY									
ALKALINITY AS CACO3	MG/L	2/2	2	0/2	44.00000-88.00000	66.00000			342
AMMONIA	MG/L	0/2	2	0/2		0.01500	0.03000	0.03000	0.0387
CHLORIDE	MG/L	2/2	2	1/2	13.70000-36.70000	25.20000			31.6
FLUORIDE	MG/L	2/2	2	2/2	0.90000-1.07000	0.98500			0.22
NITRATE/NITRITE	MG/L	2/2	2	2/2	0.69600-1.81000	1.25300			
PHENOLS	UG/L	0/2	2	0/2		0.00250	0.00500	0.00500	ND
PHOSPHATE	MG/L	2/2	2	2/2	0.21900-0.35000	0.28450			
SULFATE	MG/L	2/2	2	1/2	51.00000-90.80000	70.90000			55.7
SULFIDE	MG/L	0/2	2	0/2		0.50000	1.00000	1.00000	ND
TOTAL KJELDAHL NITROGEN	MG/L	2/2	2	2/2	0.37200-0.50900	0.44050			0.288
TOTAL ORGANIC CARBON	MG/L	2/2	2	1/2	3.63000-7.54000	5.58500			5.35
TOTAL ORGANIC HALIDES	MG/L	2/2	2	2/2	0.01630-0.02110	0.01870			0.011
TOTAL ORGANIC NITROGEN	MG/L	2/2	2	2/2	0.37200-0.50900	0.44050			0.288

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FORMER PRODUCTION AREA - 1993
SURFACE WATER DATA - FILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/L	2/2	2	2/2	36.40000-78.10000	57.25000			0.50
URANIUM, TOTAL	UG/L	4/4	3	4/4	100.00000-502.00000	348.00000			1.1
URANIUM-234	PCI/L	2/2	2	2/2	33.00000-54.30000	43.65000			0.70
THORIUM-230	PCI/L	0/2	2	0/2		0.10000	0.20000	0.20000	0.28
RADIUM-226	PCI/L	1/3	3	1/3	1.10000-1.10000	0.60000	1.00000	1.20000	ND
URANIUM-235/236	PCI/L	2/2	2	2/2	1.54000-3.40000	2.47000			ND
THORIUM-232	PCI/L	0/2	2	0/2		0.10000	0.20000	0.20000	ND
THORIUM, TOTAL	UG/L	1/1	0	1/1	0.91205-0.91205	0.91205			ND
RADIUM-228	PCI/L	0/3	3	0/3		1.50000	3.00000	3.00000	ND
THORIUM-228	PCI/L	2/2	2	2/2	0.40000-0.50000	0.45000			ND
NEPTUNIUM-237	PCI/L	0/1	1	0/1		0.25000	0.50000	0.50000	0.42
PLUTONIUM-239/240	PCI/L	0/1	1	0/1		0.25000	0.50000	0.50000	0.29
PLUTONIUM-238	PCI/L	0/1	1	0/1		0.25000	0.50000	0.50000	ND
STRONTIUM-90	PCI/L	0/1	1	0/1		0.50000	1.00000	1.00000	0.86
TECHNETIUM-99	PCI/L	1/1	1	1/1	16.25000-16.25000	16.25000			ND
RUTHENIUM-106	PCI/L	0/1	1	0/1		75.00000	150.00000	150.00000	ND
CESIUM-137	PCI/L	0/1	1	0/1		10.00000	20.00000	20.00000	3.9
GROSS ALPHA	PCI/L	3/3	0	3/3	102.00000-280.00000	127.00000			5.3
GROSS BETA	PCI/L	3/3	0	3/3	51.00000-2147.00000	160.00000			5.8

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FORMER PRODUCTION AREA - 1993
SURFACE WATER DATA - FILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/L	0/1	1	0/1		0.08050	0.16100	0.16100	0.132
ANTIMONY	MG/L	0/1	1	0/1		0.00700	0.01400	0.01400	ND
ARSENIC	MG/L	0/1	1	0/1		0.00100	0.00200	0.00200	ND
BARIUM	MG/L	1/1	1	0/1	0.02820-0.02820	0.02820			0.0526
BERYLLIUM	MG/L	0/1	1	0/1		0.00250	0.00500	0.00500	ND
CADMIUM	MG/L	0/1	1	0/1		0.00250	0.00500	0.00500	ND
CALCIUM	MG/L	1/1	1	0/1	46.90000-46.90000	46.90000			107
CHROMIUM	MG/L	0/1	1	0/1		0.00300	0.00600	0.00600	ND
COBALT	MG/L	0/1	1	0/1		0.00850	0.01700	0.01700	ND
COPPER	MG/L	0/1	1	0/1		0.00450	0.00900	0.00900	ND
CYANIDE	MG/L	0/1	1	0/1		0.00250	0.00500	0.00500	ND
IRON	MG/L	0/1	1	0/1		0.03600	0.07200	0.07200	ND
LEAD	MG/L	1/1	1	1/1	0.00330-0.00330	0.00330			ND
MAGNESIUM	MG/L	1/1	1	0/1	6.95000-6.95000	6.95000			27.7
MANGANESE	MG/L	1/1	1	0/1	0.00400-0.00400	0.00400			0.0257
MERCURY	MG/L	0/1	1	0/1		0.00005	0.00010	0.00010	ND
MOLYBDENUM	MG/L	0/1	1	0/1		0.00850	0.01700	0.01700	ND
NICKEL	MG/L	0/1	1	0/1		0.00900	0.01800	0.01800	ND
POTASSIUM	MG/L	1/1	1	0/1	2.01000-2.01000	2.01000			3.50
SILICON	MG/L	1/1	1	1/1	4.22000-4.22000	4.22000			3.01
SODIUM	MG/L	1/1	1	0/1	12.70000-12.70000	12.70000			18.3
THALLIUM	MG/L	0/1	1	0/1		0.00050	0.00100	0.00100	ND

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FORM PRODUCTION AREA - 1993
SURFACE WATER DATA - FILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
VANADIUM	MG/L	0/1	1	0/1		0.01200	0.02400	0.02400	ND
ZINC	MG/L	0/1	1	0/1		0.00300	0.00600	0.00600	ND

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FPRMER PRODUCTION AREA - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/L	5/5	5	5/5	37.00000-385.00000	177.00000			0.73
URANIUM, TOTAL	UG/L	6/6	6	6/6	112.00000-1464.00000	593.50000			1.1
URANIUM-234	PCI/L	5/5	5	5/5	32.60000-403.00000	133.00000			0.70
THORIUM-230	PCI/L	0/5	5	0/5		0.50000	1.00000	1.00000	ND
RADIUM-226	PCI/L	1/6	6	1/6	16.30000-16.30000	0.50000	1.00000	1.00000	0.35
URANIUM-235/236	PCI/L	5/5	5	5/5	1.60000-37.50000	7.40000			ND
THORIUM-232	PCI/L	0/5	5	0/5		0.50000	1.00000	1.00000	ND
RADIUM-228	PCI/L	1/6	6	1/6	127.20000-127.20000	1.50000	3.00000	3.00000	2.1
THORIUM-228	PCI/L	0/5	5	0/5		0.50000	1.00000	1.00000	ND
NEPTUNIUM-237	PCI/L	0/5	5	0/5		0.50000	1.00000	1.00000	NA
PLUTONIUM-239/240	PCI/L	0/5	5	0/5		0.50000	1.00000	1.00000	0.093
PLUTONIUM-238	PCI/L	0/5	5	0/5		0.50000	1.00000	1.00000	ND
STRONTIUM-90	PCI/L	0/5	5	0/5		2.50000	5.00000	5.00000	0.96
TECHNETIUM-99	PCI/L	2/5	5	2/5	44.90000-75.40000	15.00000	30.00000	30.00000	ND
GROSS ALPHA	PCI/L	1/1	0	1/1	1791.00000-1791.00000	1791.00000			3.7
GROSS BETA	PCI/L	1/1	0	1/1	662.00000-662.00000	662.00000			6.8

FORMER PRODUCTION AREA - 1988/89
SURFACE WATER DATA - FILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/L	5/5	5	5/5	43.30000-452.00000	177.00000			0.50
URANIUM, TOTAL	UGI/L	6/6	6	6/6	103.00000-1612.00000	541.50000			1.1
URANIUM-234	PCI/L	5/5	5	5/5	34.80000-465.00000	128.00000			0.70
THORIUM-230	PCI/L	0/5	5	0/5		0.50000	1.00000	1.00000	0.28
RADIUM-226	PCI/L	0/6	6	0/6		0.50000	1.00000	1.00000	ND
URANIUM-235/236	PCI/L	5/5	5	5/5	1.80000-22.70000	6.60000			ND
THORIUM-232	PCI/L	0/5	5	0/5		0.50000	1.00000	1.00000	ND
RADIUM-228	PCI/L	0/6	6	0/6		1.50000	3.00000	3.00000	ND
THORIUM-228	PCI/L	0/5	5	0/5		0.50000	1.00000	1.00000	ND
NEPTUNIUM-237	PCI/L	0/5	5	0/5		0.50000	1.00000	1.00000	0.42
PLUTONIUM-239/240	PCI/L	0/5	5	0/5		0.50000	1.00000	1.00000	0.29
PLUTONIUM-238	PCI/L	0/5	5	0/5		0.50000	1.00000	1.00000	ND
STRONTIUM-90	PCI/L	0/5	5	0/5		2.50000	5.00000	5.00000	0.86
TECHNETIUM-99	PCI/L	1/5	5	1/5	68.30000-68.30000	15.00000	30.00000	30.00000	ND
GROSS ALPHA	PCI/L	1/1	0	1/1	716.00000-716.00000	716.00000			5.3
GROSS BETA	PCI/L	1/1	0	1/1	177.00000-177.00000	177.00000			5.8

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AREA: FORMER PRODUCTION AREA - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/G	5/5	5	5/5	4.600-158.000	6.900			
URANIUM, TOTAL	MG/KG	10/10	4	10/10	3.600-486.000	58.350			1.67
URANIUM-234	PCI/G	5/5	5	5/5	4.100-116.000	7.200			
THORIUM-230	PCI/G	5/5	5	5/5	2.900-8.500	4.800			
RADIUM-226	PCI/G	5/5	4	2/5	0.700-9.400	0.700			1.93
URANIUM-235/236	PCI/G	5/5	5	5/5	0.200-8.560	0.200			
THORIUM-232	PCI/G	5/5	5	5/5	0.600-9.550	0.600			
THORIUM, TOTAL	MG/KG	5/6	1	5/6	5.472-51.000	22.345	87.000	87.000	
RADIUM-228	PCI/G	3/5	4	3/5	3.400-11.100	0.250	0.500	0.500	ND
THORIUM-228	PCI/G	5/5	5	5/5	0.600-9.900	1.100			
NEPTUNIUM-237	PCI/G	0/1	0	0/1		0.100	0.200	0.200	
PLUTONIUM-238	PCI/G	1/1	1	1/1	4.850-4.850	4.850			
STRONTIUM-90	PCI/G	1/1	0	1/1	3.240-3.240	3.240			
TECHNETIUM-99	PCI/G	1/1	0	1/1	1.830-1.830	1.830			
RUTHENIUM-106	PCI/G	0/1	0	0/1		0.600	1.200	1.200	
CESIUM-137	PCI/G	1/1	0	1/1	0.456-0.456	0.456			
GROSS ALPHA	PCI/G	3/3	0	3/3	38.000-289.000	43.000			
GROSS BETA	PCI/G	2/3	0	2/3	23.000-237.000	17.500	35.000	35.000	

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AREA: FORMER PRODUCTION AREA - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/KG	5/6	6	5/6	2490.000-10200.000	8795.000	0.046	0.046	1970
ANTIMONY	MG/KG	0/5	5	0/5		1.600	0.014	4.700	
ARSENIC	MG/KG	5/6	6	3/6	3.500-9.100	6.500	0.002	0.002	7
BARIUM	MG/KG	6/6	6	5/6	0.028-134.000	76.150			21
BERYLLIUM	MG/KG	2/6	6	2/6	1.400-1.500	0.700	0.005	1.700	0.50
CADMIUM	MG/KG	0/2	2	0/2		0.247	0.005	0.980	3.7
CALCIUM	MG/KG	6/6	6	5/6	43.900-146000.000	95150.000			25900
CHROMIUM	MG/KG	5/6	6	4/6	14.700-27.800	18.900	0.006	0.006	18.3
COBALT	MG/KG	5/6	6	4/6	2.400-11.800	9.750	0.017	0.017	4.9
COPPER	MG/KG	5/6	6	5/6	21.000-61.600	26.100	0.009	0.009	10.8
CYANIDE	MG/KG	0/6	6	0/6		0.148	0.005	0.420	
IRON	MG/KG	5/6	6	5/6	17300.000-19200.000	17550.000	0.083	0.083	6700
LEAD	MG/KG	6/6	6	6/6	0.004-95.700	42.950			
MAGNESIUM	MG/KG	6/6	6	4/6	6.050-30100.000	22400.000			18300
MANGANESE	MG/KG	6/6	6	4/6	0.008-791.000	691.500			411
MERCURY	MG/KG	0/6	6	0/6		0.048	0.000	0.210	ND
MOLYBDENUM	MG/KG	1/6	6	1/6	5.000-5.000	2.250	0.017	5.700	ND
NICKEL	MG/KG	5/6	6	4/6	12.600-23.500	18.550	0.018	0.018	13.7
POTASSIUM	MG/KG	6/6	6	4/6	3.250-2220.000	1595.000			307
SELENIUM	MG/KG	0/1	1	0/1		0.215	0.430	0.430	ND
SILICON	MG/KG	6/6	6	6/6	3.860-2830.000	1024.500			

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AREA: FORMER PRODUCTION AREA - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
SILVER	MG/KG	1/5	5	1/5	5.600-5.600	0.145	0.230	0.330	ND
SODIUM	MG/KG	6/6	6	2/6	30.700-382.000	128.500			197
THALLIUM	MG/KG	0/6	6	0/6		0.133	0.001	0.430	ND
VANADIUM	MG/KG	5/6	6	5/6	12.600-32.900	25.950	0.024	0.024	12.4
ZINC	MG/KG	5/6	6	5/6	83.300-231.000	113.500	0.006	0.006	13.5

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AREA: FORMER PRODUCTION AREA - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
1,1,1-TRICHLOROETHANE	UG/KG	0/5	5	0/5		5.500	11.000	17.000	
1,1,2,2-TETRACHLOROETHANE	UG/KG	0/5	5	0/5		8.500	11.000	17.000	
1,1,2-TRICHLOROETHANE	UG/KG	0/5	5	0/5		5.500	11.000	17.000	
1,1-DICHLOROETHANE	UG/KG	0/5	5	0/5		8.500	11.000	17.000	
1,1-DICHLOROETHENE	UG/KG	0/5	5	0/5		5.500	11.000	17.000	
1,2-DICHLOROETHANE	UG/KG	0/5	5	0/5		8.500	11.000	17.000	
1,2-DICHLOROETHENE (TOTAL)	UG/KG	0/5	5	0/5		5.500	11.000	17.000	
1,2-DICHLOROPROPANE	UG/KG	0/5	5	0/5		8.500	11.000	17.000	
2-BUTANONE	UG/KG	0/5	5	0/5		8.500	11.000	17.000	
2-HEXANONE	UG/KG	0/5	5	0/5		5.500	11.000	17.000	
4-METHYL-2-PENTANONE	UG/KG	0/5	5	0/5		8.500	11.000	17.000	
ACETONE	UG/KG	0/5	5	0/5		8.500	11.000	17.000	
BENZENE	UG/KG	0/5	5	0/5		8.500	11.000	17.000	
BROMODICHLOROMETHANE	UG/KG	0/5	5	0/5		5.500	11.000	17.000	
BROMOFORM	UG/KG	0/5	5	0/5		7.500	11.000	17.000	
BROMOMETHANE	UG/KG	0/5	5	0/5		5.500	11.000	17.000	
CARBON DISULFIDE	UG/KG	0/5	5	0/5		5.500	11.000	17.000	
CARBON TETRACHLORIDE	UG/KG	0/5	5	0/5		7.500	11.000	17.000	
CHLOROBENZENE	UG/KG	0/5	5	0/5		8.500	11.000	17.000	
CHLOROETHANE	UG/KG	0/5	5	0/5		5.500	11.000	17.000	
CHLOROFORM	UG/KG	0/5	5	0/5		7.500	11.000	17.000	

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AREA: FORMER PRODUCTION AREA - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
CHLOROMETHANE	UG/KG	0/5	5	0/5		5.500	11.000	17.000	
CIS-1,3-DICHLOROPROPENE	UG/KG	0/5	5	0/5		7.500	11.000	17.000	
DIBROMOCHLOROMETHANE	UG/KG	0/5	5	0/5		5.500	11.000	17.000	
ETHYLBENZENE	UG/KG	1/5	5	1/5	3.000-3.000	8.500	11.000	17.000	
METHYLENE CHLORIDE	UG/KG	1/5	5	1/5	2.000-2.000	7.500	11.000	17.000	
STYRENE	UG/KG	0/5	5	0/5		8.500	11.000	17.000	
TETRACHLOROETHENE	UG/KG	0/5	5	0/5		5.500	11.000	17.000	
TOLUENE	UG/KG	0/5	5	0/5		5.500	11.000	17.000	
TRANS-1,3-DICHLOROPROPENE	UG/KG	0/5	5	0/5		7.500	11.000	17.000	
TRICHLOROETHENE	UG/KG	0/5	5	0/5		7.500	11.000	17.000	
VINYL ACETATE	UG/KG	0/5	5	0/5		8.500	11.000	17.000	
VINYL CHLORIDE	UG/KG	0/5	5	0/5		5.500	11.000	17.000	
XYLENES, TOTAL	UG/KG	1/5	5	1/5	4.000-4.000	8.500	11.000	17.000	

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AREA: FORMER PRODUCTION AREA - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
1,2,4-TRICHLOROBENZENE	UG/KG	0/5	5	0/5		280.000	380.000	560.000	
1,2-DICHLOROBENZENE	UG/KG	0/5	5	0/5		190.000	380.000	560.000	
1,3-DICHLOROBENZENE	UG/KG	0/5	5	0/5		190.000	380.000	560.000	
1,4-DICHLOROBENZENE	UG/KG	0/5	5	0/5		280.000	380.000	560.000	
2,4,5-TRICHLOROPHENOL	UG/KG	0/5	5	0/5		475.000	950.000	2100.000	
2,4,6-TRICHLOROPHENOL	UG/KG	0/5	5	0/5		280.000	380.000	560.000	
2,4-DICHLOROPHENOL	UG/KG	0/5	5	0/5		190.000	380.000	560.000	
2,4-DIMETHYLPHENOL	UG/KG	0/5	5	0/5		280.000	380.000	560.000	
2,4-DINITROPHENOL	UG/KG	0/5	5	0/5		475.000	950.000	2100.000	
2,4-DINITROTOLUENE	UG/KG	0/5	5	0/5		280.000	380.000	560.000	
2,6-DINITROTOLUENE	UG/KG	0/5	5	0/5		190.000	380.000	560.000	
2-CHLORONAPHTHALENE	UG/KG	0/5	5	0/5		190.000	380.000	560.000	
2-CHLOROPHENOL	UG/KG	0/5	5	0/5		280.000	380.000	560.000	
2-METHYLNAPHTHALENE	UG/KG	0/5	5	0/5		280.000	380.000	560.000	
2-METHYLPHENOL	UG/KG	0/5	5	0/5		190.000	380.000	560.000	
2-NITROANILINE	UG/KG	0/5	5	0/5		700.000	950.000	2100.000	
2-NITROPHENOL	UG/KG	0/5	5	0/5		190.000	380.000	560.000	
3,3'-DICHLOROBENZIDINE	UG/KG	0/5	5	0/5		280.000	380.000	870.000	
3-NITROANILINE	NONE	0/5	5	0/5		475.000	950.000	2100.000	
4,6-DINITRO-2-METHYLPHENOL	UG/KG	0/5	5	0/5		700.000	950.000	2100.000	
4-BROMOPHENYL PHENYL ETHER	UG/KG	0/5	5	0/5		190.000	380.000	560.000	

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AREA: FORMER PRODUCTION AREA - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
4-CHLORO-3-METHYLPHENOL	UG/KG	0/5	5	0/5		280.000	380.000	560.000	
4-CHLOROPHENYLPHENYL ETHER	UG/KG	0/5	5	0/5		190.000	380.000	560.000	
4-METHYLPHENOL	UG/KG	0/5	5	0/5		190.000	380.000	560.000	
4-NITROANILINE	UG/KG	0/5	5	0/5		700.000	950.000	2100.000	
4-NITROPHENOL	UG/KG	0/5	5	0/5		475.000	950.000	2100.000	
ACENAPHTHENE	UG/KG	0/5	5	0/5		280.000	380.000	560.000	
ACENAPHTHYLENE	UG/KG	0/5	5	0/5		190.000	380.000	560.000	
ANTHRACENE	UG/KG	1/5	5	1/5	130.000-130.000	280.000	380.000	560.000	
BENZO(A)ANTHRACENE	UG/KG	4/5	5	4/5	68.000-660.000	68.000	440.000	440.000	
BENZO(A)PYRENE	UG/KG	3/5	5	3/5	61.000-1400.000	330.000	380.000	440.000	
BENZO(B)FLUORANTHENE	UG/KG	4/5	5	4/5	110.000-1800.000	110.000	440.000	440.000	
BENZO(G,H,I)PERYLENE	UG/KG	2/5	5	2/5	480.000-2600.000	2600.000	380.000	440.000	
BENZO(K)FLUORANTHENE	UG/KG	4/5	5	4/5	66.000-1200.000	66.000	440.000	440.000	
BENZOIC ACID	UG/KG	0/1	1	0/1		1050.000	2100.000	2100.000	
BENZYL ALCOHOL	UG/KG	0/1	1	0/1		220.000	440.000	440.000	
BIS(2-CHLOROETHOXY)METHANE	UG/KG	0/5	5	0/5		245.000	380.000	560.000	
BIS(2-CHLOROETHYL)ETHER	UG/KG	0/5	5	0/5		190.000	380.000	560.000	
BIS(2-CHLOROISOPROPYL) ETHER	UG/KG	0/5	5	0/5		280.000	380.000	560.000	
BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	2/5	5	2/5	63.000-560.000	190.000	380.000	560.000	
BUTYL BENZYL PHTHALATE	UG/KG	0/5	5	0/5		280.000	380.000	560.000	
CARBAZOLE	UG/KG	0/4	4	0/4		220.000	380.000	560.000	

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AREA: FORMER PRODUCTION AREA - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
CHRYSENE	UG/KG	5/5	5	5/5	62.000-1100.000	120.000			
DI-N-BUTYL PHTHALATE	UG/KG	2/5	5	2/5	78.000-550.000	550.000	390.000	560.000	
DI-N-OCTYL PHTHALATE	UG/KG	0/5	5	0/5		245.000	380.000	560.000	
DIBENZO(A,H)ANTHRACENE	UG/KG	1/5	5	1/5	280.000-280.000	190.000	380.000	560.000	
DIBENZOFURAN	UG/KG	0/5	5	0/5		280.000	380.000	560.000	
DIETHYL PHTHALATE	UG/KG	0/5	5	0/5		1250.000	440.000	3700.000	
DIMETHYL PHTHALATE	UG/KG	0/5	5	0/5		190.000	380.000	560.000	
FLUORANTHENE	UG/KG	5/5	5	5/5	150.000-1300.000	160.000			
FLUORENE	UG/KG	0/5	5	0/5		245.000	380.000	560.000	
HEXACHLOROBENZENE	UG/KG	0/5	5	0/5		190.000	380.000	560.000	
HEXACHLOROBUTADIENE	UG/KG	0/5	5	0/5		280.000	380.000	560.000	
HEXACHLOROCYCLOPENTADIENE	UG/KG	0/5	5	0/5		190.000	380.000	560.000	
HEXACHLOROETHANE	UG/KG	0/5	5	0/5		245.000	380.000	560.000	
INDENO(1,2,3-CD)PYRENE	UG/KG	2/5	5	2/5	460.000-2300.000	190.000	380.000	440.000	
ISOPHORONE	UG/KG	0/5	5	0/5		190.000	380.000	560.000	
N-NITROSO-DI-N-PROPYLAMINE	UG/KG	0/5	5	0/5		280.000	380.000	560.000	
N-NITROSODIPHENYLAMINE	UG/KG	0/5	5	0/5		190.000	380.000	560.000	
NAPHTHALENE	UG/KG	0/5	5	0/5		245.000	380.000	560.000	
NITROBENZENE	UG/KG	0/5	5	0/5		280.000	380.000	560.000	
P-CHLOROANILINE	UG/KG	0/5	5	0/5		190.000	380.000	560.000	
PENTACHLOROPHENOL	UG/KG	0/5	5	0/5		475.000	950.000	2100.000	

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AREA: FORMER PRODUCTION AREA - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
PHENANTHRENE	UG/KG	5/5	5	5/5	62.000-380.000	380.000			
PHENOL	UG/KG	0/5	5	0/5		190.000	380.000	560.000	
PYRENE	UG/KG	5/5	5	5/5	110.000-1300.000	140.000			
TRIBUTYL PHOSPHATE	UG/KG	0/1	1	0/1		220.000	440.000	440.000	

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AREA: FORMER PRODUCTION AREA - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
PESTICIDES									
4,4'-DDD	UG/KG	0/1	1	0/1		21.000	42.000	42.000	
4,4'-DDE	UG/KG	0/1	1	0/1		21.000	42.000	42.000	
4,4'-DDT	UG/KG	0/1	1	0/1		21.000	42.000	42.000	
ALDRIN	UG/KG	0/1	1	0/1		10.500	21.000	21.000	
ALPHA-BHC	UG/KG	0/1	1	0/1		10.500	21.000	21.000	
ALPHA-CHLORDANE	UG/KG	0/1	1	0/1		105.000	210.000	210.000	
AROCLOR-1016	UG/KG	0/1	1	0/1		105.000	210.000	210.000	
AROCLOR-1221	UG/KG	0/1	1	0/1		105.000	210.000	210.000	
AROCLOR-1232	UG/KG	0/1	1	0/1		105.000	210.000	210.000	
AROCLOR-1242	UG/KG	0/1	1	0/1		105.000	210.000	210.000	
AROCLOR-1248	UG/KG	0/1	1	0/1		105.000	210.000	210.000	
AROCLOR-1254	UG/KG	1/1	1	1/1	1800.000-1800.000	1800.000			
AROCLOR-1260	UG/KG	0/1	1	0/1		210.000	420.000	420.000	
BETA-BHC	UG/KG	0/1	1	0/1		10.500	21.000	21.000	
DELTA-BHC	UG/KG	0/1	1	0/1		10.500	21.000	21.000	
DIELDRIN	UG/KG	0/1	1	0/1		21.000	42.000	42.000	
ENDOSULFAN II	UG/KG	0/1	1	0/1		21.000	42.000	42.000	
ENDOSULFAN SULFATE	UG/KG	0/1	1	0/1		21.000	42.000	42.000	
ENDOSULFAN-I	UG/KG	0/1	1	0/1		10.500	21.000	21.000	
ENDRIN	UG/KG	0/1	1	0/1		21.000	42.000	42.000	
ENDRIN KETONE	UG/KG	0/1	1	0/1		21.000	42.000	42.000	

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AREA: FORMER PRODUCTION AREA - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
PESTICIDES									
GAMMA-BHC (LINDANE)	UG/KG	0/1	1	0/1		10.500	21.000	21.000	
GAMMA-CHLORDANE	UG/KG	0/1	1	0/1		105.000	210.000	210.000	
HEPTACHLOR	UG/KG	0/1	1	0/1		10.500	21.000	21.000	
HEPTACHLOR EPOXIDE	UG/KG	0/1	1	0/1		10.500	21.000	21.000	
METHOXYCHLOR	UG/KG	0/1	1	0/1		105.000	210.000	210.000	
TOXAPHENE	UG/KG	0/1	1	0/1		210.000	420.000	420.000	

AREA: FORMER PRODUCTION AREA - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM, TOTAL	MG/KG	7/7	7	7/7	34.000-230.000	154.000			1.67
RADIUM-226	PCI/G	7/7	7	5/7	1.400-10.600	10.600			1.93
RADIUM-228	PCI/G	7/7	7	7/7	0.600-21.700	0.600			ND
GROSS ALPHA	PCI/G	7/7	0	7/7	18.000-259.000	91.000			
GROSS BETA	PCI/G	7/7	0	7/7	20.000-207.000	108.000			

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WASTE STORAGE AREA - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/L	8/8	8	8/8	2.90000-2840.00000	219.50000			0.73
URANIUM, TOTAL	UG/L	15/15	15	15/15	8.00000-9318.00000	930.00000			1.1
URANIUM-234	PCI/L	8/8	8	8/8	1.60000-653.00000	74.75000			0.70
THORIUM-230	PCI/L	0/8	8	0/8		0.50000	1.00000	1.00000	ND
RADIUM-226	PCI/L	2/15	15	2/15	1.10000-3.40000	0.50000	1.00000	1.00000	0.35
URANIUM-235/236	PCI/L	7/8	8	7/8	3.40000-51.50000	5.80000	1.00000	1.00000	ND
THORIUM-232	PCI/L	0/8	8	0/8		0.50000	1.00000	1.00000	ND
THORIUM, TOTAL	UG/L	0/1	1	0/1		1.00000	2.00000	2.00000	ND
RADIUM-228	PCI/L	2/15	15	2/15	4.20000-10.90000	1.50000	3.00000	3.00000	2.1
THORIUM-228	PCI/L	0/8	8	0/8		0.50000	1.00000	1.00000	ND
NEPTUNIUM-237	PCI/L	0/8	8	0/8		0.50000	1.00000	1.00000	NA
PLUTONIUM-239/240	PCI/L	0/8	8	0/8		0.50000	1.00000	1.00000	0.093
PLUTONIUM-238	PCI/L	0/8	8	0/8		0.50000	1.00000	1.00000	ND
STRONTIUM-90	PCI/L	0/8	8	0/8		2.50000	5.00000	5.00000	0.96
TECHNETIUM-99	PCI/L	4/8	8	4/8	36.90000-206.00000	25.95000	30.00000	30.00000	ND
GROSS ALPHA	PCI/L	7/7	0	7/7	78.00000-2872.00000	1300.00000			3.7
GROSS BETA	PCI/L	7/7	0	7/7	32.00000-1496.00000	1100.00000			6.8

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WASTE STORAGE AREA - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/L	3/3	3	0/3	0.23200-0.39500	0.38300			0.640
ANTIMONY	MG/L	0/3	3	0/3		0.00100	0.00200	0.00200	ND
ARSENIC	MG/L	0/3	3	0/3		0.00100	0.00200	0.00200	ND
BARIUM	MG/L	3/3	3	2/3	0.04720-0.05720	0.05460			0.0534
BERYLLIUM	MG/L	2/3	3	2/3	0.00150-0.00170	0.00150	0.00080	0.00080	ND
CADMIUM	MG/L	2/3	3	2/3	0.00520-0.00560	0.00520	0.00380	0.00380	ND
CALCIUM	MG/L	3/3	3	0/3	72.20000-89.00000	78.50000			107
CHROMIUM	MG/L	2/3	3	2/3	0.04520-0.05250	0.04520	0.01990	0.01990	ND
COBALT	MG/L	2/3	3	2/3	0.00780-0.00970	0.00780	0.00210	0.00210	ND
COPPER	MG/L	2/3	3	2/3	0.02280-0.03110	0.02280	0.01680	0.01680	ND
CYANIDE	MG/L	0/3	3	0/3		0.00500	0.01000	0.01000	ND
IRON	MG/L	3/3	3	0/3	0.14700-0.33400	0.16800			0.513
LEAD	MG/L	0/3	3	0/3		0.00100	0.00200	0.00400	ND
MAGNESIUM	MG/L	3/3	3	1/3	23.60000-28.80000	24.90000			27.8
MANGANESE	MG/L	3/3	3	2/3	0.02420-0.13500	0.12700			0.035
MERCURY	MG/L	2/3	3	2/3	0.00060-0.00060	0.00060	0.00020	0.00020	ND
MOLYBDENUM	MG/L	2/3	3	2/3	0.04910-0.06260	0.04910	0.00300	0.00300	ND
NICKEL	MG/L	3/3	3	3/3	0.01040-0.02040	0.01660			ND
POTASSIUM	MG/L	3/3	3	1/3	1.52000-3.85000	3.38000			3.58
SELENIUM	MG/L	0/3	3	0/3		0.00100	0.00200	0.00200	ND
SILVER	MG/L	0/3	3	0/3		0.00025	0.00050	0.00050	ND
SODIUM	MG/L	3/3	3	2/3	5.27000-32.60000	27.30000			18.2

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WASTE STORAGE AREA - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
THALLIUM	MG/L	0/3	3	0/3		0.00100	0.00200	0.00400	ND
VANADIUM	MG/L	3/3	3	3/3	0.01260-0.02750	0.02340			ND
ZINC	MG/L	3/3	3	3/3	0.01020-0.02370	0.01470			ND

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WASTE STORAGE AREA - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
1,1,1-TRICHLOROETHANE	UG/L	0/3	3	0/3		2.50000	5.00000	5.00000	
1,1,2,2-TETRACHLOROETHANE	UG/L	0/3	3	0/3		2.50000	5.00000	5.00000	
1,1,2-TRICHLOROETHANE	UG/L	0/3	3	0/3		2.50000	5.00000	5.00000	
1,1-DICHLOROETHANE	UG/L	0/3	3	0/3		2.50000	5.00000	5.00000	
1,1-DICHLOROETHENE	UG/L	0/3	3	0/3		2.50000	5.00000	5.00000	
1,2-DICHLOROETHANE	UG/L	0/3	3	0/3		2.50000	5.00000	5.00000	
1,2-DICHLOROETHENE (TOTAL)	UG/L	0/3	3	0/3		2.50000	5.00000	5.00000	
1,2-DICHLOROPROPANE	UG/L	0/3	3	0/3		2.50000	5.00000	5.00000	
2-BUTANONE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
2-HEXANONE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
4-METHYL-2-PENTANONE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
ACETONE	UG/L	0/1	1	0/1		2.00000	4.00000	4.00000	
BENZENE	UG/L	0/3	3	0/3		2.50000	5.00000	5.00000	
BROMODICHLOROMETHANE	UG/L	0/3	3	0/3		2.50000	5.00000	5.00000	
BROMOFORM		0/3	3	0/3		2.50000	5.00000	5.00000	
BROMOMETHANE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
CARBON DISULFIDE	UG/L	0/3	3	0/3		2.50000	5.00000	5.00000	
CARBON TETRACHLORIDE	UG/L	0/3	3	0/3		2.50000	5.00000	5.00000	
CHLOROBENZENE	UG/L	0/3	3	0/3		2.50000	5.00000	5.00000	
CHLOROETHANE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
CHLOROFORM	UG/L	0/3	3	0/3		2.50000	5.00000	5.00000	
CHLOROMETHANE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	

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WASTE STORAGE AREA - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
CIS-1,3-DICHLOROPROPENE	UG/L	0/3	3	0/3		2.50000	5.00000	5.00000	
DIBROMOCHLOROMETHANE	UG/L	0/3	3	0/3		2.50000	5.00000	5.00000	
ETHYLBENZENE	UG/L	0/3	3	0/3		2.50000	5.00000	5.00000	
METHYLENE CHLORIDE	UG/L	0/3	3	0/3		2.50000	5.00000	5.00000	
STYRENE	UG/L	0/3	3	0/3		2.50000	5.00000	5.00000	
TETRACHLOROETHENE	UG/L	0/3	3	0/3		2.50000	5.00000	5.00000	
TOLUENE	UG/L	0/3	3	0/3		2.50000	5.00000	5.00000	
TRANS-1,3-DICHLOROPROPENE	UG/L	0/3	3	0/3		2.50000	5.00000	5.00000	
TRICHLOROETHENE	UG/L	0/3	3	0/3		2.50000	5.00000	5.00000	
VINYL ACETATE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
VINYL CHLORIDE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
XYLENES, TOTAL	UG/L	0/3	3	0/3		2.50000	5.00000	5.00000	

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WASTE STORAGE AREA - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
1,2,4-TRICHLOROBENZENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
1,2-DICHLOROBENZENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
1,3-DICHLOROBENZENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
1,4-DICHLOROBENZENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
2,4,5-TRICHLOROPHENOL	UG/L	0/3	3	0/3		25.00000	50.00000	50.00000	
2,4,6-TRICHLOROPHENOL	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
2,4-DICHLOROPHENOL	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
2,4-DIMETHYLPHENOL	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
2,4-DINITROPHENOL	UG/L	0/3	3	0/3		25.00000	50.00000	50.00000	
2,4-DINITROTOLUENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
2,6-DINITROTOLUENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
2-CHLORONAPHTHALENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
2-CHLOROPHENOL	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
2-METHYLNAPHTHALENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
2-METHYLPHENOL	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
2-NITROANILINE	UG/L	0/3	3	0/3		25.00000	50.00000	50.00000	
2-NITROPHENOL	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
3,3'-DICHLOROBENZIDINE	UG/L	0/3	3	0/3		10.00000	20.00000	20.00000	
3-NITROANILINE	NONE	0/1	1	0/1		25.00000	50.00000	50.00000	
4,6-DINITRO-2-METHYLPHENOL	UG/L	0/3	3	0/3		25.00000	50.00000	50.00000	
4-BROMOPHENYL PHENYL ETHER	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
4-CHLORO-3-METHYLPHENOL	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	

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WASTE STORAGE AREA - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
4-CHLOROPHENYLPHENYL ETHER	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
4-METHYLPHENOL	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
4-NITROANILINE	UG/L	0/3	3	0/3		25.00000	50.00000	50.00000	
4-NITROPHENOL	UG/L	0/3	3	0/3		25.00000	50.00000	50.00000	
ACENAPHTHENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
ACENAPHTHYLENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
ANTHRACENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
BENZO(A)ANTHRACENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
BENZO(A)PYRENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
BENZO(B)FLUORANTHENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
BENZO(G,H,I)PERYLENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
BENZO(K)FLUORANTHENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
BENZOIC ACID	UG/L	0/3	3	0/3		25.00000	50.00000	50.00000	
BENZYL ALCOHOL	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
BIS(2-CHLOROETHOXY)METHANE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
BIS(2-CHLOROETHYL)ETHER	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
BIS(2-CHLOROISOPROPYL) ETHER	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
BIS(2-ETHYLHEXYL)PHTHALATE	UG/L	0/3	3	0/3		5.00000	4.00000	10.00000	
BUTYL BENZYL PHTHALATE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
CHRYSENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
DI-N-BUTYL PHTHALATE	UG/L	1/3	3	1/3	3.00000-3.00000	5.00000	10.00000	10.00000	
DI-N-OCTYL PHTHALATE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	

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WASTE STORAGE AREA - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
DIBENZO(A,H)ANTHRACENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
DIBENZOFURAN	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
DIETHYL PHTHALATE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
DIMETHYL PHTHALATE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
FLUORANTHENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
FLUORENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
HEXACHLOROBENZENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
HEXACHLOROBUTADIENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
HEXACHLOROCYCLOPENTADIENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
HEXACHLOROETHANE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
INDENO(1,2,3-CD)PYRENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
ISOPHORONE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
N-NITROSO-DI-N-PROPYLAMINE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
N-NITROSODIPHENYLAMINE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
NAPHTHALENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
NITROBENZENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
P-CHLOROANILINE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
PENTACHLOROPHENOL	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
PHENANTHRENE	UG/L	0/3	3	0/3		25.00000	50.00000	50.00000	
PHENOL	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
PYRENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	

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WASTE STORAGE AREA - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
PESTICIDES									
4,4'-DDD	UG/L	0/3	3	0/3		0.05000	0.10000	0.10000	
4,4'-DDE	UG/L	0/3	3	0/3		0.05000	0.10000	0.10000	
4,4'-DDT	UG/L	0/3	3	0/3		0.05000	0.10000	0.10000	
ALDRIN	UG/L	0/3	3	0/3		0.02500	0.05000	0.05000	
ALPHA-BHC	UG/L	0/3	3	0/3		0.02500	0.05000	0.05000	
ALPHA-CHLORDANE	UG/L	0/3	3	0/3		0.25000	0.50000	0.50000	
AROCLOR-1016	UG/L	0/3	3	0/3		0.25000	0.50000	0.50000	
AROCLOR-1221	UG/L	0/3	3	0/3		0.25000	0.50000	0.50000	
AROCLOR-1232	UG/L	0/3	3	0/3		0.25000	0.50000	0.50000	
AROCLOR-1242	UG/L	0/3	3	0/3		0.25000	0.50000	0.50000	
AROCLOR-1248	UG/L	0/3	3	0/3		0.25000	0.50000	0.50000	
AROCLOR-1254	UG/L	0/3	3	0/3		0.50000	1.00000	1.00000	
AROCLOR-1260	UG/L	0/3	3	0/3		0.50000	1.00000	1.00000	
BETA-BHC	UG/L	0/3	3	0/3		0.02500	0.05000	0.05000	
DELTA-BHC	UG/L	0/3	3	0/3		0.02500	0.05000	0.05000	
DIELDRIN	UG/L	0/3	3	0/3		0.05000	0.10000	0.10000	
ENDOSULFAN II	UG/L	0/3	3	0/3		0.05000	0.10000	0.10000	
ENDOSULFAN SULFATE	UG/L	0/3	3	0/3		0.05000	0.10000	0.10000	
ENDOSULFAN-I	UG/L	0/3	3	0/3		0.02500	0.05000	0.05000	
ENDRIN	UG/L	0/3	3	0/3		0.05000	0.10000	0.10000	
ENDRIN KETONE	UG/L	0/3	3	0/3		0.05000	0.10000	0.10000	
GAMMA-BHC (LINDANE)	UG/L	0/3	3	0/3		0.02500	0.05000	0.05000	

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WASTE STORAGE AREA - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections						
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
PESTICIDES									
GAMMA-CHLORDANE	UG/L	0/3	3	0/3		0.25000	0.50000	0.50000	
HEPTACHLOR	UG/L	0/3	3	0/3		0.02500	0.05000	0.05000	
HEPTACHLOR EPOXIDE	UG/L	0/3	3	0/3		0.02500	0.05000	0.05000	
METHOXYCHLOR	UG/L	0/3	3	0/3		0.25000	0.50000	0.50000	
TOXAPHENE	UG/L	0/3	3	0/3		0.50000	1.00000	1.00000	

WASTE STORAGE AREA - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
ORGANOPHOSPHORUS PESTICIDES									
AZINPHOSMETHYL	UG/L	0/3	3	0/3		250.00000	500.00000	500.00000	
DEMETON	UG/L	0/3	3	0/3		125.00000	250.00000	250.00000	
DIAZINON	UG/L	0/3	3	0/3		125.00000	250.00000	250.00000	
DISULFOTON	UG/L	0/3	3	0/3		125.00000	250.00000	250.00000	
ETHION	UG/L	0/3	3	0/3		125.00000	250.00000	250.00000	
MALATHION	UG/L	0/3	3	0/3		125.00000	250.00000	250.00000	
METHYL PARATHION	UG/L	0/3	3	0/3		125.00000	250.00000	250.00000	
PARATHION	UG/L	0/3	3	0/3		125.00000	250.00000	250.00000	

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WASTE STORAGE AREA - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
GENERAL CHEMISTRY									
AMMONIA	MG/L	1/3	3	1/3	0.12130-0.12130	0.05000	0.10000	0.10000	0.0387
CHLORIDE	MG/L	3/3	3	2/3	7.00000-60.00000	49.00000			31.6
FLUORIDE	MG/L	3/3	3	3/3	0.44000-0.85000	0.85000			0.22
NITRATE	MG/L	3/3	3	3/3	2.30000-10.90000	9.73000			1.66
PHENOLS	UG/L	0/3	3	0/3		0.00500	0.01000	0.01000	ND
PHOSPHORUS	MG/L	3/3	3	2/3	0.11000-0.40000	0.25000			0.228
SULFATE	MG/L	3/3	3	3/3	120.00000-129.00000	123.00000			55.7
TOTAL KJELDAHL NITROGEN	MG/L	3/3	3	3/3	0.70850-1.02300	0.74520			0.288
TOTAL ORGANIC HALIDES	MG/L	3/3	3	3/3	0.01500-0.02920	0.01610			0.011
TOTAL ORGANIC NITROGEN	MG/L	3/3	3	3/3	0.62400-1.02000	0.70800			0.288

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WASTE STORAGE AREA - 1988/89
SURFACE WATER DATA - FILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/L	7/8	8	7/8	165.00000-2548.00000	216.00000	1.00000	1.00000	0.50
URANIUM, TOTAL	UG/L	15/15	15	15/15	2.00000-8148.00000	944.00000			1.1
URANIUM-234	PCI/L	7/8	8	7/8	44.00000-514.00000	73.10000	1.00000	1.00000	0.70
THORIUM-230	PCI/L	0/8	8	0/8		0.50000	1.00000	1.00000	0.28
RADIUM-226	PCI/L	1/15	15	1/15	3.40000-3.40000	0.50000	1.00000	1.00000	ND
URANIUM-235/236	PCI/L	7/8	8	7/8	4.30000-43.80000	5.95000	1.00000	1.00000	ND
THORIUM-232	PCI/L	0/8	8	0/8		0.50000	1.00000	1.00000	ND
THORIUM, TOTAL	UG/L	0/1	1	0/1		1.00000	2.00000	2.00000	ND
RADIUM-228	PCI/L	2/15	15	2/15	3.60000-5.70000	1.50000	3.00000	3.10000	ND
THORIUM-228	PCI/L	0/8	8	0/8		0.50000	1.00000	1.00000	ND
NEPTUNIUM-237	PCI/L	0/8	8	0/8		0.50000	1.00000	1.00000	0.42
PLUTONIUM-239/240	PCI/L	0/8	8	0/8		0.50000	1.00000	1.00000	0.29
PLUTONIUM-238	PCI/L	0/8	8	0/8		0.50000	1.00000	1.00000	ND
STRONTIUM-90	PCI/L	0/8	8	0/8		2.50000	5.00000	5.00000	0.86
TECHNETIUM-99	PCI/L	5/8	8	5/8	34.90000-175.00000	38.10000	30.00000	30.00000	ND
GROSS ALPHA	PCI/L	7/7	0	7/7	124.00000-5129.00000	870.00000			5.3
GROSS BETA	PCI/L	7/7	0	7/7	52.00000-1352.00000	590.00000			5.8

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AREA: WASTE STORAGE AREA - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM, TOTAL	MG/KG	3/3	3	3/3	20.000-135.000	39.000			1.67
RADIUM-226	PCI/G	3/3	3	0/3	0.900-1.100	1.100			1.93
RADIUM-228	PCI/G	3/3	3	3/3	0.900-1.300	1.300			ND
GROSS ALPHA	PCI/G	3/3	0	3/3	16.000-38.000	38.000			
GROSS BETA	PCI/G	2/3	0	2/3	38.000-67.000	38.000	31.000	31.000	

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C.2.0 PADDYS RUN AND ASSOCIATED DRAINAGES

Paddys Run is the primary drainage feature on FEMP property. With the exception of the northeast corner of the site, Paddys Run receives all uncontrolled runoff through a series of drainage ditches that drain various areas of the site. The drainage ditches are the north drainage ditch, the pilot plant drainage ditch, the southwest drainage ditch, drainage ditches in the South Field, and the storm sewer outfall ditch (SSOD) and its drainage sources. Paddys Run facilitates both the off-property migration of contaminants via the surface water pathway and the migration of contaminants to the Great Miami Aquifer by way of infiltration through portions of the creek that have eroded onto aquifer sands.

This section describes the nature and extent of contamination in Paddys Run surface water and sediment by first describing the nature and extent of contamination in surface water and sediment in the source drainages. The focus of the discussion then turns to the nature and extent of contamination in surface water and sediment in Paddys Run as it is impacted by the contributing drainages.

C.2.1 NORTH DRAINAGE DITCH

The drainage area north of the former production area consists of a series of ditches and swales that receive surface water runoff from much of the northern portion of FEMP property (Figure C-2). Potential sources of contamination within the drainage system include the fire training area, Solid Waste Landfill, and contaminated surface soils as a result of airborne deposition. The north drainage ditch flows west immediately north of the former production area and waste storage area and eventually drains to Paddys Run at a point immediately north of the railroad track. Three RI/FS investigations sampled sediment and surface water in the drainage system to assess the impact of suspected contaminant releases from the fire training area and the Solid Waste Landfill, as well as assess potential impacts on water quality in Paddys Run. Data for the north drainage ditch were also provided by the CIS investigation for sediments.

Samples were primarily for the RI/FS during the 1988/1989 sampling program, the Operable Unit 5 work plan addendum program, and the 1993 Operable Unit 2 investigation. Figure C-3 shows the stations that were sampled: ASIT-021, ASIT-022, SWL-SW-01, SWL-SD-01, and FT-1. ASIT-021 is located in the drainage ditch immediately north of the solid waste landfill. ASIT-022 is located approximately 100 yards downstream to the west. SWL-SW-01 and SWL-SD-01 are located immediately adjacent to the Solid Waste Landfill. One additional sediment sample was collected from

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location FT-1, located approximately 100 yards upstream on the Solid Waste Landfill. Complete analytical results are listed in Appendix G.

Surface Water

Surface water samples were collected in 1993 at locations SWL-SW-01 and SWL-SW-02. Samples were analyzed for unfiltered radionuclides, inorganics (unfiltered at SWL-SW-01 and filtered at SWL-SW-02), semivolatile and volatile organic compounds (VOCs), pesticides, and general water quality parameters.

As shown on Figure C-2, unfiltered total uranium was detected at 46.1 and 59.3 μg/L at SWL-SW-01 and SWL-SW-02, respectively, possibly indicating a slight contribution of uranium from the solid waste landfill. However, during the Operable Unit 2 RI/FS investigation, a surface water sample was collected approximately 50 feet from the Solid Waste Landfill in a location that contributed surface runoff to the north drainage ditch. The sample was analyzed at the onsite laboratory for total uranium and showed a concentration of 70 μg/L, indicating that the Solid Waste Landfill may not be the only source of uranium contamination in the ditch.

Manganese was the only metal to be detected at greater than two times background in the unfiltered sample from SWL-SW-01. It was likewise the only metal detected at greater than two times background in the filtered sample from SWL-SW-02.

Semivolatile bis(2-ethylhexyl)phthalate was detected at 1 μg/L, at SWL-SW-01.

Sediment

Sediment samples were collected at SWL-SD-01 and SWL-SD-02 during the 1993 Operable Unit 2 RI/FS field program in order to examine the effects, if any, of the Solid Waste Landfill on sediment being deposited in the north drainage ditch. A sediment sample was collected from FT-1 during the Operable Unit 5 work plan addendum to examine the effects, if any, of the fire training area on sediments being deposited in the north drainage ditch. Sampling locations are shown on Figure C-5.

Total uranium was detected above background at all three locations at concentrations ranging from 14.7 to 30.9 mg/kg. The highest concentration was detected at FT-1, farthest upstream of the Solid Waste Landfill. The next highest concentration was encountered at the downstream location

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SWL-SD-02. Other radionuclides detected at SWL-SD-01 include neptunium-237 and thorium isotopes. Strontium-90 was detected at SWL-SD-02.

Metals detected in sediments at greater than two times background were aluminum, barium, calcium, cobalt, iron, manganese, molybdenum, potassium, silver, vanadium, and zinc.

Twelve semivolatiles were detected at FT-1. Concentrations ranged from 140 to 390 mg/kg. All of the semivolatiles detected at FT-1 were also detected at SWL-SD-02 with the exception of benzoic acid. Concentrations ranged from 53 to 1400 mg/kg. Total semivolatiles were 2500 mg/kg at FT-1 and 6553 mg/kg at SWL-SD-02. Pyrene at 58 mg/kg was the only semivolatile detected at SWL-SD-02.

Two volatiles, acetone and 1,1-dichloroethane with concentrations of 110 and 3 mg/kg, respectively, were detected at FT-1. Only acetone at 2 mg/kg was detected at SWL-SD-02. No volatiles were detected at SWL-SD-01.

Data Summary

The primary contaminant of concern in surface water in the north drainage ditch is uranium. 1988/89 RI/FS data showed total uranium levels ranging from 46.1 to 92 μg/L with the highest value downstream of the Solid Waste Landfill. The difference in the sampling locations makes comparison difficult; however, it appears that total uranium levels in surface water in the ditch have remained consistent over time.

According to the Operable Unit 2 RI report, the contaminants present in the sediment and surface water were similar to the contaminants found in the surface soil in the area of the Solid Waste Landfill.

- Sediment samples contained semivolatiles, typically PAHs, at concentrations that significantly exceeded detection limits. These PAHs were similar to those detected in the soils at the fire training area.
- A comparison between the concentrations of radionuclides in sediment samples from the 1988/1989 sampling round and the 1993 sampling round indicated minimal temporal variations.

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- Inorganic constituents in the sediment samples were similar to those present in the solid waste landfill (Operable Unit 2 Draft Remedial Investigation, January 14, 1994, p. 43).

The impact of surface water runoff from this area on Paddys Run is discussed in Section C.2.6.

C.2.2 PILOT PLANT DRAINAGE DITCH

The pilot plant drainage ditch flows west into Paddys Run (Figure C-3) from approximately 400 feet west of the pilot plant. This ditch collects surface water runoff from areas around the pilot plant and the open fields west of the pilot plant. In addition, a drain pipe that was installed as part of Removal Action 2 empties into the ditch about midway to Paddys Run. Drainage in this culvert originates just south of the BSL and carries surface runoff from the eastern, uncontrolled portion of the waste storage area. No obvious sources of contamination exist within the area physically drained by the pilot plant drainage ditch; however, at the head of the ditch, a storm sewer pipe discharges continuously to the ditch. This pipe originates south of the pilot plant and carries runoff from the pilot plant area.

Surface water in the drainage ditch was sampled to characterize the nature and extent of contamination in the drainage ditch. In addition, numerous seeps observed along the north bank of the drainage ditch were sampled to determine the contribution, if any, the seeps were making to the contamination in the drainage ditch. In addition, surface water samples were collected from three drainage ditch locations, and one sample from the drainage pipe at midstream (PP-DD-02) (see Figure C-3). Sediment samples were collected in 1988 as part of the RI/FS investigation and in 1986 during the CIS investigation.

Seep Data

Samples were collected from nine seeps, as shown on Figure C-3. Samples, which were initially collected unfiltered and filtered, were analyzed on site for total uranium. Seep 2 was then sampled a second time for filtered and unfiltered HSL inorganics, volatile and semivolatile organics, and general water quality.

Total uranium concentrations ranged from 7.1 to 34 μg/L for unfiltered samples and 4.7 to 24 μg/L for filtered samples. The maximum unfiltered and filtered concentrations were detected at Seeps 3 and 2, respectively.

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Additional analytical data from Seep 2 indicated that the following parameters were detected at concentrations greater than 2 times background concentrations for surface water: ammonia, aluminum, barium, chromium, iron, magnesium, manganese, silicon, and vanadium. Bis(2-ethylhexyl)phthalate and tetrachloroethene were also detected, but at very low concentrations.

Surface Water

Surface water samples were collected at locations PP-DD-01, PP-DD-02, PP-DD-03, and PP-DD-04 during the 1993 RI/FS investigation. Since PP-DD-02 was collected directly from the end of the drain pipe that carries water from south of the BSL to the drainage ditch, it will not be discussed when referencing the quality of water in the ditch. Samples were collected and analyzed for unfiltered and filtered radionuclides, filtered and unfiltered HSL inorganics, volatile and semivolatile organics, and general water quality parameters.

Total uranium was detected in samples at all locations in the ditch at concentrations ranging from 703 to 2890 μg/L in unfiltered samples. The highest results were encountered at the most upstream location, PP-DD-04. Figure C-3 shows the highest unfiltered total uranium concentration detected at each location. The figure also shows that uranium levels decrease downstream. The FEMP environmental monitoring program collected weekly samples from W-10DD, located near PP-DD-01. Total uranium results for the 1993 data set ranged from 1.7 to 1600 mg/kg. The average concentration was 566 μg/L.

In addition, the sample collected from PP-DD-02 showed total uranium at 110 μg/L for unfiltered samples, indicating that the drain pipe is a relatively minor contributor to uranium in the drainage ditch. It is important to note, however, that the uranium levels in the water at PP-DD-02 are significantly higher than background.

Metals detected at concentrations greater than five times background were aluminum, iron, manganese, and silicon. Also, the following VOCs were detected: 2-hexanone and 4-methyl-2-pentanone at PP-DD-03; tetrachloroethene and trichloroethene at PP-DD-03 and PP-DD-04; and 1,1,1-trichloroethane, 1,1-dichloroethane, and 1,2-dichloroethane (total) at PP-DD-04.

Above-background concentrations of the general water quality parameters were detected in surface water in the drainage ditch: ammonia, nitrate, total Kjeldahl nitrogen, and total organic halogens.

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Most notable were maximum concentrations detected for total organic halides, ammonia, and sulfate. The highest concentration for all of these parameters was detected at PP-DD-04 (the data show a total organic halogen concentration of 15.6 mg/L at PP-DD-01, which is four orders of magnitude higher than background). This value is not consistent with the absence of volatile or semivolatile compounds and is therefore considered an outlier.

Sediment Data

No sediment samples were collected in the drainage ditch in 1993. One sediment sample was collected in 1988 at ASIT-010 as part of the early RI/FS investigation. The sample was analyzed for total uranium, radium-226, radium-228, gross alpha and beta, metals, organic chemicals, and general chemistry parameters. The CIS program collected 18 sediment samples along the entire length of the ditch. These samples were analyzed for uranium-238, radium-226, thorium-232, ruthenium-106, and cesium-137.

Total uranium was detected in the RI/FS sample at a concentration of 30 mg/kg. Radium-226 was detected only slightly above background at 0.67 pCi/g. Radium-228 was detected at 0.9 pCi/g.

Uranium-238 was detected in 18 of 18 CIS samples, with activity levels ranging from 2.9 to 16.3 pCi/g. Thorium-232 was also detected in all 18 samples. Ruthenium-106 and cesium-137 were each detected in 12 of the 18 samples. Radium-226 was not detected.

Lead and potassium were the only metals detected in 1988. General chemistry parameters detected included ammonia, chloride, fluoride, nitrate, phosphorous, sulfate, and total organic nitrogen.

Data Summary

The following is a summary of the detected constituents present in the surface waters and sediments in the pilot plant drainage ditch:

- Surface water and sediment contained uranium at levels that significantly exceeded their respective background.
- Surface water also contained VOCs at detectable concentrations.

Although the seeps and the drain pipe from the BSL exhibited higher than background total uranium concentrations, they are not the sources for the elevated uranium levels found in the pilot plant

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drainage ditch. The major contributor of contaminants is likely the drain pipe that releases water into the drainage ditch near PP-DD-04.

C.2.3 SOUTHWEST DRAINAGE DITCH

The southwest drainage ditch, which is located approximately midway between the pilot plant drainage ditch and the inactive flyash pile, receives runoff from the pine grove and roadway located to the east. No known sources exist in the immediate vicinity of the ditch. Surface water flows into the ditch only after rain or heavy snow melt. Surface water samples were collected in 1989 from locations ASIT-036 and ASIT-040 to assess water quality of the ditch for the purpose of determining potential for contribution of contamination to Paddys Run. Samples were analyzed for unfiltered and filtered total uranium, radium-226, radium-228, gross alpha, and gross beta. Complete analytical results are listed in Appendix G.

Surface Water Data

Total uranium was detected in all four samples analyzed. Concentrations at ASIT-036 were 23 and 17 μg/L for unfiltered and filtered, respectively. Concentrations at ASIT-040 were 138 and 111 μg/L for unfiltered and filtered, respectively. Radium-226 was also detected in unfiltered surface water from ASIT-040 at 1.1 pCi/L, approximately three times the background for Paddys Run.

Data Summary

Based on the 1989 data, the southwest drainage ditch was a source of uranium and radium to Paddys Run surface water. Current water quality conditions in the ditch are not known. Current impacts to Paddys Run will be discussed in Section C.2.6.

C.2.4 DRAINAGEWAYS NEAR THE SOUTH FIELD/FLYASH PILES

Several minor drainage ditches collect runoff from the flyash piles and South Field to Paddys Run. The drainage ditches contain flowing water only during and following significant precipitation events. Some drainageways may continue to carry water for up to a few days, but the majority of the time they remain dry. Potential sources of contamination to surface water runoff and associated sediment in this area include the inactive flyash pile, the South Field, and the active flyash pile. These features are waste storage units that make up the South Field portion of Operable Unit 2. Based on the "Operable Unit 2 Remedial Investigation Report" (DOE 1994h), potential contaminants include radionuclides, metals, and semivolatiles associated with flyash.

The following discussion describes the nature and extent of contamination in surface water runoff and associated sediment within the drainage pathways that lead from the South Field area to Paddys Run. Samples were collected during 1993 as part of the "Operable Unit 2 Remedial Investigation Report" (DOE 1994h). For this report, Operable Unit 5 will not evaluate every location sampled during the Operable Unit 2 investigation. It will, however, evaluate data from locations that are close to the operable unit boundaries in order to describe the potential for impact to Paddys Run and the Great Miami Aquifer. A detailed discussion of the extent of contamination in the waste storage units, along with surface water and sediment associated with runoff from this area, can be found in the Operable Unit 2 Remedial Investigation Report (DOE 1994h). The impact of runoff from this area on Paddys Run will be discussed in Section C.2.6. Impacts to the Great Miami Aquifer will be discussed in Section 4.

C.2.4.1 1993 RI/FS Inactive Flyash Pile Sampling Locations

During the 1993 Operable Unit 2 investigation, location IFP-SW/SD-02 was sampled to characterize surface water and sediments associated with the inactive flyash pile. This location is shown on Figure C-4. Samples for both matrices were collected on two separate occasions.

Surface Water Data

Total uranium was detected in unfiltered surface water runoff immediately downstream of the inactive flyash pile at concentrations ranging from 165 to 820 μg/L. During the same sampling event, plutonium-238 was detected at 2.91 pCi/L. Thorium-230 and neptunium-237 were also detected.

No metals were detected at levels greater than two times background in the first sample collected. The only metal detected above background was silicon. In the second sample, the only two metals detected around two times background were magnesium and silicon; selenium was also detected. Selenium, which has no background value, is typically found in flyash.

One volatile organic, toluene, and one semivolatile organic, bis(2-ethylhexyl)phthalate, were detected at very low concentrations. Both were detected in the first sample only.

Sediment Data

Total uranium was detected at 12.3 $\mu g/g$ in sediment collected at IFP-SD-02. Other radionuclides detected above background were strontium-90, plutonium-238, plutonium 239/240, and neptunium-237.

Calcium, magnesium, and sodium were detected above background in both sediment samples. Five semivolatile organics were detected in the first sample collected: benzo(a)pyrene, carbazole, di-n-octyl phthalate, phenol, and bis(2-ethylhexyl)phthalate. Only bis(2-ethylhexyl)phthalate was detected in the second sample.

Data Summary

The following is a summary of the data on constituents present in the inactive flyash pile drainageway surface waters and sediments:

- Surface waters contained uranium at concentrations that exceed background.
- Sediments contained uranium, other radionuclides, and metals at concentrations that exceed background.
- Sediments also had detectable concentrations of semivolatiles.

Radionuclides and metals are typical constituents of flyash resulting from the combustion of certain types of coal. Furthermore, PAHs may also be constituents of coal. These constituents would contribute to the contamination in surface soils. Contamination levels in surface water runoff and associated sediment in this drainage is likely due to the inactive flyash pile.

C.2.4.2 Drainage from the South Field and Active Flyash Pile

Samples were collected from locations SF-SW-01, SF-SW-02, SF-SD-01, SF-SD-02, SF-SD-03, and AFP-SD-01 during the 1993 Operable Unit 2 RI/FS investigation to characterize surface water and sediments associated with runoff from the South Field and active flyash pile. These sampling locations are shown on Figure C-4.

Surface Water Data

Total uranium was detected at concentrations of 340 and 487 μg/L at SW-SF-01 and SF-SF-02, respectively. All uranium isotopes were likewise detected at levels significantly exceeding background values. No other radionuclides were detected in surface water from these two locations.

Sediment Data

Total uranium was detected at concentrations ranging from 14.2 to 30.1 μg/g, with the highest concentration occurring at location SF-SD-03. Total thorium, and thorium and radium isotopes were detected at all locations. The maximum detections were encountered at SF-SD-03 or AFP-SD-01, which are the furthest downgradient and closest to the Operable Unit 2/5 boundary. In addition, plutonium isotopes and strontium-90 were detected at SF-SD-03.

Metals detected at concentrations greater than five times background include aluminum, arsenic, barium, beryllium, copper, molybdenum, nickel, potassium, selenium, silver, thallium, and zinc. A comparison with metals detected in South Field soil shows that many of the metals detected in drainageway sediments are common to the South Field.

Pesticide Aroclor-1254 was detected in sediments near the South Field, as well as the following list of semivolatile organics: bis(2-ethylhexyl)phthalate, benzoic acid, chrysene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, fluoranthene, indeno(1,2,3-cd)pyrene, pyrene, and phenol.

Data Summary for Drainageways West of the Active Flyash Pile

The following is a summary of the data on constituents present in the surface waters and sediments in the drainageways west of the active flyash pile:

- Surface waters and sediments contained uranium and some metals at concentrations that exceeded their respective background means.
- Sediments contained detectable concentrations of semivolatile organics (predominantly PAHs).

Radionuclides and metals, typical constituents of flyash obtained from the combustion of certain types of coal, would contribute to the contamination in surface soils. Further, PAHs are constituents of

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coal that would also contribute to the contamination in the drainageway. The likely source of contaminants in this drainage is the active flyash pile.

C.2.5 STORM SEWER OUTFALL DITCH DRAINAGE SYSTEM

The storm sewer outfall ditch (SSOD) originates south of the parking lot between the storm water retention basin (SWRB) and flows generally south into Paddys Run. The SSOD has a number of tributaries that collect surface water runoff from open areas east and south of the production area (details of drainage area are presented in Sections 3.3.3.1 and 5.3.2.1). Within this area, two major potential sources for contamination in the SSOD exist: contaminated surface soil in the vicinity of the sewage treatment plant, referred to as the east drainage area; and runoff from the eastern portions of the active flyash pile, located in the South Field area immediately adjacent to the SSOD. All of the drainageways in the SSOD drainage system are ephemeral - flowing only during and shortly after significant rainfalls and heavy snow melt. Furthermore, the southern portions of the SSOD have eroded through the glacial overburden, allowing infiltration to the Great Miami Aquifer. The following discussion describes the nature and extent of contamination in the east drainage area, runoff from the active flyash pile, and the SSOD. Infiltration of contaminants into the Great Miami Aquifer will be covered in Section 4.6 and Appendix F.

C.2.5.1 East Drainage Area

The east drainage area encompasses a large open field east of the production area. As shown on Figure C-5, surface water runoff flows generally to the west into a series of ditches that eventually form the eastern tributary to the SSOD. In 1993, surface water samples were collected from two locations downgradient of the sewage treatment plant area at stations SWS-10 and SWS-11 in order to determine the extent of contamination in surface water runoff as a result of soil contamination previously identified in the vicinity of the sewage treatment plant. A detailed discussion about the soil contamination in the vicinity of the sewage treatment plant can be found in Appendix D, Section 2.7.

Located in Figure C-5, SWS-10 and SWS-11 are two separate drainage swales that transport surface water west, away from the sewage treatment plant area. All samples were analyzed for total uranium; isotopic uranium, thorium, and radium; as well as HSL inorganic, volatile, and semivolatile parameters, as well as general water quality. Complete analytical results are listed in Appendix G and summary results of detected analytes are listed in Section C.2.

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Surface Water Data

Total uranium was detected above background in all filtered and unfiltered samples collected from both locations. Concentrations ranged from 37.3 to 66 μg/L in unfiltered samples and from 15 to 44 μg/L in filtered samples. The values shown next to each location on Figure C-5 represent the maximum unfiltered total uranium result.

Metals detected at concentrations greater than 5 times above background included lead and manganese. The highest concentration for lead was detected at SWS-11; for manganese, SWS-10.

Two semivolatile organics, bis(2-ethylhexyl)phthalate and di-n-octyl phthalate, were detected at low levels in unfiltered samples from both locations. In addition, toluene was detected at 1 μg/L at SWS-11.

C.2.5.2 Active Flyash Pile

Surface water runoff from much of the eastern portion of the active flyash pile flows into the SSOD. The flyash pile is a suspected source of metals and low levels of radionuclides. Samples were collected in 1988 and 1989 north of active flyash pile from locations ASIT-006 and ASIT-007 in a drainage ditch that flows east into the SSOD. All samples were analyzed for total uranium, Ra-226, Ra-228, gross alpha, and gross beta. Sediment samples at ASIT-007 were additionally analyzed for HSL metals and general chemistry parameters. An additional surface water sample was collected in 1993 during the Operable Unit 2 RI/FS investigation at location AFP-SW-02. Sample locations are shown on Figure C-6.

Complete analytical results are listed in Appendix G, and summary results of detected analytes are listed in Section C.2.

Surface Water Data

Total uranium, as shown on Figure C-6, was detected during 1993 at nearly four times background. This value is lower than the 1989 concentrations which ranged from 14 to 24 μg/L. Although several metals were detected, they were at levels only slightly above background. Of the general chemistry parameters detected, ammonia was detected at five times background; and total organic carbon, total organic halides, and total organic nitrogen were detected at concentrations two to three times background.

Sediment Data

Sediment data from 1993 were not available; however sediment data from 1988 indicated that total uranium levels in sediment ranged from 4.53 to 22.9 μg/g, with the highest concentration detected at ASIT-006. Lead was detected at 12 μg/g was the only metal detected. Other chemicals detected were ammonia, chloride, fluoride, nitrate, phosphorous, sulfate, and total organic nitrogen.

C.2.5.3 Storm Sewer Outfall Ditch

Historically, the SSOD received excess runoff from the production area; however, production area runoff is now directed into the SWRB. Detailed discussion about the SWRB and other runoff control projects can be found in Sections 1.3.1.2, 1.3.1.3, and 3.3.3.1. As mentioned above, the SSOD receives surface runoff from two primary sources of contamination - the east drainage area via the east tributary, which receives runoff from east of the production area, and the active flyash pile.

One round of surface water and sediment samples was collected from ASIT-001 and ASIT-003 in 1993. All samples were analyzed for HSL inorganic, volatile, and semivolatile parameters; total uranium; and isotopic uranium, thorium, and radium. Surface water samples were also analyzed for general water quality parameters. Complete analytical results are listed in Appendix G. Summary results of detected analytes are presented in Section C.2.

Surface water and sediment samples were also collected in 1988/89 from ASIT-001, ASIT-002, and ASIT-003. Complete analytical results are listed in Appendix C, and summary results of detected analytes are presented in Section C.2.

Surface Water Data

In 1993, total uranium was detected in unfiltered surface water at a maximum concentration of 3.2 μg/L at ASIT-001, located upstream of both the eastern tributary and the active flyash pile, as shown on Figure C-6. ASIT-003, which is located downstream of both runoff sources, had a maximum concentration of 64 μg/L, illustrating a definite contribution from some upstream source(s). The active flyash pile is an unlikely source due to the low uranium concentrations in runoff already described. It is, however, not possible to define the eastern tributary as the source, because no data have been collected in the tributary upstream of the confluence with the SSOD.

Other contaminants detected in the SSOD at levels greater than five times background were lead and thallium (detected with no background for comparison). Lead was detected at both locations with a higher concentration at ASIT-001. Thallium was detected at ASIT-003 only. One semivolatile organic, bis(2-ethylhexyl)phthalate, was detected at low levels at both locations.

Sediment Data

Sediment samples were collected from ASIT-001 and ASIT-003 in 1993. Total uranium was detected at a maximum concentration of 11 μg/L at both locations. The environmental monitoring program collects sediment from the SSOD once a year at locations approximately 100 yards apart over the entire stretch of the ditch. The 1993 sampling showed total uranium concentrations ranging from 0.82 to 16.1 mg/kg. The highest concentrations were in the vicinity of active flyash pile.

Temporal trends of total uranium concentrations in the ditch sediments do not indicate that levels are decreasing; however, they do not appear to be increasing either. Total uranium concentrations in sediment collected from ASIT-001 and ASIT-003 in 1988 were 4 and 9 mg/kg, respectively. Likewise, ASIT-002, which is located immediately southeast of the active flyash pile, had a concentration of 12 mg/kg, which is similar to the 1993 EM data in that area. Furthermore, the environmental monitoring data have shown the tendency for uranium concentrations in sediments to change drastically from one year to the next. For instance, the location showing the highest concentration in 1993 was the lowest concentration in 1992 at 1.8 mg/kg.

Finally, the FEMP began routine sampling of sediments in the SSOD in 1975. Dames and Moore (1985) summarized data for 1979 to 1983. They reported that 32 of 33 samples exceeded total uranium background levels, with concentrations ranging from 11.6 to 380 mg/kg. Based on those results, uranium levels in sediment in the SSOD have decreased, likely due to the SWRB and other runoff control projects. However, the recent data show that uranium levels are still consistently higher than background.

Other contaminants detected include five semivolatile organics at ASIT-001, and two semivolatiles organics and one volatile organic at ASIT-003. All were detected at low concentrations.

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Data Summary

The following is a summary of the data on constituents present in surface water and sediment in the storm sewer outfall ditch:

- Surface water contains uranium at concentrations that exceed background.
- Sediment contains uranium at concentrations that exceed background.

Prior to the installation of the storm water retention basin, the primary source of contamination in the SSOD was excess runoff from the production area. As a result of the SWRB, presently, the primary sources of contamination to the SSOD are the active flyash pile and the east drainage area. Data limitations in this area do not allow for a conclusion regarding the extent of contamination contributed to the SSOD by the east tributary.

The impact of the SSOD on contamination levels in Paddys Run surface water and sediment is discussed in Section C.2.6.

C.2.6 PADDYS RUN

Paddys Run, an intermittent stream that flows south along the western edge of the FEMP property to the Great Miami River (see Figure C-7), is the primary drainage feature at the FEMP. Surface runoff from all uncontrolled portions of FEMP property, with the exception of the northeast corner (described in Section C.3.1), makes its way either directly or via one of the drainages to Paddys Run. Historically, Paddys Run has been the primary pathway for the off-property migration of contaminated surface water runoff from the FEMP. Prior to the implementation of numerous storm water runoff control programs (detailed in Sections 1.3.1.2 and 1.3.1.3), contaminated runoff entered the stream from various areas with significant surface contamination problems, the primary sources being the waste storage area and the production area. As described in Section C.1, runoff in these areas is now controlled and no longer affects water quality in Paddys Run.

In addition to Paddys Run facilitating the off-property migration of FEMP surface water runoff, the creek is a direct pathway for contamination to the Great Miami Aquifer by streambed infiltration. Much of Paddys Run has eroded through the glacial overburden and flows directly onto the valley fill deposits below. Recharge to the aquifer occurs on a long stretch of Paddys Run on FEMP property from the silo area to just downstream of the SSOD. Aquifer infiltration is discussed in greater detail in Sections 3.3 and 5.3.3.

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Even with the numerous storm water runoff controls in place, surface water and sediment in Paddys Run show concentrations of production-related contaminants, primarily uranium, at levels greater than background. This section presents the nature and extent of contamination in Paddys Run surface water and sediment. Also, to the extent possible, and within the limits of the data set, the contribution of the source drainages discussed earlier in this section will be examined.

The data presented for Paddys Run come from two sources: the RI/FS surface water and sediment sampling program, which collected samples during various programs since 1988; and the FEMP EM Program, which has routinely collected surface water samples for total uranium and several other parameters since 1975, and has collected sediment samples since 1986. The RI/FS program provides a look at the spatial distribution of uranium and other contaminants during May and June of 1993. Earlier RI/FS programs and total uranium data from the EM program will illustrate temporal trends as well as the impact of the drainages on contamination levels in surface and sediment in Paddys Run.

Surface Water

Surface water samples were collected in Paddys Run during the 1933 RI/FS program at SWS-1 through SWS-9. Samples were analyzed for total uranium; isotopic uranium, thorium, and radium; metals; volatile and semivolatile organics; and general water quality parameters. The EM Program collected weekly samples, on surface water flow permitting from locations W-5, W-9, W-10US, W-10, W-10DS, W-11, W-7, and W-8 (see Figure C-7). Complete analytical results for the RI/FS data are located in Appendix G. Summary statistics for the EM data are listed in Tables C-5 through C-11.

The maximum detected total uranium result at each location for unfiltered samples is shown on Figure C-7 (the value shown for W-5 represents the background concentration for total uranium). The maximum values for all locations ranged from 2.6 to 26.1 μg/L. In general, the data show that uranium concentrations downstream of the waste storage area are higher than background concentrations. The highest value was detected at SWS-2, downstream of the pilot plant drainage ditch and the southwest drainage ditch. Uranium concentrations decreased downstream to SWS-5, which is upstream of the SSOD. Downstream of the SSOD, uranium concentrations increased slightly, then decreased again downstream.

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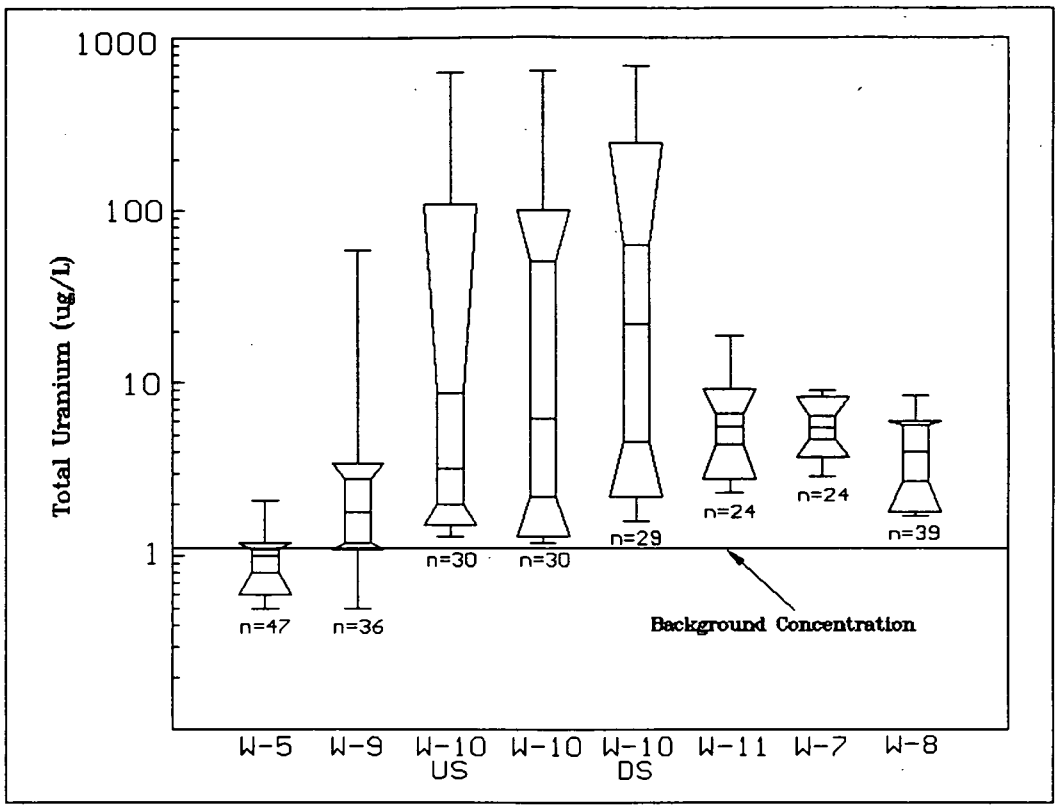
Further detail regarding spatial distribution of uranium in Paddys Run and the impacts of the contributing drainages are illustrated by examining the EM data set. The following figure is a graph showing statistical box plots of total uranium values detected during 1993 at each of the Paddys Run EM sampling stations. Each box plot shows the median, the 25th and 75th percentile background values, the 10th and 90th backgrounds, and the minimum and maximum detected values for each data set.



Box Plots of EM Total Uranium Data - Paddys Run, 1993

This figure illustrates two facts. The first is that the median total uranium concentration at each location is higher than background. The second is that uranium concentrations greatly increase downstream of the waste storage area. Concentrations then decrease downstream; however, even minimum detected values remain above background. The following discussion focuses on the impact of each drainage discussed in the previous sections on total uranium levels in Paddys Run.

EM sampling location W-9 is located immediately downstream of the north drainage ditch. During 1993, total uranium concentrations ranged from 0.5 to 59 μg/L. Excluding the maximum detected value, only one result was greater than 5 μg/L, and the average concentration was approximately two times background.

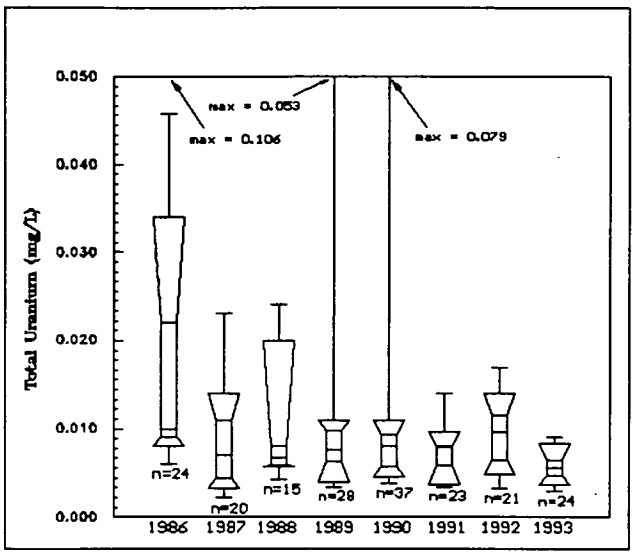
The pilot plant drainage ditch has the highest uranium concentrations of all of the uncontrolled drainages at the FEMP. Maximum uranium concentrations range anywhere from 500 μg/L just upstream from the confluence with Paddys Run to greater than 2500 μg/L at the headwaters. Downstream of the drainage ditch at SWS-1, the RI/FS program detected a maximum unfiltered total uranium concentration of 3.6 μg/L. The EM Program has three Paddys Run monitoring locations to measure the impact of pilot plant drainage ditch surface water: W-10US, upstream of the ditch; W-10, at the confluence of the ditch; and W-10DS, several hundred feet downstream of the ditch. As illustrated on the figure above, the data show that uranium concentrations vary greatly at all three locations. The minimum and maximum detected concentrations at each location were very similar, ranging from background to 630, 640 and 690 μg/L at W-10US, W-10, and W-10DS, respectively. The impact of the pilot plant drainage ditch on uranium levels in Paddys Run becomes evident by looking more closely at the data. Twenty-two of 30 samples collected at W-10US were below 10 μg/L; 20 were less than 5 μg/L. At W-10, 16 of 30 were less than 10 μg/L; 13 less than 5 μg/L. At W-10DS, only 11 of 29 samples collected were less than 10 μg/L; 7 of those were below 5 μg/L. Likewise, the number of detected values greater than 50 μg/L increased downstream.

Based on the 1993 RI/FS data, the impact of the South Field area on uranium concentrations in Paddys Run is minimal. While total uranium concentrations in drainages from the South Field area were significantly higher than background, concentrations actually decreased over the stretch of Paddys Run closest to the creek. 1993 EM data from W-11 were similar to the RI/FS data. Total uranium concentrations ranged from 2.3 to 19 μg/L. The UCL on the median and the average for the data set were both 6.5 μg/L.

The SSOD was historically one of the major conveyances of uranium and other process-related contaminants to Paddys Run. W-7 has been used over the years to gauge the contribution of the SSOD to Paddys Run. The EM data summary tables indicate that prior to the implementation of the storm water runoff control projects, total uranium concentrations were consistently higher at W-7 than at W-11.

The current impact of the SSOD on uranium levels in Paddys Run is not evident by looking at either the RI/FS or the EM data. As mentioned previously, the one-time RI/FS sampling program showed a very slight increase in total uranium at W-7. However, the EM data summary statistics tend to show that uranium levels are generally higher at W-11, indicating, perhaps, that the overall current impact on Paddys Run from the SSOD is minimal. Total uranium levels at W-7 have generally decreased since the installation of the SWRB, the first phase of which was completed in 1986. The following figure is a graph showing statistical box plots of total uranium concentrations at W7 for the years 1986 through 1993.

The graph shows elevated concentrations in 1986, followed by a sharp decrease in 1987. This decrease is primarily due to the completion of the storm water retention basinal, although other runoff control projects have likely contributed to the overall decrease. The plots also show that the range of concentrations has decreased in recent years, most likely the result of decreased releases through the SSOD. It is important to note, however, that total uranium concentrations continue to be higher than background.



EM Total Uranium Data at W-7, 1986-1993

W-7 is the final sampling location on FEMP property. The RI/FS and EM data indicate that uranium concentrations in Paddys Run surface water downstream of FEMP property were higher than background during 1993. EM sampling location W-8 is the only off-property monitoring station in Paddys Run. In 1993, 39 samples were collected. Total uranium concentrations ranged from 1.7 to 8.4 μg/L. The average concentration was 4.1 μg/L, and the upper confidence level (UCL) on the median was slightly higher at 4.8 μg/L. W-8 is located in a portion of Paddys Run that receives discharge from the Great Miami Aquifer. It is also possible that surface water and groundwater act as sources of contamination to each other through mixing during periods of high stream flow.

The only other radionuclide detected in unfiltered samples from Paddys Run was total thorium, which was detected at SWS-2 at 3.6 μg/L, and at SWS-8 at 0.9 μg/L.

No metals having established background concentrations for Paddys Run were detected in unfiltered samples at greater than five times background. Metals that were detected, but have no background value include cadmium, chromium, copper, iron, lead, nickel, silver, and vanadium. Of these metals, only two showed trends: iron which was detected only at upstream locations SWS-1, SWS-2, SWS-3, and SWS-4; and lead which was detected only at downstream locations SWS-6, SWS-7, and SWS-8.

Semivolatile organic chemicals bis(2-ethylhexyl)phthalate and di-n-octyl phthalate were detected at concentrations ranging from 11 to 89 μg/L. Volatile organic trichloroethene was detected at 2 μg/L at SWS-7.

Sediment Data

Sediment samples were collected during the 1993 RI/FS program along Paddys Run from locations SWS-1 through SWS-9. Samples were analyzed for total uranium, isotopic uranium, radium, thorium, metals, and volatile and semivolatile organics. Additional total uranium data are provided by the 1993 EM Program which included the collection of samples approximately every 200 meters over the entire stretch of Paddys Run. Sample collection began at the Great Miami River and ended at the railroad bridge upstream of the waste storage area.

Total uranium concentrations from the 1993 RI/FS locations ranged from 1.2 to 22.8 mg/kg. The maximum concentration was detected at SWS-2. Above background concentrations were detected at SWS-1, SWS-2, SWS-3, and SWS-6, indicating elevated levels downstream of the PPDD, upstream of the South Field area, and downstream of the SSOD. Total uranium concentrations in sediment collected as part of the 1993 EM Program ranged from 0.49 to 3.82 mg/kg. The maximum concentration was detected approximately 100 feet downstream of the SSOD. This sample was also the only concentration higher than background.

Metals detected in Paddys Run sediment at concentrations greater than five times background were beryllium, calcium, potassium, silver, and zinc.

Semivolatile organic chemicals were detected in sediments of Paddys Run during 1993 at SWS-1, SWS-2, and SWS-6. The maximum occurrence of semivolatiles was at location SWS-6, where 11 PAHs were detected at concentrations ranging from 80 to 350 mg/kg. Also, eight PAHs were

detected at SWS-2 ranging from 49 to 150 mg/kg; and three were detected at SWS-1 ranging from 56 to 63 mg/kg.

The volatiles detected in 1993 were acetone, methylene chloride, and toluene. Methylene chloride was detected at SWS-3, SWS-4, and SWS-7. Acetone was detected at SWS-3 and SWS-4. Concentrations were very low, ranging from 2 to 7 mg/kg.

Data Summary

The following is a summary of contaminants present in surface water and sediments in Paddys Run:

- Surface water in Paddys Run contains above background levels of uranium.
- Sediment in Paddys Run has elevated levels of uranium, primarily downstream of the SSOD.
- Sediment at several locations in Paddys Run has concentrations of a number of PAHs.

Various sources exist at the FEMP that contribute to contamination levels in Paddys Run. However, due to the completion of several storm water runoff control projects, the major past contributors (e.g., the waste storage area and the production area) are no longer primary source areas. Furthermore, the environmental monitoring data clearly show that uranium levels at most sampling stations are decreasing. The data show a definite impact by PPDD surface water on total uranium concentrations in Paddys Run. The data also indicate a possible source of contamination upstream of W-10US. Based on EM data, sediments in Paddys Run exhibit above background concentrations of uranium; however, overall uranium levels in sediment are below background.

TABLE C-1

SUMMARY STATISTICS FOR ENVIRONMENTAL MONITORING DATA
PILOT PLANT DRAINAGE DITCH
SAMPLE LOCATION W-10DD
TOTAL URANIUM (mg/L)

Year	Number of Samples	Distribution	Range	Average	Upper Confidence Limit on Median	95th Percentile
1986						
1987						
1988						
1989						
1990						
1991	25	normal	0.0660-1.1400	0.4978	0.6300	0.9868
1992	46	undefined	0.0006-2.7300	0.7115	0.7300	1.7
1993	34	undefined	0.0017-1.6000	0.5658	0.5800	1.5

TABLE C-2

SUMMARY STATISTICS FOR ENVIRONMENTAL MONITORING DATA
PADDYS RUN
SAMPLE LOCATION W-5
TOTAL URANIUM (mg/L)

Year	Number of Samples	Distribution	Range	Average	Upper Confidence Limit on Median	95th Percentile
1986	52	undefined	0.0006-0.0026	0.0014	0.0014	0.0025
1987	52	undefined	0.0007-0.0053	0.0015	0.0015	0.002
1988	50	lognormal	0.0005-0.0021	0.0011	0.0012	0.0018
1989	50	undefined	0.0007-0.0035	0.0013	0.0013	0.0022
1990	52	undefined	0.0001-0.0016	0.0011	0.0012	0.0014
1991	47	lognormal	0.0006-0.0023	0.0012	0.0012	0.0017
1992	48	lognormal	0.0007-0.0017	0.0011	0.0011	0.0015
1993	47	undefined	0.0005-0.0021	0.001	0.0011	0.0012

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TABLE C-3

SUMMARY STATISTICS FOR ENVIRONMENTAL MONITORING DATA
PADDYS RUN
SAMPLE LOCATION W-9
TOTAL URANIUM (mg/L)

Year	Number of Samples	Distribution	Range	Average	Upper Confidence Limit on Median	95th Percentile
1986	42	undefined	0.0013-0.0078	0.0027	0.0025	0.006
1987	49	undefined	0.0010-0.0087	0.0025	0.0023	0.0067
1988	33	undefined	0.0004-0.0310	0.0038	0.0025	0.017
1989	47	lognormal	0.0009-0.0064	0.0022	0.0024	0.0042
1990	51	lognormal	0.0013-0.0042	0.0022	0.0022	0.0033
1991	40	undefined	0.0007-0.0079	0.0022	0.0019	0.0059
1992	50	lognormal	0.0010-0.0100	0.0029	0.0031	0.0057
1993	36	undefined	0.0005-0.0590	0.0036	0.0023	0.0060

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TABLE C-4

SUMMARY STATISTICS FOR ENVIRONMENTAL MONITORING DATA
PADDYS RUN
SAMPLE LOCATION W-10US
TOTAL URANIUM (mg/L)

Year	Number of Samples	Distribution	Range	Average	Upper Confidence Limit on Median	95th Percentile
1986						
1987						
1988						
1989						
1990						
1991	25	undefined	0.0014-1.2600	0.0788	0.0080	0.37
1992	38	undefined	0.0012-1.2000	0.1251	0.0038	1
1993	30	undefined	0.0013-0.630	0.0468	0.0061	0.3000

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TABLE C-5

SUMMARY STATISTICS FOR ENVIRONMENTAL MONITORING DATA
PADDYS RUN
SAMPLE LOCATION W-10
TOTAL URANIUM (mg/L)

Year	Number of Samples	Distribution	Range	Average	Upper Confidence Limit on Median	95th Percentile
1986	40	undefined	0.0017-0.1860	0.0169	0.0096	0.079
1987	32	undefined	0.0016-0.1300	0.0101	0.0059	0.035
1988	24	undefined	0.0021-1.2000	0.0574	0.0095	0.019
1989	31	undefined	0.0024-0.9500	0.1031	0.0160	0.73
1990	45	undefined	0.0016-1.6000	0.1105	0.0230	0.68
1991	25	undefined	0.0015-1.6700	0.0981	0.0140	0.36
1992	38	undefined	0.0012-1.0800	0.1279	0.0037	0.98
1993	30	undefined	0.0012-0.6400	0.0598	0.0450	0.3

P 9 8 6

TABLE C-6

SUMMARY STATISTICS FOR ENVIRONMENTAL MONITORING DATA
PADDYS RUN
SAMPLE LOCATION W-10DS
TOTAL URANIUM (mg/L)

Year	Number of Samples	Distribution	Range	Average	Upper Confidence Limit on Median	95th Percentile
1986						
1987						
1988						
1989						
1990						
1991	25	lognormal	0.0017-0.4300	0.0724	0.0527	0.2926
1992	38	undefined	0.0016-1.0000	0.1394	0.0490	0.87
1993	29	lognormal	0.0016-0.6900	0.0836	0.0540	0.4031

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TABLE C-7

SUMMARY STATISTICS FOR ENVIRONMENTAL MONITORING DATA
PADDYS RUN
SAMPLE LOCATION W-11
TOTAL URANIUM (mg/L)

Year	Number of Samples	Distribution	Range	Average	Upper Confidence Limit on Median	95th Percentile
1986	32	undefined	0.0060-0.8700	0.0422	0.0130	0.094
1987	18	lognormal	0.0027-0.0220	0.0086	0.0094	0.0165
1988	16	lognormal	0.0040-0.0190	0.0085	0.0082	0.0153
1989	24	undefined	0.0041-0.0410	0.0099	0.0094	0.018
1990	38	undefined	0.0020-0.1200	0.0132	0.0095	0.072
1991	24	lognormal	0.0037-0.0170	0.0085	0.0087	0.015
1992	21	normal	0.0019-0.0180	0.0093	0.0110	0.0159
1993	24	lognormal	0.0023-0.0190	0.0065	0.0064	0.013

TABLE C-8

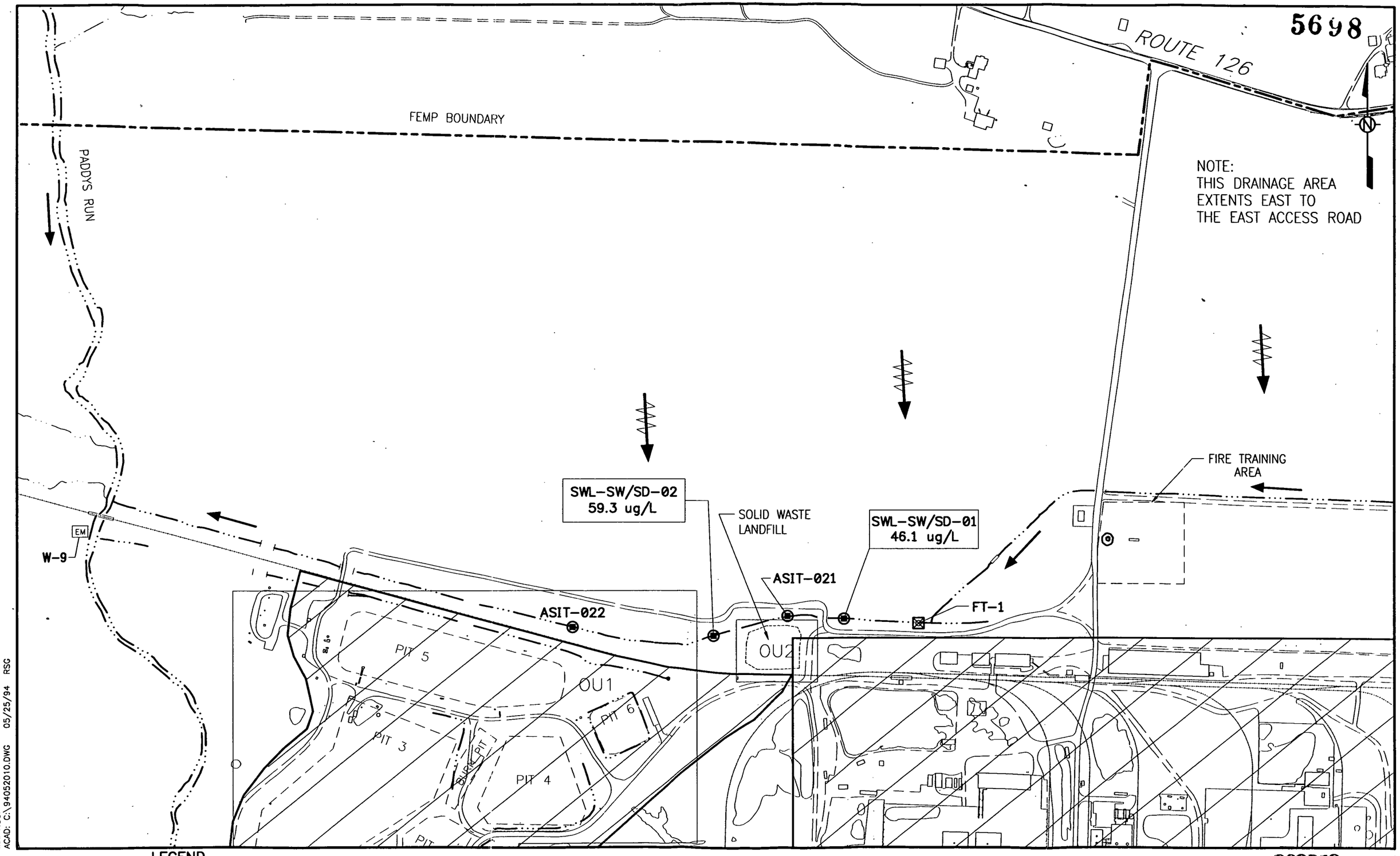
SUMMARY STATISTICS FOR ENVIRONMENTAL MONITORING DATA
PADDYS RUN
SAMPLE LOCATION W-7
TOTAL URANIUM (mg/L)

Year	Number of Samples	Distribution	Range	Average	Upper Confidence Limit on Median	95th Percentile
1986	24	undefined	0.0060- 1.0600	0.0718	0.0150	0.28
1987	20	lognormal	0.0022-0.0230	0.0086	0.0109	0.0195
1988	15	undefined	0.0043-0.0240	0.01	0.0140	0.024
1989	28	undefined	0.0034-0.0530	0.0095	0.0089	0.016
1990	37	undefined	0.0038-0.0790	0.0097	0.0089	0.016
1991	23	lognormal	0.0034-0.0140	0.0077	0.0081	0.0135
1992	21	normal	0.0032-0.0170	0.0095	0.0110	0.0155
1993	24	lognormal	0.0029-0.0091	0.0058	0.0062	0.009

TABLE C-9

SUMMARY STATISTICS FOR ENVIRONMENTAL MONITORING DATA
PADDYS RUN
SAMPLE LOCATION W-8
TOTAL URANIUM (mg/L)

Year	Number of Samples	Distribution	Range	Average	Upper Confidence Limit on Median	95th Percentile
1986	28	undefined	0.0020-0.1650	0.014	0.0090	0.023
1987	32	lognormal	0.0011-0.0069	0.0028	0.0029	0.0052
1988	21	lognormal	0.0015-0.0071	0.0031	0.0033	0.0057
1989	20	undefined	0.0020-0.0380	0.0067	0.0053	0.015
1990	28	lognormal	0.0017-0.0140	0.0062	0.0077	0.0124
1991	50	undefined	0.0016-0.0120	0.0057	0.0076	0.011
1992	48	undefined	0.0018-0.0280	0.0042	0.0036	0.0089
1993	39	lognormal	0.0017-0.0084	0.0041	0.0048	0.008



MAP1.SCR
ACAD: C:\94052010.DWG 05/25/94 RSG

LEGEND

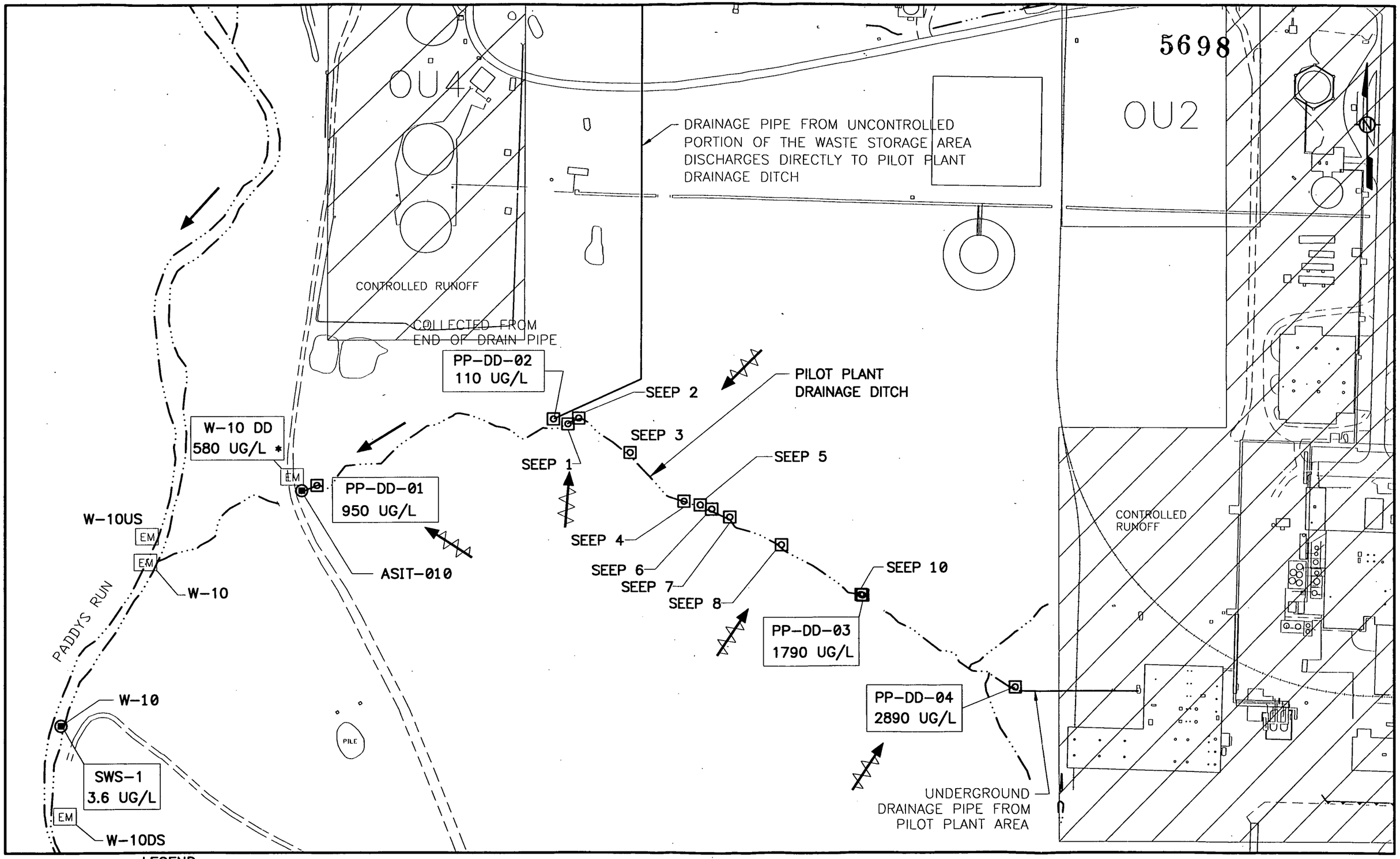
- SURFACE WATER ONLY (RI/FS)
- SEDIMENT ONLY (RI/FS)
- SURFACE WATER AND SEDIMENT (RI/FS)
- DIRECTION OF SURFACE WATER
- EM ENVIRONMENTAL MONITORING LOCATION
- GENERAL DIRECTION OF SURFACE RUNOFF

SCALE
0 300 600 FEET

DRAFT

000349

FIGURE C-2
NORTH DRAINAGE AREA
1993 UNFILTERED SURFACE WATER TOTAL URANIUM DATA



MAP5.SCR
ACAD: C:\94052010.DWG 05/25/94 RSG

LEGEND

- SURFACE WATER ONLY (RI/FS)
- SURFACE WATER AND SEDIMENT (RI/FS)
- EM ENVIRONMENTAL MONITORING LOCATION
- DIRECTION OF SURFACE WATER
- GENERAL DIRECTION OF SURFACE RUNOFF
- * DATA PRESENTED IS THE UCL ON THE MEDIAN, 1993

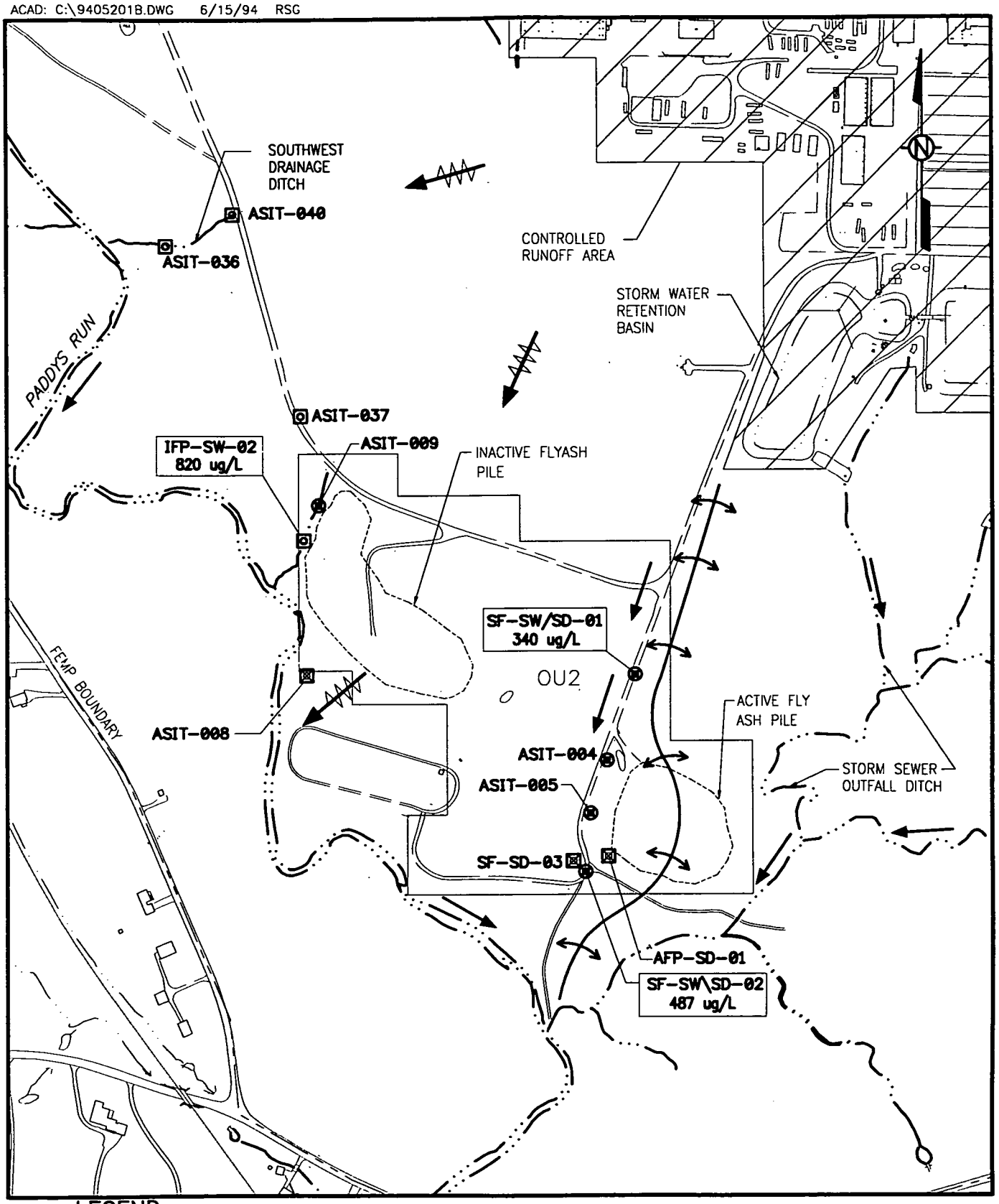
SCALE
0 150 300 FEET

DRAFT

FIGURE C-3
PILOT PLANT DRAINAGE DITCH
1993 UNFILTERED SURFACE WATER TOTAL URANIUM DATA

000350

MAP6.SCR
ACAD: C:\9405201B.DWG 6/15/94 RSG



LEGEND:
- SURFACE WATER ONLY (RI/FS)
- SEDIMENT ONLY (RI/FS)
- SURFACE WATER AND SEDIMENT (RI/FS)
- DIRECTION OF SURFACE WATER
- APPROXIMATE DRAINAGE DIVIDE
- GENERAL DIRECTION OF SURFACE RUNOFF

SCALE
0 400 800 FEET

FIGURE C-4
SOUTHWEST DRAINAGE DITCH & SOUTH FIELD AREA DRAINAGES
1993 UNFILTERED SURFACE WATER TOTAL URANIUM DATA

DRAFT

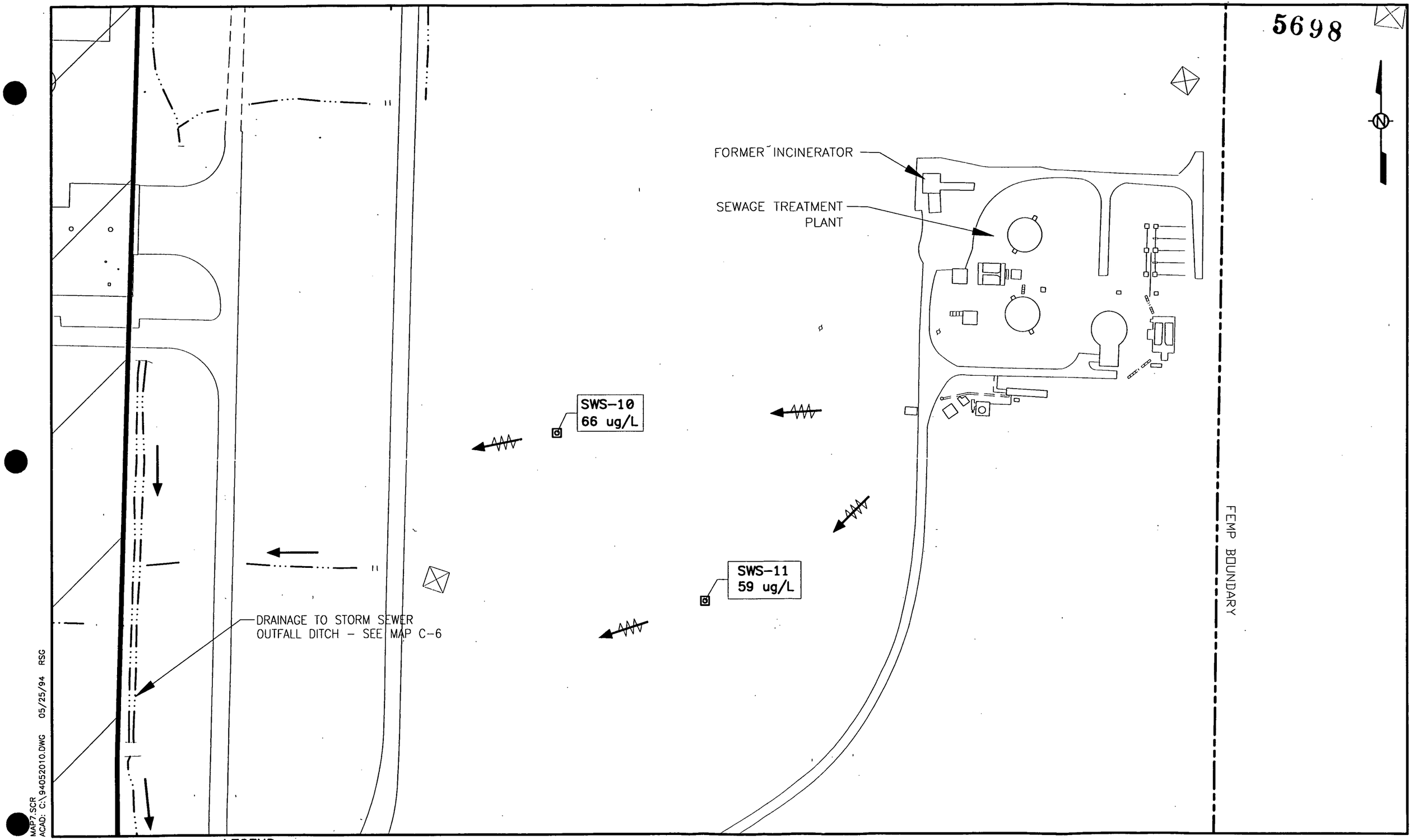
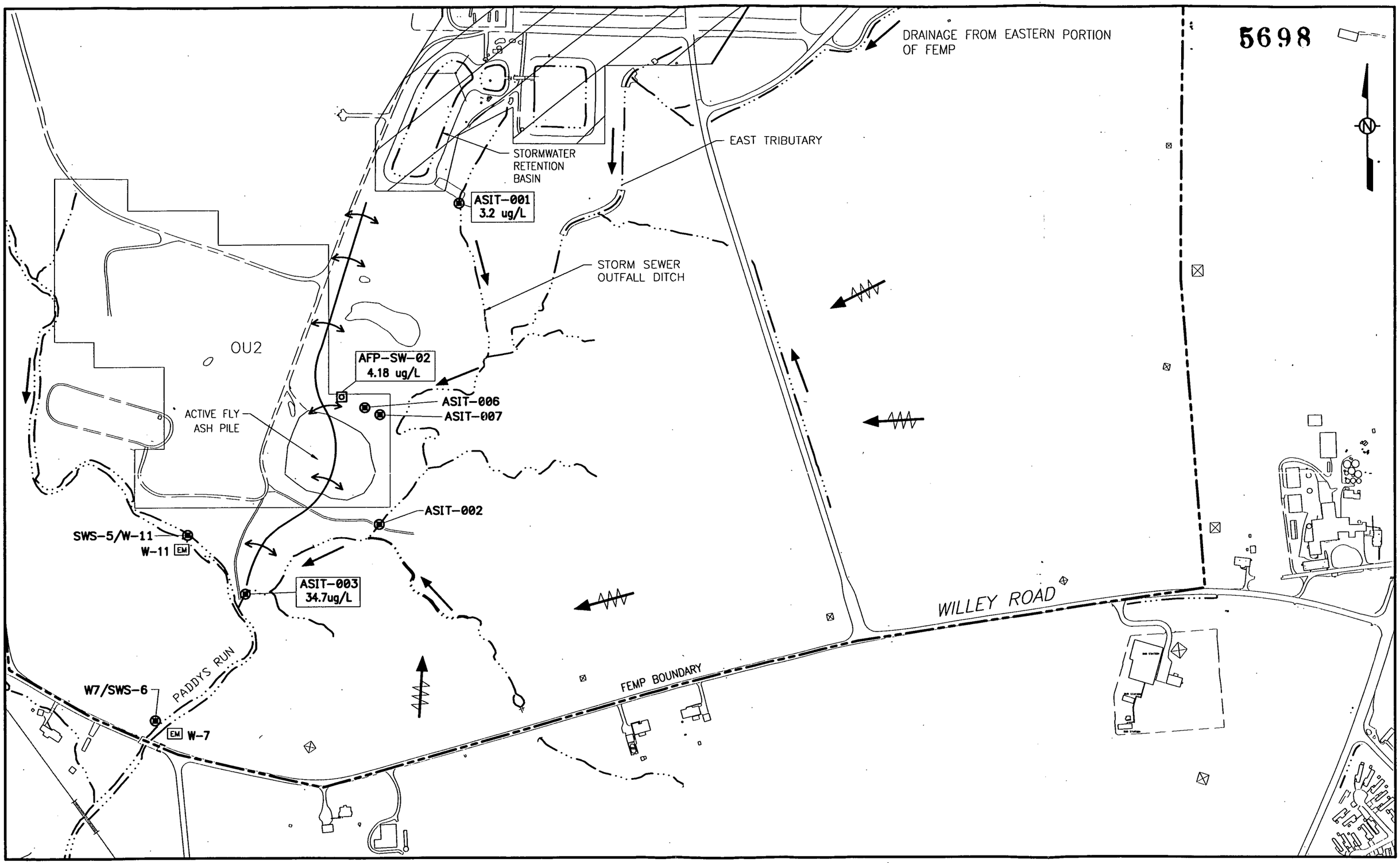


FIGURE C-5
EAST DRAINAGE
1993 UNFILTERED SURFACE WATER TOTAL URANIUM DATA



MAP-4.SCR
ACAD: C:\94052010.DWG 05/25/94 RSG

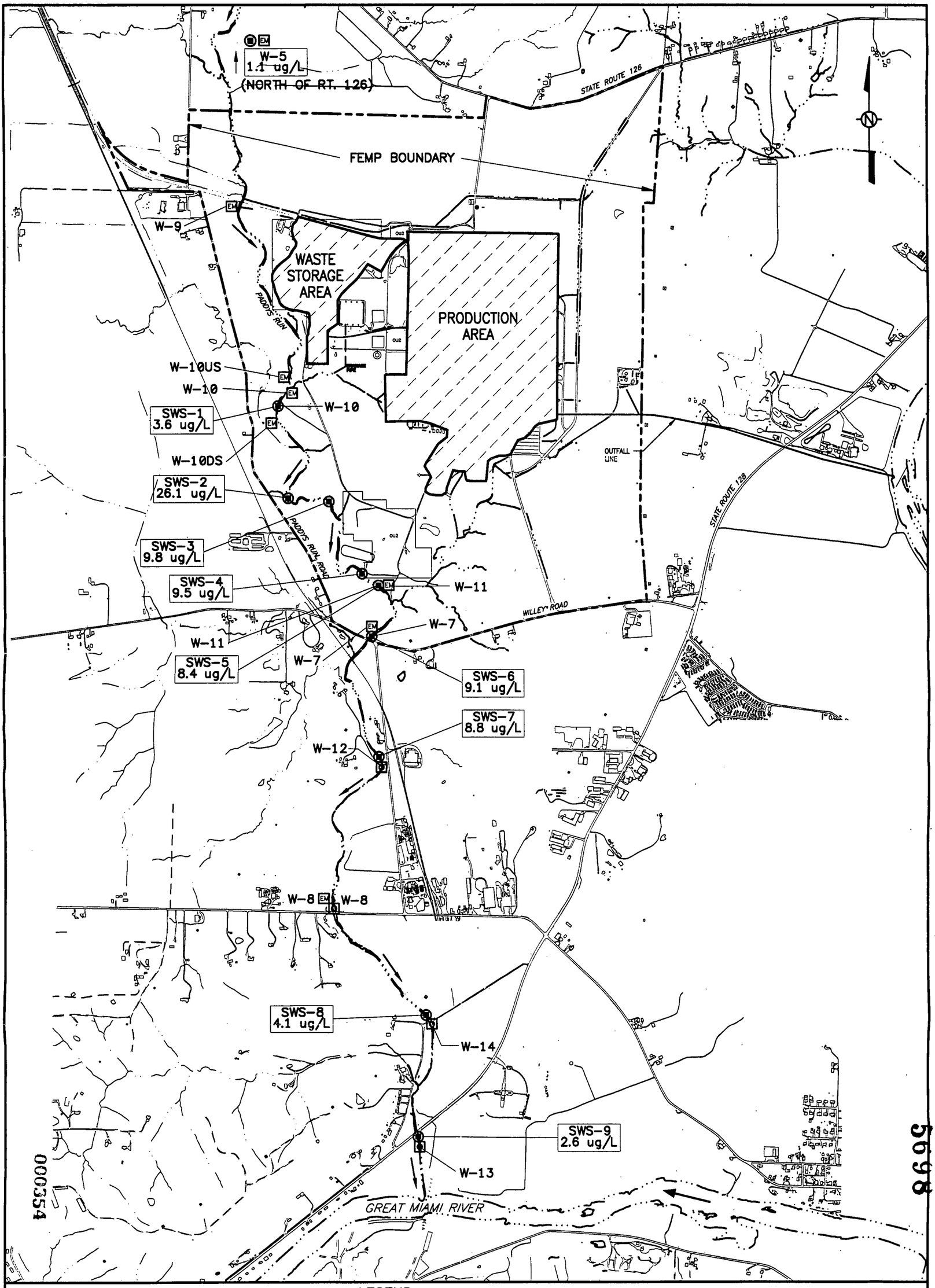
LEGEND
- SURFACE WATER ONLY (RI/FS)
- SURFACE WATER AND SEDIMENT (RI/FS)
- DIRECTION OF SURFACE WATER
- EM ENVIRONMENTAL MONITORING LOCATION
- GENERAL DIRECTION OF SURFACE RUNOFF
- APPROXIMATE DRAINAGE DIVIDE

SCALE 0 300 600 FEET

DRAFT

FIGURE C-6
STORM SEWER OUTFALL DITCH
1993 UNFILTERED SURFACE WATER TOTAL URANIUM DATA

MAP8.SCR
ACAD: C:\94052010.DWG 06/16/94 JAK



MAP C-7
PADDYS RUN 1993 UNFILTERED SURFACE WATER TOTAL URANIUM DATA

LEGEND
- SURFACE WATER ONLY (RI/FS)
- SURFACE WATER AND SEDIMENT (RI/FS)
- ENVIRONMENTAL MONITORING LOCATION
- DIRECTION OF SURFACE WATER FLOW
- CONTROLLED RUNOFF

SCALE
0 1300 2600 FEET

DRAFT

000354

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Paddys Run and Associated Drainages

NORTH OF RR TRACKS - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/L	2/2	2	2/2	18.70000-20.20000	19.45000			0.73
URANIUM, TOTAL	UG/L	2/2	2	2/2	46.10000-59.30000	52.70000			1.1
URANIUM-234	PCI/L	2/2	2	2/2	17.10000-17.20000	17.15000			0.70
THORIUM-230	PCI/L	0/1	1	0/1		0.10000	0.20000	0.20000	ND
RADIUM-226	PCI/L	0/2	2	0/2		0.50000	1.00000	1.00000	0.35
URANIUM-235/236	PCI/L	2/2	2	2/2	0.84600-1.30000	1.07300			ND
THORIUM-232	PCI/L	0/1	1	0/1		0.10000	0.20000	0.20000	ND
THORIUM, TOTAL	UG/L	0/1	1	0/1		0.69500	1.39000	1.39000	ND
RADIUM-228	PCI/L	0/2	2	0/2		1.50000	3.00000	3.00000	2.1
THORIUM-228	PCI/L	0/1	1	0/1		0.10000	0.20000	0.20000	ND
NEPTUNIUM-237	PCI/L	0/2	2	0/2		0.25000	0.50000	0.50000	NA
PLUTONIUM-239/240	PCI/L	0/2	2	0/2		0.25000	0.50000	0.50000	0.093
PLUTONIUM-238	PCI/L	0/2	2	0/2		0.25000	0.50000	0.50000	ND
STRONTIUM-90	PCI/L	0/2	2	0/2		0.50000	1.00000	1.00000	0.96
TECHNETIUM-99	PCI/L	0/2	2	0/2		7.50000	15.00000	15.00000	ND
RUTHENIUM-106	PCI/L	0/2	2	0/2		75.00000	150.00000	150.00000	ND
CESIUM-137	PCI/L	0/2	2	0/2		7.77500	15.30000	15.80000	3.1
GROSS ALPHA	PCI/L	2/2	2	2/2	24.70000-32.90000	28.80000			3.7
GROSS BETA	PCI/L	2/2	2	2/2	11.50000-11.80000	11.65000			6.8

000356

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NORTH OF RR TRACKS - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/L	1/1	1	0/1	0.14000-0.14000	0.14000			0.640
ANTIMONY	MG/L	0/1	1	0/1		0.00250	0.00500	0.00500	ND
ARSENIC	MG/L	0/1	1	0/1		0.00100	0.00200	0.00200	ND
BARIUM	MG/L	1/1	1	0/1	0.03850-0.03850	0.03850			0.0534
BERYLLIUM	MG/L	0/1	1	0/1		0.00100	0.00200	0.00200	ND
CADMIUM	MG/L	0/1	1	0/1		0.00250	0.00500	0.00500	ND
CALCIUM	MG/L	1/1	1	0/1	92.50000-92.50000	92.50000			107
CHROMIUM	MG/L	0/1	1	0/1		0.00500	0.01000	0.01000	ND
COBALT	MG/L	0/1	1	0/1		0.00500	0.01000	0.01000	ND
COPPER	MG/L	0/1	1	0/1		0.00500	0.01000	0.01000	ND
CYANIDE	MG/L	2/2	2	2/2	0.00240-0.00240	0.00240			ND
IRON	MG/L	0/1	1	0/1		0.01000	0.02000	0.02000	0.513
LEAD	MG/L	0/1	1	0/1		0.00100	0.00200	0.00200	ND
MAGNESIUM	MG/L	1/1	1	0/1	23.50000-23.50000	23.50000			27.8
MANGANESE	MG/L	1/1	1	1/1	0.17700-0.17700	0.17700			0.035
MERCURY	MG/L	0/1	1	0/1		0.00010	0.00020	0.00020	ND
MOLYBDENUM	MG/L	0/1	1	0/1		0.01000	0.02000	0.02000	ND
NICKEL	MG/L	0/1	1	0/1		0.01000	0.02000	0.02000	ND
POTASSIUM	MG/L	1/1	1	0/1	0.86500-0.86500	0.86500			3.58
SELENIUM	MG/L	0/1	1	0/1		0.00100	0.00200	0.00200	ND
SILICON	MG/L	1/1	1	0/1	1.91000-1.91000	1.91000			3.36
SILVER	MG/L	0/1	1	0/1		0.00500	0.01000	0.01000	ND

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000337

NORTH OF RR TRACKS - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
SODIUM	MG/L	1/1	1	0/1	11.30000-11.30000	11.30000			18.2
THALLIUM	MG/L	0/1	1	0/1		0.00100	0.00200	0.00200	ND
VANADIUM	MG/L	0/1	1	0/1		0.00500	0.01000	0.01000	ND
ZINC	MG/L	0/1	1	0/1		0.00250	0.00500	0.00500	ND

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NORTH OF RR TRACKS - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
1,1,1-TRICHLOROETHANE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
1,1,2,2-TETRACHLOROETHANE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
1,1,2-TRICHLOROETHANE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
1,1-DICHLOROETHANE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
1,1-DICHLOROETHENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
1,2-DICHLOROETHANE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
1,2-DICHLOROETHENE (TOTAL)	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
1,2-DICHLOROPROPANE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2-BUTANONE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2-HEXANONE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
4-METHYL-2-PENTANONE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
ACETONE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BENZENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BROMODICHLOROMETHANE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BROMOFORM		0/2	2	0/2		5.00000	10.00000	10.00000	
BROMOMETHANE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
CARBON DISULFIDE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
CARBON TETRACHLORIDE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
CHLOROBENZENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
CHLOROETHANE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
CHLOROFORM	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
CHLOROMETHANE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	

06/11/94

NORTH OF RR TRACKS - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
CIS-1,3-DICHLOROPROPENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
DIBROMOCHLOROMETHANE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
ETHYLBENZENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
METHYLENE CHLORIDE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
STYRENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
TETRACHLOROETHENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
TOLUENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
TRANS-1,3-DICHLOROPROPENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
TRICHLOROETHENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
VINYL ACETATE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
VINYL CHLORIDE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
XYLENES, TOTAL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	

NORTH OF RR TRACKS - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
1,2,4-TRICHLOROBENZENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
1,2-DICHLOROBENZENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
1,3-DICHLOROBENZENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
1,4-DICHLOROBENZENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2,4,5-TRICHLOROPHENOL	UG/L	0/2	2	0/2		12.50000	25.00000	25.00000	
2,4,6-TRICHLOROPHENOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2,4-DICHLOROPHENOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2,4-DIMETHYLPHENOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2,4-DINITROPHENOL	UG/L	0/2	2	0/2		12.50000	25.00000	25.00000	
2,4-DINITROTOLUENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2,6-DINITROTOLUENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2-CHLORONAPHTHALENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2-CHLOROPHENOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2-METHYLNAPHTHALENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2-METHYLPHENOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2-NITROANILINE	UG/L	0/2	2	0/2		12.50000	25.00000	25.00000	
2-NITROPHENOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
3,3'-DICHLOROBENZIDINE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
3-NITROANILINE	NONE	0/2	2	0/2		12.50000	25.00000	25.00000	
4,6-DINITRO-2-METHYLPHENOL	UG/L	0/2	2	0/2		12.50000	25.00000	25.00000	
4-BROMOPHENYL PHENYL ETHER	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
4-CHLORO-3-METHYLPHENOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	

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NORTH OF RR TRACKS - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
4-CHLOROPHENYLPHENYL ETHER	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
4-METHYLPHENOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
4-NITROANILINE	UG/L	0/2	2	0/2		12.50000	25.00000	25.00000	
4-NITROPHENOL	UG/L	0/2	2	0/2		12.50000	25.00000	25.00000	
ACENAPHTHENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
ACENAPHTHYLENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
ANTHRACENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BENZO(A)ANTHRACENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BENZO(A)PYRENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BENZO(B)FLUORANTHENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BENZO(G,H,I)PERYLENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BENZO(K)FLUORANTHENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BENZOIC ACID	UG/L	0/2	2	0/2		25.00000	50.00000	50.00000	
BENZYL ALCOHOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BIS(2-CHLOROETHOXY)METHANE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BIS(2-CHLOROETHYL)ETHER	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BIS(2-CHLOROISOPROPYL) ETHER	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BIS(2-ETHYLHEXYL)PHTHALATE	UG/L	1/2	2	1/2	1.00000-1.00000	3.00000	10.00000	10.00000	
BUTYL BENZYL PHTHALATE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
CARBAZOLE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
CHRYSENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
DI-N-BUTYL PHTHALATE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	

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NORTH OF RR TRACKS - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
DI-N-OCTYL PHTHALATE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
DIBENZO(A,H)ANTHRACENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
DIBENZOFURAN	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
DIETHYL PHTHALATE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
DIMETHYL PHTHALATE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
FLUORANTHENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
FLUORENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
HEXACHLOROBENZENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
HEXACHLOROCYCLOPENTADIENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
HEXACHLOROETHANE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
INDENO(1,2,3-CD)PYRENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
ISOPHORONE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
N-NITROSO-DI-N-PROPYLAMINE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
N-NITROSODIPHENYLAMINE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
NAPHTHALENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
NITROBENZENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
P-CHLOROANILINE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
PENTACHLOROPHENOL	UG/L	0/2	2	0/2		12.50000	25.00000	25.00000	
PHENANTHRENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
PHENOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
PYRENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	

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NORTH OF RR TRACKS - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
PESTICIDES									
4,4'-DDD	UG/L	0/2	2	0/2		0.05000	0.10000	0.10000	
4,4'-DDE	UG/L	0/2	2	0/2		0.05000	0.10000	0.10000	
4,4'-DDT	UG/L	0/2	2	0/2		0.05000	0.10000	0.10000	
ALDRIN	UG/L	0/2	2	0/2		0.02500	0.05000	0.05000	
ALPHA-BHC	UG/L	0/2	2	0/2		0.02500	0.05000	0.05000	
ALPHA-CHLORDANE	UG/L	0/2	2	0/2		0.02500	0.05000	0.05000	
AROCLOR-1016	UG/L	0/2	2	0/2		0.50000	1.00000	1.00000	
AROCLOR-1221	UG/L	0/2	2	0/2		1.00000	2.00000	2.00000	
AROCLOR-1232	UG/L	0/2	2	0/2		0.50000	1.00000	1.00000	
AROCLOR-1242	UG/L	0/2	2	0/2		0.50000	1.00000	1.00000	
AROCLOR-1248	UG/L	0/2	2	0/2		0.50000	1.00000	1.00000	
AROCLOR-1254	UG/L	0/2	2	0/2		0.50000	1.00000	1.00000	
AROCLOR-1260	UG/L	0/2	2	0/2		0.50000	1.00000	1.00000	
BETA-BHC	UG/L	0/2	2	0/2		0.02500	0.05000	0.05000	
DELTA-BHC	UG/L	0/2	2	0/2		0.02500	0.05000	0.05000	
DIELDRIN	UG/L	0/2	2	0/2		0.05000	0.10000	0.10000	
ENDOSULFAN II	UG/L	0/2	2	0/2		0.05000	0.10000	0.10000	
ENDOSULFAN SULFATE	UG/L	0/2	2	0/2		0.05000	0.10000	0.10000	
ENDOSULFAN-I	UG/L	0/2	2	0/2		0.02500	0.05000	0.05000	
ENDRIN	UG/L	0/2	2	0/2		0.05000	0.10000	0.10000	
ENDRIN ALDEHYDE	UG/L	0/2	2	0/2		0.05000	0.10000	0.10000	
ENDRIN KETONE	UG/L	0/2	2	0/2		0.05000	0.10000	0.10000	

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NORTH OF RR TRACKS - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
PESTICIDES									
GAMMA-BHC (LINDANE)	UG/L	0/2	2	0/2		0.02500	0.05000	0.05000	
GAMMA-CHLORDANE	UG/L	0/2	2	0/2		0.02500	0.05000	0.05000	
HEPTACHLOR	UG/L	0/2	2	0/2		0.02500	0.05000	0.05000	
HEPTACHLOR EPOXIDE	UG/L	0/2	2	0/2		0.02500	0.05000	0.05000	
METHOXYCHLOR	UG/L	0/2	2	0/2		0.25000	0.50000	0.50000	
TOXAPHENE	UG/L	0/2	2	0/2		2.50000	5.00000	5.00000	

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NORTH OF RR TRACKS - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
GENERAL CHEMISTRY									
ALKALINITY AS CACO3	MG/L	2/2	2	0/2	276.00000-276.50000	276.25000	-		342
AMMONIA	MG/L	0/2	2	0/2		0.05000	0.10000	0.10000	0.0387
CHLORIDE	MG/L	2/2	2	0/2	17.10000-24.60000	20.85000			31.6
FLUORIDE	MG/L	2/2	2	0/2	0.19000-0.22000	0.20500			0.22
NITRATE	MG/L	1/2	2	1/2	2.34000-2.34000	6.62000	21.80000	21.80000	1.66
PHENOLS	UG/L	0/2	2	0/2		0.00500	0.01000	0.01000	ND
PHOSPHORUS	MG/L	2/2	2	0/2	0.03000-0.04000	0.03500			0.228
SULFATE	MG/L	1/2	2	1/2	61.01000-61.01000	31.00500	2.00000	2.00000	55.7
SULFIDE	MG/L	1/2	2	1/2	1.01000-1.01000	0.63000	0.50000	0.50000	ND
TOTAL KJELDAHL NITROGEN	MG/L	2/2	2	0/2	0.20000-0.23000	0.21500			0.288
TOTAL ORGANIC CARBON	MG/L	2/2	2	0/2	2.70000-2.80000	2.75000			5.35
TOTAL ORGANIC HALIDES	MG/L	0/2	2	0/2		0.00500	0.01000	0.01000	0.011
TOTAL ORGANIC NITROGEN	MG/L	2/2	2	0/2	0.20000-0.23000	0.21500			0.288

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NORTH OF RR TRACKS - 1993
SURFACE WATER DATA - FILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/L	0/1	1	0/1		0.09850	0.19700	0.19700	0.132
ANTIMONY	MG/L	0/1	1	0/1		0.00250	0.00500	0.00500	ND
ARSENIC	MG/L	0/1	1	0/1		0.00100	0.00200	0.00200	ND
BARIUM	MG/L	1/1	1	0/1	0.04050-0.04050	0.04050			0.0526
BERYLLIUM	MG/L	0/1	1	0/1		0.00100	0.00200	0.00200	ND
CADMIUM	MG/L	0/1	1	0/1		0.00250	0.00500	0.00500	ND
CALCIUM	MG/L	1/1	1	0/1	105.00000-105.00000	105.00000			107
CHROMIUM	MG/L	0/1	1	0/1		0.00500	0.01000	0.01000	ND
COBALT	MG/L	0/1	1	0/1		0.00500	0.01000	0.01000	ND
COPPER	MG/L	0/1	1	0/1		0.00500	0.01000	0.01000	ND
IRON	MG/L	0/1	1	0/1		0.01000	0.02000	0.02000	ND
LEAD	MG/L	0/1	1	0/1		0.00100	0.00200	0.00200	ND
MAGNESIUM	MG/L	1/1	1	0/1	25.70000-25.70000	25.70000			27.7
MANGANESE	MG/L	1/1	1	1/1	0.18500-0.18500	0.18500			0.0257
MERCURY	MG/L	0/1	1	0/1		0.00010	0.00020	0.00020	ND
MOLYBDENUM	MG/L	0/1	1	0/1		0.01000	0.02000	0.02000	ND
NICKEL	MG/L	0/1	1	0/1		0.01000	0.02000	0.02000	ND
POTASSIUM	MG/L	1/1	1	0/1	0.86900-0.86900	0.86900			3.50
SELENIUM	MG/L	0/1	1	0/1		0.00100	0.00200	0.00200	ND
SILICON	MG/L	1/1	1	0/1	2.03000-2.03000	2.03000			3.01
SILVER	MG/L	0/1	1	0/1		0.00500	0.01000	0.01000	ND
SODIUM	MG/L	1/1	1	0/1	13.00000-13.00000	13.00000			18.3

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NORTH OF RR TRACKS - 1993
SURFACE WATER DATA - FILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
THALLIUM	MG/L	0/1	1	0/1		0.00100	0.00200	0.00200	ND
VANADIUM	MG/L	0/1	1	0/1		0.00500	0.01000	0.01000	ND
ZINC	MGØL	0/1	1	0/1		0.00250	0.00500	0.00500	ND

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NORTH OF RR TRACKS - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/L	2/2	2	2/2	9.70000-18.00000	13.85000			0.73
URANIUM, TOTAL	UG/L	2/2	2	2/2	26.00000-54.00000	40.00000			1.1
URANIUM-234	PCI/L	2/2	2	2/2	6.10000-10.30000	8.20000			0.70
THORIUM-230	PCI/L	0/2	2	0/2		0.50000	1.00000	1.00000	ND
RADIUM-226	PCI/L	0/2	2	0/2		0.50000	1.00000	1.00000	0.35
URANIUM-235/236	PCI/L	0/2	2	0/2		0.50000	1.00000	1.00000	ND
THORIUM-232	PCI/L	0/2	2	0/2		0.50000	1.00000	1.00000	ND
RADIUM-228	PCI/L	0/2	2	0/2		1.50000	3.00000	3.00000	2.1
THORIUM-228	PCI/L	0/2	2	0/2		0.50000	1.00000	1.00000	ND
NEPTUNIUM-237	PCI/L	0/2	2	0/2		0.50000	1.00000	1.00000	NA
PLUTONIUM-239/240	PCI/L	0/2	2	0/2		0.50000	1.00000	1.00000	0.093
PLUTONIUM-238	PCI/L	0/2	2	0/2		0.50000	1.00000	1.00000	ND
STRONTIUM-90	PCI/L	0/2	2	0/2		2.50000	5.00000	5.00000	0.96
TECHNETIUM-99	PCI/L	0/2	2	0/2		15.00000	30.00000	30.00000	ND

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NORTH OF RR TRACKS - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/L	1/1	1	0/1	0.16100-0.16100	0.16100			0.640
ANTIMONY	MG/L	0/1	1	0/1		0.00100	0.00200	0.00200	ND
ARSENIC	MG/L	0/1	1	0/1		0.00100	0.00200	0.00200	ND
BARIUM	MG/L	1/1	1	1/1	0.06330-0.06330	0.06330			0.0534
BERYLLIUM	MG/L	1/1	1	1/1	0.00150-0.00150	0.00150			ND
CADMIUM	MG/L	1/1	1	1/1	0.00630-0.00630	0.00630			ND
CALCIUM	MG/L	1/1	1	0/1	47.00000-47.00000	47.00000			107
CHROMIUM	MG/L	1/1	1	1/1	0.01750-0.01750	0.01750			ND
COBALT	MG/L	1/1	1	1/1	0.01360-0.01360	0.01360			ND
COPPER	MG/L	1/1	1	1/1	0.01560-0.01560	0.01560			ND
CYANIDE	MG/L	0/1	1	0/1		0.00500	0.01000	0.01000	ND
IRON	MG/L	1/1	1	0/1	0.08660-0.08660	0.08660			0.513
LEAD	MG/L	0/1	1	0/1		0.00100	0.00200	0.00200	ND
MAGNESIUM	MG/L	1/1	1	0/1	10.70000-10.70000	10.70000			27.8
MANGANESE	MG/L	1/1	1	1/1	0.06510-0.06510	0.06510			0.035
MERCURY	MG/L	0/1	1	0/1		0.00010	0.00020	0.00020	ND
MOLYBDENUM	MG/L	1/1	1	1/1	0.02300-0.02300	0.02300			ND
NICKEL	MG/L	1/1	1	1/1	0.01590-0.01590	0.01590			ND
POTASSIUM	MG/L	1/1	1	0/1	2.02000-2.02000	2.02000			3.58
SELENIUM	MG/L	0/1	1	0/1		0.00100	0.00200	0.00200	ND
SILVER	MG/L	0/1	1	0/1		0.00025	0.00050	0.00050	ND
SODIUM	MG/L	1/1	1	0/1	4.96000-4.96000	4.96000			18.2

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NORTH OF RR TRACKS - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
THALLIUM	MG/L	0/1	1	0/1		0.00200	0.00400	0.00400	ND
VANADIUM	MG/L	1/1	1	1/1	0.01870-0.01870	0.01870			ND
ZINC	MG/L	1/1	1	1/1	0.03250-0.03250	0.03250			ND

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NORTH OF RR TRACKS - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
1,1,1-TRICHLOROETHANE	UG/L	0/1	1	0/1		2.50000	5.00000	5.00000	
1,1,2,2-TETRACHLOROETHANE	UG/L	0/1	1	0/1		2.50000	5.00000	5.00000	
1,1,2-TRICHLOROETHANE	UG/L	0/1	1	0/1		2.50000	5.00000	5.00000	
1,1-DICHLOROETHANE	UG/L	0/1	1	0/1		2.50000	5.00000	5.00000	
1,1-DICHLOROETHENE	UG/L	0/1	1	0/1		2.50000	5.00000	5.00000	
1,2-DICHLOROETHANE	UG/L	0/1	1	0/1		2.50000	5.00000	5.00000	
1,2-DICHLOROETHENE (TOTAL)	UG/L	0/1	1	0/1		2.50000	5.00000	5.00000	
1,2-DICHLOROPROPANE	UG/L	0/1	1	0/1		2.50000	5.00000	5.00000	
2-HEXANONE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
4-METHYL-2-PENTANONE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
ACETONE	UG/L	0/1	1	0/1		1.00000	2.00000	2.00000	
BROMODICHLOROMETHANE	UG/L	0/1	1	0/1		2.50000	5.00000	5.00000	
BROMOFORM		0/1	1	0/1		2.50000	5.00000	5.00000	
BROMOMETHANE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
CARBON DISULFIDE	UG/L	0/1	1	0/1		2.50000	5.00000	5.00000	
CARBON TETRACHLORIDE	UG/L	0/1	1	0/1		2.50000	5.00000	5.00000	
CHLOROETHANE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
CHLOROFORM	UG/L	0/1	1	0/1		2.50000	5.00000	5.00000	
CHLOROMETHANE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
CIS-1,3-DICHLOROPROPENE	UG/L	0/1	1	0/1		2.50000	5.00000	5.00000	
DIBROMOCHLOROMETHANE	UG/L	0/1	1	0/1		2.50000	5.00000	5.00000	
METHYLENE CHLORIDE	UG/L	0/1	1	0/1		2.50000	5.00000	5.00000	

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SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
TETRACHLOROETHENE	UG/L	0/1	1	0/1		2.50000	5.00000	5.00000	
TRANS-1,3-DICHLOROPROPENE	UG/L	0/1	1	0/1		2.50000	5.00000	5.00000	
TRICHLOROETHENE	UG/L	0/1	1	0/1		2.50000	5.00000	5.00000	
VINYL ACETATE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
VINYL CHLORIDE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	

NORTH OF RR TRACKS - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
1,2,4-TRICHLOROBENZENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
1,2-DICHLOROBENZENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
1,3-DICHLOROBENZENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
1,4-DICHLOROBENZENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
2,4,5-TRICHLOROPHENOL	UG/L	0/1	1	0/1		25.00000	50.00000	50.00000	
2,4,6-TRICHLOROPHENOL	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
2,4-DICHLOROPHENOL	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
2,4-DIMETHYLPHENOL	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
2,4-DINITROPHENOL	UG/L	0/1	1	0/1		25.00000	50.00000	50.00000	
2,4-DINITROTOLUENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
2,6-DINITROTOLUENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
2-CHLORONAPHTHALENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
2-CHLOROPHENOL	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
2-METHYLNAPHTHALENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
2-METHYLPHENOL	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
2-NITROANILINE	UG/L	0/1	1	0/1		25.00000	50.00000	50.00000	
2-NITROPHENOL	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
3,3'-DICHLOROBENZIDINE	UG/L	0/1	1	0/1		10.00000	20.00000	20.00000	
4,6-DINITRO-2-METHYLPHENOL	UG/L	0/1	1	0/1		25.00000	50.00000	50.00000	
4-BROMOPHENYL PHENYL ETHER	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
4-CHLORO-3-METHYLPHENOL	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
4-CHLOROPHENYLPHENYL ETHER	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	

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SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
4-METHYLPHENOL	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
4-NITROANILINE	UG/L	0/1	1	0/1		25.00000	50.00000	50.00000	
4-NITROPHENOL	UG/L	0/1	1	0/1		25.00000	50.00000	50.00000	
ACENAPHTHENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
ACENAPHTHYLENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
ANTHRACENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
BENZO(A)ANTHRACENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
BENZO(A)PYRENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
BENZO(B)FLUORANTHENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
BENZO(G,H,I)PERYLENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
BENZO(K)FLUORANTHENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
BENZOIC ACID	UG/L	0/1	1	0/1		25.00000	50.00000	50.00000	
BENZYL ALCOHOL	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
BIS(2-CHLOROETHOXY)METHANE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
BIS(2-CHLOROETHYL)ETHER	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
BIS(2-CHLOROISOPROPYL) ETHER	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
BIS(2-ETHYLHEXYL)PHTHALATE	UG/L	0/1	1	0/1		2.00000	4.00000	4.00000	
BUTYL BENZYL PHTHALATE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
CHRYSENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
DI-N-BUTYL PHTHALATE	UG/L	1/1	1	1/1	3.00000-3.00000	3.00000			
DI-N-OCTYL PHTHALATE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
DIBENZO(A,H)ANTHRACENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	

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SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
DIBENZOFURAN	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
DIETHYL PHTHALATE	UG/L	1/1	1	1/1	3.00000-3.00000	3.00000			
DIMETHYL PHTHALATE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
FLUORANTHENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
FLUORENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
HEXACHLOROBENZENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
HEXACHLOROBUTADIENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
HEXACHLOROCYCLOPENTADIENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
HEXACHLOROETHANE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
INDENO(1,2,3-CD)PYRENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
ISOPHORONE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
N-NITROSO-DI-N-PROPYLAMINE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
N-NITROSODIPHENYLAMINE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
NAPHTHALENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
NITROBENZENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
PENTACHLOROPHENOL	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
PHENANTHRENE	UG/L	0/1	1	0/1		25.00000	50.00000	50.00000	
PHENOL	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
PYRENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	

NORTH OF RR TRACKS - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
PESTICIDES									
4,4'-DDD	UG/L	0/1	1	0/1		0.05000	0.10000	0.10000	
4,4'-DDE	UG/L	0/1	1	0/1		0.05000	0.10000	0.10000	
4,4'-DDT	UG/L	0/1	1	0/1		0.05000	0.10000	0.10000	
ALDRIN	UG/L	0/1	1	0/1		0.02500	0.05000	0.05000	
ALPHA-BHC	UG/L	0/1	1	0/1		0.02500	0.05000	0.05000	
ALPHA-CHLORDANE	UG/L	0/1	1	0/1		0.25000	0.50000	0.50000	
AROCLOR-1016	UG/L	0/1	1	0/1		0.25000	0.50000	0.50000	
AROCLOR-1221	UG/L	0/1	1	0/1		0.25000	0.50000	0.50000	
AROCLOR-1232	UG/L	0/1	1	0/1		0.25000	0.50000	0.50000	
AROCLOR-1242	UG/L	0/1	1	0/1		0.25000	0.50000	0.50000	
AROCLOR-1248	UG/L	0/1	1	0/1		0.25000	0.50000	0.50000	
AROCLOR-1254	UG/L	0/1	1	0/1		0.50000	1.00000	1.00000	
AROCLOR-1260	UG/L	0/1	1	0/1		0.50000	1.00000	1.00000	
BETA-BHC	UG/L	0/1	1	0/1		0.02500	0.05000	0.05000	
DELTA-BHC	UG/L	0/1	1	0/1		0.02500	0.05000	0.05000	
DIELDRIN	UG/L	0/1	1	0/1		0.05000	0.10000	0.10000	
ENDOSULFAN II	UG/L	0/1	1	0/1		0.05000	0.10000	0.10000	
ENDOSULFAN SULFATE	UG/L	0/1	1	0/1		0.05000	0.10000	0.10000	
ENDOSULFAN-I	UG/L	0/1	1	0/1		0.02500	0.05000	0.05000	
ENDRIN	UG/L	0/1	1	0/1		0.05000	0.10000	0.10000	
ENDRIN KETONE	UG/L	0/1	1	0/1		0.05000	0.10000	0.10000	
GAMMA-BHC (LINDANE)	UG/L	0/1	1	0/1		0.02500	0.05000	0.05000	

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NORTH OF RR TRACKS - 1988/89
SURFACE WATER DATA - UNFILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
PESTICIDES									
GAMMA-CHLORDANE	UG/L	0/1	1	0/1		0.25000	0.50000	0.50000	
HEPTACHLOR	UG/L	0/1	1	0/1		0.02500	0.05000	0.05000	
HEPTACHLOR EPOXIDE	UG/L	0/1	1	0/1		0.02500	0.05000	0.05000	
METHOXYCHLOR	UG/L	0/1	1	0/1		0.25000	0.50000	0.50000	
TOXAPHENE	UG/L	0/1	1	0/1		0.50000	1.00000	1.00000	

NORTH OF RR TRACKS - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
ORGANOPHOSPHORUS PESTICIDES									
AZINPHOSMETHYL	UG/L	0/1	1	0/1		250.00000	500.00000	500.00000	
DEMETON	UG/L	0/1	1	0/1		125.00000	250.00000	250.00000	
DIAZINON	UG/L	0/1	1	0/1		125.00000	250.00000	250.00000	
DISULFOTON	UG/L	0/1	1	0/1		125.00000	250.00000	250.00000	
ETHION	UG/L	0/1	1	0/1		125.00000	250.00000	250.00000	
MALATHION	UG/L	0/1	1	0/1		125.00000	250.00000	250.00000	
METHYL PARATHION	UG/L	0/1	1	0/1		125.00000	250.00000	250.00000	
PARATHION	UG/L	0/1	1	0/1		125.00000	250.00000	250.00000	

NORTH OF RR TRACKS - 1988/89
SURFACE WATER DATA - UNFILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
GENERAL CHEMISTRY									
AMMONIA	MG/L	0/1	1	0/1		0.05000	0.10000	0.10000	0.0387
CHLORIDE	MG/L	1/1	1	0/1	12.00000-12.00000	12.00000			31.6
FLUORIDE	MG/L	1/1	1	0/1	0.14000-0.14000	0.14000			0.22
NITRATE	MG/L	1/1	1	1/1	1.80000-1.80000	1.80000			1.66
PHENOLS	UG/L	0/1	1	0/1		0.00500	0.01000	0.01000	ND
PHOSPHORUS	MG/L	1/1	1	1/1	0.27000-0.27000	0.27000			0.228
SULFATE	MG/L	1/1	1	0/1	36.80000-36.80000	36.80000			55.7
TOTAL KJELDAHL NITROGEN	MG/L	1/1	1	1/1	1.02830-1.02830	1.02830			0.288
TOTAL ORGANIC HALIDES	MG/L	1/1	1	1/1	0.01890-0.01890	0.01890			0.011
TOTAL ORGANIC NITROGEN	MG/L	1/1	1	1/1	1.03000-1.03000	1.03000			0.288

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SURFACE WATER DATA - FILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/L	2/2	2	2/2	13.70000-30.30000	22.00000			0.50
URANIUM, TOTAL	UG/L	2/2	2	2/2	42.00000-92.00000	67.00000			1.1
URANIUM-234	PCI/L	2/2	2	2/2	7.30000-22.70000	15.00000			0.70
THORIUM-230	PCI/L	0/2	2	0/2		0.50000	1.00000	1.00000	0.28
RADIUM-226	PCI/L	0/2	2	0/2		0.50000	1.00000	1.00000	ND
URANIUM-235/236	PCI/L	1/2	2	1/2	1.50000-1.50000	1.00000	1.00000	1.00000	ND
THORIUM-232	PCI/L	0/2	2	0/2		0.50000	1.00000	1.00000	ND
RADIUM-228	PCI/L	0/2	2	0/2		1.50000	3.00000	3.00000	ND
THORIUM-228	PCI/L	0/2	2	0/2		0.50000	1.00000	1.00000	ND
NEPTUNIUM-237	PCI/L	0/2	2	0/2		0.50000	1.00000	1.00000	0.42
PLUTONIUM-239/240	PCI/L	0/2	2	0/2		0.50000	1.00000	1.00000	0.29
PLUTONIUM-238	PCI/L	0/2	2	0/2		0.50000	1.00000	1.00000	ND
STRONTIUM-90	PCI/L	0/2	2	0/2		2.50000	5.00000	5.00000	0.86
TECHNETIUM-99	PCI/L	0/2	2	0/2		15.00000	30.00000	30.00000	ND

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AREA: NORTH OF RR TRACKS - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/G	2/2	2	2/2	0.007-4.560	2.28340			
URANIUM, TOTAL	MG/KG	1/2	2	1/2	14.700-14.700	7.37500	0.10000	0.10000	1.67
URANIUM-234	PCI/G	2/2	2	2/2	0.004-3.660	1.83209			
THORIUM-230	PCI/G	1/1	1	1/1	1.050-1.050	1.05000			
RADIUM-226	PCI/G	2/2	2	0/2	0.001-0.970	0.48545			1.93
URANIUM-235/236	PCI/G	1/2	2	1/2	0.250-0.250	0.12501	0.00003	0.00003	
THORIUM-232	PCI/G	1/1	1	1/1	0.570-0.570	0.57000			
THORIUM, TOTAL	MG/KG	1/1	1	1/1	5.200-5.200	5.20000			
RADIUM-228	PCI/G	2/2	2	2/2	0.001-0.750	0.37554			ND
THORIUM-228	PCI/G	1/1	1	1/1	0.730-0.730	0.73000			
NEPTUNIUM-237	PCI/G	1/2	2	1/2	0.625-0.625	0.31251	0.00004	0.00004	
PLUTONIUM-239/240	PCI/G	0/2	2	0/2		0.05001	0.00004	0.20000	
PLUTONIUM-238	PCI/G	0/2	2	0/2		0.05002	0.00005	0.20000	
STRONTIUM-90	PCI/G	2/2	2	2/2	0.586-0.990	0.78800			
TECHNETIUM-99	PCI/G	0/2	2	0/2		0.25010	0.00037	1.00000	
RUTHENIUM-106	PCI/G	0/2	2	0/2		0.25019	0.00073	1.00000	
CESIUM-137	PCI/G	0/2	2	0/2		0.05003	0.00010	0.20000	
GROSS ALPHA	PCI/G	2/2	2	2/2	0.015-27.700	13.85765			
GROSS BETA	PCI/G	2/2	2	2/2	0.016-26.900	13.45815			

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AREA: NORTH OF RR TRACKS - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/KG	3/3	3	3/3	7010.000-10900.000	8380.00000			1970
ANTIMONY	MG/KG	0/2	2	0/2		0.65000	1.10000	1.50000	
ARSENIC	MG/KG	3/3	3	1/3	4.500-10.400	5.30000			7
BARIUM	MG/KG	3/3	3	3/3	55.900-114.000	62.50000			21
BERYLLIUM	MG/KG	1/3	3	1/3	0.830-0.830	0.83000	0.59000	2.30000	0.50
CADMIUM	MG/KG	0/3	3	0/3		0.75000	1.50000	5.60000	3.7
CALCIUM	MG/KG	3/3	3	2/3	12700.000-161000.000	105000.0000			25900
CHROMIUM	MG/KG	2/3	3	0/3	11.500-13.100	11.50000	11.30000	11.30000	18.3
COBALT	MG/KG	2/3	3	2/3	6.400-10.900	6.40000	11.30000	11.30000	4.9
COPPER	MG/KG	3/3	3	3/3	11.900-19.200	15.30000			10.8
CYANIDE	MG/KG	0/3	3	0/3		0.07500	0.13000	0.21000	
IRON	MG/KG	3/3	3	3/3	13400.000-20300.000	15400.00000			6700
LEAD	MG/KG	3/3	3	3/3	11.400-23.200	14.10000			
MAGNESIUM	MG/KG	3/3	3	2/3	5070.000-26000.000	22500.00000			18300
MANGANESE	MG/KG	3/3	3	3/3	424.000-1640.000	645.00000			411
MERCURY	MG/KG	0/3	3	0/3		0.05000	0.08000	0.21000	ND
MOLYBDENUM	MG/KG	1/3	3	1/3	6.600-6.600	6.60000	5.90000	22.60000	ND
NICKEL	MG/KG	2/3	3	2/3	16.400-21.700	16.40000	22.60000	22.60000	13.7
POTASSIUM	MG/KG	3/3	3	3/3	895.000-1100.000	1030.00000			307
SELENIUM	MG/KG	0/3	3	0/3		0.29500	0.52000	0.84000	ND
SILICON	MG/KG	2/2	2	2/2	1280.000-1330.000	1305.00000			

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Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
SILVER	MG/KG	2/3	3	2/3	4.200-6.800	5.65000	11.30000	11.30000	ND
SODIUM	MG/KG	3/3	3	1/3	129.000-346.000	158.00000			197
THALLIUM	MG/KG	1/3	3	1/3	0.760-0.760	0.42000	0.59000	0.84000	ND
VANADIUM	MG/KG	3/3	3	3/3	19.000-29.800	23.80000			12.4
ZINC	MG/KG	3/3	3	3/3	45.700-72.600	68.00000			13.5

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Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
1,1,1-TRICHLOROETHANE	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	
1,1,2,2-TETRACHLOROETHANE	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	
1,1,2-TRICHLOROETHANE	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	
1,1-DICHLOROETHANE	UG/KG	1/3	3	1/3	3.000-3.000	6.50000	13.00000	15.00000	
1,1-DICHLOROETHENE	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	
1,2-DICHLOROETHANE	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	
1,2-DICHLOROETHENE (TOTAL)	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	
1,2-DICHLOROPROPANE	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	
2-BUTANONE	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	
2-HEXANONE	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	
4-METHYL-2-PENTANONE	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	
ACETONE	UG/KG	2/3	3	2/3	2.000-110.000	6.50000	13.00000	13.00000	
BENZENE	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	
BROMODICHLOROMETHANE	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	
BROMOFORM	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	
BROMOMETHANE	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	
CARBON DISULFIDE	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	
CARBON TETRACHLORIDE	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	
CHLOROBENZENE	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	
CHLOROETHANE	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	
CHLOROFORM	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	

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Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
CHLOROMETHANE	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	
CIS-1,3-DICHLOROPROPENE	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	
DIBROMOCHLOROMETHANE	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	
ETHYLBENZENE	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	1.0
METHYLENE CHLORIDE	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	
STYRENE	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	
TETRACHLOROETHENE	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	
TOLUENE	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	
TRANS-1,3-DICHLOROPROPENE	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	
TRICHLOROETHENE	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	
VINYL ACETATE	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	
VINYL CHLORIDE	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	
XYLENES, TOTAL	UG/KG	0/3	3	0/3		7.50000	13.00000	21.00000	

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Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
1,2,4-TRICHLOROBENZENE	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
1,2-DICHLOROBENZENE	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
1,3-DICHLOROBENZENE	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
1,4-DICHLOROBENZENE	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
2,4,5-TRICHLOROPHENOL	UG/KG	0/3	3	0/3		600.00000	1100.00000	3400.00000	
2,4,6-TRICHLOROPHENOL	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
2,4-DICHLOROPHENOL	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
2,4-DIMETHYLPHENOL	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
2,4-DINITROPHENOL	UG/KG	0/3	3	0/3		600.00000	1100.00000	3400.00000	
2,4-DINITROTOLUENE	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
2,6-DINITROTOLUENE	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
2-CHLORONAPHTHALENE	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
2-CHLOROPHENOL	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
2-METHYLNAPHTHALENE	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
2-METHYLPHENOL	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
2-NITROANILINE	UG/KG	0/3	3	0/3		600.00000	1100.00000	3400.00000	
2-NITROPHENOL	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
3,3'-DICHLOROBENZIDINE	UG/KG	0/3	3	0/3		250.00000	450.00000	1400.00000	
3-NITROANILINE	NONE	0/3	3	0/3		600.00000	1100.00000	3400.00000	
4,6-DINITRO-2-METHYLPHENOL	UG/KG	0/3	3	0/3		600.00000	1100.00000	3400.00000	
4-BROMOPHENYL PHENYL ETHER	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	

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Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
4-CHLORO-3-METHYLPHENOL	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
4-CHLOROPHENYLPHENYL ETHER	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
4-METHYLPHENOL	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
4-NITROANILINE	UG/KG	0/3	3	0/3		600.00000	1100.00000	3400.00000	
4-NITROPHENOL	UG/KG	0/3	3	0/3		600.00000	1100.00000	3400.00000	
ACENAPHTHENE	UG/KG	1/3	3	1/3	98.000-98.000	225.00000	450.00000	690.00000	
ACENAPHTHYLENE	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
ANTHRACENE	UG/KG	1/3	3	1/3	240.000-240.000	240.00000	450.00000	690.00000	
BENZO(A)ANTHRACENE	UG/KG	2/3	3	2/3	170.000-500.000	225.00000	450.00000	450.00000	
BENZO(A)PYRENE	UG/KG	2/3	3	2/3	180.000-550.000	225.00000	450.00000	450.00000	
BENZO(B)FLUORANTHENE	UG/KG	2/3	3	2/3	180.000-730.000	225.00000	450.00000	450.00000	
BENZO(G,H,I)PERYLENE	UG/KG	2/3	3	2/3	150.000-240.000	225.00000	450.00000	450.00000	
BENZO(K)FLUORANTHENE	UG/KG	2/3	3	2/3	180.000-270.000	225.00000	450.00000	450.00000	
BENZOIC ACID	UG/KG	1/3	3	1/3	200.000-200.000	1100.00000	2200.00000	2400.00000	
BENZYL ALCOHOL	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
BIS(2-CHLOROETHOXY)METHANE	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
BIS(2-CHLOROETHYL)ETHER	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
BIS(2-CHLOROISOPROPYL) ETHER	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	2/3	3	2/3	53.000-140.000	140.00000	450.00000	450.00000	
BUTYL BENZYL PHTHALATE	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
CARBAZOLE	UG/KG	1/2	2	1/2	120.000-120.000	172.50000	450.00000	450.00000	

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Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
CHRYSENE	UG/KG	2/3	3	2/3	230.000-510.000	230.00000	450.00000	450.00000	
DI-N-BUTYL PHTHALATE	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
DI-N-OCTYL PHTHALATE	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
DIBENZO(A,H)ANTHRACENE	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
DIBENZOFURAN	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
DIETHYL PHTHALATE	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
DIMETHYL PHTHALATE	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
FLUORANTHENE	UG/KG	2/3	3	2/3	390.000-1400.000	390.00000	450.00000	450.00000	
FLUORENE	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
HEXACHLOROBENZENE	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
HEXACHLOROBUTADIENE	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
HEXACHLOROCYCLOPENTADIENE	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
HEXACHLOROETHANE	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
INDENO(1,2,3-CD)PYRENE	UG/KG	2/3	3	2/3	150.000-310.000	225.00000	450.00000	450.00000	
ISOPHORONE	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
N-NITROSO-DI-N-PROPYLAMINE	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
N-NITROSODIPHENYLAMINE	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
NAPHTHALENE	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
NITROBENZENE	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
P-CHLOROANILINE	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
PENTACHLOROPHENOL	UG/KG	0/3	3	0/3		600.00000	1100.00000	3400.00000	

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AREA: NORTH OF RR TRACKS - 1993
SEDIMENT DATA

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
PHENANTHRENE	UG/KG	2/3	3	2/3	200.000-1000.000	225.00000	450.00000	450.00000	
PHENOL	UG/KG	0/3	3	0/3		250.00000	450.00000	690.00000	
PYRENE	UG/KG	3/3	3	3/3	58.000-990.000	330.00000			
TRIBUTYL PHOSPHATE	UG/KG	0/1	1	0/1		345.00000	690.00000	690.00000	

AREA: NORTH OF RR TRACKS - 1993
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Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
PESTICIDES									
4,4'-DDD	UG/KG	0/3	3	0/3		2.50000	4.50000	34.00000	
4,4'-DDE	UG/KG	0/3	3	0/3		2.50000	4.50000	34.00000	
4,4'-DDT	UG/KG	0/3	3	0/3		2.50000	4.50000	34.00000	
ALDRIN	UG/KG	0/3	3	0/3		1.30000	2.30000	17.00000	
ALPHA-BHC	UG/KG	0/3	3	0/3		1.30000	2.30000	17.00000	
ALPHA-CHLORDANE	UG/KG	0/3	3	0/3		1.30000	2.30000	170.00000	
AROCLOR-1016	UG/KG	0/3	3	0/3		25.00000	45.00000	170.00000	
AROCLOR-1221	UG/KG	0/3	3	0/3		50.00000	91.00000	170.00000	
AROCLOR-1232	UG/KG	0/3	3	0/3		25.00000	45.00000	170.00000	
AROCLOR-1242	UG/KG	0/3	3	0/3		25.00000	45.00000	170.00000	
AROCLOR-1248	UG/KG	0/3	3	0/3		25.00000	45.00000	170.00000	
AROCLOR-1254	UG/KG	0/3	3	0/3		25.00000	45.00000	340.00000	
AROCLOR-1260	UG/KG	0/3	3	0/3		25.00000	45.00000	340.00000	
BETA-BHC	UG/KG	0/3	3	0/3		1.30000	2.30000	17.00000	
DELTA-BHC	UG/KG	0/3	3	0/3		1.30000	2.30000	17.00000	
DIELDRIN	UG/KG	0/3	3	0/3		2.50000	4.50000	34.00000	
ENDOSULFAN II	UG/KG	0/3	3	0/3		2.50000	4.50000	34.00000	
ENDOSULFAN SULFATE	UG/KG	0/3	3	0/3		2.50000	4.50000	34.00000	
ENDOSULFAN-I	UG/KG	0/3	3	0/3		1.30000	2.30000	17.00000	
ENDRIN	UG/KG	0/3	3	0/3		2.50000	4.50000	34.00000	
ENDRIN ALDEHYDE	UG/KG	0/2	2	0/2		2.37500	4.50000	5.00000	

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AREA: NORTH OF RR TRACKS - 1993
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Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
PESTICIDES									
ENDRIN KETONE	UG/KG	0/3	3	0/3		2.50000	4.50000	34.00000	
GAMMA-BHC (LINDANE)	UG/KG	0/3	3	0/3		1.30000	2.30000	17.00000	
GAMMA-CHLORDANE	UG/KG	0/3	3	0/3		1.30000	2.30000	170.00000	
HEPTACHLOR	UG/KG	0/3	3	0/3		1.30000	2.30000	17.00000	
HEPTACHLOR EPOXIDE	UG/KG	0/3	3	0/3		1.30000	2.30000	17.00000	
METHOXYCHLOR	UG/KG	0/3	3	0/3		13.00000	23.00000	170.00000	
TOXAPHENE	UG/KG	0/3	3	0/3		130.00000	230.00000	340.00000	

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AREA: NORTH OF RR TRACKS - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
ORGANOPHOSPHORUS PESTICIDES									
AZINPHOSMETHYL	UG/KG	0/1	1	0/1		41.50000	83.00000	83.00000	
DEMETON	UG/KG	0/1	1	0/1		33.00000	66.00000	66.00000	
DIAZINON	UG/KG	0/1	1	0/1		16.50000	33.00000	33.00000	
DISULFOTON	UG/KG	0/1	1	0/1		16.50000	33.00000	33.00000	
ETHION	UG/KG	0/1	1	0/1		16.50000	33.00000	33.00000	
MALATHION	UG/KG	0/1	1	0/1		16.50000	33.00000	33.00000	
METHYL PARATHION	UG/KG	0/1	1	0/1		16.50000	33.00000	33.00000	
PARATHION	UG/KG	0/1	1	0/1		16.50000	33.00000	33.00000	

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AREA: NORTH OF RR TRACKS - 1993
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Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
DIOXINS/FURANS									
1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	NG/G	0/1	1	0/1		500.00000	1000.00000	1000.00000	
1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	NG/G	0/1	1	0/1		500.00000	1000.00000	1000.00000	
1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	NG/G	0/1	1	0/1		500.00000	1000.00000	1000.00000	
1,2,3,4,7,8-HEXACHLORODIBENZO-P-DIOXIN	NG/G	0/1	1	0/1		500.00000	1000.00000	1000.00000	
1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	NG/G	0/1	1	0/1		500.00000	1000.00000	1000.00000	
1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	NG/G	0/1	1	0/1		500.00000	1000.00000	1000.00000	
1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	NG/G	0/1	1	0/1		500.00000	1000.00000	1000.00000	
1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	NG/G	0/1	1	0/1		500.00000	1000.00000	1000.00000	
1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	NG/G	0/1	1	0/1		500.00000	1000.00000	1000.00000	
1,2,3,7,8-PENTACHLORODIBENZO-P-DIOXIN	NG/G	0/1	1	0/1		500.00000	1000.00000	1000.00000	
1,2,3,7,8-PENTACHLORODIBENZOFURAN	NG/G	0/1	1	0/1		500.00000	1000.00000	1000.00000	
2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	NG/G	0/1	1	0/1		500.00000	1000.00000	1000.00000	
2,3,4,7,8-PENTACHLORODIBENZOFURAN	NG/G	0/1	1	0/1		500.00000	1000.00000	1000.00000	
2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN	NG/G	0/1	1	0/1		500.00000	1000.00000	1000.00000	
2,3,7,8-TETRACHLORODIBENZOFURAN	NG/G	0/1	1	0/1		500.00000	1000.00000	1000.00000	
HEPTACHLORODIBENZO-P-DIOXINS	NG/G	0/1	1	0/1		500.00000	1000.00000	1000.00000	
HEPTACHLORODIBENZOFURANS	NG/G	0/1	1	0/1		500.00000	1000.00000	1000.00000	
HEXACHLORODIBENZO-P-DIOXINS	NG/G	0/1	1	0/1		500.00000	1000.00000	1000.00000	
HEXACHLORODIBENZOFURANS	NG/G	0/1	1	0/1		500.00000	1000.00000	1000.00000	
OCTACHLORODIBENZO-P-DIOXIN	NG/G	0/1	1	0/1		500.00000	1000.00000	1000.00000	
OCTACHLORODIBENZOFURAN	NG/G	0/1	1	0/1		500.00000	1000.00000	1000.00000	

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AREA: NORTH OF RR TRACKS - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
DIOXINS/FURANS									
PENTACHLORODIBENZO-P-DIOXINS	NG/G	0/1	1	0/1		500.00000	1000.00000	1000.00000	
PENTACHLORODIBENZOFURANS	NG/G	0/1	1	0/1		500.00000	1000.00000	1000.00000	
TETRACHLORODIBENZO-P-DIOXINS	NG/G	0/1	1	0/1		500.00000	1000.00000	1000.00000	
TETRACHLORODIBENZOFURANS	NG/G	0/1	1	0/1		500.00000	1000.00000	1000.00000	

000395

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AREA: NORTH OF RR TRACKS - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM, TOTAL	MG/KG	2/2	2	2/2	15.000-24.000	19.500			1.67
RADIUM-226	PCI/G	2/2	2	0/2	0.800-1.000	0.900			1.93
RADIUM-228	PCI/G	2/2	2	2/2	1.000-1.100	1.050			ND
GROSS ALPHA	PCI/G	2/2	0	2/2	12.000-15.000	13.500			
GROSS BETA	PCI/G	0/2	0	0/2		26.500	28.000	78.000	

000398

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AREA: NORTH OF RR TRACKS - CIS
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/G	39/40	1	39/40	2.400-16.800	6.80000	5.65000	5.65000	
URANIUM, TOTAL	MG/KG	40/40	4	40/40	7.152-68.773	18.79730			1.67
URANIUM-234	PCI/G	3/4	4	3/4	1.000-12.000	1.70000	1.71590	1.71590	
THORIUM-230	PCI/G	2/4	4	2/4	0.200-5.000	0.16250	0.10000	0.25000	
RADIUM-226	PCI/G	39/40	0	0/40	0.300-1.470	0.70000	0.25000	0.25000	1.93
URANIUM-235/236	PCI/G	1/4	4	1/4	0.500-0.500	0.05000	0.10000	0.10000	
THORIUM-232	PCI/G	40/40	1	40/40	0.200-3.600	0.85000			
THORIUM-228	PCI/G	2/4	4	2/4	0.300-1.200	0.20150	0.10000	0.20600	
NEPTUNIUM-237	PCI/G	0/4	4	0/4		0.10000	0.20000	0.20000	
PLUTONIUM-239/240	PCI/G	0/4	4	0/4		0.10000	0.20000	0.20000	
PLUTONIUM-238	PCI/G	1/4	4	1/4	0.300-0.300	0.10000	0.20000	0.20000	
STRONTIUM-90	PCI/G	0/4	4	0/4		0.25000	0.50000	0.50000	
TECHNETIUM-99	PCI/G	0/4	4	0/4		0.55000	1.00000	1.20000	
RUTHENIUM-106	PCI/G	30/40	2	30/40	1.900-12.000	3.95000	1.00000	2.00000	
CESIUM-137	PCI/G	25/40	2	25/40	0.300-0.900	0.40000	0.20000	0.20000	
URANIUM-235	PCI/G	0/3	3	0/3		0.03635	0.06100	0.13900	

000237

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PILOT PLANT DRAINAGE DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/L	11/11	7	11/11	26.50000-1050.00000	333.00000			0.73
URANIUM, TOTAL	UG/L	27/27	5	27/27	7.10000-2890.00000	135.70689			1.1
URANIUM-234	PCI/L	11/11	7	11/11	19.80000-1040.00000	299.00000			0.70
THORIUM-230	PCI/L	1/8	4	1/8	2.51000-2.51000	0.50000	0.20000	1.00000	ND
RADIUM-226	PCI/L	0/9	5	0/9		0.50000	1.00000	1.00000	0.35
URANIUM-235/236	PCI/L	10/11	7	10/11	1.16000-41.80000	19.70000	0.34000	0.34000	ND
THORIUM-232	PCI/L	0/8	4	0/8		0.10000	0.20000	1.00000	ND
THORIUM, TOTAL	UG/L	1/8	4	1/8	1.08000-1.08000	0.50000	1.00000	2.90000	ND
RADIUM-228	PCI/L	0/9	5	0/9		1.50000	3.00000	3.00000	2.1
THORIUM-228	PCI/L	1/8	4	1/8	1.00000-1.00000	0.33250	0.20000	1.00000	ND
NEPTUNIUM-237	PCI/L	0/4	4	0/4		0.25000	0.50000	0.50000	NA
PLUTONIUM-239/240	PCI/L	1/4	4	1/4	0.81000-0.81000	0.25000	0.50000	0.50000	0.093
PLUTONIUM-238	PCI/L	0/4	4	0/4		0.25000	0.50000	0.50000	ND
STRONTIUM-90	PCI/L	0/4	4	0/4		0.50000	1.00000	1.00000	0.96
TECHNETIUM-99	PCI/L	0/4	4	0/4		7.50000	15.00000	15.00000	ND
RUTHENIUM-106	PCI/L	0/4	4	0/4		75.00000	150.00000	164.00000	ND
CESIUM-137	PCI/L	0/4	4	0/4		10.00000	20.00000	20.00000	3.1

000358

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PILOT PLANT DRAINAGE DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
1,1,1-TRICHLOROETHANE	UG/L	1/6	6	1/6	4.00000-4.00000	5.00000	10.00000	10.00000	
1,1,2,2-TETRACHLOROETHANE	UG/L	0/6	6	0/6		5.00000	10.00000	20.00000	
1,1,2-TRICHLOROETHANE	UG/L	0/6	6	0/6		5.00000	10.00000	20.00000	
1,1-DICHLOROETHANE	UG/L	1/6	6	1/6	10.00000-10.00000	5.00000	10.00000	10.00000	
1,1-DICHLOROETHENE	UG/L	0/6	6	0/6		5.00000	10.00000	20.00000	
1,2-DICHLOROETHANE	UG/L	0/6	6	0/6		5.00000	10.00000	20.00000	
1,2-DICHLOROETHENE (TOTAL)	UG/L	1/6	6	1/6	67.00000-67.00000	5.00000	10.00000	10.00000	
1,2-DICHLOROPROPANE	UG/L	0/6	6	0/6		5.00000	10.00000	20.00000	
2-BUTANONE	UG/L	0/6	6	0/6		5.00000	10.00000	20.00000	
2-HEXANONE	UG/L	1/6	6	1/6	19.00000-19.00000	5.00000	10.00000	20.00000	
4-METHYL-2-PENTANONE	UG/L	1/6	6	1/6	16.00000-16.00000	5.00000	10.00000	20.00000	
ACETONE	UG/L	0/6	6	0/6		5.00000	10.00000	34.00000	
BENZENE	UG/L	0/6	6	0/6		5.00000	10.00000	20.00000	
BROMODICHLOROMETHANE	UG/L	0/6	6	0/6		5.00000	10.00000	20.00000	
BROMOFORM		0/6	6	0/6		5.00000	10.00000	20.00000	
BROMOMETHANE	UG/L	0/6	6	0/6		5.00000	10.00000	20.00000	
CARBON DISULFIDE	UG/L	0/6	6	0/6		5.00000	10.00000	20.00000	
CARBON TETRACHLORIDE	UG/L	0/6	6	0/6		5.00000	10.00000	20.00000	
CHLOROBENZENE	UG/L	0/6	6	0/6		5.00000	10.00000	20.00000	
CHLOROETHANE	UG/L	0/6	6	0/6		5.00000	10.00000	20.00000	
CHLOROFORM	UG/L	0/6	6	0/6		5.00000	10.00000	20.00000	
CHLOROMETHANE	UG/L	0/6	6	0/6		5.00000	10.00000	20.00000	

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PILOT PLANT DRAINAGE DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
CIS-1,3-DICHLOROPROPENE	UG/L	0/6	6	0/6		5.00000	10.00000	20.00000	
DIBROMOCHLOROMETHANE	UG/L	0/6	6	0/6		5.00000	10.00000	20.00000	
ETHYLBENZENE	UG/L	0/6	6	0/6		5.00000	10.00000	20.00000	
METHYLENE CHLORIDE	UG/L	0/6	6	0/6		5.00000	10.00000	20.00000	
STYRENE	UG/L	0/6	6	0/6		5.00000	10.00000	20.00000	
TETRACHLOROETHENE	UG/L	4/6	6	4/6	1.00000-240.00000	16.00000	10.00000	10.00000	
TOLUENE	UG/L	0/6	6	0/6		5.00000	10.00000	20.00000	
TRANS-1,3-DICHLOROPROPENE	UG/L	0/6	6	0/6		5.00000	10.00000	20.00000	
TRICHLOROETHENE	UG/L	3/6	6	3/6	2.00000-18.00000	5.00000	10.00000	10.00000	
VINYL ACETATE	UG/L	0/6	6	0/6		5.00000	10.00000	20.00000	
VINYL CHLORIDE	UG/L	0/6	6	0/6		5.00000	10.00000	20.00000	
XYLENES, TOTAL	UG/L	0/6	6	0/6		5.00000	10.00000	20.00000	

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PILOT PLANT DRAINAGE DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
1,2,4-TRICHLOROBENZENE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
1,2-DICHLOROBENZENE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
1,3-DICHLOROBENZENE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
1,4-DICHLOROBENZENE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
2,4,5-TRICHLOROPHENOL	UG/L	0/7	7	0/7		12.50000	25.00000	25.00000	
2,4,6-TRICHLOROPHENOL	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
2,4-DICHLOROPHENOL	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
2,4-DIMETHYLPHENOL	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
2,4-DINITROPHENOL	UG/L	0/7	7	0/7		12.50000	25.00000	25.00000	
2,4-DINITROTOLUENE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
2,6-DINITROTOLUENE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
2-CHLORONAPHTHALENE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
2-CHLOROPHENOL	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
2-METHYLNAPHTHALENE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
2-METHYLPHENOL	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
2-NITROANILINE	UG/L	0/7	7	0/7		12.50000	25.00000	25.00000	
2-NITROPHENOL	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
3,3'-DICHLOROBENZIDINE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
3-NITROANILINE	NONE	0/7	7	0/7		12.50000	25.00000	25.00000	
4,6-DINITRO-2-METHYLPHENOL	UG/L	0/7	7	0/7		12.50000	25.00000	25.00000	
4-BROMOPHENYL PHENYL ETHER	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
4-CHLORO-3-METHYLPHENOL	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	

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PILOT PLANT DRAINAGE DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
4-CHLOROPHENYLPHENYL ETHER	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
4-METHYLPHENOL	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
4-NITROANILINE	UG/L	0/7	7	0/7		12.50000	25.00000	25.00000	
4-NITROPHENOL	UG/L	0/7	7	0/7		12.50000	25.00000	25.00000	
ACENAPHTHENE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
ACENAPHTHYLENE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
ANTHRACENE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
BENZO(A)ANTHRACENE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
BENZO(A)PYRENE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
BENZO(B)FLUORANTHENE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
BENZO(G,H,I)PERYLENE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
BENZO(K)FLUORANTHENE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
BENZOIC ACID	UG/L	0/5	5	0/5		25.00000	25.00000	50.00000	
BENZYL ALCOHOL	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
BIS(2-CHLOROETHOXY)METHANE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
BIS(2-CHLOROETHYL)ETHER	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
BIS(2-CHLOROISOPROPYL) ETHER	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
BIS(2-ETHYLHEXYL)PHTHALATE	UG/L	1/7	7	1/7	2.00000-2.00000	5.00000	10.00000	10.00000	
BUTYL BENZYL PHTHALATE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
CARBAZOLE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
CHRYSENE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
DI-N-BUTYL PHTHALATE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	

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PILOT PLANT DRAINAGE DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
DI-N-OCTYL PHTHALATE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
DIBENZO(A,H)ANTHRACENE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
DIBENZOFURAN	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
DIETHYL PHTHALATE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
DIMETHYL PHTHALATE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
FLUORANTHENE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
FLUORENE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
HEXACHLOROBENZENE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
HEXACHLOROBUTADIENE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
HEXACHLOROCYCLOPENTADIENE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
HEXACHLOROETHANE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
INDENO(1,2,3-CD)PYRENE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
ISOPHORONE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
N-NITROSO-DI-N-PROPYLAMINE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
N-NITROSODIPHENYLAMINE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
NAPHTHALENE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
NITROBENZENE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
P-CHLOROANILINE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
PENTACHLOROPHENOL	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
PHENANTHRENE	UG/L	0/7	7	0/7		12.50000	25.00000	25.00000	
PHENOL	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	
PYRENE	UG/L	0/7	7	0/7		5.00000	10.00000	10.00000	

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PILOT PLANT DRAINAGE DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/L	10/11	11	3/11	0.15700-14.40000	0.18900	0.09000	0.09000	0.640
ANTIMONY	MG/L	0/11	11	0/11		0.00250	0.00500	0.01400	ND
ARSENIC	MG/L	1/11	11	1/11	0.00340-0.00340	0.00100	0.00200	0.00350	ND
BARIUM	MG/L	11/11	11	7/11	0.04920-0.22300	0.06390			0.0534
BERYLLIUM	MG/L	0/11	11	0/11		0.00100	0.00200	0.00400	ND
CADMIUM	MG/L	0/11	11	0/11		0.00250	0.00500	0.00500	ND
CALCIUM	MG/L	11/11	11	7/11	99.80000-198.00000	111.00000			107
CHROMIUM	MG/L	1/11	11	1/11	0.01140-0.01140	0.00500	0.00600	0.01000	ND
COBALT	MG/L	0/11	11	0/11		0.00500	0.00700	0.01000	ND
COPPER	MG/L	1/11	11	1/11	0.02020-0.02020	0.00500	0.00800	0.01000	ND
CYANIDE	MG/L	2/13	13	2/13	0.00240-0.00280	0.00100	0.00200	0.00500	ND
IRON	MG/L	6/11	11	5/11	0.28800-17.70000	0.28800	0.01700	0.02000	0.513
LEAD	MG/L	1/11	11	1/11	0.00910-0.00910	0.00100	0.00100	0.00270	ND
MAGNESIUM	MG/L	11/11	11	11/11	30.30000-65.70000	35.70000			27.8
MANGANESE	MG/L	11/11	11	10/11	0.01470-0.82500	0.17200			0.035
MERCURY	MG/L	0/11	11	0/11		0.00010	0.00010	0.00020	ND
MOLYBDENUM	MG/L	0/11	11	0/11		0.00500	0.01000	0.02000	ND
NICKEL	MG/L	1/11	11	1/11	0.02700-0.02700	0.01000	0.01100	0.02000	ND
POTASSIUM	MG/L	11/11	11	3/11	1.12000-9.15000	1.42000			3.58
SELENIUM	MG/L	0/11	11	0/11		0.00100	0.00200	0.00200	ND
SILICON	MG/L	11/11	11	11/11	3.73000-30.20000	5.84000			3.36
SILVER	MG/L	0/11	11	0/11		0.00500	0.00100	0.01000	ND

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000404

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PILOT PLANT DRAINAGE DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
SODIUM	MG/L	11/11	11	4/11	6.37000-46.40000	15.50000			18.2
THALLIUM	MG/L	0/11	11	0/11		0.00100	0.00100	0.01000	ND
VANADIUM	MG/L	1/11	11	1/11	0.03170-0.03170	0.00500	0.01000	0.01200	ND
ZINC	MG/L	7/11	11	7/11	0.00540-0.07300	0.00940	0.00500	0.00600	ND

000405

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PILOT PLANT DRAINAGE DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
GENERAL CHEMISTRY									
ALKALINITY AS CACO3	MG/L	7/7	7	3/7	295.00000-392.50000	337.00000			342
AMMONIA	MG/L	3/7	7	3/7	0.16300-0.44600	0.05000	0.10000	0.10000	0.0387
CHLORIDE	MG/L	7/7	7	1/7	7.06000-97.94000	11.27000			31.6
FLUORIDE	MG/L	7/7	7	7/7	0.26000-0.56000	0.33000			0.22
NITRATE	MG/L	3/5	5	2/5	0.74000-2.67000	0.74000	0.10000	0.10000	1.66
NITRATE/NITRITE	MG/L	2/2	2	2/2	2.61000-5.66000	4.13500			
PHENOLS	UG/L	0/7	7	0/7		0.00500	0.00500	0.01000	ND
PHOSPHORUS	MG/L	5/7	7	1/7	0.04000-0.25000	0.05000	0.02000	0.02000	0.228
SULFATE	MG/L	7/7	7	5/7	31.80000-101.00000	77.40000			55.7
SULFIDE	MG/L	0/7	7	0/7		0.25000	0.50000	1.00000	ND
TOTAL KJELDAHL NITROGEN	MG/L	6/6	6	1/6	0.13000-0.65900	0.22500			0.288
TOTAL ORGANIC CARBON	MG/L	7/7	7	0/7	2.12000-3.60000	2.90000			5.35
TOTAL ORGANIC HALIDES	MG/L	7/7	7	7/7	0.01190-15.60000	0.03280			0.011
TOTAL ORGANIC NITROGEN	MG/L	6/6	6	1/6	0.21300-13.00000	0.22500			0.288

000408

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PILOT PLANT DRAINAGE DITCH - 1993
SURFACE WATER DATA - FILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/L	4/4	4	4/4	26.80000-629.00000	153.40000			0.50
URANIUM, TOTAL	UG/L	18/18	4	18/18	4.70000-1850.00000	47.90000			1.1
URANIUM-234	PCI/L	4/4	4	4/4	20.00000-662.00000	160.40000			0.70
THORIUM-230	PCI/L	2/4	4	2/4	0.48000-0.50000	0.29000	0.20000	0.20000	0.28
RADIUM-226	PCI/L	0/4	4	0/4		0.50000	1.00000	1.00000	ND
URANIUM-235/236	PCI/L	4/4	4	4/4	1.11000-33.00000	8.95000			ND
THORIUM-232	PCI/L	0/4	4	0/4		0.10000	0.20000	0.29000	ND
THORIUM, TOTAL	UG/L	1/4	4	1/4	0.87000-0.87000	0.63500	0.80000	2.60000	ND
RADIUM-228	PCI/L	0/4	4	0/4		1.50000	3.00000	3.10000	ND
THORIUM-228	PCI/L	0/4	4	0/4		0.14750	0.20000	0.39000	ND
NEPTUNIUM-237	PCI/L	1/4	4	1/4	0.75000-0.75000	0.25000	0.50000	0.50000	0.42
PLUTONIUM-239/240	PCI/L	0/4	4	0/4		0.25000	0.50000	0.50000	0.29
PLUTONIUM-238	PCI/L	0/4	4	0/4		0.25000	0.50000	0.50000	ND
STRONTIUM-90	PCI/L	0/4	4	0/4		0.50000	1.00000	1.00000	0.86
TECHNETIUM-99	PCI/L	0/4	4	0/4		7.50000	15.00000	15.00000	ND
RUTHENIUM-106	PCI/L	0/4	4	0/4		75.00000	150.00000	150.00000	ND
CESIUM-137	PCI/L	0/4	4	0/4		10.00000	20.00000	20.00000	3.9

000407

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PILOT PLANT DRAINAGE DITCH - 1993
SURFACE WATER DATA - FILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/L	4/4	4	4/4	0.13300-0.20100	0.16100			0.132
ANTIMONY	MG/L	0/4	4	0/4		0.00250	0.00500	0.00500	ND
ARSENIC	MG/L	0/4	4	0/4		0.00100	0.00200	0.00200	ND
BARIUM	MG/L	4/4	4	4/4	0.05760-0.07110	0.06245			0.0526
BERYLLIUM	MG/L	0/4	4	0/4		0.00100	0.00200	0.00200	ND
CADMIUM	MG/L	0/4	4	0/4		0.00250	0.00500	0.00500	ND
CALCIUM	MG/L	4/4	4	2/4	95.10000-119.00000	109.20000			107
CHROMIUM	MG/L	0/4	4	0/4		0.00500	0.01000	0.01000	ND
COBALT	MG/L	0/4	4	0/4		0.00500	0.01000	0.01000	ND
COPPER	MG/L	0/4	4	0/4		0.00500	0.01000	0.01000	ND
CYANIDE	MG/L	1/2	2	1/2	0.00240-0.00240	0.00170	0.00200	0.00200	ND
IRON	MG/L	3/4	4	3/4	0.04020-0.10200	0.05565	0.02000	0.02000	ND
LEAD	MG/L	0/4	4	0/4		0.00100	0.00200	0.00200	ND
MAGNESIUM	MG/L	4/4	4	4/4	32.80000-37.70000	36.35000			27.7
MANGANESE	MG/L	4/4	4	4/4	0.14900-0.34400	0.20400			0.0257
MERCURY	MG/L	0/4	4	0/4		0.00010	0.00020	0.00020	ND
MOLYBDENUM	MG/L	0/4	4	0/4		0.00500	0.01000	0.01000	ND
NICKEL	MG/L	0/4	4	0/4		0.01000	0.02000	0.02000	ND
POTASSIUM	MG/L	4/4	4	2/4	1.05000-9.55000	4.70500			3.50
SELENIUM	MG/L	0/4	4	0/4		0.00100	0.00200	0.00200	ND
SILICON	MG/L	4/4	4	4/4	5.33000-6.72000	6.04000			3.01
SILVER	MG/L	0/4	4	0/4		0.00500	0.01000	0.01000	ND

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PILOT PLANT DRAINAGE DITCH - 1993
SURFACE WATER DATA - FILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
SODIUM	MG/L	4/4	4	2/4	15.90000-46.00000	31.45000			18.3
THALLIUM	MG/L	0/4	4	0/4		0.00100	0.00200	0.00200	ND
VANADIUM	MG/L	0/4	4	0/4		0.00500	0.01000	0.01000	ND
ZINC	MG/L	2/4	4	2/4	0.01340-0.03840	0.00795	0.00500	0.00500	ND

000409

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PILOT PLANT DRAINAGE DITCH - 1993
SURFACE WATER DATA - FILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
GENERAL CHEMISTRY									
SULFIDE	MG/L	0/1	1	0/1		0.50000	1.00000	1.00000	NA

000410

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5698

PILOT PLANT DRAINAGE DITCH - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM, TOTAL	UG/L	2/2	2	2/2	231.00000-2219.00000	1225.00000			1.1
RADIUM-226	PCI/L	0/2	2	0/2		0.50000	1.00000	1.00000	0.35
RADIUM-228	PCI/L	0/2	2	0/2		1.50000	3.00000	3.00000	2.1
GROSS ALPHA	PCI/L	2/2	0	2/2	232.00000-678.00000	455.00000			3.7
GROSS BETA	PCI/L	2/2	0	2/2	67.00000-242.00000	154.50000			6.8

000411

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PILOT PLANT DRAINAGE DITCH - 1988/89
SURFACE WATER DATA - FILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM, TOTAL	UG/L	2/2	2	2/2	282.00000-2199.00000	1240.50000			1.1
RADIUM-226	PCI/L	0/2	2	0/2		0.50000	1.00000	1.00000	ND
RADIUM-228	PCI/L	1/2	2	1/2	4.10000-4.10000	2.80000	3.00000	3.00000	ND
GROSS ALPHA	PCI/L	2/2	0	2/2	190.00000-908.00000	549.00000			5.3
GROSS BETA	PCI/L	2/2	0	2/2	62.00000-430.00000	246.00000			5.8

000412

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5698

AREA: PILOT PLANT DRAINAGE DITCH - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							95% Background Concentration Value
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	
RADIONUCLIDES									
URANIUM, TOTAL	MG/KG	1/1	1	1/1	30.300-30.300	30.300			1.67
RADIUM-226	PCI/G	1/1	1	0/1	0.686-0.686	0.686			1.93
RADIUM-228	PCI/G	1/1	1	1/1	0.900-0.900	0.900			ND
GROSS ALPHA	PCI/G	1/2	0	1/2	26.000-26.000	19.500	26.000	26.000	
GROSS BETA	PCI/G	1/2	0	1/2	26.000-26.000	19.500	26.000	26.000	

000413

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AREA: PILOT PLANT DRAINAGE DITCH - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ANTIMONY	MG/KG	0/1	1	0/1		0.050	0.100	0.100	
CADMIUM	MG/KG	0/1	1	0/1		0.100	0.200	0.200	3.7
CYANIDE	MG/KG	0/1	1	0/1		0.450	0.900	0.900	
LEAD	MG/KG	1/1	1	1/1	18.400-18.400	18.400			
MOLYBDENUM	MG/KG	0/1	1	0/1		1.200	2.400	2.400	ND
POTASSIUM	MG/KG	1/1	1	1/1	659.000-659.000	659.000			307
THALLIUM	MG/KG	0/1	1	0/1		0.050	0.100	0.100	ND

000414

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5698

AREA: PILOT PLANT DRAINAGE DITCH - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
1,1,1-TRICHLOROETHANE	UG/KG	0/1	1	0/1		3.500	7.000	7.000	
1,1,2,2-TETRACHLOROETHANE	UG/KG	0/1	1	0/1		3.500	7.000	7.000	
1,1,2-TRICHLOROETHANE	UG/KG	0/1	1	0/1		3.500	7.000	7.000	
1,1-DICHLOROETHANE	UG/KG	0/1	1	0/1		3.500	7.000	7.000	
1,1-DICHLOROETHENE	UG/KG	0/1	1	0/1		3.500	7.000	7.000	
1,2-DICHLOROETHANE	UG/KG	0/1	1	0/1		3.500	7.000	7.000	
1,2-DICHLOROETHENE (TOTAL)	UG/KG	0/1	1	0/1		3.500	7.000	7.000	
1,2-DICHLOROPROPANE	UG/KG	0/1	1	0/1		3.500	7.000	7.000	
2-BUTANONE	UG/KG	0/1	1	0/1		7.500	15.000	15.000	
2-HEXANONE	UG/KG	0/1	1	0/1		7.500	15.000	15.000	
4-METHYL-2-PENTANONE	UG/KG	0/1	1	0/1		7.500	15.000	15.000	
ACETONE	UG/KG	0/1	1	0/1		47.000	94.000	94.000	
BENZENE	UG/KG	0/1	1	0/1		3.500	7.000	7.000	
BROMODICHLOROMETHANE	UG/KG	0/1	1	0/1		3.500	7.000	7.000	
BROMOFORM	UG/KG	0/1	1	0/1		3.500	7.000	7.000	
BROMOMETHANE	UG/KG	0/1	1	0/1		7.500	15.000	15.000	
CARBON DISULFIDE	UG/KG	0/1	1	0/1		3.500	7.000	7.000	
CARBON TETRACHLORIDE	UG/KG	0/1	1	0/1		3.500	7.000	7.000	
CHLOROBENZENE	UG/KG	0/1	1	0/1		3.500	7.000	7.000	
CHLOROETHANE	UG/KG	0/1	1	0/1		7.500	15.000	15.000	
CHLOROFORM	UG/KG	0/1	1	0/1		3.500	7.000	7.000	

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AREA: PILOT PLANT DRAINAGE DITCH - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
CHLOROMETHANE	UG/KG	0/1	1	0/1		7.500	15.000	15.000	
CIS-1,3-DICHLOROPROPENE	UG/KG	0/1	1	0/1		3.500	7.000	7.000	
DIBROMOCHLOROMETHANE	UG/KG	0/1	1	0/1		3.500	7.000	7.000	
ETHYLBENZENE	UG/KG	0/1	1	0/1		3.500	7.000	7.000	
METHYLENE CHLORIDE	UG/KG	0/1	1	0/1		9.500	19.000	19.000	
STYRENE	UG/KG	0/1	1	0/1		3.500	7.000	7.000	
TETRACHLOROETHENE	UG/KG	0/1	1	0/1		3.500	7.000	7.000	
TOLUENE	UG/KG	0/1	1	0/1		3.500	7.000	7.000	
TRANS-1,3-DICHLOROPROPENE	UG/KG	0/1	1	0/1		3.500	7.000	7.000	
TRICHLOROETHENE	UG/KG	0/1	1	0/1		3.500	7.000	7.000	
VINYL ACETATE	UG/KG	0/1	1	0/1		7.500	15.000	15.000	
VINYL CHLORIDE	UG/KG	0/1	1	0/1		7.500	15.000	15.000	
XYLENES, TOTAL	UG/KG	0/1	1	0/1		3.500	7.000	7.000	

000416

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AREA: PILOT PLANT DRAINAGE DITCH - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
1,2,4-TRICHLOROBENZENE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
1,2-DICHLOROBENZENE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
1,3-DICHLOROBENZENE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
1,4-DICHLOROBENZENE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
2,4,5-TRICHLOROPHENOL	UG/KG	0/1	1	0/1		1250.000	2500.000	2500.000	
2,4,6-TRICHLOROPHENOL	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
2,4-DICHLOROPHENOL	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
2,4-DIMETHYLPHENOL	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
2,4-DINITROPHENOL	UG/KG	0/1	1	0/1		1250.000	2500.000	2500.000	
2,4-DINITROTOLUENE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
2,6-DINITROTOLUENE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
2-CHLORONAPHTHALENE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
2-CHLOROPHENOL	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
2-METHYLNAPHTHALENE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
2-METHYLPHENOL	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
2-NITROANILINE	UG/KG	0/1	1	0/1		1250.000	2500.000	2500.000	
2-NITROPHENOL	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
3,3'-DICHLOROBENZIDINE	UG/KG	0/1	1	0/1		490.000	980.000	980.000	
3-NITROANILINE	NONE	0/1	1	0/1		1250.000	2500.000	2500.000	
4,6-DINITRO-2-METHYLPHENOL	UG/KG	0/1	1	0/1		1250.000	2500.000	2500.000	
4-BROMOPHENYL PHENYL ETHER	UG/KG	0/1	1	0/1		245.000	490.000	490.000	

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AREA: PILOT PLANT DRAINAGE DITCH - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
4-CHLORO-3-METHYLPHENOL	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
4-CHLOROPHENYLPHENYL ETHER	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
4-METHYLPHENOL	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
4-NITROANILINE	UG/KG	0/1	1	0/1		1250.000	2500.000	2500.000	
4-NITROPHENOL	UG/KG	0/1	1	0/1		1250.000	2500.000	2500.000	
ACENAPHTHENE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
ACENAPHTHYLENE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
ANTHRACENE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
BENZO(A)ANTHRACENE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
BENZO(A)PYRENE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
BENZO(B)FLUORANTHENE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
BENZO(G,H,I)PERYLENE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
BENZO(K)FLUORANTHENE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
BENZOIC ACID	UG/KG	0/1	1	0/1		1250.000	2500.000	2500.000	
BENZYL ALCOHOL	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
BIS(2-CHLOROETHOXY)METHANE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
BIS(2-CHLOROETHYL)ETHER	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
BIS(2-CHLOROISOPROPYL) ETHER	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
BUTYL BENZYL PHTHALATE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
CHRYSENE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	

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AREA: PILOT PLANT DRAINAGE DITCH - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
DI-N-BUTYL PHTHALATE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
DI-N-OCTYL PHTHALATE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
DIBENZO(A,H)ANTHRACENE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
DIBENZOFURAN	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
DIETHYL PHTHALATE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
DIMETHYL PHTHALATE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
FLUORANTHENE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
FLUORENE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
HEXACHLOROBENZENE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
HEXACHLOROBUTADIENE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
HEXACHLOROCYCLOPENTADIENE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
HEXACHLOROETHANE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
INDENO(1,2,3-CD)PYRENE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
ISOPHORONE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
N-NITROSO-DI-N-PROPYLAMINE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
N-NITROSODIPHENYLAMINE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
NAPHTHALENE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
NITROBENZENE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
P-CHLOROANILINE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
PENTACHLOROPHENOL	UG/KG	0/1	1	0/1		1250.000	2500.000	2500.000	
PHENANTHRENE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	

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AREA: PILOT PLANT DRAINAGE DITCH - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
PHENOL	UG/KG	0/1	1	0/1		245.000	490.000	490.000	
PYRENE	UG/KG	0/1	1	0/1		245.000	490.000	490.000	

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AREA: PILOT PLANT DRAINAGE DITCH - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
PESTICIDES									
4,4'-DDD	UG/KG	0/1	1	0/1		11.500	23.000	23.000	
4,4'-DDE	UG/KG	0/1	1	0/1		11.500	23.000	23.000	
4,4'-DDT	UG/KG	0/1	1	0/1		11.500	23.000	23.000	
ALDRIN	UG/KG	0/1	1	0/1		6.000	12.000	12.000	
ALPHA-BHC	UG/KG	0/1	1	0/1		6.000	12.000	12.000	
ALPHA-CHLORDANE	UG/KG	0/1	1	0/1		60.000	120.000	120.000	
AROCLOR-1016	UG/KG	0/1	1	0/1		60.000	120.000	120.000	
AROCLOR-1221	UG/KG	0/1	1	0/1		60.000	120.000	120.000	
AROCLOR-1232	UG/KG	0/1	1	0/1		60.000	120.000	120.000	
AROCLOR-1242	UG/KG	0/1	1	0/1		60.000	120.000	120.000	
AROCLOR-1248	UG/KG	0/1	1	0/1		60.000	120.000	120.000	
AROCLOR-1254	UG/KG	0/1	1	0/1		115.000	230.000	230.000	
AROCLOR-1260	UG/KG	0/1	1	0/1		115.000	230.000	230.000	
BETA-BHC	UG/KG	0/1	1	0/1		6.000	12.000	12.000	
DELTA-BHC	UG/KG	0/1	1	0/1		6.000	12.000	12.000	
DIELDRIN	UG/KG	0/1	1	0/1		11.500	23.000	23.000	
ENDOSULFAN II	UG/KG	0/1	1	0/1		11.500	23.000	23.000	
ENDOSULFAN SULFATE	UG/KG	0/1	1	0/1		11.500	23.000	23.000	
ENDOSULFAN-I	UG/KG	0/1	1	0/1		6.000	12.000	12.000	
ENDRIN	UG/KG	0/1	1	0/1		11.500	23.000	23.000	
ENDRIN KETONE	UG/KG	0/1	1	0/1		11.500	23.000	23.000	

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AREA: PILOT PLANT DRAINAGE DITCH - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
PESTICIDES									
GAMMA-BHC (LINDANE)	UG/KG	0/1	1	0/1		6.000	12.000	12.000	
GAMMA-CHLORDANE	UG/KG	0/1	1	0/1		60.000	120.000	120.000	
HEPTACHLOR	UG/KG	0/1	1	0/1		6.000	12.000	12.000	
HEPTACHLOR EPOXIDE	UG/KG	0/1	1	0/1		6.000	12.000	12.000	
METHOXYCHLOR	UG/KG	0/1	1	0/1		60.000	120.000	120.000	
TOXAPHENE	UG/KG	0/1	1	0/1		115.000	230.000	230.000	

AREA: PILOT PLANT DRAINAGE DITCH - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
ORGANOPHOSPHORUS PESTICIDES									
AZINPHOSMETHYL	UG/KG	0/1	1	0/1		250.000	500.000	500.000	
DEMETON	UG/KG	0/1	1	0/1		25.000	50.000	50.000	
DIAZINON	UG/KG	0/1	1	0/1		25.000	50.000	50.000	
DISULFOTON	UG/KG	0/1	1	0/1		25.000	50.000	50.000	
ETHION	UG/KG	0/1	1	0/1		25.000	50.000	50.000	
MALATHION	UG/KG	0/1	1	0/1		25.000	50.000	50.000	
METHYL PARATHION	UG/KG	0/1	1	0/1		25.000	50.000	50.000	
PARATHION	UG/KG	0/1	1	0/1		25.000	50.000	50.000	

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AREA: PILOT PLANT DRAINAGE DITCH - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
GENERAL CHEMISTRY									
AMMONIA	MG/KG	1/1	1	1/1	93.600-93.600	93.600			
CHLORIDE	MG/KG	1/1	1	1/1	40.000-40.000	40.000			27.8
FLUORIDE	MG/KG	1/1	1	1/1	5.690-5.690	5.690			0.22
NITRATE	MG/KG	1/1	1	1/1	2.620-2.620	2.620			1.70
PHENOLS	UG/KG	0/1	1	0/1		0.250	0.500	0.500	
PHOSPHORUS	MG/KG	1/1	1	1/1	38.900-38.900	38.900			
SULFATE	MG/KG	1/1	1	1/1	418.000-418.000	418.000			55.7
TOTAL ORGANIC NITROGEN	MG/KG	1/1	1	1/1	794.000-794.000	794.000			0.29

000424

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5698

AREA: PILOT PLANT DRAINAGE DITCH - CIS
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/G	18/18	0	18/18	2.900-16.300	6.20000			
URANIUM, TOTAL	MG/KG	18/18	0	18/18	8.642-48.574	18.47600			1.67
RADIUM-226	PCI/G	18/18	0	0/18	0.500-1.600	0.70000			1.93
THORIUM-232	PCI/G	18/18	0	18/18	0.200-2.300	0.95000			
RUTHENIUM-106	PCI/G	12/18	0	12/18	2.500-7.300	3.85000	1.00000	1.00000	
CESIUM-137	PCI/G	12/18	0	12/18	0.400-1.100	0.40000	0.20000	0.20000	

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SOUTHWEST DRAINAGE DITCH - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM, TOTAL	UG/L	2/2	2	2/2	23.00000-138.00000	80.50000			1.1
RADIUM-226	PCI/L	1/2	2	1/2	1.10000-1.10000	0.80000	1.00000	1.00000	0.35
RADIUM-228	PCI/L	0/2	2	0/2		1.50000	3.00000	3.00000	2.1
GROSS ALPHA	PCI/L	2/2	0	2/2	16.00000-57.00000	36.50000			3.7
GROSS BETA	PCI/L	2/2	0	2/2	11.00000-50.00000	30.50000			6.8

000426

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5698

SOUTHWEST DRAINAGE DITCH - 1988/89
SURFACE WATER DATA - FILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM, TOTAL	UG/L	2/2	2	2/2	17.00000-111.00000	64.00000			1.1
RADIUM-226	PCI/L	0/2	2	0/2		0.50000	1.00000	1.00000	ND
RADIUM-228	PCI/L	0/2	2	0/2		1.50000	3.00000	3.00000	ND
GROSS ALPHA	PCI/L	1/2	0	1/2	10.00000-10.00000	5.72500	2.90000	2.90000	5.3
GROSS BETA	PCI/L	2/2	0	2/2	7.00000-31.00000	19.00000			5.8

000427

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SOUTHFIELD - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/L	5/5	5	5/5	1.69000-257.00000	136.00000			0.80
URANIUM, TOTAL	PCI/L	5/5	5	5/5	4.18000-820.00000	340.00000			1.30
URANIUM-234	PCI/L	5/5	5	5/5	1.50000-265.00000	110.00000			0.90
THORIUM-230	PCI/L	2/5	5	0/5	0.34000-0.65300	0.19300	0.20000	0.38600	1.30
RADIUM-226	PCI/L	0/5	5	0/5		0.50000	1.00000	1.00000	0.900
URANIUM-235/236	PCI/L	4/5	5	4/5	2.90000-14.00000	7.40000	0.20000	0.20000	ND
THORIUM-232	PCI/L	0/5	5	0/5		0.10000	0.20000	0.36400	0.340
THORIUM, TOTAL	PCI/L	0/5	5	0/5		0.60000	0.53000	3.35000	3.1
RADIUM-228	PCI/L	0/5	5	0/5		1.50000	3.00000	3.00000	3.00
THORIUM-228	PCI/L	0/5	5	0/5		0.20850	0.20000	0.47900	1.60
NEPTUNIUM-237	PCI/L	1/4	4	1/4	0.79000-0.79000	0.25000	0.50000	0.50000	0.250
PLUTONIUM-239/240	PCI/L	0/5	5	0/5		0.25000	0.50000	0.50000	ND
PLUTONIUM-238	PCI/L	1/5	5	1/5	2.91000-2.91000	0.25000	0.50000	0.50000	0.075
STRONTIUM-90	PCI/L	0/5	5	0/5		0.50000	1.00000	1.37000	2.00
TECHNETIUM-99	PCI/L	0/5	5	0/5		7.50000	15.00000	15.00000	30
RUTHENIUM-106	PCI/L	0/5	5	0/5		75.00000	150.00000	151.00000	ND
CESIUM-137	PCI/L	0/5	5	0/5		7.85000	11.20000	19.30000	ND
GROSS ALPHA	PCI/L	5/5	5	5/5	3.90000-426.00000	205.00000			
GROSS BETA	PCI/L	5/5	5	5/5	6.22000-172.00000	97.00000			

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SOUTHFIELD - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/L	0/1	1	0/1		0.02050	0.04100	0.04100	2.29
ANTIMONY	MG/L	0/1	1	0/1		0.00310	0.00620	0.00620	ND
ARSENIC	MG/L	1/1	1	0/1	0.00540-0.00540	0.00540			0.0194
BARIUM	MG/L	1/1	1	0/1	0.02730-0.02730	0.02730			0.454
BERYLLIUM	MG/L	0/1	1	0/1		0.00050	0.00100	0.00100	ND
CADMIUM	MG/L	0/1	1	0/1		0.00100	0.00200	0.00200	ND
CALCIUM	MG/L	1/1	1	0/1	43.30000-43.30000	43.30000			172
CHROMIUM	MG/L	0/1	1	0/1		0.00200	0.00400	0.00400	0.0046
COBALT	MG/L	0/1	1	0/1		0.00150	0.00300	0.00300	ND
COPPER	MG/L	0/1	1	0/1		0.00410	0.00820	0.00820	0.0294
CYANIDE	MG/L	0/3	3	0/3		0.00100	0.00200	0.00200	ND
IRON	MG/L	1/1	1	0/1	0.08240-0.08240	0.08240			6.35
LEAD	MG/L	0/1	1	0/1		0.00050	0.00100	0.00100	0.0016
MAGNESIUM	MG/L	1/1	1	0/1	6.91000-6.91000	6.91000			50.7
MANGANESE	MG/L	1/1	1	0/1	0.00530-0.00530	0.00530			0.205
MERCURY	MG/L	0/1	1	0/1		0.00010	0.00020	0.00020	ND
MOLYBDENUM	MG/L	0/1	1	0/1		0.00150	0.00300	0.00300	ND
NICKEL	MG/L	0/1	1	0/1		0.00150	0.00300	0.00300	0.0072
POTASSIUM	MG/L	1/1	1	0/1	4.65000-4.65000	4.65000			17.2
SELENIUM	MG/L	1/1	1	1/1	0.00100-0.00100	0.00100			ND
SILICON	MG/L	1/1	1	0/1	4.12000-4.12000	4.12000			10.7
SILVER	MG/L	0/1	1	0/1		0.00105	0.00210	0.00210	0.0031

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SOUTHFIELD - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
SODIUM	MG/L	1/1	1	0/1	0.79500-0.79500	0.79500			50
THALLIUM	MG/L	0/1	1	0/1		0.00050	0.00100	0.00100	ND
VANADIUM	MG/L	0/1	1	0/1		0.00165	0.00330	0.00330	0.0051
ZINC	MG/L	0/1	1	0/1		0.00215	0.00430	0.00430	0.352

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SOUTHFIELD - 1993
SURFACE WATER DATA - UNFILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
1,1,1-TRICHLOROETHANE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
1,1,2,2-TETRACHLOROETHANE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
1,1,2-TRICHLOROETHANE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
1,1-DICHLOROETHANE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
1,1-DICHLOROETHENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
1,2-DICHLOROETHANE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
1,2-DICHLOROETHENE (TOTAL)	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
1,2-DICHLOROPROPANE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
2-BUTANONE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
2-HEXANONE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
4-METHYL-2-PENTANONE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
ACETONE	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
BENZENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
BROMODICHLOROMETHANE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
BROMOFORM		0/5	5	0/5		5.00000	10.00000	10.00000	
BROMOMETHANE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
CARBON DISULFIDE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
CARBON TETRACHLORIDE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
CHLOROBENZENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
CHLOROETHANE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
CHLOROFORM	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
CHLOROMETHANE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	

0004431

SOUTHFIELD - 1993
SURFACE WATER DATA - UNFILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
CIS-1,3-DICHLOROPROPENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
DIBROMOCHLOROMETHANE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
ETHYLBENZENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
METHYLENE CHLORIDE	UG/L	0/5	5	0/5		5.00000	10.00000	11.00000	
STYRENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
TETRACHLOROETHENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
TOLUENE	UG/L	1/5	5	1/5	2.00000-2.00000	5.00000	10.00000	10.00000	
TRANS-1,3-DICHLOROPROPENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
TRICHLOROETHENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
VINYL ACETATE	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
VINYL CHLORIDE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
XYLENES, TOTAL	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	

SOUTHFIELD - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
1,2,4-TRICHLOROBENZENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
1,2-DICHLOROBENZENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
1,3-DICHLOROBENZENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
1,4-DICHLOROBENZENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
2,4,5-TRICHLOROPHENOL	UG/L	0/5	5	0/5		12.50000	25.00000	25.00000	
2,4,6-TRICHLOROPHENOL	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
2,4-DICHLOROPHENOL	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
2,4-DIMETHYLPHENOL	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
2,4-DINITROPHENOL	UG/L	0/2	2	0/2		18.75000	25.00000	50.00000	
2,4-DINITROTOLUENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
2,6-DINITROTOLUENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
2-BENZYL-4-CHLOROPHENOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2-CHLORONAPHTHALENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
2-CHLOROPHENOL	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
2-METHYLNAPHTHALENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
2-METHYLPHENOL	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
2-NITROANILINE	UG/L	0/5	5	0/5		12.50000	25.00000	25.00000	
2-NITROPHENOL	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
3,3'-DICHLOROBENZIDINE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
3-NITROANILINE	NONE	0/5	5	0/5		12.50000	25.00000	25.00000	
4,6-DINITRO-2-METHYLPHENOL	UG/L	0/1	1	0/1		12.50000	25.00000	25.00000	
4-BROMOPHENYL PHENYL ETHER	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	

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SOUTHFIELD - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
4-CHLORO-3-METHYLPHENOL	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
4-CHLOROPHENYLPHENYL ETHER	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
4-METHYLPHENOL	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
4-NITROANILINE	UG/L	0/4	4	0/4		12.50000	25.00000	25.00000	
4-NITROPHENOL	UG/L	0/4	4	0/4		12.50000	25.00000	25.00000	
ACENAPHTHENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
ACENAPHTHYLENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
ANTHRACENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
BENZO(A)ANTHRACENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
BENZO(A)PYRENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
BENZO(B)FLUORANTHENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
BENZO(G,H,I)PERYLENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
BENZO(K)FLUORANTHENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
BENZOIC ACID	UG/L	0/2	2	0/2		25.00000	50.00000	50.00000	
BENZYL ALCOHOL	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
BIS(2-CHLOROETHOXY)METHANE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
BIS(2-CHLOROETHYL)ETHER	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
BIS(2-CHLOROISOPROPYL) ETHER	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
BIS(2-ETHYLHEXYL)PHTHALATE	UG/L	1/5	5	1/5	1.00000-1.00000	5.00000	10.00000	10.00000	
BUTYL BENZYL PHTHALATE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
CARBAZOLE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
CHRYSENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	

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SOUTHFIELD - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
DI-N-BUTYL PHTHALATE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
DI-N-OCTYL PHTHALATE	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
DIBENZO(A,H)ANTHRACENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
DIBENZOFURAN	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
DIETHYL PHTHALATE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
DIMETHYL PHTHALATE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
FLUORANTHENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
FLUORENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
HEXACHLOROBENZENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
HEXACHLOROBUTADIENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
HEXACHLOROCYCLOPENTADIENE	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
HEXACHLOROETHANE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
INDENO(1,2,3-CD)PYRENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
ISOPHORONE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
N-NITROSO-DI-N-PROPYLAMINE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
N-NITROSODIMETHYLAMINE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
N-NITROSODIPHENYLAMINE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
NAPHTHALENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
NITROBENZENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
P-CHLOROANILINE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
PENTACHLOROPHENOL	UG/L	0/5	5	0/5		12.50000	25.00000	25.00000	
PHENANTHRENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	

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SOUTHFIELD - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
PHENOL	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
PYRENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
TRIBUTYL PHOSPHATE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	

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SURFACE WATER DATA - UNFILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
PESTICIDES									
4,4'-DDD	UG/L	0/5	5	0/5		0.05000	0.10000	0.10000	
4,4'-DDE	UG/L	0/5	5	0/5		0.05000	0.10000	0.10000	
4,4'-DDT	UG/L	0/5	5	0/5		0.05000	0.10000	0.10000	
ALDRIN	UG/L	0/5	5	0/5		0.02500	0.05000	0.05000	
ALPHA-BHC	UG/L	0/5	5	0/5		0.02500	0.05000	0.05000	
ALPHA-CHLORDANE	UG/L	0/5	5	0/5		0.02500	0.05000	0.05000	
AROCLOR-1016	UG/L	0/5	5	0/5		0.50000	1.00000	1.00000	
AROCLOR-1221	UG/L	0/5	5	0/5		1.00000	2.00000	2.00000	
AROCLOR-1232	UG/L	0/5	5	0/5		0.50000	1.00000	1.00000	
AROCLOR-1242	UG/L	0/5	5	0/5		0.50000	1.00000	1.00000	
AROCLOR-1248	UG/L	0/5	5	0/5		0.50000	1.00000	1.00000	
AROCLOR-1254	UG/L	0/5	5	0/5		0.50000	1.00000	1.00000	
AROCLOR-1260	UG/L	0/5	5	0/5		0.50000	1.00000	1.00000	
BETA-BHC	UG/L	0/5	5	0/5		0.02500	0.05000	0.05000	
DELTA-BHC	UG/L	0/5	5	0/5		0.02500	0.05000	0.05000	
DIELDRIN	UG/L	0/5	5	0/5		0.05000	0.10000	0.10000	
ENDOSULFAN II	UG/L	0/5	5	0/5		0.05000	0.10000	0.10000	
ENDOSULFAN SULFATE	UG/L	0/5	5	0/5		0.05000	0.10000	0.10000	
ENDOSULFAN-I	UG/L	0/5	5	0/5		0.02500	0.05000	0.05000	
ENDRIN	UG/L	0/5	5	0/5		0.05000	0.10000	0.10000	
ENDRIN ALDEHYDE	UG/L	0/5	5	0/5		0.05000	0.10000	0.10000	
ENDRIN KETONE	UG/L	0/5	5	0/5		0.05000	0.10000	0.10000	

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SURFACE WATER DATA - UNFILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
PESTICIDES									
GAMMA-BHC (LINDANE)	UG/L	0/5	5	0/5		0.02500	0.05000	0.05000	
GAMMA-CHLORDANE	UG/L	0/5	5	0/5		0.02500	0.05000	0.05000	
HEPTACHLOR	UG/L	0/5	5	0/5		0.02500	0.05000	0.05000	
HEPTACHLOR EPOXIDE	UG/L	0/5	5	0/5		0.02500	0.05000	0.05000	
METHOXYCHLOR	UG/L	0/5	5	0/5		0.25000	0.50000	0.50000	
TOXAPHENE	UG/L	0/5	5	0/5		2.50000	5.00000	5.00000	

SOUTHFIELD - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
GENERAL CHEMISTRY									
ALKALINITY AS CACO3	MG/L	5/5	5	0/5	114.00000-395.00000	315.00000			430
AMMONIA	MG/L	2/5	5	0/5	0.13000-0.15000	0.05000	0.10000	0.10000	4.3
CHLORIDE	MG/L	5/5	5	0/5	1.50000-4.63000	3.70000			50
FLUORIDE	MG/L	5/5	5	0/5	0.20000-0.40000	0.36000			1.3
NITRATE	MG/L	1/1	1	0/1	0.14000-0.14000	0.14000			0.29
PHENOLS	UG/L	1/5	5	0/5	0.01000-0.01000	0.00500	0.01000	0.01000	0.030
PHOSPHORUS	MG/L	5/5	5	2/5	0.05000-0.20000	0.18000			0.18
SULFATE	MG/L	5/5	5	0/5	30.40000-133.90000	71.74000			136
SULFIDE	MG/L	1/5	5	1/5	1.00000-1.00000	0.25000	0.05000	0.50000	ND
TOTAL KJELDAHL NITROGEN	MG/L	5/5	5	0/5	0.18000-0.90000	0.35000			4.34
TOTAL ORGANIC CARBON	MG/L	5/5	5	1/5	2.14000-9.06000	3.44000			9.00
TOTAL ORGANIC HALIDES	MG/L	2/5	5	0/5	0.01060-0.02100	0.01060	0.01000	10.00000	0.126
TOTAL ORGANIC NITROGEN	MG/L	5/5	5	3/5	0.18000-0.85000	0.35000			0.340

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SOUTHFIELD - 1993
SURFACE WATER DATA - UNFILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
No sort code listed.									
1,2-DIPHENYLHYDRAZINE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	

SOUTHFIELD - 1993
SURFACE WATER DATA - FILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/L	4/4	4	0/4	0.08280-0.18300	0.15450			2.29
ANTIMONY	MG/L	0/4	4	0/4		0.00250	0.00210	0.00500	ND
ARSENIC	MG/L	1/4	4	0/4	0.00140-0.00140	0.00100	0.00200	0.00200	0.0194
BARIUM	MG/L	4/4	4	0/4	0.04090-0.06610	0.05205			0.454
BERYLLIUM	MG/L	0/4	4	0/4		0.00100	0.00200	0.00220	ND
CADMIUM	MG/L	0/4	4	0/4		0.00250	0.00200	0.00500	ND
CALCIUM	MG/L	4/4	4	0/4	82.60000-132.00000	106.00000			172
CHROMIUM	MG/L	0/4	4	0/4		0.00500	0.00400	0.01000	0.0046
COBALT	MG/L	0/4	4	0/4		0.00500	0.00300	0.01000	ND
COPPER	MG/L	0/4	4	0/4		0.00500	0.00200	0.01000	0.0294
IRON	MG/L	1/4	4	0/4	0.07290-0.07290	0.01000	0.00410	0.02000	6.35
LEAD	MG/L	0/4	4	0/4		0.00100	0.00100	0.00200	0.0016
MAGNESIUM	MG/L	4/4	4	0/4	24.80000-45.70000	34.10000			50.7
MANGANESE	MG/L	2/4	4	0/4	0.01280-0.02250	0.00890	0.01000	0.01000	0.205
MERCURY	MG/L	0/4	4	0/4		0.00010	0.00020	0.00020	ND
MOLYBDENUM	MG/L	0/4	4	0/4		0.01000	0.00300	0.02000	ND
NICKEL	MG/L	0/4	4	0/4		0.01000	0.00300	0.02000	0.0072
POTASSIUM	MG/L	4/4	4	0/4	1.05000-1.83000	1.50500			17.2
SELENIUM	MG/L	1/4	4	1/4	0.00400-0.00400	0.00100	0.00200	0.00200	ND
SILICON	MG/L	4/4	4	0/4	4.22000-7.04000	5.80000			10.7
SILVER	MG/L	0/4	4	0/4		0.00500	0.00200	0.01000	0.0031
SODIUM	MG/L	4/4	4	0/4	2.72000-6.01000	4.65500			50

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SURFACE WATER DATA - FILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
THALLIUM	MG/L	0/4	4	0/4		0.00100	0.00100	0.00200	ND
VANADIUM	MG/L	0/4	4	0/4		0.00500	0.01000	0.01040	0.0051
ZINC	MG/L	0/4	4	0/4		0.00250	0.00400	0.00500	0.352

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SURFACE WATER DATA - FILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							95% Background Concentration Value
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	
RADIONUCLIDES									
URANIUM, TOTAL	UG/L	5/5	5	5/5	14.00000-1829.00000	32.00000			1.1
RADIUM-226	PCI/L	0/5	5	0/5		0.50000	1.00000	1.00000	ND
RADIUM-228	PCI/L	0/5	5	0/5		1.50000	3.00000	3.00000	ND
GROSS ALPHA	PCI/L	5/5	0	5/5	10.00000-572.00000	23.00000			5.3
GROSS BETA	PCI/L	5/5	0	5/5	6.00000-106.00000	14.00000			5.8

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SOUTHFIELD - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM, TOTAL	UG/L	5/5	5	5/5	14.00000-1692.00000	40.00000			1.1
RADIUM-226	PCI/L	0/3	3	0/3		0.50000	1.00000	1.00000	0.35
RADIUM-228	PCI/L	0/5	5	0/5		1.50000	3.00000	3.00000	2.1
GROSS ALPHA	PCI/L	5/5	0	5/5	8.00000-450.00000	19.00000			3.7
GROSS BETA	PCI/L	5/5	0	5/5	9.00000-61.00000	20.00000			6.8

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SOUTHFIELD - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ARSENIC	MG/L	1/3	3	1/3	0.04550-0.04550	0.00335	0.00200	0.00670	ND
BARIUM	MG/L	3/3	3	1/3	0.02670-0.06330	0.04260			0.0534
CADMIUM	MG/L	1/3	3	1/3	0.00160-0.00160	0.00050	0.00100	0.00100	ND
CALCIUM	MG/L	3/3	3	0/3	38.30000-80.80000	73.00000			107
CHROMIUM	MG/L	2/3	3	2/3	0.01550-0.02240	0.01550	0.00200	0.00200	ND
COPPER	MG/L	0/3	3	0/3		0.00805	0.00810	0.02210	ND
IRON	MG/L	3/3	3	0/3	0.04750-0.28400	0.26200			0.513
LEAD	MG/L	2/3	3	2/3	0.00830-0.03620	0.00830	0.00200	0.00200	ND
MAGNESIUM	MG/L	3/3	3	2/3	10.10000-268.00000	155.00000			27.8
MANGANESE	MG/L	3/3	3	2/3	0.00230-0.15800	0.04620			0.035
MERCURY	MG/L	3/3	3	3/3	0.00022-0.00099	0.00080			ND
MOLYBDENUM	MG/L	2/3	3	2/3	0.00620-0.01830	0.00620	0.00300	0.00300	ND
NICKEL	MG/L	3/3	3	3/3	0.00800-0.01490	0.01220			ND
POTASSIUM	MG/L	3/3	3	0/3	2.33000-2.42000	2.42000			3.58
SELENIUM	MG/L	0/1	1	0/1		0.00100	0.00200	0.00200	ND
SILVER	MG/L	0/3	3	0/3		0.00025	0.00050	0.00050	ND
SODIUM	MG/L	3/3	3	2/3	1.99000-87.80000	69.40000			18.2

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SOUTHFIELD - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
GENERAL CHEMISTRY									
AMMONIA	MG/L	3/3	3	3/3	0.15200-0.18800	0.16260			0.0387
CHLORIDE	MG/L	3/3	3	0/3	3.50000-15.00000	8.00000			31.6
FLUORIDE	MG/L	3/3	3	3/3	0.30000-0.80000	0.68000			0.22
NITRATE	MG/L	3/3	3	0/3	0.12000-0.44000	0.14000			1.66
PHENOLS	UG/L	0/3	3	0/3		0.00500	0.01000	0.01000	ND
PHOSPHORUS	MG/L	3/3	3	3/3	0.82700-1.10000	0.84200			0.228
SULFATE	MG/L	3/3	3	3/3	171.00000-327.00000	253.00000			55.7
TOTAL KJELDAHL NITROGEN	MG/L	3/3	3	3/3	1.09000-2.03000	1.91000			0.288
TOTAL ORGANIC HALIDES	MG/L	1/3	3	1/3	0.01590-0.01590	0.02500	0.05000	0.05000	0.011
TOTAL ORGANIC NITROGEN	MG/L	3/3	3	3/3	0.92700-1.88000	1.72000			0.288

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AREA: SOUTHFIELD - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/G	3/3	3	3/3	3.420-6.210	5.21000			
URANIUM, TOTAL	MG/KG	3/3	3	3/3	14.800-20.000	15.20000			1.67
URANIUM-234	PCI/G	3/3	3	3/3	3.390-5.130	3.62000			
THORIUM-230	PCI/G	3/3	3	3/3	1.830-8.960	3.09000			
RADIUM-226	PCI/G	3/3	3	1/3	1.570-3.530	1.68000			1.93
URANIUM-235/236	PCI/G	3/3	3	3/3	0.199-0.290	0.25500			
THORIUM-232	PCI/G	3/3	3	3/3	0.870-2.410	1.04000			
THORIUM, TOTAL	MG/KG	3/3	3	3/3	7.930-22.200	9.45000			
RADIUM-228	PCI/G	3/3	3	3/3	0.930-2.920	1.24000			ND
THORIUM-228	PCI/G	3/3	3	3/3	1.030-2.380	1.06000			
NEPTUNIUM-237	PCI/G	2/2	2	2/2	0.285-0.323	0.30400			
PLUTONIUM-239/240	PCI/G	0/3	3	0/3		0.10000	0.20000	0.20000	
PLUTONIUM-238	PCI/G	0/3	3	0/3		0.10000	0.20000	0.20000	
STRONTIUM-90	PCI/G	1/3	3	1/3	0.546-0.546	0.25000	0.50000	0.50000	
TECHNETIUM-99	PCI/G	0/3	3	0/3		0.50000	1.00000	1.00000	
RUTHENIUM-106	PCI/G	0/3	3	0/3		0.50000	1.00000	1.00000	
CESIUM-137	PCI/G	1/3	3	1/3	0.258-0.258	0.10000	0.20000	0.20000	
GROSS ALPHA	PCI/G	3/3	3	3/3	29.100-42.400	33.50000			
GROSS BETA	PCI/G	3/3	3	3/3	32.600-58.200	34.00000			

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AREA: SOUTHFIELD - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/KG	4/4	4	4/4	3430.000-12000.000	7235.00000			1970
ANTIMONY	MG/KG	0/4	4	0/4		0.67500	1.20000	1.60000	
ARSENIC	MG/KG	4/4	4	4/4	7.700-75.600	22.50000			7
BARIUM	MG/KG	4/4	4	4/4	52.900-212.000	134.50000			21
BERYLLIUM	MG/KG	3/4	4	3/4	1.100-4.600	1.55000	0.46000	0.46000	0.50
CADMIUM	MG/KG	0/4	4	0/4		0.67500	1.20000	1.60000	3.7
CALCIUM	MG/KG	4/4	4	1/4	5340.000-83500.000	20850.00000			25900
CHROMIUM	MG/KG	4/4	4	1/4	6.800-19.200	11.30000			18.3
COBALT	MG/KG	4/4	4	3/4	3.700-19.400	9.95000			4.9
COPPER	MG/KG	4/4	4	3/4	8.000-122.000	33.05000			10.8
CYANIDE	MG/KG	3/4	4	3/4	0.180-0.540	0.20000	0.16000	0.16000	
IRON	MG/KG	4/4	4	4/4	7430.000-22300.000	10250.00000			6700
LEAD	MG/KG	4/4	4	4/4	27.000-91.500	41.50000			
MAGNESIUM	MG/KG	4/4	4	1/4	1180.000-20200.000	5485.00000			18300
MANGANESE	MG/KG	4/4	4	2/4	32.500-896.000	356.00000			411
MERCURY	MG/KG	1/4	4	1/4	0.190-0.190	0.07500	0.13000	0.16000	ND
MOLYBDENUM	MG/KG	2/4	4	2/4	6.300-6.300	4.72500	4.60000	6.30000	ND
NICKEL	MG/KG	4/4	4	3/4	7.100-36.400	23.15000			13.7
POTASSIUM	MG/KG	4/4	4	4/4	597.000-1920.000	1065.50000			307
SELENIUM	MG/KG	3/4	4	3/4	0.860-9.600	3.38000	0.55000	0.55000	ND
SILICON	MG/KG	4/4	4	4/4	410.000-1670.000	945.00000			

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AREA: SOUTHFIELD - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
SILVER	MG/KG	2/4	4	2/4	2.900-6.500	2.25000	2.80000	3.20000	ND
SODIUM	MG/KG	4/4	4	1/4	67.100-237.000	151.50000			197
THALLIUM	MG/KG	2/4	4	2/4	1.100-4.400	0.70250	0.55000	0.61000	ND
VANADIUM	MG/KG	4/4	4	4/4	15.300-53.600	29.80000			12.4
ZINC	MG/KG	4/4	4	4/4	24.900-118.000	54.75000			13.5

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Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
PESTICIDES									
4,4'-DDD	UG/KG	0/4	4	0/4		2.65000	4.80000	6.10000	
4,4'-DDE	UG/KG	0/4	4	0/4		2.65000	4.80000	6.10000	
4,4'-DDT	UG/KG	0/4	4	0/4		2.65000	4.80000	6.10000	
ALDRIN	UG/KG	0/4	4	0/4		1.37500	2.50000	3.10000	
ALPHA-BHC	UG/KG	0/4	4	0/4		1.37500	2.50000	3.10000	
ALPHA-CHLORDANE	UG/KG	0/4	4	0/4		1.37500	2.50000	3.10000	
AROCLOR-1016	UG/KG	0/4	4	0/4		26.50000	48.00000	61.00000	
AROCLOR-1221	UG/KG	0/4	4	0/4		52.50000	98.00000	120.00000	
AROCLOR-1232	UG/KG	0/4	4	0/4		26.50000	48.00000	61.00000	
AROCLOR-1242	UG/KG	0/4	4	0/4		26.50000	48.00000	61.00000	
AROCLOR-1248	UG/KG	0/4	4	0/4		26.50000	48.00000	61.00000	
AROCLOR-1254	UG/KG	1/4	4	1/4	96.000-96.000	28.25000	48.00000	61.00000	
AROCLOR-1260	UG/KG	0/4	4	0/4		26.50000	48.00000	61.00000	
BETA-BHC	UG/KG	0/4	4	0/4		1.37500	2.50000	3.10000	
DELTA-BHC	UG/KG	0/4	4	0/4		1.37500	2.50000	3.10000	
DIELDRIN	UG/KG	0/4	4	0/4		2.65000	4.80000	6.10000	
ENDOSULFAN II	UG/KG	0/4	4	0/4		2.65000	4.80000	6.10000	
ENDOSULFAN SULFATE	UG/KG	0/4	4	0/4		2.65000	4.80000	6.10000	
ENDOSULFAN-I	UG/KG	0/4	4	0/4		1.37500	2.50000	3.10000	
ENDRIN	UG/KG	0/4	4	0/4		2.65000	4.80000	6.10000	
ENDRIN ALDEHYDE	UG/KG	0/4	4	0/4		2.65000	4.80000	6.10000	

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SEDIMENT DATA

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
PESTICIDES									
ENDRIN KETONE	UG/KG	0/4	4	0/4		2.65000	4.80000	6.10000	
GAMMA-BHC (LINDANE)	UG/KG	0/4	4	0/4		1.37500	2.50000	3.10000	
GAMMA-CHLORDANE	UG/KG	0/4	4	0/4		1.37500	2.50000	3.10000	
HEPTACHLOR	UG/KG	0/4	4	0/4		1.37500	2.50000	3.10000	
HEPTACHLOR EPOXIDE	UG/KG	0/4	4	0/4		1.37500	2.50000	3.10000	
METHOXYCHLOR	UG/KG	0/4	4	0/4		13.75000	25.00000	31.00000	
TOXAPHENE	UG/KG	0/4	4	0/4		137.50000	250.00000	310.00000	

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AREA: SOUTHFIELD - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
1,1,1-TRICHLOROETHANE	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	
1,1,2,2-TETRACHLOROETHANE	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	
1,1,2-TRICHLOROETHANE	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	
1,1-DICHLOROETHANE	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	
1,1-DICHLOROETHENE	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	
1,2-DICHLOROETHANE	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	
1,2-DICHLOROETHENE (TOTAL)	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	
1,2-DICHLOROPROPANE	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	
2-BUTANONE	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	
2-HEXANONE	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	
4-METHYL-2-PENTANONE	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	
ACETONE	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	
BENZENE	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	
BROMODICHLOROMETHANE	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	
BROMOFORM	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	
BROMOMETHANE	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	
CARBON DISULFIDE	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	
CARBON TETRACHLORIDE	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	
CHLOROBENZENE	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	
CHLOROETHANE	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	
CHLOROFORM	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	

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Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
CHLOROMETHANE	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	
CIS-1,3-DICHLOROPROPENE	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	
DIBROMOCHLOROMETHANE	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	
ETHYLBENZENE	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	1.0
METHYLENE CHLORIDE	UG/KG	0/4	4	0/4		8.25000	15.00000	18.00000	
STYRENE	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	
TETRACHLOROETHENE	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	
TOLUENE	UG/KG	2/4	4	2/4	4.000-8.000	7.75000	15.00000	16.00000	
TRANS-1,3-DICHLOROPROPENE	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	
TRICHLOROETHENE	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	
VINYL ACETATE	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	
VINYL CHLORIDE	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	
XYLENES, TOTAL	UG/KG	0/4	4	0/4		7.75000	14.00000	18.00000	

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Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
1,2,4-TRICHLOROBENZENE	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
1,2-DICHLOROBENZENE	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
1,3-DICHLOROBENZENE	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
1,4-DICHLOROBENZENE	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
2,4,5-TRICHLOROPHENOL	UG/KG	0/4	4	0/4		700.00000	1200.00000	2500.00000	
2,4,6-TRICHLOROPHENOL	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
2,4-DICHLOROPHENOL	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
2,4-DIMETHYLPHENOL	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
2,4-DINITROPHENOL	UG/KG	0/2	2	0/2		925.00000	1200.00000	2500.00000	
2,4-DINITROTOLUENE	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
2,6-DINITROTOLUENE	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
2-CHLORONAPHTHALENE	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
2-CHLOROPHENOL	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
2-METHYLNAPHTHALENE	UG/KG	1/4	4	1/4	56.000-56.000	262.50000	510.00000	610.00000	
2-METHYLPHENOL	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
2-NITROANILINE	UG/KG	0/4	4	0/4		700.00000	1200.00000	2500.00000	
2-NITROPHENOL	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
3,3'-DICHLOROBENZIDINE	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
3-NITROANILINE	NONE	0/4	4	0/4		700.00000	1200.00000	2500.00000	
4,6-DINITRO-2-METHYLPHENOL	UG/KG	0/1	1	0/1		600.00000	1200.00000	1200.00000	
4-BROMOPHENYL PHENYL ETHER	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	

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Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
4-CHLORO-3-METHYLPHENOL	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
4-CHLOROPHENYLPHENYL ETHER	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
4-METHYLPHENOL	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
4-NITROANILINE	UG/KG	0/4	4	0/4		700.00000	1200.00000	2500.00000	
4-NITROPHENOL	UG/KG	0/4	4	0/4		700.00000	1200.00000	2500.00000	
ACENAPHTHENE	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
ACENAPHTHYLENE	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
ANTHRACENE	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
BENZO(A)ANTHRACENE	UG/KG	2/4	4	2/4	53.000-66.000	160.50000	510.00000	610.00000	
BENZO(A)PYRENE	UG/KG	1/3	3	1/3	110.000-110.000	245.00000	490.00000	610.00000	
BENZO(B)FLUORANTHENE	UG/KG	2/3	3	2/3	100.000-110.000	110.00000	610.00000	610.00000	
BENZO(G,H,I)PERYLENE	UG/KG	1/3	3	1/3	120.000-120.000	245.00000	490.00000	610.00000	
BENZO(K)FLUORANTHENE	UG/KG	3/3	3	3/3	54.000-120.000	74.00000			
BENZOIC ACID	UG/KG	2/3	3	2/3	99.000-160.000	160.00000	2500.00000	2500.00000	
BENZYL ALCOHOL	UG/KG	0/3	3	0/3		270.00000	510.00000	610.00000	
BIS(2-CHLOROETHOXY)METHANE	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
BIS(2-CHLOROETHYL)ETHER	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
BIS(2-CHLOROISOPROPYL) ETHER	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	3/4	4	3/4	74.000-130.000	125.00000	490.00000	490.00000	
BUTYL BENZYL PHTHALATE	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
CARBAZOLE	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	

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Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
CHRYSENE	UG/KG	4/4	4	4/4	67.000-110.000	78.00000			
DI-N-BUTYL PHTHALATE	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
DI-N-OCTYL PHTHALATE	UG/KG	0/3	3	0/3		270.00000	490.00000	610.00000	
DIBENZO(A,H)ANTHRACENE	UG/KG	0/3	3	0/3		270.00000	490.00000	610.00000	
DIBENZOFURAN	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
DIETHYL PHTHALATE	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
DIMETHYL PHTHALATE	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
FLUORANTHENE	UG/KG	4/4	4	4/4	74.000-130.000	125.00000			
FLUORENE	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
HEXACHLOROBENZENE	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
HEXACHLOROBUTADIENE	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
HEXACHLOROCYCLOPENTADIENE	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
HEXACHLOROETHANE	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
INDENO(1,2,3-CD)PYRENE	UG/KG	1/3	3	1/3	99.000-99.000	245.00000	490.00000	610.00000	
ISOPHORONE	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
N-NITROSO-DI-N-PROPYLAMINE	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
N-NITROSODIMETHYLAMINE	UG/KG	0/3	3	0/3		270.00000	510.00000	610.00000	
N-NITROSODIPHENYLAMINE	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
NAPHTHALENE	UG/KG	1/4	4	1/4	51.000-51.000	262.50000	510.00000	610.00000	
NITROBENZENE	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	
P-CHLOROANILINE	UG/KG	0/4	4	0/4		262.50000	490.00000	610.00000	

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SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
PENTACHLOROPHENOL	UG/KG	0/4	4	0/4		700.00000	1200.00000	2500.00000	
PHENANTHRENE	UG/KG	2/4	4	2/4	63.000-99.000	184.50000	540.00000	610.00000	
PHENOL	UG/KG	1/4	4	1/4	56.000-56.000	250.00000	490.00000	610.00000	
PYRENE	UG/KG	4/4	4	4/4	71.000-110.000	105.00000			
TRIBUTYL PHOSPHATE	UG/KG	0/3	3	0/3		270.00000	510.00000	610.00000	

06/16/94

AREA: SOUTHFIELD - 1993
SEDIMENT DATA

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
GENERAL CHEMISTRY									
TOTAL ORGANIC CARBON	MG/KG	1/1	1	1/1	43343.000-43343.000	43343.00000			1.7

AREA: SOUTHFIELD - 1993
SEDIMENT DATA

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
No sort code listed.									
1,2-DIPHENYLHYDRAZINE	UG/KG	0/3	3	0/3		270.00000	510.00000	610.00000	

000459

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AREA: SOUTHFIELD - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM, TOTAL	MG/KG	6/6	6	6/6	4.530-51.800	18.400			1.67
RADIUM-226	PCI/G	4/4	4	0/4	0.637-1.240	0.786			1.93
RADIUM-228	PCI/G	4/4	4	4/4	0.690-1.080	0.802			ND
GROSS ALPHA	PCI/G	6/6	0	6/6	6.000-41.000	14.000			
GROSS BETA	PCI/G	6/6	0	6/6	13.000-109.000	24.000			

000460

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AREA: SOUTHFIELD - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ANTIMONY	MG/KG	0/1	1	0/1		0.050	0.100	0.100	
CADMIUM	MG/KG	0/1	1	0/1		0.100	0.200	0.200	3.7
CYANIDE	MG/KG	0/1	1	0/1		0.450	0.900	0.900	
LEAD	MG/KG	1/1	1	1/1	12.000-12.000	12.000			
MOLYBDENUM	MG/KG	0/1	1	0/1		1.000	2.000	2.000	ND

000461

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AREA: SOUTHFIELD - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
1,1,1-TRICHLOROETHANE	UG/KG	0/1	1	0/1		3.000	6.000	6.000	
1,1,2,2-TETRACHLOROETHANE	UG/KG	0/1	1	0/1		3.000	6.000	6.000	
1,1,2-TRICHLOROETHANE	UG/KG	0/1	1	0/1		3.000	6.000	6.000	
1,1-DICHLOROETHANE	UG/KG	0/1	1	0/1		3.000	6.000	6.000	
1,1-DICHLOROETHENE	UG/KG	0/1	1	0/1		3.000	6.000	6.000	
1,2-DICHLOROETHANE	UG/KG	0/1	1	0/1		3.000	6.000	6.000	
1,2-DICHLOROETHENE (TOTAL)	UG/KG	0/1	1	0/1		3.000	6.000	6.000	
1,2-DICHLOROPROPANE	UG/KG	0/1	1	0/1		3.000	6.000	6.000	
2-BUTANONE	UG/KG	0/1	1	0/1		3.000	6.000	6.000	
2-HEXANONE	UG/KG	0/1	1	0/1		6.000	12.000	12.000	
4-METHYL-2-PENTANONE	UG/KG	0/1	1	0/1		6.000	12.000	12.000	
ACETONE	UG/KG	0/1	1	0/1		6.000	12.000	12.000	
BENZENE	UG/KG	0/1	1	0/1		27.500	55.000	55.000	
BROMODICHLOROMETHANE	UG/KG	0/1	1	0/1		3.000	6.000	6.000	
BROMOFORM	UG/KG	0/1	1	0/1		3.000	6.000	6.000	
BROMOMETHANE	UG/KG	0/1	1	0/1		3.000	6.000	6.000	
CARBON DISULFIDE	UG/KG	0/1	1	0/1		6.000	12.000	12.000	
CARBON TETRACHLORIDE	UG/KG	0/1	1	0/1		3.000	6.000	6.000	
CHLOROBENZENE	UG/KG	0/1	1	0/1		3.000	6.000	6.000	
CHLOROETHANE	UG/KG	0/1	1	0/1		3.000	6.000	6.000	
CHLOROFORM	UG/KG	0/1	1	0/1		6.000	12.000	12.000	
						3.000	6.000	6.000	

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000462

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AREA: SOUTHFIELD - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
CHLOROMETHANE	UG/KG	0/1	1	0/1		6.000	12.000	12.000	
CIS-1,3-DICHLOROPROPENE	UG/KG	0/1	1	0/1		3.000	6.000	6.000	
DIBROMOCHLOROMETHANE	UG/KG	0/1	1	0/1		3.000	6.000	6.000	
ETHYLBENZENE	UG/KG	0/1	1	0/1		3.000	6.000	6.000	
METHYLENE CHLORIDE	UG/KG	0/1	1	0/1		8.000	16.000	16.000	
STYRENE	UG/KG	0/1	1	0/1		3.000	6.000	6.000	
TETRACHLOROETHENE	UG/KG	0/1	1	0/1		3.000	6.000	6.000	
TOLUENE	UG/KG	0/1	1	0/1		3.000	6.000	6.000	
TRANS-1,3-DICHLOROPROPENE	UG/KG	0/1	1	0/1		3.000	6.000	6.000	
TRICHLOROETHENE	UG/KG	0/1	1	0/1		3.000	6.000	6.000	
VINYL ACETATE	UG/KG	0/1	1	0/1		6.000	12.000	12.000	
VINYL CHLORIDE	UG/KG	0/1	1	0/1		6.000	12.000	12.000	
XYLENES, TOTAL	UG/KG	0/1	1	0/1		3.000	6.000	6.000	

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AREA: SOUTHFIELD - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
1,2,4-TRICHLOROBENZENE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
1,2-DICHLOROBENZENE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
1,3-DICHLOROBENZENE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
1,4-DICHLOROBENZENE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
2,2-OXYBIS(1-CHLOROPROPANE)	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
2,4,5-TRICHLOROPHENOL	UG/KG	0/1	1	0/1		1000.000	2000.000	2000.000	
2,4,6-TRICHLOROPHENOL	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
2,4-DICHLOROPHENOL	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
2,4-DIMETHYLPHENOL	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
2,4-DINITROPHENOL	UG/KG	0/1	1	0/1		1000.000	2000.000	2000.000	
2,4-DINITROTOLUENE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
2,6-DINITROTOLUENE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
2-CHLORONAPHTHALENE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
2-CHLOROPHENOL	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
2-METHYLNAPHTHALENE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
2-METHYLPHENOL	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
2-NITROANILINE	UG/KG	0/1	1	0/1		1000.000	2000.000	2000.000	
2-NITROPHENOL	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
3,3'-DICHLOROBENZIDINE	UG/KG	0/1	1	0/1		405.000	810.000	810.000	
3-NITROANILINE	NONE	0/1	1	0/1		1000.000	2000.000	2000.000	
4,6-DINITRO-2-METHYLPHENOL	UG/KG	0/1	1	0/1		1000.000	2000.000	2000.000	

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AREA: SOUTHFIELD - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
4-BROMOPHENYL PHENYL ETHER	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
4-CHLORO-3-METHYLPHENOL	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
4-CHLOROPHENYLPHENYL ETHER	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
4-METHYLPHENOL	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
4-NITROANILINE	UG/KG	0/1	1	0/1		1000.000	2000.000	2000.000	
4-NITROPHENOL	UG/KG	0/1	1	0/1		1000.000	2000.000	2000.000	
ACENAPHTHENE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
ACENAPHTHYLENE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
ANTHRACENE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
BENZO(A)ANTHRACENE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
BENZO(A)PYRENE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
BENZO(B)FLUORANTHENE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
BENZO(G,H,I)PERYLENE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
BENZO(K)FLUORANTHENE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
BENZOIC ACID	UG/KG	0/1	1	0/1		1000.000	2000.000	2000.000	
BENZYL ALCOHOL	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
BIS(2-CHLOROETHOXY)METHANE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
BIS(2-CHLOROETHYL)ETHER	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
BUTYL BENZYL PHTHALATE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
CHRYSENE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	

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AREA: SOUTHFIELD - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
DI-N-BUTYL PHTHALATE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
DI-N-OCTYL PHTHALATE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
DIBENZO(A,H)ANTHRACENE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
DIBENZOFURAN	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
DIETHYL PHTHALATE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
DIMETHYL PHTHALATE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
FLUORANTHENE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
FLUORENE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
HEXACHLOROBENZENE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
HEXACHLOROBUTADIENE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
HEXACHLOROCYCLOPENTADIENE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
HEXACHLOROETHANE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
INDENO(1,2,3-CD)PYRENE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
ISOPHORONE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
N-NITROSO-DI-N-PROPYLAMINE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
N-NITROSODIPHENYLAMINE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
NAPHTHALENE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
NITROBENZENE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
P-CHLOROANILINE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
PENTACHLOROPHENOL	UG/KG	0/1	1	0/1		1000.000	2000.000	2000.000	
PHENANTHRENE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	

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AREA: SOUTHFIELD - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
PHENOL	UG/KG	0/1	1	0/1		200.000	400.000	400.000	
PYRENE	UG/KG	0/1	1	0/1		200.000	400.000	400.000	

AREA: SOUTHFIELD - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
PESTICIDES									
4,4'-DDD	UG/KG	0/1	1	0/1		9.500	19.000	19.000	
4,4'-DDE	UG/KG	0/1	1	0/1		9.500	19.000	19.000	
4,4'-DDT	UG/KG	0/1	1	0/1		9.500	19.000	19.000	
ALDRIN	UG/KG	0/1	1	0/1		4.850	9.700	9.700	
ALPHA-BHC	UG/KG	0/1	1	0/1		4.850	9.700	9.700	
ALPHA-CHLORDANE	UG/KG	0/1	1	0/1		48.500	97.000	97.000	
AROCLOR-1016	UG/KG	0/1	1	0/1		48.500	97.000	97.000	
AROCLOR-1221	UG/KG	0/1	1	0/1		48.500	97.000	97.000	
AROCLOR-1232	UG/KG	0/1	1	0/1		48.500	97.000	97.000	
AROCLOR-1242	UG/KG	0/1	1	0/1		48.500	97.000	97.000	
AROCLOR-1248	UG/KG	0/1	1	0/1		48.500	97.000	97.000	
AROCLOR-1254	UG/KG	0/1	1	0/1		95.000	190.000	190.000	
AROCLOR-1260	UG/KG	0/1	1	0/1		95.000	190.000	190.000	
BETA-BHC	UG/KG	0/1	1	0/1		4.850	9.700	9.700	
DELTA-BHC	UG/KG	0/1	1	0/1		4.850	9.700	9.700	
DIELDRIN	UG/KG	0/1	1	0/1		9.500	19.000	19.000	
ENDOSULFAN II	UG/KG	0/1	1	0/1		9.500	19.000	19.000	
ENDOSULFAN SULFATE	UG/KG	0/1	1	0/1		9.500	19.000	19.000	
ENDOSULFAN-I	UG/KG	0/1	1	0/1		4.850	9.700	9.700	
ENDRIN	UG/KG	0/1	1	0/1		9.500	19.000	19.000	
ENDRIN KETONE	UG/KG	0/1	1	0/1		9.500	19.000	19.000	

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AREA: SOUTHFIELD - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
PESTICIDES									
GAMMA-BHC (LINDANE)	UG/KG	0/1	1	0/1		4.850	9.700	9.700	
GAMMA-CHLORDANE	UG/KG	0/1	1	0/1		48.500	97.000	97.000	
HEPTACHLOR	UG/KG	0/1	1	0/1		4.850	9.700	9.700	
HEPTACHLOR EPOXIDE	UG/KG	0/1	1	0/1		4.850	9.700	9.700	
METHOXYCHLOR	UG/KG	0/1	1	0/1		48.500	97.000	97.000	
TOXAPHENE	UG/KG	0/1	1	0/1		95.000	190.000	190.000	

AREA: SOUTHFIELD - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
ORGANOPHOSPHORUS PESTICIDES									
AZINPHOSMETHYL	UG/KG	0/1	1	0/1		250.000	500.000	500.000	
DEMETON	UG/KG	0/1	1	0/1		25.000	50.000	50.000	
DIAZINON	UG/KG	0/1	1	0/1		25.000	50.000	50.000	
DISULFOTON	UG/KG	0/1	1	0/1		25.000	50.000	50.000	
ETHION	UG/KG	0/1	1	0/1		25.000	50.000	50.000	
MALATHION	UG/KG	0/1	1	0/1		25.000	50.000	50.000	
METHYL PARATHION	UG/KG	0/1	1	0/1		25.000	50.000	50.000	
PARATHION	UG/KG	0/1	1	0/1		25.000	50.000	50.000	

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5698

AREA: SOUTHFIELD - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
GENERAL CHEMISTRY									
AMMONIA	MG/KG	1/1	1	1/1	50.400-50.400	50.400			
CHLORIDE	MG/KG	1/1	1	1/1	230.000-230.000	230.000			27.8
FLUORIDE	MG/KG	1/1	1	1/1	7.580-7.580	7.580			0.22
NITRATE	MG/KG	1/1	1	1/1	2.760-2.760	2.760			1.70
PHENOLS	UG/KG	0/1	1	0/1		0.250	0.500	0.500	
PHOSPHORUS	MG/KG	1/1	1	1/1	37.400-37.400	37.400			
SULFATE	MG/KG	1/1	1	1/1	697.000-697.000	697.000			55.7
TOTAL ORGANIC NITROGEN	MG/KG	1/1	1	1/1	355.000-355.000	355.000			0.29

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AREA: SOUTHFIELD - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
No sort code listed.									
2,2-OXYBIS(1-CHLOROPROPANE)	UG/KG	0/1	1	0/1		200.000	400.000	400.000	

EAST DRAINAGE DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/L	2/2	2	2/2	14.90000-26.80000	20.85000			0.73
URANIUM, TOTAL	UG/L	5/5	2	5/5	37.30000-66.00000	55.60000			1.1
URANIUM-234	PCI/L	2/2	2	2/2	14.20000-23.90000	19.05000			0.70
THORIUM-230	PCI/L	1/2	2	1/2	0.30000-0.30000	0.20000	0.20000	0.20000	ND
RADIUM-226	PCI/L	0/2	2	0/2		0.50000	1.00000	1.00000	0.35
URANIUM-235/236	PCI/L	2/2	2	2/2	0.50000-1.90000	1.20000			ND
THORIUM-232	PCI/L	0/2	2	0/2		0.10000	0.20000	0.20000	ND
RADIUM-228	PCI/L	0/2	2	0/2		1.50000	3.00000	3.00000	2.1
THORIUM-228	PCI/L	0/2	2	0/2		0.10000	0.20000	0.20000	ND
GROSS ALPHA	PCI/L	2/4	0	2/4	20.80000-23.90000	224.45000	850.00000	850.00000	3.7
GROSS BETA	PCI/L	2/4	0	2/4	20.10000-31.70000	515.85000	2000.00000	2000.00000	6.8

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EAST DRAINAGE DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/L	1/1	1	1/1	0.69700-0.69700	0.69700			0.640
ANTIMONY	MG/L	0/2	2	0/2		0.00700	0.01400	0.01400	ND
ARSENIC	MG/L	0/2	2	0/2		0.00100	0.00200	0.00200	ND
BARIUM	MG/L	2/2	2	0/2	0.04880-0.05210	0.05045			0.0534
BERYLLIUM	MG/L	0/2	2	0/2		0.00250	0.00500	0.00500	ND
CADMIUM	MG/L	1/2	2	1/2	0.00550-0.00550	0.00400	0.00500	0.00500	ND
CALCIUM	MG/L	2/2	2	0/2	69.00000-80.80000	74.90000			107
CHROMIUM	MG/L	0/2	2	0/2		0.00300	0.00600	0.00600	ND
COBALT	MG/L	0/2	2	0/2		0.00850	0.01700	0.01700	ND
COPPER	MG/L	0/2	2	0/2		0.00450	0.00900	0.00900	ND
CYANIDE	MG/L	0/2	2	0/2		0.00250	0.00500	0.00500	ND
IRON	MG/L	1/1	1	1/1	1.32000-1.32000	1.32000			0.513
LEAD	MG/L	2/2	2	2/2	0.00380-0.00540	0.00460			ND
MAGNESIUM	MG/L	2/2	2	0/2	20.30000-23.70000	22.00000			27.8
MANGANESE	MG/L	2/2	2	2/2	0.09650-0.15400	0.12525			0.035
MERCURY	MG/L	0/2	2	0/2		0.00005	0.00010	0.00010	ND
MOLYBDENUM	MG/L	0/2	2	0/2		0.00850	0.01700	0.01700	ND
NICKEL	MG/L	0/2	2	0/2		0.00900	0.01800	0.01800	ND
POTASSIUM	MG/L	2/2	2	1/2	3.58000-3.91000	3.74500			3.58
SILICON	MG/L	2/2	2	1/2	3.31000-3.85000	3.58000			3.36
SODIUM	MG/L	2/2	2	2/2	50.50000-51.00000	50.75000			18.2
THALLIUM	MG/L	0/2	2	0/2		0.00050	0.00100	0.00100	ND

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EAST DRAINAGE DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
VANADIUM	MG/L	0/2	2	0/2		0.01200	0.02400	0.02400	ND
ZINC	MG/L	0/2	2	0/2		0.00300	0.00600	0.00600	ND

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EAST DRAINAGE DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
1,1,1-TRICHLOROETHANE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
1,1,2,2-TETRACHLOROETHANE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
1,1,2-TRICHLOROETHANE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
1,1-DICHLOROETHANE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
1,1-DICHLOROETHENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
1,2-DICHLOROETHANE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
1,2-DICHLOROETHENE (TOTAL)	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
1,2-DICHLOROPROPANE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2-BUTANONE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2-HEXANONE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
4-METHYL-2-PENTANONE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
ACETONE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BENZENE	UG/L	0/2	2	0/2		8.50000	10.00000	24.00000	
BROMODICHLOROMETHANE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BROMOFORM		0/2	2	0/2		5.00000	10.00000	10.00000	
BROMOMETHANE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
CARBON DISULFIDE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
CARBON TETRACHLORIDE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
CHLOROBENZENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
CHLOROETHANE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
CHLOROFORM	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
CHLOROMETHANE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	

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EAST DRAINAGE DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
CIS-1,3-DICHLOROPROPENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
DIBROMOCHLOROMETHANE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
ETHYLBENZENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
METHYLENE CHLORIDE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
STYRENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
TETRACHLOROETHENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
TOLUENE	UG/L	1/2	2	1/2	1.00000-1.00000	3.00000	10.00000	10.00000	
TRANS-1,3-DICHLOROPROPENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
TRICHLOROETHENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
VINYL ACETATE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
VINYL CHLORIDE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
XYLENES, TOTAL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	

EAST DRAINAGE DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
1,2,4-TRICHLOROBENZENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
1,2-DICHLOROBENZENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
1,3-DICHLOROBENZENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
1,4-DICHLOROBENZENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2,4,5-TRICHLOROPHENOL	UG/L	0/2	2	0/2		12.50000	25.00000	25.00000	
2,4,6-TRICHLOROPHENOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2,4-DICHLOROPHENOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2,4-DIMETHYLPHENOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2,4-DINITROPHENOL	UG/L	0/2	2	0/2		12.50000	25.00000	25.00000	
2,4-DINITROTOLUENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2,6-DINITROTOLUENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2-CHLORONAPHTHALENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2-CHLOROPHENOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2-METHYLNAPHTHALENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2-METHYLPHENOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2-NITROANILINE	UG/L	0/2	2	0/2		12.50000	25.00000	25.00000	
2-NITROPHENOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
3,3'-DICHLOROBENZIDINE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
3-NITROANILINE	NONE	0/2	2	0/2		12.50000	25.00000	25.00000	
4,6-DINITRO-2-METHYLPHENOL	UG/L	0/2	2	0/2		12.50000	25.00000	25.00000	
4-BROMOPHENYL PHENYL ETHER	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
4-CHLORO-3-METHYLPHENOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	

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EAST DRAINAGE DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
4-CHLOROPHENYLPHENYL ETHER	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
4-METHYLPHENOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
4-NITROANILINE	UG/L	0/2	2	0/2		12.50000	25.00000	25.00000	
4-NITROPHENOL	UG/L	0/2	2	0/2		12.50000	25.00000	25.00000	
ACENAPHTHENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
ACENAPHTHYLENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
ANTHRACENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BENZO(A)ANTHRACENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BENZO(A)PYRENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BENZO(B)FLUORANTHENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BENZO(G,H,I)PERYLENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BENZO(K)FLUORANTHENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BIS(2-CHLOROETHOXY)METHANE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BIS(2-CHLOROETHYL)ETHER	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BIS(2-CHLOROISOPROPYL) ETHER	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BIS(2-ETHYLHEXYL)PHTHALATE	UG/L	2/2	2	2/2	11.00000-16.00000	13.50000			
BUTYL BENZYL PHTHALATE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
CARBAZOLE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
CHRYSENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
DI-N-BUTYL PHTHALATE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
DI-N-OCTYL PHTHALATE	UG/L	2/2	2	2/2	1.00000-2.00000	1.50000			
DIBENZO(A,H)ANTHRACENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	

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EAST DRAINAGE DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections						
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
DIBENZOFURAN	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
DIETHYL PHTHALATE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
DIMETHYL PHTHALATE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
FLUORANTHENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
FLUORENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
HEXACHLOROBENZENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
HEXACHLOROBUTADIENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
HEXACHLOROCYCLOPENTADIENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
HEXACHLOROETHANE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
INDENO(1,2,3-CD)PYRENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
ISOPHORONE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
N-NITROSO-DI-N-PROPYLAMINE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
N-NITROSODIPHENYLAMINE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
NAPHTHALENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
NITROBENZENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
P-CHLOROANILINE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
PENTACHLOROPHENOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
PHENANTHRENE	UG/L	0/2	2	0/2		12.50000	25.00000	25.00000	
PHENOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
PYRENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	

EAST DRAINAGE DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
GENERAL CHEMISTRY									
ALKALINITY AS CACO3	MG/L	2/2	2	0/2	224.00000-234.00000	229.00000			342
AMMONIA	MG/L	1/2	2	0/2	0.03000-0.03000	0.02250	0.03000	0.03000	0.0387
CHLORIDE	MG/L	2/2	2	2/2	48.00000-59.00000	53.50000			31.6
FLUORIDE	MG/L	2/2	2	2/2	0.28000-0.28000	0.28000			0.22
NITRATE/NITRITE	MG/L	2/2	2	2/2	0.34700-0.41300	0.38000			
PHENOLS	UG/L	2/2	2	2/2	0.01210-0.01260	0.01235			ND
PHOSPHATE	MG/L	2/2	2	2/2	0.15600-0.22900	0.19250			
SULFATE	MG/L	2/2	2	2/2	63.90000-69.00000	66.45000			55.7
SULFIDE	MG/L	0/2	2	0/2		0.50000	1.00000	1.00000	ND
TOTAL KJELDAHL NITROGEN	MG/L	2/2	2	2/2	0.62500-1.03000	0.82750			0.288
TOTAL ORGANIC CARBON	MG/L	2/2	2	2/2	8.54000-13.80000	11.17000			5.35
TOTAL ORGANIC HALIDES	MG/L	2/2	2	2/2	0.01530-0.01640	0.01585			0.011
TOTAL ORGANIC NITROGEN	MG/L	2/2	2	2/2	0.62500-1.00000	0.81250			0.288

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EAST DRAINAGE DITCH - 1993
SURFACE WATER DATA - FILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/L	1/1	1	1/1	12.30000-12.30000	12.30000			0.50
URANIUM, TOTAL	UG/L	2/2	1	2/2	35.00000-39.70000	37.35000			1.1
URANIUM-234	PCI/L	1/1	1	1/1	11.80000-11.80000	11.80000			0.70
RADIUM-226	PCI/L	0/1	1	0/1		0.50000	1.00000	1.00000	ND
URANIUM-235/236	PCI/L	1/1	1	1/1	0.70000-0.70000	0.70000			ND
RADIUM-228	PCI/L	0/1	1	0/1		1.50000	3.00000	3.00000	ND
GROSS ALPHA	PCI/L	1/1	0	1/1	21.70000-21.70000	21.70000			5.3
GROSS BETA	PCI/L	1/1	0	1/1	23.00000-23.00000	23.00000			5.8

EAST DRAINAGE DITCH - 1993
SURFACE WATER DATA - FILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/L	0/1	1	0/1		0.08050	0.16100	0.16100	0.132
ANTIMONY	MG/L	0/2	2	0/2		0.00700	0.01400	0.01400	ND
ARSENIC	MG/L	0/2	2	0/2		0.00100	0.00200	0.00200	ND
BARIUM	MG/L	2/2	2	2/2	0.05300-0.05660	0.05480			0.0526
BERYLLIUM	MG/L	0/2	2	0/2		0.00250	0.00500	0.00500	ND
CADMIUM	MG/L	0/2	2	0/2		0.00250	0.00500	0.00500	ND
CALCIUM	MG/L	2/2	2	0/2	78.80000-80.40000	79.60000			107
CHROMIUM	MG/L	0/2	2	0/2		0.00300	0.00600	0.00600	ND
COBALT	MG/L	0/2	2	0/2		0.00850	0.01700	0.01700	ND
COPPER	MG/L	0/2	2	0/2		0.00450	0.00900	0.00900	ND
CYANIDE	MG/L	0/2	2	0/2		0.00250	0.00500	0.00500	ND
IRON	MG/L	0/1	1	0/1		0.08200	0.16400	0.16400	ND
LEAD	MG/L	2/2	2	2/2	0.00350-0.00680	0.00515			ND
MAGNESIUM	MG/L	2/2	2	0/2	23.50000-24.00000	23.75000			27.7
MANGANESE	MG/L	2/2	2	2/2	0.09120-0.20400	0.14760			0.0257
MERCURY	MG/L	0/2	2	0/2		0.00005	0.00010	0.00010	ND
MOLYBDENUM	MG/L	0/2	2	0/2		0.00850	0.01700	0.01700	ND
NICKEL	MG/L	0/2	2	0/2		0.00900	0.01800	0.01800	ND
POTASSIUM	MG/L	2/2	2	1/2	3.09000-3.51000	3.30000			3.50
SILICON	MG/L	2/2	2	2/2	3.63000-6.03000	4.83000			3.01
SODIUM	MG/L	2/2	2	2/2	47.30000-62.40000	54.85000			18.3
THALLIUM	MG/L	0/2	2	0/2		0.00050	0.00100	0.00100	ND

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EAST DRAINAGE DITCH - 1993
SURFACE WATER DATA - FILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
VANADIUM	MG/L	0/2	2	0/2		0.01200	0.02400	0.02400	ND
ZINC	MG/L	0/2	2	0/2		0.00300	0.00600	0.00600	ND

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AREA: EAST DRAINAGE DITCH - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/G	2/2	2	2/2	0.900-1.100	1.000			
URANIUM, TOTAL	MG/KG	4/4	2	4/4	10.800-11.300	11.000			1.67
URANIUM-234	PCI/G	2/2	2	2/2	0.800-1.200	1.000			
THORIUM-230	PCI/G	2/2	2	2/2	1.000-1.300	1.150			
RADIUM-226	PCI/G	2/2	2	0/2	0.400-0.500	0.450			1.93
URANIUM-235/236	PCI/G	1/2	2	1/2	0.100-0.100	0.075	0.100	0.100	
THORIUM-232	PCI/G	2/2	2	2/2	0.700-0.800	0.750			
THORIUM, TOTAL	MG/KG	1/1	0	1/1	7.296-7.296	7.296			
RADIUM-228	PCI/G	1/2	2	1/2	0.400-0.400	0.325	0.500	0.500	ND
THORIUM-228	PCI/G	2/2	2	2/2	0.700-1.000	0.850			

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AREA: EAST DRAINAGE DITCH - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/KG	2/2	2	2/2	15500.000-20500.000	18000.000			1970
ANTIMONY	MG/KG	0/2	2	0/2		2.250	4.300	4.700	
ARSENIC	MG/KG	2/2	2	1/2	6.800-7.600	7.200			7
BARIUM	MG/KG	2/2	2	2/2	130.000-147.000	138.500			21
BERYLLIUM	MG/KG	0/2	2	0/2		0.800	1.500	1.700	0.50
CALCIUM	MG/KG	2/2	2	1/2	8530.000-35700.000	22115.000			25900
CHROMIUM	MG/KG	2/2	2	2/2	20.500-27.800	24.150			18.3
COBALT	MG/KG	2/2	2	2/2	11.900-12.100	12.000			4.9
COPPER	MG/KG	2/2	2	2/2	17.700-22.900	20.300			10.8
CYANIDE	MG/KG	0/2	2	0/2		0.200	0.380	0.420	
IRON	MG/KG	2/2	2	2/2	29500.000-33000.000	31250.000			6700
LEAD	MG/KG	2/2	2	2/2	16.800-42.900	29.850			
MAGNESIUM	MG/KG	2/2	2	0/2	4950.000-13800.000	9375.000			18300
MANGANESE	MG/KG	2/2	2	2/2	705.000-981.000	843.000			411
MERCURY	MG/KG	0/2	2	0/2		0.045	0.080	0.100	ND
MOLYBDENUM	MG/KG	0/2	2	0/2		2.725	5.200	5.700	ND
NICKEL	MG/KG	2/2	2	2/2	22.900-32.000	27.450			13.7
POTASSIUM	MG/KG	2/2	2	2/2	1560.000-2600.000	2080.000			307
SILICON	MG/KG	2/2	2	2/2	286.000-806.000	546.000			
SILVER	MG/KG	0/2	2	0/2		0.163	0.310	0.340	ND
SODIUM	MG/KG	2/2	2	2/2	231.000-357.000	294.000			197

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AREA: EAST DRAINAGE DITCH - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
THALLIUM	MG/KG	0/2	2	0/2		0.163	0.310	0.340	ND
VANADIUM	MG/KG	2/2	2	2/2	35.900-42.200	39.050			12.4
ZINC	MG/KG	2/2	2	2/2	73.500-87.600	80.550			13.5

000487

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AREA: EAST DRAINAGE DITCH - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
1,1,1-TRICHLOROETHANE	UG/KG	0/2	2	0/2		8.000	15.000	17.000	
1,1,2,2-TETRACHLOROETHANE	UG/KG	0/2	2	0/2		8.000	15.000	17.000	
1,1,2-TRICHLOROETHANE	UG/KG	0/2	2	0/2		8.000	15.000	17.000	
1,1-DICHLOROETHANE	UG/KG	0/2	2	0/2		8.000	15.000	17.000	
1,1-DICHLOROETHENE	UG/KG	0/2	2	0/2		8.000	15.000	17.000	
1,2-DICHLOROETHANE	UG/KG	0/2	2	0/2		8.000	15.000	17.000	
1,2-DICHLOROETHENE (TOTAL)	UG/KG	0/2	2	0/2		8.000	15.000	17.000	
1,2-DICHLOROPROPANE	UG/KG	0/2	2	0/2		8.000	15.000	17.000	
2-BUTANONE	UG/KG	0/2	2	0/2		8.000	15.000	17.000	
2-HEXANONE	UG/KG	0/2	2	0/2		8.000	15.000	17.000	
4-METHYL-2-PENTANONE	UG/KG	0/2	2	0/2		8.000	15.000	17.000	
ACETONE	UG/KG	1/2	2	1/2	180.000-180.000	93.750	15.000	15.000	
BENZENE	UG/KG	0/2	2	0/2		8.000	15.000	17.000	
BROMODICHLOROMETHANE	UG/KG	0/2	2	0/2		8.000	15.000	17.000	
BROMOFORM	UG/KG	0/2	2	0/2		8.000	15.000	17.000	
BROMOMETHANE	UG/KG	0/2	2	0/2		8.000	15.000	17.000	
CARBON DISULFIDE	UG/KG	0/2	2	0/2		8.000	15.000	17.000	
CARBON TETRACHLORIDE	UG/KG	0/2	2	0/2		8.000	15.000	17.000	
CHLOROBENZENE	UG/KG	0/2	2	0/2		8.000	15.000	17.000	
CHLOROETHANE	UG/KG	0/2	2	0/2		8.000	15.000	17.000	
CHLOROFORM	UG/KG	0/2	2	0/2		8.000	15.000	17.000	

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AREA: EAST DRAINAGE DITCH - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
CHLOROMETHANE	UG/KG	0/2	2	0/2		8.000	15.000	17.000	
CIS-1,3-DICHLOROPROPENE	UG/KG	0/2	2	0/2		8.000	15.000	17.000	
DIBROMOCHLOROMETHANE	UG/KG	0/2	2	0/2		8.000	15.000	17.000	
ETHYLBENZENE	UG/KG	0/2	2	0/2		8.000	15.000	17.000	
METHYLENE CHLORIDE	UG/KG	1/2	2	1/2	2.000-2.000	4.750	15.000	15.000	
STYRENE	UG/KG	0/2	2	0/2		8.000	15.000	17.000	
TETRACHLOROETHENE	UG/KG	0/2	2	0/2		8.000	15.000	17.000	
TOLUENE	UG/KG	1/2	2	1/2	5.000-5.000	6.250	15.000	15.000	
TRANS-1,3-DICHLOROPROPENE	UG/KG	0/2	2	0/2		8.000	15.000	17.000	
TRICHLOROETHENE	UG/KG	0/2	2	0/2		8.000	15.000	17.000	
VINYL ACETATE	UG/KG	0/2	2	0/2		8.000	15.000	17.000	
VINYL CHLORIDE	UG/KG	0/2	2	0/2		8.000	15.000	17.000	
XYLENES, TOTAL	UG/KG	0/2	2	0/2		8.000	15.000	17.000	

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AREA: EAST DRAINAGE DITCH - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
1,2,4-TRICHLOROBENZENE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
1,2-DICHLOROBENZENE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
1,3-DICHLOROBENZENE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
1,4-DICHLOROBENZENE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
2,4,5-TRICHLOROPHENOL	UG/KG	0/2	2	0/2		675.000	1300.000	1400.000	
2,4,6-TRICHLOROPHENOL	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
2,4-DICHLOROPHENOL	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
2,4-DIMETHYLPHENOL	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
2,4-DINITROPHENOL	UG/KG	0/2	2	0/2		675.000	1300.000	1400.000	
2,4-DINITROTOLUENE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
2,6-DINITROTOLUENE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
2-CHLORONAPHTHALENE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
2-CHLOROPHENOL	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
2-METHYLNAPHTHALENE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
2-METHYLPHENOL	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
2-NITROANILINE	UG/KG	0/2	2	0/2		675.000	1300.000	1400.000	
2-NITROPHENOL	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
3,3'-DICHLOROBENZIDINE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
3-NITROANILINE	NONE	0/2	2	0/2		675.000	1300.000	1400.000	
4,6-DINITRO-2-METHYLPHENOL	UG/KG	0/2	2	0/2		675.000	1300.000	1400.000	
4-BROMOPHENYL PHENYL ETHER	UG/KG	0/2	2	0/2		267.500	510.000	560.000	

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AREA: EAST DRAINAGE DITCH - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
4-CHLORO-3-METHYLPHENOL	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
4-CHLOROPHENYLPHENYL ETHER	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
4-METHYLPHENOL	UG/KG	1/2	2	1/2	310.000-310.000	282.500	510.000	510.000	
4-NITROANILINE	UG/KG	0/2	2	0/2		675.000	1300.000	1400.000	
4-NITROPHENOL	UG/KG	0/2	2	0/2		675.000	1300.000	1400.000	
ACENAPHTHENE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
ACENAPHTHYLENE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
ANTHRACENE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
BENZO(A)ANTHRACENE	UG/KG	2/2	2	2/2	50.000-77.000	63.500			
BENZO(A)PYRENE	UG/KG	2/2	2	2/2	54.000-64.000	59.000			
BENZO(B)FLUORANTHENE	UG/KG	2/2	2	2/2	76.000-110.000	93.000			
BENZO(G,H,I)PERYLENE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
BENZO(K)FLUORANTHENE	UG/KG	2/2	2	2/2	58.000-66.000	62.000			
BIS(2-CHLOROETHOXY)METHANE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
BIS(2-CHLOROETHYL)ETHER	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
BIS(2-CHLOROISOPROPYL) ETHER	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
BUTYL BENZYL PHTHALATE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
CARBAZOLE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
CHRYSENE	UG/KG	2/2	2	2/2	87.000-120.000	103.500			
DI-N-BUTYL PHTHALATE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	

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AREA: EAST DRAINAGE DITCH - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
DI-N-OCTYL PHTHALATE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
DIBENZO(A,H)ANTHRACENE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
DIBENZOFURAN	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
DIETHYL PHTHALATE	UG/KG	0/2	2	0/2		1400.000	2600.000	3000.000	
DIMETHYL PHTHALATE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
FLUORANTHENE	UG/KG	2/2	2	2/2	140.000-240.000	190.000			
FLUORENE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
HEXACHLOROBENZENE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
HEXACHLOROBUTADIENE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
HEXACHLOROCYCLOPENTADIENE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
HEXACHLOROETHANE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
INDENO(1,2,3-CD)PYRENE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
ISOPHORONE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
N-NITROSO-DI-N-PROPYLAMINE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
N-NITROSODIPHENYLAMINE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
NAPHTHALENE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
NITROBENZENE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
P-CHLOROANILINE	UG/KG	0/2	2	0/2		267.500	510.000	560.000	
PENTACHLOROPHENOL	UG/KG	0/2	2	0/2		675.000	1300.000	1400.000	
PHENANTHRENE	UG/KG	2/2	2	2/2	72.000-110.000	91.000			
PHENOL	UG/KG	0/2	2	0/2		267.500	510.000	560.000	

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AREA: EAST DRAINAGE DITCH - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
PYRENE	UG/KG	2/2	2	2/2	110.000-150.000	130.000			

000493

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STORM SEWER OUTFALL DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/L	3/5	5	3/5	1.10000-15.50000	1.10000	0.20000	0.20000	0.73
URANIUM, TOTAL	UG/L	8/9	5	7/9	0.30000-64.00000	3.20000	0.10000	0.10000	1.1
URANIUM-234	PCI/L	3/5	5	3/5	0.90000-16.20000	0.90000	0.20000	0.20000	0.70
THORIUM-230	PCI/L	1/3	3	1/3	0.40000-0.40000	0.15000	0.30000	0.30000	ND
RADIUM-226	PCI/L	0/5	5	0/5		0.50000	1.00000	1.00000	0.35
URANIUM-235/236	PCI/L	1/5	5	1/5	0.50000-0.50000	0.10000	0.20000	0.20000	ND
THORIUM-232	PCI/L	0/3	3	0/3		0.10000	0.20000	0.20000	ND
RADIUM-228	PCI/L	0/5	5	0/5		1.50000	3.00000	3.00000	2.1
THORIUM-228	PCI/L	0/3	3	0/3		0.10000	0.20000	0.20000	ND
TECHNETIUM-99	PCI/L	0/1	0	0/1		7.50000	15.00000	15.00000	ND
GROSS ALPHA	PCI/L	4/5	0	2/5	1.10000-21.00000	1.40000	2.80000	2.80000	3.7
GROSS BETA	PCI/L	4/5	0	3/5	2.00000-27.90000	8.20000	1.00000	1.00000	6.8

000494

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STORM SEWER OUTFALL DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/L	1/4	4	0/4	0.44300-0.44300	0.14275	0.09700	0.37300	0.640
ANTIMONY	MG/L	0/4	4	0/4		0.00700	0.01400	0.04500	ND
ARSENIC	MG/L	1/4	4	1/4	0.00340-0.00340	0.00100	0.00200	0.00200	ND
BARIUM	MG/L	4/4	4	0/4	0.04040-0.05250	0.04895			0.0534
BERYLLIUM	MG/L	0/4	4	0/4		0.00250	0.00100	0.00500	ND
CADMIUM	MG/L	0/4	4	0/4		0.00250	0.00300	0.00500	ND
CALCIUM	MG/L	4/4	4	0/4	75.10000-88.80000	82.35000			107
CHROMIUM	MG/L	0/4	4	0/4		0.00300	0.00500	0.00600	ND
COBALT	MG/L	0/4	4	0/4		0.00850	0.00800	0.01700	ND
COPPER	MG/L	0/4	4	0/4		0.00450	0.00430	0.00900	ND
CYANIDE	MG/L	2/4	4	2/4	0.00710-0.00770	0.00605	0.00500	0.01000	ND
IRON	MG/L	1/4	4	1/4	0.93700-0.93700	0.16475	0.17900	0.36000	0.513
LEAD	MG/L	3/4	4	3/4	0.00310-0.09790	0.00740	0.00240	0.00240	ND
MAGNESIUM	MG/L	4/4	4	2/4	22.60000-30.10000	28.50000			27.8
MANGANESE	MG/L	4/4	4	1/4	0.01160-0.04120	0.01505			0.035
MERCURY	MG/L	0/4	4	0/4		0.00005	0.00010	0.00020	ND
MOLYBDENUM	MG/L	0/3	3	0/3		0.00850	0.01700	0.01700	ND
NICKEL	MG/L	0/4	4	0/4		0.00900	0.01800	0.02000	ND
POTASSIUM	MG/L	4/4	4	3/4	2.47000-4.63000	4.28500			3.58
SELENIUM	MG/L	0/1	1	0/1		0.00085	0.00170	0.00170	ND
SILICON	MG/L	3/3	3	2/3	3.18000-3.72000	3.39000			3.36
SILVER	MG/L	0/1	1	0/1		0.00350	0.00700	0.00700	ND

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STORM SEWER OUTFALL DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
SODIUM	MG/L	4/4	4	3/4	12.00000-27.60000	24.95000			18.2
THALLIUM	MG/L	1/4	4	1/4	0.00220-0.00220	0.00050	0.00100	0.00100	ND
VANADIUM	MG/L	0/4	4	0/4		0.01200	0.00300	0.02400	ND
ZINC	MG/L	1/4	4	1/4	0.00980-0.00980	0.00640	0.00600	0.03090	ND

000498

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STORM SEWER OUTFALL DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
1,1,1-TRICHLOROETHANE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
1,1,2,2-TETRACHLOROETHANE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
1,1,2-TRICHLOROETHANE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
1,1-DICHLOROETHANE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
1,1-DICHLOROETHENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
1,2-DICHLOROETHANE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
1,2-DICHLOROETHENE (TOTAL)	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
1,2-DICHLOROPROPANE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
2-BUTANONE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
2-HEXANONE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
4-METHYL-2-PENTANONE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
ACETONE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
BENZENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
BROMODICHLOROMETHANE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
BROMOFORM		0/3	3	0/3		5.00000	10.00000	10.00000	
BROMOMETHANE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
CARBON DISULFIDE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
CARBON TETRACHLORIDE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
CHLOROBENZENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
CHLOROETHANE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
CHLOROFORM	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
CHLOROMETHANE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	

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STORM SEWER OUTFALL DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
CIS-1,3-DICHLOROPROPENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
DIBROMOCHLOROMETHANE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
ETHYLBENZENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
METHYLENE CHLORIDE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
STYRENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
TETRACHLOROETHENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
TOLUENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
TRANS-1,3-DICHLOROPROPENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
TRICHLOROETHENE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
VINYL ACETATE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
VINYL CHLORIDE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
XYLENES, TOTAL	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	

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STORM SEWER OUTFALL DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
1,2,4-TRICHLOROBENZENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
1,2-DICHLOROBENZENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
1,3-DICHLOROBENZENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
1,4-DICHLOROBENZENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2,4,5-TRICHLOROPHENOL	UG/L	0/2	2	0/2		12.50000	25.00000	25.00000	
2,4,6-TRICHLOROPHENOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2,4-DICHLOROPHENOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2,4-DIMETHYLPHENOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2,4-DINITROPHENOL	UG/L	0/2	2	0/2		12.50000	25.00000	25.00000	
2,4-DINITROTOLUENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2,6-DINITROTOLUENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2-CHLORONAPHTHALENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2-CHLOROPHENOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2-METHYLNAPHTHALENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2-METHYLPHENOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
2-NITROANILINE	UG/L	0/2	2	0/2		12.50000	25.00000	25.00000	
2-NITROPHENOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
3,3'-DICHLOROBENZIDINE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
3-NITROANILINE	NONE	0/2	2	0/2		12.50000	25.00000	25.00000	
4,6-DINITRO-2-METHYLPHENOL	UG/L	0/2	2	0/2		12.50000	25.00000	25.00000	
4-BROMOPHENYL PHENYL ETHER	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
4-CHLORO-3-METHYLPHENOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	

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STORM SEWER OUTFALL DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
4-CHLOROPHENYLPHENYL ETHER	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
4-METHYLPHENOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
4-NITROANILINE	UG/L	0/2	2	0/2		12.50000	25.00000	25.00000	
4-NITROPHENOL	UG/L	0/2	2	0/2		12.50000	25.00000	25.00000	
ACENAPHTHENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
ACENAPHTHYLENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
ANTHRACENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BENZO(A)ANTHRACENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BENZO(A)PYRENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BENZO(B)FLUORANTHENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BENZO(G,H,I)PERYLENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BENZO(K)FLUORANTHENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BIS(2-CHLOROETHOXY)METHANE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BIS(2-CHLOROETHYL)ETHER	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BIS(2-CHLOROISOPROPYL) ETHER	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BIS(2-ETHYLHEXYL)PHTHALATE	UG/L	2/2	2	2/2	16.00000-58.00000	37.00000			
BUTYL BENZYL PHTHALATE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
CARBAZOLE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
CHRYSENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
DI-N-BUTYL PHTHALATE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
DI-N-OCTYL PHTHALATE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
DIBENZO(A,H)ANTHRACENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	

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STORM SEWER OUTFALL DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
DIBENZOFURAN	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
DIETHYL PHTHALATE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
DIMETHYL PHTHALATE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
FLUORANTHENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
FLUORENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
HEXACHLOROBENZENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
HEXACHLOROBUTADIENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
HEXACHLOROCYCLOPENTADIENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
HEXACHLOROETHANE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
INDENO(1,2,3-CD)PYRENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
ISOPHORONE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
N-NITROSO-DI-N-PROPYLAMINE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
N-NITROSODIPHENYLAMINE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
NAPHTHALENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
NITROBENZENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
P-CHLOROANILINE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
PENTACHLOROPHENOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
PHENANTHRENE	UG/L	0/2	2	0/2		12.50000	25.00000	25.00000	
PHENOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
PYRENE	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	

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STORM SEWER OUTFALL DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
GENERAL CHEMISTRY									
ALKALINITY AS CACO3	MG/L	3/3	3	0/3	216.00000-236.00000	226.00000			342
AMMONIA	MG/L	0/3	3	0/3		0.01500	0.02000	0.03000	0.0387
BICARBONATE ALKALINITY	MG/L	1/1	1	1/1	311.00000-311.00000	311.00000			
CARBONATE ALKALINITY	MG/L	0/1	1	0/1		1.50000	3.00000	3.00000	
CHLORIDE	MG/L	3/3	3	2/3	27.00000-45.20000	43.30000			31.6
FLUORIDE	MG/L	2/3	3	0/3	0.19000-0.20000	0.19000	0.22000	0.22000	0.22
NITRATE/NITRITE	MG/L	3/3	3	3/3	1.59000-5.36000	4.04000			
PH	STD	1/1	1	1/1	7.35000-7.35000	7.35000			
PHENOLS	UG/L	0/3	3	0/3		0.00250	0.00500	0.01000	ND
PHOSPHATE	MG/L	2/2	2	2/2	0.32400-0.34200	0.33300			
PHOSPHORUS	MG/L	1/1	1	0/1	0.12000-0.12000	0.12000			0.228
SPECIFIC CONDUCTIVITY	UMHOS/C	1/1	1	1/1	604.00000-604.00000	604.00000			
SULFATE	MG/L	3/3	3	3/3	67.30000-89.00000	73.60000			55.7
SULFIDE	MG/L	0/2	2	0/2		0.50000	1.00000	1.00000	ND
TOTAL KJELDAHL NITROGEN	MG/L	3/3	3	2/3	0.17000-0.59500	0.44600			0.288
TOTAL ORGANIC CARBON	MG/L	3/3	3	0/3	3.00000-3.86000	3.45000			5.35
TOTAL ORGANIC HALIDES	MG/L	2/2	2	1/2	0.01040-0.01220	0.01130			0.011
TOTAL ORGANIC HALOGENS	NONE	0/1	1	0/1		0.00500	0.01000	0.01000	
TOTAL ORGANIC NITROGEN	MG/L	3/3	3	2/3	0.17000-0.59500	0.44600			0.288
TOTAL SOLIDS	MG/L	1/1	1	1/1	424.00000-424.00000	424.00000			

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STORM SEWER OUTFALL DITCH - 1993
SURFACE WATER DATA - FILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/L	3/4	4	3/4	1.10000-10.30000	2.25000	0.20000	0.20000	0.50
URANIUM, TOTAL	UG/L	5/6	4	4/6	0.60000-51.80000	3.30000	0.10000	0.10000	1.1
URANIUM-234	PCI/L	3/4	4	3/4	1.00000-8.70000	1.95000	0.20000	0.20000	0.70
THORIUM-230	PCI/L	1/3	3	1/3	0.30000-0.30000	0.10000	0.20000	0.20000	0.28
RADIUM-226	PCI/L	0/4	4	0/4		0.50000	1.00000	1.00000	ND
URANIUM-235/236	PCI/L	1/4	4	1/4	0.30000-0.30000	0.10000	0.20000	0.20000	ND
THORIUM-232	PCI/L	0/4	3	0/4		0.10000	0.20000	0.30000	ND
RADIUM-228	PCI/L	0/5	3	0/5		1.50000	3.00000	3.00000	ND
THORIUM-228	PCI/L	0/3	3	0/3		0.10000	0.20000	0.20000	ND
TECHNETIUM-99	PCI/L	0/3	2	0/3		7.50000	15.00000	15.00000	ND
GROSS ALPHA	PCI/L	2/5	0	2/5	13.10000-56.00000	1.80000	1.10000	3.60000	5.3
GROSS BETA	PCI/L	3/5	0	2/5	5.00000-12.90000	10.60000	2.00000	180.00000	5.8

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STORM SEWER OUTFALL DITCH - 1993
SURFACE WATER DATA - FILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/L	0/2	2	0/2		0.02420	0.02390	0.07290	0.132
ANTIMONY	MG/L	0/2	2	0/2		0.01475	0.01400	0.04500	ND
ARSENIC	MG/L	0/2	2	0/2		0.00100	0.00200	0.00200	ND
BARIUM	MG/L	2/2	2	0/2	0.03500-0.04960	0.04230			0.0526
BERYLLIUM	MG/L	0/2	2	0/2		0.00150	0.00100	0.00500	ND
CADMIUM	MG/L	0/2	2	0/2		0.00200	0.00300	0.00500	ND
CALCIUM	MG/L	2/2	2	0/2	80.20000-82.30000	81.25000			107
CHROMIUM	MG/L	0/2	2	0/2		0.00275	0.00500	0.00600	ND
COBALT	MG/L	0/2	2	0/2		0.00625	0.00800	0.01700	ND
COPPER	MG/L	1/2	2	1/2	0.00480-0.00480	0.00465	0.00900	0.00900	ND
CYANIDE	MG/L	0/2	2	0/2		0.00375	0.00500	0.01000	ND
IRON	MG/L	0/2	2	0/2		0.01258	0.02200	0.02830	ND
LEAD	MG/L	1/2	2	1/2	0.00430-0.00430	0.00328	0.00450	0.00450	ND
MAGNESIUM	MG/L	2/2	2	1/2	20.00000-29.80000	24.90000			27.7
MANGANESE	MG/L	2/2	2	0/2	0.00450-0.00980	0.00715			0.0257
MERCURY	MG/L	0/2	2	0/2		0.00008	0.00010	0.00020	ND
MOLYBDENUM	MG/L	0/1	1	0/1		0.00850	0.01700	0.01700	ND
NICKEL	MG/L	0/2	2	0/2		0.00950	0.01800	0.02000	ND
POTASSIUM	MG/L	2/2	2	1/2	2.33000-4.21000	3.27000			3.50
SELENIUM	MG/L	0/1	1	0/1		0.00080	0.00160	0.00160	ND
SILICON	MG/L	1/1	1	1/1	3.46000-3.46000	3.46000			3.01
SILVER	MG/L	0/1	1	0/1		0.00350	0.00700	0.00700	ND

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STORM SEWER OUTFALL DITCH - 1993
SURFACE WATER DATA - FILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
SODIUM	MG/L	2/2	2	1/2	11.50000-25.50000	18.50000			18.3
THALLIUM	MG/L	0/2	2	0/2		0.00075	0.00100	0.00200	ND
VANADIUM	MG/L	0/2	2	0/2		0.00675	0.00300	0.02400	ND
ZINC	MG/L	0/2	2	0/2		0.00780	0.00600	0.02520	ND

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STORM SEWER OUTFALL DITCH - 1993
SURFACE WATER DATA - FILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
GENERAL CHEMISTRY									
TOTAL DISSOLVED SOLIDS	MG/L	1/1	1	1/1	373.00000-373.00000	373.00000			

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STORM SEWER OUTFALL DITCH - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/L	1/1	1	1/1	1.30000-1.30000	1.30000			0.73
URANIUM, TOTAL	UG/L	4/4	4	4/4	2.00000-24.00000	12.50000			1.1
URANIUM-234	PCI/L	0/1	1	0/1		0.50000	1.00000	1.00000	0.70
THORIUM-230	PCI/L	0/1	1	0/1		0.50000	1.00000	1.00000	ND
RADIUM-226	PCI/L	0/3	3	0/3		0.50000	1.00000	1.00000	0.35
URANIUM-235/236	PCI/L	0/1	1	0/1		0.50000	1.00000	1.00000	ND
THORIUM-232	PCI/L	0/1	1	0/1		0.50000	1.00000	1.00000	ND
THORIUM, TOTAL	UG/L	0/1	1	0/1		3.00000	6.00000	6.00000	ND
RADIUM-228	PCI/L	0/4	4	0/4		1.50000	3.00000	3.00000	2.1
THORIUM-228	PCI/L	0/1	1	0/1		0.50000	1.00000	1.00000	ND
NEPTUNIUM-237	PCI/L	0/1	1	0/1		0.50000	1.00000	1.00000	NA
PLUTONIUM-239/240	PCI/L	0/1	1	0/1		0.50000	1.00000	1.00000	0.093
PLUTONIUM-238	PCI/L	0/1	1	0/1		0.50000	1.00000	1.00000	ND
STRONTIUM-90	PCI/L	0/1	1	0/1		2.50000	5.00000	5.00000	0.96
TECHNETIUM-99	PCI/L	0/1	1	0/1		15.00000	30.00000	30.00000	ND
RUTHENIUM-106	PCI/L	0/1	1	0/1		75.00000	150.00000	150.00000	ND
CESIUM-137	PCI/L	0/1	1	0/1	-	10.00000	20.00000	20.00000	3.1
GROSS ALPHA	PCI/L	3/3	0	3/3	8.00000-21.00000	12.00000			3.7
GROSS BETA	PCI/L	3/3	0	2/3	5.00000-12.00000	7.00000			6.8

000507

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STORM SEWER OUTFALL DITCH - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ARSENIC	MG/L	0/1	1	0/1		0.00100	0.00200	0.00200	ND
BARIUM	MG/L	1/1	1	0/1	0.02710-0.02710	0.02710			0.0534
CADMIUM	MG/L	0/1	1	0/1		0.00050	0.00100	0.00100	ND
CALCIUM	MG/L	1/1	1	0/1	39.00000-39.00000	39.00000			107
CHROMIUM	MG/L	1/1	1	1/1	0.00720-0.00720	0.00720			ND
COPPER	MG/L	0/1	1	0/1		0.00525	0.01050	0.01050	ND
IRON	MG/L	1/1	1	0/1	0.29200-0.29200	0.29200			0.513
LEAD	MG/L	1/1	1	1/1	0.00220-0.00220	0.00220			ND
MAGNESIUM	MG/L	1/1	1	1/1	107.00000-107.00000	107.00000			27.8
MANGANESE	MG/L	1/1	1	0/1	0.00840-0.00840	0.00840			0.035
MERCURY	MG/L	1/1	1	1/1	0.00026-0.00026	0.00026			ND
MOLYBDENUM	MG/L	0/1	1	0/1		0.00150	0.00300	0.00300	ND
NICKEL	MG/L	0/1	1	0/1		0.00300	0.00600	0.00600	ND
POTASSIUM	MG/L	1/1	1	0/1	1.88000-1.88000	1.88000			3.58
SILVER	MG/L	0/1	1	0/1		0.00025	0.00050	0.00050	ND
SODIUM	MG/L	1/1	1	1/1	138.00000-138.00000	138.00000			18.2

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STORM SEWER OUTFALL DITCH - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
GENERAL CHEMISTRY									
AMMONIA	MG/L	2/2	2	2/2	0.12600-0.16200	0.14400			0.0387
CHLORIDE	MG/L	2/2	2	1/2	29.00000-34.00000	31.50000			31.6
FLUORIDE	MG/L	2/2	2	0/2	0.19000-0.21000	0.20000			0.22
NITRATE	MG/L	2/2	2	1/2	0.71000-5.44000	3.07500			1.66
PHENOLS	UG/L	0/2	2	0/2		0.00500	0.01000	0.01000	ND
PHOSPHORUS	MG/L	2/2	2	0/2	0.16100-0.19400	0.17750			0.228
SULFATE	MG/L	2/2	2	0/2	47.60000-51.30000	49.45000			55.7
TOTAL KJELDAHL NITROGEN	MG/L	2/2	2	2/2	0.69100-0.97700	0.83400			0.288
TOTAL ORGANIC CARBON	MG/L	0/1	1	0/1		0.50000	1.00000	1.00000	5.35
TOTAL ORGANIC HALIDES	MG/L	0/2	1	0/2		0.01500	0.01000	0.05000	0.011
TOTAL ORGANIC NITROGEN	MG/L	2/2	2	2/2	0.56500-0.81500	0.69000			0.288

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STORM SEWER OUTFALL DITCH - 1988/89
SURFACE WATER DATA - FILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/L	1/1	1	1/1	15.90000-15.90000	15.90000			0.50
URANIUM, TOTAL	UG/L	3/3	3	3/3	15.00000-44.00000	21.00000			1.1
URANIUM-234	PCI/L	1/1	1	1/1	15.90000-15.90000	15.90000			0.70
THORIUM-230	PCI/L	0/1	1	0/1		0.50000	1.00000	1.00000	0.28
RADIUM-226	PCI/L	0/3	3	0/3		0.50000	1.00000	1.00000	ND
URANIUM-235/236	PCI/L	0/1	1	0/1		0.50000	1.00000	1.00000	ND
THORIUM-232	PCI/L	0/1	1	0/1		0.50000	1.00000	1.00000	ND
THORIUM, TOTAL	UG/L	0/1	1	0/1		2.50000	5.00000	5.00000	ND
RADIUM-228	PCI/L	0/3	3	0/3		1.50000	3.00000	3.00000	ND
THORIUM-228	PCI/L	0/1	1	0/1		0.50000	1.00000	1.00000	ND
NEPTUNIUM-237	PCI/L	0/1	1	0/1		0.50000	1.00000	1.00000	0.42
PLUTONIUM-239/240	PCI/L	0/1	1	0/1		0.50000	1.00000	1.00000	0.29
PLUTONIUM-238	PCI/L	0/1	1	0/1		0.50000	1.00000	1.00000	ND
STRONTIUM-90	PCI/L	0/1	1	0/1		2.50000	5.00000	5.00000	0.86
TECHNETIUM-99	PCI/L	0/1	1	0/1		15.00000	30.00000	30.00000	ND
GROSS ALPHA	PCI/L	2/2	0	2/2	17.00000-37.00000	27.00000			5.3
GROSS BETA	PCI/L	2/2	0	2/2	10.00000-13.00000	11.50000			5.8

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STORM SEWER OUTFALL DITCH - 1988/89
SURFACE WATER DATA - FILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/L	1/1	1	0/1	0.08660-0.08660	0.08660			0.132
ARSENIC	MG/L	0/1	1	0/1		0.00100	0.00200	0.00200	ND
BARIUM	MG/L	1/1	1	0/1	0.03990-0.03990	0.03990			0.0526
CADMIUM	MG/L	0/1	1	0/1		0.00100	0.00200	0.00200	ND
CALCIUM	MG/L	1/1	1	0/1	72.30000-72.30000	72.30000			107
CHROMIUM	MG/L	0/1	1	0/1		0.00500	0.01000	0.01000	ND
COPPER	MG/L	0/1	1	0/1		0.00500	0.01000	0.01000	ND
IRON	MG/L	1/1	1	1/1	0.06590-0.06590	0.06590			ND
LEAD	MG/L	1/1	1	1/1	0.00260-0.00260	0.00260			ND
MAGNESIUM	MG/L	1/1	1	0/1	19.90000-19.90000	19.90000			27.7
MANGANESE	MG/L	1/1	1	0/1	0.00970-0.00970	0.00970			0.0257
MERCURY	MG/L	0/1	1	0/1		0.00010	0.00020	0.00020	ND
MOLYBDENUM	MG/L	0/1	1	0/1		0.00500	0.01000	0.01000	ND
NICKEL	MG/L	0/1	1	0/1		0.01000	0.02000	0.02000	ND
POTASSIUM	MG/L	1/1	1	0/1	1.84000-1.84000	1.84000			3.50
SELENIUM	MG/L	0/1	1	0/1		0.00100	0.00200	0.00200	ND
SILICON	MG/L	1/1	1	1/1	3.89000-3.89000	3.89000			3.01
SILVER	MG/L	0/1	1	0/1		0.00500	0.01000	0.01000	ND
SODIUM	MG/L	1/1	1	0/1	14.60000-14.60000	14.60000			18.3
VANADIUM	MG/L	0/1	1	0/1		0.00500	0.01000	0.01000	ND

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STORM SEWER OUTFALL DITCH - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/G	1/1	1	1/1	0.200-0.200	0.200			
URANIUM, TOTAL	MG/KG	2/3	1	2/3	3.300-11.000	5.500	11.000	11.000	1.67
URANIUM-234	PCI/G	1/1	1	1/1	0.400-0.400	0.400			
THORIUM-230	PCI/G	1/1	1	1/1	0.900-0.900	0.900			
RADIUM-226	PCI/G	1/1	1	0/1	0.300-0.300	0.300			1.93
URANIUM-235/236	PCI/G	0/1	1	0/1		0.050	0.100	0.100	
THORIUM-232	PCI/G	1/1	1	1/1	0.300-0.300	0.300			
THORIUM, TOTAL	MG/KG	1/1	0	1/1	2.736-2.736	2.736			
RADIUM-228	PCI/G	1/1	1	1/1	0.600-0.600	0.600			ND
THORIUM-228	PCI/G	1/1	1	1/1	0.400-0.400	0.400			

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STORM SEWER OUTFALL DITCH - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/KG	2/2	2	2/2	2210.000-3890.000	3050.000			1970
ANTIMONY	MG/KG	0/2	2	0/2		1.850	3.700	3.700	
ARSENIC	MG/KG	2/2	2	0/2	3.400-5.500	4.450			7
BARIUM	MG/KG	2/2	2	1/2	19.300-38.100	28.700			21
BERYLLIUM	MG/KG	1/2	2	1/2	1.300-1.300	0.975	1.300	1.300	0.50
CALCIUM	MG/KG	2/2	2	2/2	56000.000-90000.000	73000.000			25900
CHROMIUM	MG/KG	2/2	2	0/2	5.700-6.800	6.250			18.3
COBALT	MG/KG	1/2	2	0/2	4.700-4.700	3.450	4.400	4.400	4.9
COPPER	MG/KG	2/2	2	0/2	6.300-8.100	7.200			10.8
CYANIDE	MG/KG	0/2	2	0/2		0.165	0.330	0.330	
IRON	MG/KG	2/2	2	1/2	6390.000-8780.000	7585.000			6700
LEAD	MG/KG	2/2	2	2/2	5.000-10.500	7.750			
MAGNESIUM	MG/KG	2/2	2	1/2	13900.000-19600.000	16750.000			18300
MANGANESE	MG/KG	2/2	2	2/2	428.000-450.000	439.000			411
MERCURY	MG/KG	0/2	2	0/2		0.035	0.070	0.070	ND
MOLYBDENUM	MG/KG	0/2	2	0/2		2.225	4.400	4.500	ND
NICKEL	MG/KG	2/2	2	0/2	5.600-9.000	7.300			13.7
POTASSIUM	MG/KG	0/2	2	0/2		345.750	498.000	885.000	307
SILICON	MG/KG	2/2	2	2/2	426.000-831.000	628.500			
SILVER	MG/KG	0/2	2	0/2		0.130	0.260	0.260	ND
SODIUM	MG/KG	2/2	2	0/2	111.000-111.000	111.000			197

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000513

STORM SEWER OUTFALL DITCH - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
THALLIUM	MG/KG	0/2	2	0/2		0.130	0.260	0.260	ND
VANADIUM	MG/KG	2/2	2	1/2	12.000-14.700	13.350			12.4
ZINC	MG/KG	1/1	1	1/1	80.800-80.800	80.800			13.5

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5028

STORM SEWER OUTFALL DITCH - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
1,1,1-TRICHLOROETHANE	UG/KG	0/2	2	0/2		6.500	13.000	13.000	
1,1,2,2-TETRACHLOROETHANE	UG/KG	0/2	2	0/2		6.500	13.000	13.000	
1,1,2-TRICHLOROETHANE	UG/KG	0/2	2	0/2		6.500	13.000	13.000	
1,1-DICHLOROETHANE	UG/KG	0/2	2	0/2		6.500	13.000	13.000	
1,1-DICHLOROETHENE	UG/KG	0/2	2	0/2		6.500	13.000	13.000	
1,2-DICHLOROETHANE	UG/KG	0/2	2	0/2		6.500	13.000	13.000	
1,2-DICHLOROETHENE (TOTAL)	UG/KG	0/2	2	0/2		6.500	13.000	13.000	
1,2-DICHLOROPROPANE	UG/KG	0/2	2	0/2		6.500	13.000	13.000	
2-BUTANONE	UG/KG	0/2	2	0/2		6.500	13.000	13.000	
2-HEXANONE	UG/KG	0/2	2	0/2		6.500	13.000	13.000	
4-METHYL-2-PENTANONE	UG/KG	0/2	2	0/2		6.500	13.000	13.000	
ACETONE	UG/KG	0/2	2	0/2		6.500	13.000	13.000	
BENZENE	UG/KG	0/2	2	0/2		6.500	13.000	13.000	
BROMODICHLOROMETHANE	UG/KG	0/2	2	0/2		6.500	13.000	13.000	
BROMOFORM	UG/KG	0/2	2	0/2		6.500	13.000	13.000	
BROMOMETHANE	UG/KG	0/2	2	0/2		6.500	13.000	13.000	
CARBON DISULFIDE	UG/KG	0/2	2	0/2		6.500	13.000	13.000	
CARBON TETRACHLORIDE	UG/KG	0/2	2	0/2		6.500	13.000	13.000	
CHLOROBENZENE	UG/KG	0/2	2	0/2		6.500	13.000	13.000	
CHLOROETHANE	UG/KG	0/2	2	0/2		6.500	13.000	13.000	
CHLOROFORM	UG/KG	0/2	2	0/2		6.500	13.000	13.000	

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STORM SEWER OUTFALL DITCH - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
CHLOROMETHANE	UG/KG	0/2	2	0/2		6.500	13.000	13.000	
CIS-1,3-DICHLOROPROPENE	UG/KG	0/2	2	0/2		6.500	13.000	13.000	
DIBROMOCHLOROMETHANE	UG/KG	0/2	2	0/2		6.500	13.000	13.000	
ETHYLBENZENE	UG/KG	0/2	2	0/2		6.500	13.000	13.000	
METHYLENE CHLORIDE	UG/KG	1/2	2	1/2	6.000-6.000	6.250	13.000	13.000	
STYRENE	UG/KG	0/2	2	0/2		6.500	13.000	13.000	
TETRACHLOROETHENE	UG/KG	0/2	2	0/2		6.500	13.000	13.000	
TOLUENE	UG/KG	0/2	2	0/2		6.500	13.000	13.000	
TRANS-1,3-DICHLOROPROPENE	UG/KG	0/2	2	0/2		6.500	13.000	13.000	
TRICHLOROETHENE	UG/KG	0/2	2	0/2		6.500	13.000	13.000	
VINYL ACETATE	UG/KG	0/2	2	0/2		6.500	13.000	13.000	
VINYL CHLORIDE	UG/KG	0/2	2	0/2		6.500	13.000	13.000	
XYLENES, TOTAL	UG/KG	0/2	2	0/2		6.500	13.000	13.000	

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STORM SEWER OUTFALL DITCH - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
1,2,4-TRICHLOROBENZENE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
1,2-DICHLOROBENZENE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
1,3-DICHLOROBENZENE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
1,4-DICHLOROBENZENE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
2,4,5-TRICHLOROPHENOL	UG/KG	0/2	2	0/2		550.000	1100.000	1100.000	
2,4,6-TRICHLOROPHENOL	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
2,4-DICHLOROPHENOL	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
2,4-DIMETHYLPHENOL	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
2,4-DINITROPHENOL	UG/KG	0/2	2	0/2		550.000	1100.000	1100.000	
2,4-DINITROTOLUENE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
2,6-DINITROTOLUENE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
2-CHLORONAPHTHALENE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
2-CHLOROPHENOL	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
2-METHYLNAPHTHALENE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
2-METHYLPHENOL	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
2-NITROANILINE	UG/KG	0/2	2	0/2		550.000	1100.000	1100.000	
2-NITROPHENOL	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
3,3'-DICHLOROBENZIDINE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
3-NITROANILINE	NONE	0/2	2	0/2		550.000	1100.000	1100.000	
4,6-DINITRO-2-METHYLPHENOL	UG/KG	0/2	2	0/2		550.000	1100.000	1100.000	
4-BROMOPHENYL PHENYL ETHER	UG/KG	0/2	2	0/2		217.500	430.000	440.000	

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STORM SEWER OUTFALL DITCH - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
4-CHLORO-3-METHYLPHENOL	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
4-CHLOROPHENYLPHENYL ETHER	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
4-METHYLPHENOL	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
4-NITROANILINE	UG/KG	0/2	2	0/2		550.000	1100.000	1100.000	
4-NITROPHENOL	UG/KG	0/2	2	0/2		550.000	1100.000	1100.000	
ACENAPHTHENE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
ACENAPHTHYLENE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
ANTHRACENE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
BENZO(A)ANTHRACENE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
BENZO(A)PYRENE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
BENZO(B)FLUORANTHENE	UG/KG	1/2	2	1/2	76.000-76.000	145.500	430.000	430.000	
BENZO(G,H,I)PERYLENE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
BENZO(K)FLUORANTHENE	UG/KG	1/2	2	1/2	96.000-96.000	155.500	430.000	430.000	
BIS(2-CHLOROETHOXY)METHANE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
BIS(2-CHLOROETHYL)ETHER	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
BIS(2-CHLOROISOPROPYL) ETHER	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	1/2	2	1/2	54.000-54.000	137.000	440.000	440.000	
BUTYL BENZYL PHTHALATE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
CARBAZOLE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
CHRYSENE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
DI-N-BUTYL PHTHALATE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	

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STORM SEWER OUTFALL DITCH - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
DI-N-OCTYL PHTHALATE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
DIBENZO(A,H)ANTHRACENE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
DIBENZOFURAN	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
DIETHYL PHTHALATE	UG/KG	0/2	2	0/2		1125.000	2200.000	2300.000	
DIMETHYL PHTHALATE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
FLUORANTHENE	UG/KG	2/2	2	2/2	50.000-110.000	80.000			
FLUORENE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
HEXACHLOROBENZENE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
HEXACHLOROBUTADIENE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
HEXACHLOROCYCLOPENTADIENE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
HEXACHLOROETHANE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
INDENO(1,2,3-CD)PYRENE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
ISOPHORONE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
N-NITROSO-DI-N-PROPYLAMINE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
N-NITROSODIPHENYLAMINE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
NAPHTHALENE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
NITROBENZENE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
P-CHLOROANILINE	UG/KG	0/2	2	0/2		217.500	430.000	440.000	
PENTACHLOROPHENOL	UG/KG	0/2	2	0/2		550.000	1100.000	1100.000	
PHENANTHRENE	UG/KG	1/2	2	1/2	62.000-62.000	138.500	430.000	430.000	
PHENOL	UG/KG	0/2	2	0/2		217.500	430.000	440.000	

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STORM SEWER OUTFALL DITCH - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
PYRENE	UG/KG	1/2	2	1/2	74.000-74.000	144.500	430.000	430.000	

000520

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AREA: STORM SEWER OUTFALL DITCH - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/G	3/3	0	3/3	1.400-4.600	4.600			
URANIUM, TOTAL	MG/KG	3/3	3	3/3	4.000-12.000	9.000			1.67
URANIUM-234	PCI/G	3/3	0	3/3	1.300-3.800	3.800			
THORIUM-230	PCI/G	3/3	3	3/3	1.900-2.600	1.900			
RADIUM-226	PCI/G	3/3	3	0/3	0.500-0.700	0.600			1.93
URANIUM-235/236	PCI/G	1/3	2	1/3	0.900-0.900	0.300	0.600	0.600	
THORIUM-232	PCI/G	1/3	3	1/3	0.800-0.800	0.300	0.600	0.600	
THORIUM, TOTAL	MG/KG	1/1	0	1/1	7.296-7.296	7.296			
RADIUM-228	PCI/G	0/3	3	0/3		0.250	0.500	0.500	ND
THORIUM-228	PCI/G	0/3	3	0/3		0.300	0.600	0.600	
NEPTUNIUM-237	PCI/G	0/3	3	0/3		0.300	0.600	0.600	
PLUTONIUM-239/240	PCI/G	0/3	3	0/3		0.300	0.600	0.600	
PLUTONIUM-238	PCI/G	0/3	3	0/3		0.300	0.600	0.600	
STRONTIUM-90	PCI/G	0/3	3	0/3		0.250	0.500	0.500	
TECHNETIUM-99	PCI/G	0/3	3	0/3		0.500	1.000	1.000	
RUTHENIUM-106	PCI/G	0/3	3	0/3		0.500	1.000	1.000	
CESIUM-137	PCI/G	0/3	3	0/3		0.100	0.200	0.200	

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PADDY'S RUN - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/L	5/5	5	5/5	2.70000-14.10000	3.60000			0.80
URANIUM, TOTAL	UG/L	17/18	10	17/18	1.70000-26.10000	8.20000	12.00000	12.00000	1.30
URANIUM-234	PCI/L	5/5	5	5/5	2.60000-10.90000	3.30000			0.90
THORIUM-230	PCI/L	1/6	6	0/6	0.30000-0.30000	0.17500	0.20000	0.50000	1.30
RADIUM-226	PCI/L	0/10	10	0/10		0.50000	1.00000	1.00000	0.900
URANIUM-235/236	PCI/L	1/5	5	1/5	0.40000-0.40000	0.10000	0.20000	0.20000	ND
THORIUM-232	PCI/L	1/6	6	1/6	0.40000-0.40000	0.12500	0.20000	0.30000	0.340
THORIUM, TOTAL	UG/L	2/2	0	1/2	0.91201-3.64800	2.28001			3.1
RADIUM-228	PCI/L	0/10	10	0/10		1.50000	3.00000	3.00000	3.00
THORIUM-228	PCI/L	0/6	6	0/6		0.10000	0.20000	0.20000	1.60
TECHNETIUM-99	PCI/L	0/1	1	0/1		7.50000	15.00000	15.00000	30
GROSS ALPHA	PCI/L	4/9	0	4/9	3.80000-11.20000	3.80000	2.50000	120.00000	
GROSS BETA	PCI/L	5/9	0	5/9	3.30000-142.00000	5.10000	0.00000	400.00000	

000522

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PADDY'S RUN - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/L	4/9	7	0/9	0.06390-0.14500	0.08350	0.12000	0.39500	2.29
ANTIMONY	MG/L	0/9	7	0/9		0.00700	0.01400	0.02700	ND
ARSENIC	MG/L	1/9	7	0/9	0.00300-0.00300	0.00100	0.00100	0.00200	0.0194
BARIUM	MG/L	9/9	7	0/9	0.03780-0.05010	0.04770			0.454
BERYLLIUM	MG/L	0/9	7	0/9		0.00250	0.00100	0.00500	ND
CADMIUM	MG/L	1/9	7	1/9	0.00500-0.00500	0.00250	0.00200	0.00500	ND
CALCIUM	MG/L	9/9	7	0/9	65.40000-102.00000	96.40000			172
CHROMIUM	MG/L	0/9	7	0/9		0.00300	0.00400	0.00600	0.0046
COBALT	MG/L	0/9	7	0/9		0.00850	0.00500	0.01700	ND
COPPER	MG/L	1/9	7	0/9	0.00380-0.00380	0.00450	0.00300	0.00900	0.0294
CYANIDE	MG/L	0/9	7	0/9		0.00250	0.00500	0.02000	ND
IRON	MG/L	5/9	7	0/9	0.10700-0.43200	0.10700	0.11000	0.14400	6.35
LEAD	MG/L	3/8	6	3/8	0.00440-0.15600	0.00148	0.00200	0.00390	0.0016
MAGNESIUM	MG/L	9/9	7	0/9	17.10000-28.20000	26.70000			50.7
MANGANESE	MG/L	9/9	7	0/9	0.00750-0.05450	0.01650			0.205
MERCURY	MG/L	0/9	7	0/9		0.00005	0.00010	0.00020	ND
MOLYBDENUM	MG/L	0/9	7	0/9		0.00850	0.01100	0.01700	ND
NICKEL	MG/L	2/9	7	2/9	0.01280-0.01410	0.00900	0.01100	0.01800	0.0072
POTASSIUM	MG/L	9/9	7	0/9	2.18000-3.91000	2.69000			17.2
SELENIUM	MG/L	0/6	4	0/6		0.00050	0.00100	0.00100	ND
SILICON	MG/L	5/5	5	0/5	2.29000-2.97000	2.76000			10.7
SILVER	MG/L	0/6	4	0/6		0.00200	0.00200	0.00400	0.0031

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000523

PADDY'S RUN - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
SODIUM	MG/L	9/9	7	1/9	9.71000-86.00000	14.00000			50
THALLIUM	MG/L	0/8	6	0/8		0.00100	0.00100	0.00300	ND
VANADIUM	MG/L	0/9	7	0/9		0.01200	0.00400	0.02400	0.0051
ZINC	MG/L	2/9	7	0/9	0.00510-0.00930	0.00300	0.00490	0.00760	0.352

000524

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5698

PADDY'S RUN - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
1,1,1-TRICHLOROETHANE	UG/L	0/7	5	0/7		5.00000	10.00000	10.00000	
1,1,2,2-TETRACHLOROETHANE	UG/L	0/7	5	0/7		5.00000	10.00000	10.00000	
1,1,2-TRICHLOROETHANE	UG/L	0/7	5	0/7		5.00000	10.00000	10.00000	
1,1-DICHLOROETHANE	UG/L	0/7	5	0/7		5.00000	10.00000	10.00000	
1,1-DICHLOROETHENE	UG/L	0/7	5	0/7		5.00000	10.00000	10.00000	
1,2-DICHLOROETHANE	UG/L	0/7	5	0/7		5.00000	10.00000	10.00000	
1,2-DICHLOROETHENE (TOTAL)	UG/L	0/7	5	0/7		5.00000	10.00000	10.00000	
1,2-DICHLOROPROPANE	UG/L	0/7	5	0/7		5.00000	10.00000	10.00000	
2-BUTANONE	UG/L	0/7	5	0/7		5.00000	10.00000	10.00000	
2-HEXANONE	UG/L	0/7	5	0/7		5.00000	10.00000	10.00000	
4-METHYL-2-PENTANONE	UG/L	0/7	5	0/7		5.00000	10.00000	10.00000	
ACETONE	UG/L	0/7	5	0/7		5.00000	10.00000	16.00000	
BENZENE	UG/L	0/7	5	0/7		5.00000	10.00000	10.00000	
BROMODICHLOROMETHANE	UG/L	0/7	5	0/7		5.00000	10.00000	10.00000	
BROMOFORM		0/7	5	0/7		5.00000	10.00000	10.00000	
BROMOMETHANE	UG/L	0/7	5	0/7		5.00000	10.00000	10.00000	
CARBON DISULFIDE	UG/L	0/7	5	0/7		5.00000	10.00000	10.00000	
CARBON TETRACHLORIDE	UG/L	0/7	5	0/7		5.00000	10.00000	10.00000	
CHLOROBENZENE	UG/L	0/7	5	0/7		5.00000	10.00000	10.00000	
CHLOROETHANE	UG/L	0/7	5	0/7		5.00000	10.00000	10.00000	
CHLOROFORM	UG/L	0/7	5	0/7		5.00000	10.00000	10.00000	
CHLOROMETHANE	UG/L	0/7	5	0/7		5.00000	10.00000	10.00000	

000525

PADDY'S RUN - 1993
SURFACE WATER DATA - UNFILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
CIS-1,3-DICHLOROPROPENE	UG/L	0/7	5	0/7		5.00000	10.00000	10.00000	
DIBROMOCHLOROMETHANE	UG/L	0/7	5	0/7		5.00000	10.00000	10.00000	
ETHYLBENZENE	UG/L	0/7	5	0/7		5.00000	10.00000	10.00000	
METHYLENE CHLORIDE	UG/L	0/7	5	0/7		5.00000	10.00000	10.00000	
STYRENE	UG/L	0/7	5	0/7		5.00000	10.00000	10.00000	
TETRACHLOROETHENE	UG/L	0/7	5	0/7		5.00000	10.00000	10.00000	
TOLUENE	UG/L	0/7	5	0/7		5.00000	10.00000	10.00000	
TRANS-1,3-DICHLOROPROPENE	UG/L	0/7	5	0/7		5.00000	10.00000	10.00000	
TRICHLOROETHENE	UG/L	2/7	5	2/7	2.00000-2.00000	5.00000	10.00000	10.00000	
VINYL ACETATE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
VINYL CHLORIDE	UG/L	0/7	5	0/7		5.00000	10.00000	10.00000	
XYLENES, TOTAL	UG/L	0/7	5	0/7		5.00000	10.00000	10.00000	

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PADDY'S RUN - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
1,2,4-TRICHLOROBENZENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
1,2-DICHLOROBENZENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
1,3-DICHLOROBENZENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
1,4-DICHLOROBENZENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
2,4,5-TRICHLOROPHENOL	UG/L	0/5	5	0/5		12.50000	25.00000	25.00000	
2,4,6-TRICHLOROPHENOL	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
2,4-DICHLOROPHENOL	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
2,4-DIMETHYLPHENOL	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
2,4-DINITROPHENOL	UG/L	0/5	5	0/5		12.50000	25.00000	25.00000	
2,4-DINITROTOLUENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
2,6-DINITROTOLUENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
2-CHLORONAPHTHALENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
2-CHLOROPHENOL	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
2-METHYLNAPHTHALENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
2-METHYLPHENOL	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
2-NITROANILINE	UG/L	0/5	5	0/5		12.50000	25.00000	25.00000	
2-NITROPHENOL	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
3,3'-DICHLOROBENZIDINE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
3-NITROANILINE	NONE	0/5	5	0/5		12.50000	25.00000	25.00000	
4,6-DINITRO-2-METHYLPHENOL	UG/L	0/5	5	0/5		12.50000	25.00000	25.00000	
4-BROMOPHENYL PHENYL ETHER	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
4-CHLORO-3-METHYLPHENOL	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	

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PADDY'S RUN - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
4-CHLOROPHENYLPHENYL ETHER	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
4-METHYLPHENOL	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
4-NITROANILINE	UG/L	0/5	5	0/5		12.50000	25.00000	25.00000	
4-NITROPHENOL	UG/L	0/5	5	0/5		12.50000	25.00000	25.00000	
ACENAPHTHENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
ACENAPHTHYLENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
ANTHRACENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
BENZO(A)ANTHRACENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
BENZO(A)PYRENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
BENZO(B)FLUORANTHENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
BENZO(G,H,I)PERYLENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
BENZO(K)FLUORANTHENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
BENZOIC ACID	UG/L	0/2	2	0/2		12.50000	25.00000	25.00000	
BENZYL ALCOHOL	UG/L	0/2	2	0/2		5.00000	10.00000	10.00000	
BIS(2-CHLOROETHOXY)METHANE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
BIS(2-CHLOROETHYL)ETHER	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
BIS(2-CHLOROISOPROPYL) ETHER	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
BIS(2-ETHYLHEXYL)PHTHALATE	UG/L	3/5	5	3/5	11.00000-40.00000	22.00000	10.00000	82.00000	
BUTYL BENZYL PHTHALATE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
CARBAZOLE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	
CHRYSENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
DI-N-BUTYL PHTHALATE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	

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PADDY'S RUN - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
DI-N-OCTYL PHTHALATE	UG/L	2/5	5	2/5	52.00000-89.00000	5.00000	10.00000	10.00000	
DIBENZO(A,H)ANTHRACENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
DIBENZOFURAN	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
DIETHYL PHTHALATE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
DIMETHYL PHTHALATE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
FLUORANTHENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
FLUORENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
HEXACHLOROBENZENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
HEXACHLOROBUTADIENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
HEXACHLOROCYCLOPENTADIENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
HEXACHLOROETHANE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
INDENO(1,2,3-CD)PYRENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
ISOPHORONE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
N-NITROSO-DI-N-PROPYLAMINE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
N-NITROSODIPHENYLAMINE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
NAPHTHALENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
NITROBENZENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
P-CHLOROANILINE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
PENTACHLOROPHENOL	UG/L	0/5	5	0/5		12.50000	25.00000	25.00000	
PHENANTHRENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
PHENOL	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	
PYRENE	UG/L	0/5	5	0/5		5.00000	10.00000	10.00000	

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PADDY'S RUN - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
GENERAL CHEMISTRY									
ALKALINITY AS CACO3	MG/L	5/5	5	0/5	166.00000-290.00000	260.00000			430
AMMONIA	MG/L	6/9	7	0/9	0.00008-0.15400	0.07100	0.03000	0.03000	4.3
CHLORIDE	MG/L	9/9	7	0/9	0.02100-26.00000	24.00000			50
FLUORIDE	MG/L	9/9	7	0/9	0.00023-0.23000	0.19000			1.3
NITRATE/NITRITE	MG/L	8/8	6	8/8	1.60000-7.57000	2.52500			0.07
NITRITE, AS NITROGEN	MG/L	1/1	1	1/1	1.50000-1.50000	1.50000			
PHENOLS	UG/L	0/9	7	0/9		0.00250	0.00015	0.15000	0.030
PHOSPHATE	MG/L	5/5	5	3/5	0.15900-0.45900	0.20900			0.191
PHOSPHORUS	MG/L	3/4	2	0/4	0.00006-0.06700	0.02500	0.03000	0.03000	0.18
SULFATE	MG/L	5/5	5	0/5	42.30000-62.90000	58.80000			136
SULFIDE	MG/L	0/5	5	0/5		0.50000	1.00000	1.00000	ND
TOTAL KJELDAHL NITROGEN	MG/L	5/5	5	0/5	0.29300-0.70100	0.37100			4.34
TOTAL ORGANIC CARBON	MG/L	9/9	7	0/9	0.00360-6.70000	3.20000			9.00
TOTAL ORGANIC HALIDES	MG/L	4/9	7	0/9	0.00530-0.03820	0.00690	0.00005	0.04500	0.126
TOTAL ORGANIC NITROGEN	MG/L	5/5	5	3/5	0.29300-0.54700	0.37100			0.340

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PADDY'S RUN - 1993
SURFACE WATER DATA - FILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	*95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/L	3/3	3	3/3	2.30000-9.20000	2.90000			0.80
URANIUM, TOTAL	UG/L	9/9	5	9/9	1.80000-34.20000	9.60000			1.30
URANIUM-234	PCI/L	3/3	3	3/3	2.30000-9.70000	2.70000			0.90
THORIUM-230	PCI/L	1/4	4	0/4	0.40000-0.40000	0.12500	0.20000	0.30000	1.30
RADIUM-226	PCI/L	2/5	5	2/5	1.40000-1.70000	0.60000	1.00000	1.20000	0.900
URANIUM-235/236	PCI/L	1/3	3	1/3	0.40000-0.40000	0.10000	0.20000	0.20000	ND
THORIUM-232	PCI/L	1/4	4	1/4	0.40000-0.40000	0.12500	0.20000	0.30000	0.340
THORIUM, TOTAL	UG/L	3/3	0	1/3	0.91200-3.64803	0.91201			3.1
RADIUM-228	PCI/L	1/5	5	1/5	3.20000-3.20000	1.50000	3.00000	3.00000	3.00
THORIUM-228	PCI/L	0/4	4	0/4		0.10000	0.20000	0.30000	1.60
GROSS ALPHA	PCI/L	1/5	0	1/5	20.60000-20.60000	2.15000	3.00000	22.20000	
GROSS BETA	PCI/L	4/5	0	4/5	4.30000-22.70000	7.80000	3.90000	3.90000	

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PADDY'S RUN - 1993
SURFACE WATER DATA - FILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/L	1/7	5	0/7	0.02710-0.02710	0.02710	0.02400	0.10500	2.29
ANTIMONY	MG/L	0/7	5	0/7		0.01350	0.01400	0.02700	ND
ARSENIC	MG/L	0/7	5	0/7		0.00100	0.00200	0.00200	0.0194
BARIUM	MG/L	7/7	5	0/7	0.04230-0.04570	0.04390			0.454
BERYLLIUM	MG/L	0/7	5	0/7		0.00050	0.00100	0.00500	ND
CADMIUM	MG/L	0/7	5	0/7		0.00100	0.00200	0.00500	ND
CALCIUM	MG/L	7/7	5	0/7	96.00000-103.00000	98.30000			172
CHROMIUM	MG/L	0/7	5	0/7		0.00200	0.00400	0.00600	0.0046
COBALT	MG/L	0/7	5	0/7		0.00250	0.00500	0.01700	ND
COPPER	MG/L	0/7	5	0/7		0.00150	0.00300	0.00900	0.0294
CYANIDE	MG/L	0/7	5	0/7		0.01000	0.00500	0.02000	ND
IRON	MG/L	4/7	5	0/7	0.00640-0.07000	0.01100	0.02200	0.02200	6.35
LEAD	MG/L	2/6	4	2/6	0.00430-0.01070	0.00100	0.00200	0.00200	0.0016
MAGNESIUM	MG/L	7/7	5	0/7	25.30000-27.60000	26.30000			50.7
MANGANESE	MG/L	6/7	5	0/7	0.00480-0.01850	0.00820	0.00400	0.00400	0.205
MERCURY	MG/L	0/7	5	0/7		0.00010	0.00010	0.00020	ND
MOLYBDENUM	MG/L	0/7	5	0/7		0.00550	0.01100	0.01700	ND
NICKEL	MG/L	0/7	5	0/7		0.00550	0.01100	0.01800	0.0072
POTASSIUM	MG/L	7/7	5	0/7	1.32000-2.80000	2.12000			17.2
SELENIUM	MG/L	0/4	2	0/4		0.00050	0.00100	0.00100	ND
SILICON	MG/L	3/3	3	0/3	2.47000-2.83000	2.64000			10.7
SILVER	MG/L	1/4	2	1/4	0.00400-0.00400	0.00200	0.00400	0.00400	0.0031

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PADDY'S RUN - 1993
SURFACE WATER DATA - FILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
SODIUM	MG/L	7/7	5	0/7	12.00000-14.50000	13.60000			50
THALLIUM	MG/L	1/7	5	1/7	0.00140-0.00140	0.00150	0.00100	0.00300	ND
VANADIUM	MG/L	0/7	5	0/7		0.00200	0.00400	0.02400	0.0051
ZINC	MG/L	2/7	5	0/7	0.00360-0.00380	0.00300	0.00300	0.00600	0.352

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PADDY'S RUN - 1990/91
SURFACE WATER DATA - UNFILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/L	18/19	18	18/19	2.38000-4.36000	2.76000	1.00000	1.00000	0.80
URANIUM, TOTAL	UG/L	14/14	13	14/14	5.92000-11.00000	6.62500			1.30
URANIUM-234	PCI/L	18/19	18	18/19	1.44000-4.26000	2.17000	1.00000	1.00000	0.90
THORIUM-230	PCI/L	6/19	18	5/19	1.12000-6.74000	0.50000	1.00000	1.00000	1.30
RADIUM-226	PCI/L	0/18	17	0/18		0.50000	1.00000	1.00000	0.900
URANIUM-235/236	PCI/L	0/19	18	0/19		0.50000	1.00000	1.00000	ND
THORIUM-232	PCI/L	0/19	18	0/19		0.50000	1.00000	1.00000	0.340
THORIUM, TOTAL	UG/L	1/19	18	1/19	3.58000-3.58000	2.20000	1.50000	5.50000	3.1
RADIUM-228	PCI/L	0/18	17	0/18		1.50000	3.00000	3.00000	3.00
THORIUM-228	PCI/L	9/19	18	9/19	1.78000-4.82000	0.50000	1.00000	1.00000	1.60
NEPTUNIUM-237	PCI/L	0/19	18	0/19		0.50000	1.00000	1.00000	0.250
PLUTONIUM-239/240	PCI/L	0/19	18	0/19		0.50000	1.00000	1.00000	ND
PLUTONIUM-238	PCI/L	0/19	18	0/19		0.50000	1.00000	1.00000	0.075
STRONTIUM-90	PCI/L	1/19	18	1/19	24.00000-24.00000	2.50000	5.00000	5.00000	2.00
TECHNETIUM-99	PCI/L	0/6	5	0/6		15.00000	30.00000	30.00000	30
RUTHENIUM-106	PCI/L	0/7	6	0/7		75.00000	150.00000	150.00000	ND
CESIUM-137	PCI/L	0/7	6	0/7		10.00000	20.00000	20.00000	ND

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PADDY'S RUN - 1990/91
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/L	4/4	4	0/4	0.07100-0.07500	0.07100			2.29
ARSENIC	MG/L	1/4	4	0/4	0.00200-0.00200	0.00100	0.00200	0.00200	0.0194
BARIUM	MG/L	0/4	4	0/4		0.02150	0.04200	0.04300	0.454
CADMIUM	MG/L	4/4	4	4/4	0.00400-0.00500	0.00400			ND
CALCIUM	MG/L	4/4	4	0/4	93.80000-97.80000	96.85000			172
CHROMIUM	MG/L	4/4	4	4/4	0.01700-0.01800	0.01750			0.0046
COPPER	MG/L	4/4	4	0/4	0.01100-0.01200	0.01200			0.0294
IRON	MG/L	0/4	4	0/4		0.01075	0.01500	0.02600	6.35
LEAD	MG/L	0/4	4	0/4		0.00100	0.00200	0.00200	0.0016
MAGNESIUM	MG/L	4/4	4	0/4	22.50000-23.80000	23.55000			50.7
MANGANESE	MG/L	4/4	4	0/4	0.02000-0.03200	0.02850			0.205
MERCURY	MG/L	0/4	4	0/4		0.00010	0.00020	0.00020	ND
MOLYBDENUM	MG/L	0/4	4	0/4		0.00500	0.01000	0.01000	ND
NICKEL	MG/L	0/4	4	0/4		0.01000	0.02000	0.02000	0.0072
POTASSIUM	MG/L	4/4	4	0/4	2.13000-2.65000	2.25500			17.2
SELENIUM	MG/L	0/4	4	0/4		0.00100	0.00200	0.00200	ND
SILICON	MG/L	4/4	4	0/4	4.12000-4.27000	4.21500			10.7
SILVER	MG/L	4/4	4	4/4	0.01800-0.01900	0.01900			0.0031
SODIUM	MG/L	4/4	4	0/4	9.71000-10.50000	10.19000			50
VANADIUM	MG/L	0/4	4	0/4		0.00500	0.01000	0.01000	0.0051

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PADDY'S RUN - 1990/91
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
GENERAL CHEMISTRY									
AMMONIA	MG/L	1/15	15	0/15	0.17000-0.17000	0.05000	0.10000	0.10000	4.3
CHLORIDE	MG/L	15/15	15	0/15	2.00000-38.90000	18.98000			50
FLUORIDE	MG/L	15/15	15	0/15	0.18000-0.30000	0.22000			1.3
NITRATE	MG/L	14/14	14	14/14	0.86300-12.10000	2.17500			0.29
NITRATE/NITRITE	MG/L	0/1	1	0/1		0.04500	0.09000	0.09000	0.07
PHENOLS	UG/L	5/15	15	0/15	0.01000-0.02000	0.00500	0.01000	0.01000	0.030
PHOSPHORUS	MG/L	15/15	15	4/15	0.02000-0.43000	0.15000			0.18
SULFATE	MG/L	15/15	15	0/15	28.57000-88.90000	49.05000			136
SULFIDE	MG/L	0/15	15	0/15		0.25000	0.20000	0.50000	ND
TOTAL ORGANIC CARBON	MG/L	14/15	15	0/15	1.68000-5.59000	3.74100	1.00000	1.00000	9.00
TOTAL ORGANIC HALIDES	MG/L	1/15	15	0/15	0.01100-0.01100	0.00500	0.01000	0.01000	0.126
TOTAL ORGANIC NITROGEN	MG/L	13/15	15	10/15	0.20000-1.17000	0.37000	0.10000	0.10000	0.340

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PADDY'S RUN - 1990/91
SURFACE WATER DATA - FILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/L	13/14	14	13/14	1.09000-4.17000	2.87000	1.00000	1.00000	0.80
URANIUM, TOTAL	UG/L	23/23	17	23/23	1.96000-25.20000	6.95000			1.30
URANIUM-234	PCI/L	14/16	16	14/16	1.41000-8.76000	3.11500	1.00000	1.00000	0.90
THORIUM-230	PCI/L	4/16	16	2/16	1.06000-1.98000	0.50000	1.00000	1.00000	1.30
RADIUM-226	PCI/L	0/16	16	0/16		0.50000	1.00000	1.00000	0.900
URANIUM-235/236	PCI/L	2/16	16	2/16	1.69000-1.98000	0.50000	1.00000	1.00000	ND
THORIUM-232	PCI/L	0/16	16	0/16		0.50000	1.00000	1.00000	0.340
THORIUM, TOTAL	UG/L	1/16	16	1/16	3.19000-3.19000	1.20000	1.30000	7.40000	3.1
RADIUM-228	PCI/L	0/15	15	0/15		1.50000	3.00000	3.00000	3.00
THORIUM-228	PCI/L	7/16	16	4/16	1.00000-5.48000	0.50000	1.00000	1.00000	1.60
NEPTUNIUM-237	PCI/L	0/9	9	0/9		0.50000	1.00000	1.00000	0.250
PLUTONIUM-239/240	PCI/L	0/16	16	0/16		0.50000	1.00000	1.00000	ND
PLUTONIUM-238	PCI/L	0/16	16	0/16		0.50000	1.00000	1.00000	0.075
STRONTIUM-90	PCI/L	0/15	15	0/15		2.50000	5.00000	5.00000	2.00
TECHNETIUM-99	PCI/L	2/15	15	2/15	59.90000-62.50000	15.00000	30.00000	30.00000	30
RUTHENIUM-106	PCI/L	0/11	11	0/11		75.00000	150.00000	150.00000	ND
CESIUM-137	PCI/L	0/11	11	0/11		10.00000	20.00000	20.00000	ND
GROSS ALPHA	PCI/L	6/7	0	6/7	5.01000-17.50000	7.24000	7.40000	7.40000	
GROSS BETA	PCI/L	5/7	0	5/7	4.12000-8.53000	4.49000	4.00000	4.70000	

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PADDY'S RUN - 1990/91
SURFACE WATER DATA - FILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/L	7/11	11	0/11	0.07000-0.11400	0.07400	0.04000	0.06000	2.29
ANTIMONY	MG/L	0/1	1	0/1		0.01500	0.03000	0.03000	ND
ARSENIC	MG/L	2/11	11	0/11	0.00220-0.00300	0.00100	0.00200	0.00200	0.0194
BARIUM	MG/L	10/11	11	0/11	0.03500-0.04700	0.03960	0.04200	0.04200	0.454
BERYLLIUM	MG/L	0/1	1	0/1		0.00050	0.00100	0.00100	ND
CADMIUM	MG/L	10/11	11	10/11	0.00300-0.00400	0.00340	0.00500	0.00500	ND
CALCIUM	MG/L	11/11	11	0/11	86.02000-110.00000	90.58000			172
CHROMIUM	MG/L	10/11	11	10/11	0.01700-0.05300	0.02200	0.01000	0.01000	0.0046
COBALT	MG/L	0/1	1	0/1		0.01000	0.02000	0.02000	ND
COPPER	MG/L	3/11	11	0/11	0.01060-0.01210	0.00500	0.01000	0.01920	0.0294
IRON	MG/L	10/11	11	0/11	0.01600-0.06900	0.02400	0.01500	0.01500	6.35
LEAD	MG/L	2/11	11	2/11	0.00300-0.00600	0.00100	0.00200	0.00200	0.0016
MAGNESIUM	MG/L	11/11	11	0/11	20.40000-27.20000	22.98000			50.7
MANGANESE	MG/L	11/11	11	0/11	0.00800-0.09210	0.02000			0.205
MERCURY	MG/L	0/11	11	0/11		0.00010	0.00020	0.00020	ND
MOLYBDENUM	MG/L	0/11	11	0/11		0.00500	0.01000	0.01000	ND
NICKEL	MG/L	1/11	11	1/11	0.02500-0.02500	0.01000	0.02000	0.02000	0.0072
POTASSIUM	MG/L	9/11	11	0/11	1.39000-5.01000	1.78000	1.00000	2.30000	17.2
SELENIUM	MG/L	0/11	11	0/11		0.00100	0.00200	0.00400	ND
SILICON	MG/L	11/11	11	0/11	2.80600-5.91000	4.10000			10.7
SILVER	MG/L	10/11	11	10/11	0.01100-0.02280	0.01900	0.00500	0.00500	0.0031
SODIUM	MG/L	11/11	11	0/11	5.55000-20.00000	9.84000			50

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PADDY'S RUN - 1990/91
SURFACE WATER DATA - FILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
THALLIUM	MG/L	0/1	1	0/1		0.00100	0.00200	0.00200	ND
VANADIUM	MG/L	5/11	11	5/11	0.01000-0.01450	0.00500	0.01000	0.01000	0.0051
ZINC	MG/L	0/1	1	0/1		0.00435	0.00870	0.00870	0.352

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PADDY'S RUN - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/L	6/6	6	6/6	2.00000-6.80000	4.10000			0.73
URANIUM, TOTAL	UG/L	3/3	3	3/3	5.00000-15.00000	9.00000			1.1
URANIUM-234	PCI/L	6/6	6	6/6	1.30000-5.00000	2.65000			0.70
THORIUM-230	PCI/L	0/6	6	0/6		0.50000	1.00000	1.00000	ND
RADIUM-226	PCI/L	0/5	5	0/5		0.50000	1.00000	1.00000	0.35
URANIUM-235/236	PCI/L	0/6	6	0/6		0.50000	1.00000	1.00000	ND
THORIUM-232	PCI/L	0/6	6	0/6		0.50000	1.00000	1.00000	ND
THORIUM, TOTAL	UG/L	0/3	3	0/3		1.50000	2.00000	6.00000	ND
RADIUM-228	PCI/L	0/6	6	0/6		1.50000	3.00000	3.00000	2.1
THORIUM-228	PCI/L	0/6	6	0/6		0.50000	1.00000	1.00000	ND
NEPTUNIUM-237	PCI/L	0/6	6	0/6		0.50000	1.00000	1.00000	NA
PLUTONIUM-239/240	PCI/L	0/6	6	0/6		0.50000	1.00000	1.00000	0.093
PLUTONIUM-238	PCI/L	0/6	6	0/6		0.50000	1.00000	1.00000	ND
STRONTIUM-90	PCI/L	0/6	6	0/6		2.50000	5.00000	5.00000	0.96
TECHNETIUM-99	PCI/L	0/6	6	0/6		15.00000	30.00000	30.00000	ND

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PADDY'S RUN - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/L	3/3	2	1/3	0.15000-2.95000	0.45100			0.640
ANTIMONY	MG/L	1/3	2	1/3	0.00250-0.00250	0.00125	0.00050	0.00250	ND
ARSENIC	MG/L	1/3	2	1/3	0.00370-0.00370	0.00100	0.00200	0.00200	ND
BARIUM	MG/L	3/3	2	2/3	0.03830-0.06580	0.05520			0.0534
BERYLLIUM	MG/L	2/3	2	2/3	0.00110-0.00120	0.00110	0.00100	0.00100	ND
CADMIUM	MG/L	3/3	2	3/3	0.00270-0.00320	0.00280			ND
CALCIUM	MG/L	2/2	1	0/2	52.30000-56.60000	54.45000			107
CHROMIUM	MG/L	3/3	2	3/3	0.01390-0.01730	0.01610			ND
COBALT	MG/L	0/3	2	0/3		0.00500	0.01000	0.01000	ND
COPPER	MG/L	2/3	2	2/3	0.01000-0.01470	0.01000	0.01000	0.01000	ND
CYANIDE	MG/L	1/3	2	1/3	0.00530-0.00530	0.00500	0.01000	0.01000	ND
IRON	MG/L	3/3	2	2/3	0.20000-2.84000	0.55600			0.513
LEAD	MG/L	0/3	2	0/3		0.00100	0.00200	0.00270	ND
MAGNESIUM	MG/L	2/2	1	0/2	12.70000-13.70000	13.20000			27.8
MANGANESE	MG/L	3/3	2	1/3	0.01990-0.04710	0.02650			0.035
MERCURY	MG/L	0/3	2	0/3		0.00010	0.00020	0.00020	ND
MOLYBDENUM	MG/L	1/3	2	1/3	0.02050-0.02050	0.01000	0.02000	0.02000	ND
NICKEL	MG/L	0/3	2	0/3		0.01000	0.02000	0.02000	ND
POTASSIUM	MG/L	3/3	2	1/3	2.77000-3.95000	3.19000			3.58
SELENIUM	MG/L	0/3	2	0/3		0.00100	0.00200	0.00200	ND
SILVER	MG/L	0/3	2	0/3		0.00025	0.00050	0.00050	ND
SODIUM	MG/L	2/2	1	0/2	8.39000-9.23000	8.81000			18.2

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PADDY'S RUN - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
THALLIUM	MG/L	0/3	2	0/3		0.00100	0.00200	0.00200	ND
VANADIUM	MG/L	3/3	2	3/3	0.01270-0.01770	0.01360			ND
ZINC	MG/L	3/3	2	3/3	0.01110-0.03680	0.01860			ND

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PADDY'S RUN - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
1,1,1-TRICHLOROETHANE	UG/L	0/3	2	0/3		2.50000	5.00000	5.00000	
1,1,2,2-TETRACHLOROETHANE	UG/L	0/3	2	0/3		2.50000	5.00000	5.00000	
1,1,2-TRICHLOROETHANE	UG/L	0/3	2	0/3		2.50000	5.00000	5.00000	
1,1-DICHLOROETHANE	UG/L	0/3	2	0/3		2.50000	5.00000	5.00000	
1,1-DICHLOROETHENE	UG/L	0/3	2	0/3		2.50000	5.00000	5.00000	
1,2-DICHLOROETHANE	UG/L	0/3	2	0/3		2.50000	5.00000	5.00000	
1,2-DICHLOROETHENE (TOTAL)	UG/L	0/3	2	0/3		2.50000	5.00000	5.00000	
1,2-DICHLOROPROPANE	UG/L	0/3	2	0/3		2.50000	5.00000	5.00000	
2-BUTANONE	UG/L	0/1	0	0/1		5.00000	10.00000	10.00000	
2-HEXANONE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
4-METHYL-2-PENTANONE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
ACETONE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
BENZENE	UG/L	0/3	2	0/3		2.50000	5.00000	5.00000	
BROMODICHLOROMETHANE	UG/L	0/3	2	0/3		2.50000	5.00000	5.00000	
BROMOFORM		0/3	2	0/3		2.50000	5.00000	5.00000	
BROMOMETHANE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
CARBON DISULFIDE	UG/L	0/3	2	0/3		2.50000	5.00000	5.00000	
CARBON TETRACHLORIDE	UG/L	0/3	2	0/3		2.50000	5.00000	5.00000	
CHLOROBENZENE	UG/L	0/3	2	0/3		2.50000	5.00000	5.00000	
CHLOROETHANE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
CHLOROFORM	UG/L	0/3	2	0/3		2.50000	5.00000	5.00000	
CHLOROMETHANE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	

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PADDY'S RUN - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
CIS-1,3-DICHLOROPROPENE	UG/L	0/3	2	0/3		2.50000	5.00000	5.00000	
DIBROMOCHLOROMETHANE	UG/L	0/3	2	0/3		2.50000	5.00000	5.00000	
ETHYLBENZENE	UG/L	0/3	2	0/3		2.50000	5.00000	5.00000	
METHYLENE CHLORIDE	UG/L	0/3	2	0/3		2.50000	5.00000	5.00000	
STYRENE	UG/L	0/3	2	0/3		2.50000	5.00000	5.00000	
TETRACHLOROETHENE	UG/L	0/3	2	0/3		2.50000	5.00000	5.00000	
TOLUENE	UG/L	0/3	2	0/3		2.50000	5.00000	5.00000	
TRANS-1,3-DICHLOROPROPENE	UG/L	0/3	2	0/3		2.50000	5.00000	5.00000	
TRICHLOROETHENE	UG/L	0/3	2	0/3		2.50000	5.00000	5.00000	
VINYL ACETATE	UG/L	0/3	2	0/3		2.50000	5.00000	5.00000	
VINYL CHLORIDE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
XYLENES, TOTAL	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	

PADDY'S RUN - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
1,2,4-TRICHLOROBENZENE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
1,2-DICHLOROBENZENE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
1,3-DICHLOROBENZENE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
1,4-DICHLOROBENZENE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
2,4,5-TRICHLOROPHENOL	UG/L	0/3	2	0/3		25.00000	50.00000	50.00000	
2,4,6-TRICHLOROPHENOL	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
2,4-DICHLOROPHENOL	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
2,4-DIMETHYLPHENOL	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
2,4-DINITROPHENOL	UG/L	0/3	2	0/3		25.00000	50.00000	50.00000	
2,4-DINITROTOLUENE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
2,6-DINITROTOLUENE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
2-CHLORONAPHTHALENE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
2-CHLOROPHENOL	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
2-METHYLNAPHTHALENE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
2-METHYLPHENOL	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
2-NITROANILINE	UG/L	0/3	2	0/3		25.00000	50.00000	50.00000	
2-NITROPHENOL	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
3,3'-DICHLOROBENZIDINE	UG/L	0/3	2	0/3		10.00000	20.00000	20.00000	
3-NITROANILINE	NONE	0/3	2	0/3		25.00000	50.00000	50.00000	
4,6-DINITRO-2-METHYLPHENOL	UG/L	0/3	2	0/3		25.00000	50.00000	50.00000	
4-BROMOPHENYL PHENYL ETHER	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
4-CHLORO-3-METHYLPHENOL	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	

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PADDY'S RUN - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
4-CHLOROPHENYLPHENYL ETHER	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
4-METHYLPHENOL	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
4-NITROANILINE	UG/L	0/3	2	0/3		25.00000	50.00000	50.00000	
4-NITROPHENOL	UG/L	0/3	2	0/3		25.00000	50.00000	50.00000	
ACENAPHTHENE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
ACENAPHTHYLENE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
ANTHRACENE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
BENZO(A)ANTHRACENE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
BENZO(A)PYRENE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
BENZO(B)FLUORANTHENE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
BENZO(G,H,I)PERYLENE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
BENZO(K)FLUORANTHENE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
BENZOIC ACID	UG/L	0/3	2	0/3		25.00000	50.00000	50.00000	
BENZYL ALCOHOL	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
BIS(2-CHLOROETHOXY)METHANE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
BIS(2-CHLOROETHYL)ETHER	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
BIS(2-CHLOROISOPROPYL) ETHER	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
BIS(2-ETHYLHEXYL)PHTHALATE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
BUTYL BENZYL PHTHALATE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
CHRYSENE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
DI-N-BUTYL PHTHALATE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
DI-N-OCTYL PHTHALATE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	

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PADDY'S RUN - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
DIBENZO(A,H)ANTHRACENE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
DIBENZOFURAN	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
DIETHYL PHTHALATE	UG/L	1/3	2	1/3	2.00000-2.00000	5.00000	10.00000	10.00000	
DIMETHYL PHTHALATE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
FLUORANTHENE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
FLUORENE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
HEXACHLOROBENZENE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
HEXACHLOROBUTADIENE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
HEXACHLOROCYCLOPENTADIENE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
HEXACHLOROETHANE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
INDENO(1,2,3-CD)PYRENE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
ISOPHORONE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
N-NITROSO-DI-N-PROPYLAMINE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
N-NITROSODIPHENYLAMINE	UG/L	1/3	2	1/3	4.00000-4.00000	5.00000	10.00000	10.00000	
NAPHTHALENE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
NITROBENZENE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
P-CHLOROANILINE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
PENTACHLOROPHENOL	UG/L	0/3	2	0/3		25.00000	50.00000	50.00000	
PHENANTHRENE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
PHENOL	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	
PYRENE	UG/L	0/3	2	0/3		5.00000	10.00000	10.00000	

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PADDY'S RUN - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
PESTICIDES									
4,4'-DDD	UG/L	0/3	2	0/3		0.05000	0.10000	0.10000	
4,4'-DDE	UG/L	0/3	2	0/3		0.05000	0.10000	0.10000	
4,4'-DDT	UG/L	0/3	2	0/3		0.05000	0.10000	0.10000	
ALDRIN	UG/L	0/3	2	0/3		0.02500	0.05000	0.05000	
ALPHA-BHC	UG/L	0/3	2	0/3		0.02500	0.05000	0.05000	
ALPHA-CHLORDANE	UG/L	0/3	2	0/3		0.25000	0.50000	0.50000	
AROCLOR-1016	UG/L	0/3	2	0/3		0.25000	0.50000	0.50000	
AROCLOR-1221	UG/L	0/3	2	0/3		0.25000	0.50000	0.50000	
AROCLOR-1232	UG/L	0/3	2	0/3		0.25000	0.50000	0.50000	
AROCLOR-1242	UG/L	0/3	2	0/3		0.25000	0.50000	0.50000	
AROCLOR-1248	UG/L	0/3	2	0/3		0.25000	0.50000	0.50000	
AROCLOR-1254	UG/L	0/3	2	0/3		0.50000	1.00000	1.00000	
AROCLOR-1260	UG/L	0/3	2	0/3		0.50000	1.00000	1.00000	
BETA-BHC	UG/L	0/3	2	0/3		0.02500	0.05000	0.05000	
DELTA-BHC	UG/L	0/3	2	0/3		0.02500	0.05000	0.05000	
DIELDRIN	UG/L	0/3	2	0/3		0.05000	0.10000	0.10000	
ENDOSULFAN II	UG/L	0/3	2	0/3		0.05000	0.10000	0.10000	
ENDOSULFAN SULFATE	UG/L	0/3	2	0/3		0.05000	0.10000	0.10000	
ENDOSULFAN-I	UG/L	0/3	2	0/3		0.02500	0.05000	0.05000	
ENDRIN	UG/L	0/3	2	0/3		0.05000	0.10000	0.10000	
ENDRIN KETONE	UG/L	0/3	2	0/3		0.05000	0.10000	0.10000	
GAMMA-BHC (LINDANE)	UG/L	0/3	2	0/3		0.02500	0.05000	0.05000	

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PADDY'S RUN - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
PESTICIDES									
GAMMA-CHLORDANE	UG/L	0/3	2	0/3		0.25000	0.50000	0.50000	
HEPTACHLOR	UG/L	0/3	2	0/3		0.02500	0.05000	0.05000	
HEPTACHLOR EPOXIDE	UG/L	0/3	2	0/3		0.02500	0.05000	0.05000	
METHOXYCHLOR	UG/L	0/3	2	0/3		0.25000	0.50000	0.50000	
TOXAPHENE	UG/L	0/3	2	0/3		0.50000	1.00000	10.00000	

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PADDY'S RUN - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
ORGANOPHOSPHORUS PESTICIDES									
AZINPHOSMETHYL	UG/L	0/3	3	0/3		1.25000	2.50000	2.50000	
DEMETON	UG/L	0/3	3	0/3		0.12500	0.25000	0.25000	
DIAZINON	UG/L	0/3	3	0/3		0.12500	0.25000	0.25000	
DISULFOTON	UG/L	0/3	3	0/3		0.12500	0.25000	0.25000	
ETHION	UG/L	0/3	3	0/3		0.12500	0.25000	0.25000	
MALATHION	UG/L	0/3	3	0/3		0.12500	0.25000	1.00000	
METHYL PARATHION	UG/L	0/3	3	0/3		0.12500	0.25000	0.25000	
PARATHION	UG/L	0/3	3	0/3		0.12500	0.25000	0.25000	

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PADDY'S RUN - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
GENERAL CHEMISTRY									
AMMONIA	MG/L	4/6	6	4/6	0.10000-0.45200	0.13150	0.10000	0.10000	0.0387
CHLORIDE	MG/L	6/6	6	0/6	12.00000-19.99000	16.25000			31.6
FLUORIDE	MG/L	6/6	6	2/6	0.18000-0.22500	0.21250			0.22
NITRATE	MG/L	6/6	6	6/6	2.12000-5.30000	2.65000			1.66
PHENOLS	UG/L	0/6	6	0/6		0.00500	0.01000	0.01000	ND
PHOSPHORUS	MG/L	5/6	6	4/6	0.03200-0.54100	0.32250	0.02000	0.02000	0.228
SULFATE	MG/L	6/6	6	2/6	37.00000-57.36000	45.85000			55.7
TOTAL KJELDAHL NITROGEN	MG/L	6/6	6	6/6	0.34700-1.81000	1.11500			0.288
TOTAL ORGANIC CARBON	MG/L	1/3	3	0/3	4.84800-4.84800	0.50000	1.00000	1.00000	5.35
TOTAL ORGANIC HALIDES	MG/L	2/3	3	1/3	0.01000-0.03100	0.01000	0.01000	0.01000	0.011
TOTAL ORGANIC NITROGEN	MG/L	6/6	6	6/6	0.34700-1.36000	0.98350			0.288

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PADDY'S RUN - 1988/89
SURFACE WATER DATA - FILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/L	6/6	6	6/6	2.80000-6.20000	4.65000			0.50
URANIUM, TOTAL	UG/L	3/3	3	3/3	9.00000-25.00000	20.00000			1.1
URANIUM-234	PCI/L	6/6	6	6/6	1.20000-4.00000	2.55000			0.70
THORIUM-230	PCI/L	0/6	6	0/6		0.50000	1.00000	1.00000	0.28
RADIUM-226	PCI/L	0/5	5	0/5		0.50000	1.00000	1.00000	ND
URANIUM-235/236	PCI/L	0/6	6	0/6		0.50000	1.00000	1.00000	ND
THORIUM-232	PCI/L	0/6	6	0/6		0.50000	1.00000	1.00000	ND
THORIUM, TOTAL	UG/L	0/3	3	0/3		2.50000	5.00000	6.00000	ND
RADIUM-228	PCI/L	0/5	5	0/5		1.50000	3.00000	3.00000	ND
THORIUM-228	PCI/L	0/6	6	0/6		0.50000	1.00000	1.00000	ND
NEPTUNIUM-237	PCI/L	0/6	6	0/6		0.50000	1.00000	1.00000	0.42
PLUTONIUM-239/240	PCI/L	0/6	6	0/6		0.50000	1.00000	1.00000	0.29
PLUTONIUM-238	PCI/L	0/6	6	0/6		0.50000	1.00000	1.00000	ND
STRONTIUM-90	PCI/L	0/6	6	0/6		2.50000	5.00000	5.00000	0.86
TECHNETIUM-99	PCI/L	0/6	6	0/6		15.00000	30.00000	30.00000	ND
RUTHENIUM-106	PCI/L	0/1	1	0/1		75.00000	150.00000	150.00000	ND
CESIUM-137	PCI/L	0/1	1	0/1		10.00000	20.00000	20.00000	3.9

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PADDY'S RUN - 1988/89
SURFACE WATER DATA - FILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/L	1/2	2	0/2	0.07640-0.07640	0.05320	0.06000	0.06000	0.132
ARSENIC	MG/L	1/3	3	1/3	0.01880-0.01880	0.00100	0.00200	0.00200	ND
BARIUM	MG/L	3/3	3	0/3	0.02880-0.03740	0.03130			0.0526
CADMIUM	MG/L	1/3	3	1/3	0.00320-0.00320	0.00100	0.00200	0.00200	ND
CALCIUM	MG/L	3/3	3	0/3	45.20000-84.70000	71.80000			107
CHROMIUM	MG/L	1/3	3	1/3	0.02430-0.02430	0.00500	0.01000	0.01000	ND
COPPER	MG/L	0/3	3	0/3		0.00500	0.01000	0.01000	ND
IRON	MG/L	3/3	3	3/3	0.02860-0.46400	0.04150			ND
LEAD	MG/L	3/3	3	3/3	0.00210-0.00930	0.00740			ND
MAGNESIUM	MG/L	3/3	3	0/3	9.97000-21.40000	20.90000			27.7
MANGANESE	MG/L	3/3	3	1/3	0.01210-0.02780	0.01520			0.0257
MERCURY	MG/L	3/3	3	3/3	0.00020-0.00030	0.00020			ND
MOLYBDENUM	MG/L	0/3	3	0/3		0.00500	0.01000	0.01000	ND
NICKEL	MG/L	0/3	3	0/3		0.01000	0.02000	0.02000	ND
POTASSIUM	MG/L	3/3	3	0/3	1.55000-2.72000	1.68000			3.50
SELENIUM	MG/L	1/3	3	1/3	0.01690-0.01690	0.00100	0.00200	0.00200	ND
SILICON	MG/L	2/2	2	0/2	1.73000-2.25000	1.99000			3.01
SILVER	MG/L	0/3	3	0/3		0.00500	0.01000	0.01000	ND
SODIUM	MG/L	3/3	3	0/3	5.90300-9.93000	9.69000			18.3
VANADIUM	MG/L	0/2	2	0/2		0.00500	0.01000	0.01000	ND

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PADDY'S RUN - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/G	11/11	11	11/11	0.300-3.100	1.100			
URANIUM, TOTAL	MG/KG	17/23	13	15/23	1.200-22.800	5.500	11.000	11.000	1.67
URANIUM-234	PCI/G	11/11	11	11/11	0.200-3.600	0.500			
THORIUM-230	PCI/G	11/11	11	11/11	0.500-1.000	0.700			
RADIUM-226	PCI/G	10/12	12	0/12	0.300-1.400	0.300	0.250	0.800	1.93
URANIUM-235/236	PCI/G	1/11	11	1/11	0.200-0.200	0.050	0.100	0.100	
THORIUM-232	PCI/G	11/11	11	11/11	0.200-0.600	0.500			
THORIUM, TOTAL	MG/KG	11/11	0	11/11	1.824-5.472	2.736			
RADIUM-228	PCI/G	3/12	12	3/12	0.600-0.800	0.250	0.500	0.600	ND
THORIUM-228	PCI/G	11/11	11	11/11	0.300-0.700	0.400			
GROSS ALPHA	PCI/G	0/1	0	0/1		3.800	7.600	7.600	
GROSS BETA	PCI/G	0/1	0	0/1		9.000	18.000	18.000	

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PADDY'S RUN - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/KG	9/9	9	4/9	888.000-9600.000	2010.000			1970
ANTIMONY	MG/KG	0/9	9	0/9		1.450	2.800	3.900	
ARSENIC	MG/KG	9/9	9	0/9	2.000-5.400	2.400			7
BARIUM	MG/KG	9/9	9	7/9	14.000-65.400	32.700			21
BERYLLIUM	MG/KG	6/9	9	6/9	1.600-3.500	1.800	1.200	1.400	0.50
CADMIUM	MG/KG	0/6	6	0/6		0.600	1.200	1.300	3.7
CALCIUM	MG/KG	9/9	9	9/9	62800.000-294000.000	115000.000			25900
CHROMIUM	MG/KG	9/9	9	0/9	2.500-13.100	2.900			18.3
COBALT	MG/KG	4/9	9	3/9	4.100-7.600	6.200	4.000	4.500	4.9
COPPER	MG/KG	9/9	9	2/9	3.300-12.200	4.600			10.8
CYANIDE	MG/KG	1/9	9	1/9	0.490-0.490	0.490	0.300	0.350	
IRON	MG/KG	9/9	9	5/9	5350.000-16300.000	10100.000			6700
LEAD	MG/KG	8/9	9	8/9	4.300-15.200	0.600	1.200	1.200	
MAGNESIUM	MG/KG	9/9	9	8/9	16800.000-72500.000	22600.000			18300
MANGANESE	MG/KG	9/9	9	5/9	317.000-1270.000	727.000			411
MERCURY	MG/KG	1/9	9	1/9	0.070-0.070	0.030	0.060	0.070	ND
MOLYBDENUM	MG/KG	0/9	9	0/9		2.050	4.000	4.700	ND
NICKEL	MG/KG	7/9	9	0/9	5.000-13.400	5.700	4.300	4.800	13.7
POTASSIUM	MG/KG	8/9	9	3/9	214.000-1640.000	267.000	531.000	531.000	307
SILICON	MG/KG	9/9	9	9/9	164.000-626.000	626.000			
SILVER	MG/KG	1/3	3	1/3	0.250-0.250	0.250	0.270	0.280	ND

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PADDY'S RUN - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
SODIUM	MG/KG	3/9	9	0/9	111.000-155.000	43.050	86.100	157.000	197
THALLIUM	MG/KG	0/9	9	0/9		0.120	0.240	0.280	ND
VANADIUM	MG/KG	9/9	9	4/9	6.100-27.000	7.200			12.4
ZINC	MG/KG	7/8	8	7/8	29.300-89.200	40.600	15.100	15.100	13.5

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PADDY'S RUN - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
1,1,1-TRICHLOROETHANE	UG/KG	0/9	9	0/9		6.000	12.000	14.000	
1,1,2,2-TETRACHLOROETHANE	UG/KG	0/9	9	0/9		6.500	12.000	14.000	
1,1,2-TRICHLOROETHANE	UG/KG	0/9	9	0/9		6.000	12.000	14.000	
1,1-DICHLOROETHANE	UG/KG	0/9	9	0/9		6.500	12.000	14.000	
1,1-DICHLOROETHENE	UG/KG	0/9	9	0/9		6.000	12.000	14.000	
1,2-DICHLOROETHANE	UG/KG	0/9	9	0/9		6.500	12.000	14.000	
1,2-DICHLOROETHENE (TOTAL)	UG/KG	0/9	9	0/9		6.000	12.000	14.000	
1,2-DICHLOROPROPANE	UG/KG	0/9	9	0/9		6.500	12.000	14.000	
2-BUTANONE	UG/KG	0/6	6	0/6		6.500	12.000	14.000	
2-HEXANONE	UG/KG	0/9	9	0/9		6.000	12.000	14.000	
4-METHYL-2-PENTANONE	UG/KG	0/9	9	0/9		6.500	12.000	14.000	
ACETONE	UG/KG	0/9	9	0/9		6.500	12.000	31.000	
BENZENE	UG/KG	0/9	9	0/9		6.500	12.000	14.000	
BROMODICHLOROMETHANE	UG/KG	0/9	9	0/9		6.000	12.000	14.000	
BROMOFORM	UG/KG	0/9	9	0/9		6.500	12.000	14.000	
BROMOMETHANE	UG/KG	0/9	9	0/9		6.000	12.000	14.000	
CARBON DISULFIDE	UG/KG	0/9	9	0/9		6.000	12.000	14.000	
CARBON TETRACHLORIDE	UG/KG	0/9	9	0/9		6.000	12.000	14.000	
CHLOROBENZENE	UG/KG	0/9	9	0/9		6.000	12.000	14.000	
CHLOROETHANE	UG/KG	0/9	9	0/9		6.000	12.000	14.000	
CHLOROFORM	UG/KG	0/9	9	0/9		6.000	12.000	14.000	

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PADDY'S RUN - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
CHLOROMETHANE	UG/KG	0/9	9	0/9		6.000	12.000	14.000	
CIS-1,3-DICHLOROPROPENE	UG/KG	0/9	9	0/9		6.000	12.000	14.000	
DIBROMOCHLOROMETHANE	UG/KG	0/9	9	0/9		6.000	12.000	14.000	
ETHYLBENZENE	UG/KG	0/9	9	0/9		6.000	12.000	14.000	
METHYLENE CHLORIDE	UG/KG	3/9	9	3/9	3.000-7.000	6.000	12.000	14.000	
STYRENE	UG/KG	0/9	9	0/9		6.000	12.000	14.000	
TETRACHLOROETHENE	UG/KG	0/9	9	0/9		6.000	12.000	14.000	
TOLUENE	UG/KG	2/9	9	2/9	2.000-2.000	6.000	12.000	14.000	
TRANS-1,3-DICHLOROPROPENE	UG/KG	0/9	9	0/9		6.000	12.000	14.000	
TRICHLOROETHENE	UG/KG	0/9	9	0/9		6.000	12.000	14.000	
VINYL ACETATE	UG/KG	0/8	8	0/8		6.000	12.000	14.000	
VINYL CHLORIDE	UG/KG	0/9	9	0/9		6.000	12.000	14.000	
XYLENES, TOTAL	UG/KG	0/9	9	0/9		6.000	12.000	14.000	

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PADDY'S RUN - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
1,2,4-TRICHLOROBENZENE	UG/KG	0/7	7	0/7		200.000	400.000	460.000	
1,2-DICHLOROBENZENE	UG/KG	0/7	7	0/7		200.000	400.000	460.000	
1,3-DICHLOROBENZENE	UG/KG	0/7	7	0/7		200.000	400.000	460.000	
1,4-DICHLOROBENZENE	UG/KG	0/7	7	0/7		200.000	400.000	460.000	
2,4,5-TRICHLOROPHENOL	UG/KG	0/7	7	0/7		1000.000	1000.000	2000.000	
2,4,6-TRICHLOROPHENOL	UG/KG	0/7	7	0/7		200.000	400.000	460.000	
2,4-DICHLOROPHENOL	UG/KG	0/7	7	0/7		200.000	400.000	460.000	
2,4-DIMETHYLPHENOL	UG/KG	0/7	7	0/7		200.000	400.000	460.000	
2,4-DINITROPHENOL	UG/KG	0/7	7	0/7		1000.000	1000.000	2000.000	
2,4-DINITROTOLUENE	UG/KG	0/7	7	0/7		200.000	400.000	460.000	
2,6-DINITROTOLUENE	UG/KG	0/7	7	0/7		200.000	400.000	460.000	
2-CHLORONAPHTHALENE	UG/KG	0/7	7	0/7		200.000	400.000	460.000	
2-CHLOROPHENOL	UG/KG	0/7	7	0/7		200.000	400.000	460.000	
2-METHYLNAPHTHALENE	UG/KG	0/7	7	0/7		200.000	400.000	460.000	
2-METHYLPHENOL	UG/KG	0/7	7	0/7		200.000	400.000	460.000	
2-NITROANILINE	UG/KG	0/7	7	0/7		500.000	1000.000	2000.000	
2-NITROPHENOL	UG/KG	0/7	7	0/7		200.000	400.000	460.000	
3,3'-DICHLOROBENZIDINE	UG/KG	0/7	7	0/7		200.000	400.000	810.000	
3-NITROANILINE	NONE	0/7	7	0/7		1000.000	1000.000	2000.000	
4,6-DINITRO-2-METHYLPHENOL	UG/KG	0/7	7	0/7		500.000	1000.000	2000.000	
4-BROMOPHENYL PHENYL ETHER	UG/KG	0/7	7	0/7		200.000	400.000	460.000	

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PADDY'S RUN - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
4-CHLORO-3-METHYLPHENOL	UG/KG	0/7	7	0/7		200.000	400.000	460.000	
4-CHLOROPHENYLPHENYL ETHER	UG/KG	0/7	7	0/7		200.000	400.000	460.000	
4-METHYLPHENOL	UG/KG	0/7	7	0/7		200.000	400.000	460.000	
4-NITROANILINE	UG/KG	0/7	7	0/7		500.000	1000.000	2000.000	
4-NITROPHENOL	UG/KG	0/7	7	0/7		1000.000	1000.000	2000.000	
ACENAPHTHENE	UG/KG	0/7	7	0/7		200.000	400.000	460.000	
ACENAPHTHYLENE	UG/KG	0/7	7	0/7		200.000	400.000	460.000	
ANTHRACENE	UG/KG	0/7	7	0/7		200.000	400.000	460.000	
BENZO(A)ANTHRACENE	UG/KG	2/7	7	2/7	49.000-140.000	200.000	400.000	460.000	
BENZO(A)PYRENE	UG/KG	1/7	7	1/7	130.000-130.000	200.000	400.000	460.000	
BENZO(B)FLUORANTHENE	UG/KG	2/7	7	2/7	59.000-240.000	200.000	400.000	460.000	
BENZO(G,H,I)PERYLENE	UG/KG	1/7	7	1/7	100.000-100.000	200.000	400.000	460.000	
BENZO(K)FLUORANTHENE	UG/KG	2/7	7	2/7	69.000-300.000	200.000	400.000	460.000	
BENZOIC ACID	UG/KG	0/4	4	0/4		775.000	1000.000	2000.000	
BENZYL ALCOHOL	UG/KG	0/4	4	0/4		200.000	400.000	440.000	
BIS(2-CHLOROETHOXY)METHANE	UG/KG	0/7	7	0/7		200.000	400.000	460.000	
BIS(2-CHLOROETHYL)ETHER	UG/KG	0/7	7	0/7		220.000	400.000	460.000	
BIS(2-CHLOROISOPROPYL) ETHER	UG/KG	0/7	7	0/7		200.000	400.000	460.000	
BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	0/7	7	0/7		220.000	400.000	460.000	
BUTYL BENZYL PHTHALATE	UG/KG	0/7	7	0/7		200.000	400.000	460.000	
CARBAZOLE	UG/KG	0/3	3	0/3		230.000	420.000	460.000	

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PADDY'S RUN - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
CHRYSENE	UG/KG	2/7	7	2/7	50.000-150.000	220.000	400.000	460.000	
DI-N-BUTYL PHTHALATE	UG/KG	3/7	7	3/7	53.000-80.000	220.000	400.000	460.000	
DI-N-OCTYL PHTHALATE	UG/KG	0/7	7	0/7		200.000	400.000	460.000	
DIBENZO(A,H)ANTHRACENE	UG/KG	0/7	7	0/7		220.000	400.000	460.000	
DIBENZOFURAN	UG/KG	0/7	7	0/7		200.000	400.000	460.000	
DIETHYL PHTHALATE	UG/KG	0/7	7	0/7		200.000	400.000	2400.000	
DIMETHYL PHTHALATE	UG/KG	0/7	7	0/7		220.000	400.000	460.000	
FLUORANTHENE	UG/KG	3/7	7	3/7	56.000-350.000	220.000	400.000	460.000	
FLUORENE	UG/KG	0/7	7	0/7		200.000	400.000	460.000	
HEXACHLOROBENZENE	UG/KG	0/7	7	0/7		220.000	400.000	460.000	
HEXACHLOROBUTADIENE	UG/KG	0/7	7	0/7		200.000	400.000	460.000	
HEXACHLOROCYCLOPENTADIENE	UG/KG	0/7	7	0/7		220.000	400.000	460.000	
HEXACHLOROETHANE	UG/KG	0/7	7	0/7		200.000	400.000	460.000	
INDENO(1,2,3-CD)PYRENE	UG/KG	1/7	7	1/7	100.000-100.000	220.000	400.000	460.000	
ISOPHORONE	UG/KG	0/7	7	0/7		220.000	400.000	460.000	
N-NITROSO-DI-N-PROPYLAMINE	UG/KG	0/7	7	0/7		200.000	400.000	460.000	
N-NITROSODIPHENYLAMINE	UG/KG	0/7	7	0/7		220.000	400.000	460.000	
NAPHTHALENE	UG/KG	0/7	7	0/7		200.000	400.000	460.000	
NITROBENZENE	UG/KG	0/7	7	0/7		200.000	400.000	460.000	
P-CHLOROANILINE	UG/KG	0/7	7	0/7		220.000	400.000	460.000	
PENTACHLOROPHENOL	UG/KG	0/7	7	0/7		550.000	1000.000	2000.000	

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PADDY'S RUN - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
PHENANTHRENE	UG/KG	2/7	7	2/7	81.000-190.000	200.000	400.000	460.000	
PHENOL	UG/KG	0/7	7	0/7		220.000	400.000	460.000	
PYRENE	UG/KG	3/7	7	3/7	60.000-260.000	220.000	400.000	460.000	

000582

AREA: PADDY'S RUN - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM, TOTAL	MG/KG	8/9	9	5/9	1.000-4.000	1.000	1.000	1.000	1.67
THORIUM-230	PCI/G	1/1	1	1/1	0.800-0.800	0.800			
RADIUM-226	PCI/G	9/9	9	0/9	0.400-1.000	1.000			1.93
THORIUM-232	PCI/G	0/1	1	0/1		0.300	0.600	0.600	
RADIUM-228	PCI/G	0/9	9	0/9		0.250	0.500	0.500	ND
THORIUM-228	PCI/G	0/1	1	0/1		0.300	0.600	0.600	
NEPTUNIUM-237	PCI/G	0/1	1	0/1		0.300	0.600	0.600	
PLUTONIUM-239/240	PCI/G	0/1	1	0/1		0.300	0.600	0.600	
PLUTONIUM-238	PCI/G	0/1	1	0/1		0.300	0.600	0.600	
STRONTIUM-90	PCI/G	0/1	1	0/1		0.250	0.500	0.500	
TECHNETIUM-99	PCI/G	0/1	1	0/1		0.500	1.000	1.000	
RUTHENIUM-106	PCI/G	0/1	1	0/1		0.500	1.000	1.000	
CESIUM-137	PCI/G	0/1	1	0/1		0.100	0.200	0.200	
GROSS ALPHA	PCI/G	4/5	0	4/5	9.000-34.000	16.000	3.000	3.000	
GROSS BETA	PCI/G	2/5	0	2/5	10.000-13.000	4.000	7.000	9.000	

000563

06/06/94

AREA: PADDY'S RUN - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/KG	3/3	3	3/3	2080.000-3920.000	2480.000			1970
ARSENIC	MG/KG	3/3	3	0/3	2.600-6.500	6.500			7
BARIUM	MG/KG	3/3	3	2/3	21.000-31.200	31.200			21
BERYLLIUM	MG/KG	3/3	3	0/3	0.500-0.500	0.500			0.50
CADMIUM	MG/KG	3/3	3	3/3	3.900-5.500	3.900			3.7
CALCIUM	MG/KG	3/3	3	3/3	78700.000-110000.000	103000.000			25900
CHROMIUM	MG/KG	3/3	3	1/3	16.900-18.400	18.400			18.3
COBALT	MG/KG	3/3	3	2/3	4.700-6.500	6.500			4.9
COPPER	MG/KG	3/3	3	3/3	11.500-14.500	11.500			10.8
CYANIDE	MG/KG	0/3	3	0/3		1.350	2.300	2.700	
IRON	MG/KG	3/3	3	1/3	5600.000-8830.000	8830.000			6700
MAGNESIUM	MG/KG	3/3	3	2/3	18300.000-35900.000	35900.000			18300
MANGANESE	MG/KG	3/3	3	1/3	273.000-415.000	273.000			411
MERCURY	MG/KG	0/3	3	0/3		0.050	0.100	0.100	ND
MOLYBDENUM	MG/KG	0/3	3	0/3		2.500	4.400	5.000	ND
NICKEL	MG/KG	3/3	3	3/3	16.400-19.500	17.900			13.7
POTASSIUM	MG/KG	3/3	3	3/3	366.000-655.000	655.000			307
SELENIUM	MG/KG	0/3	3	0/3		0.250	0.500	0.500	ND
SILVER	MG/KG	0/3	3	0/3		0.050	0.100	0.100	ND
SODIUM	MG/KG	3/3	3	0/3	180.000-188.000	188.000			197
THALLIUM	MG/KG	0/3	3	0/3		0.100	0.200	0.300	ND

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AREA: PADDY'S RUN - 1988/89
SEDIMENT DATA

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
VANADIUM	MG/KG	3/3	3	3/3	13.700-15.400	13.700			12.4
ZINC	MG/KG	3/3	3	2/3	13.400-24.400	13.400			13.5

000585

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AREA: PADDY'S RUN - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
1,1,1-TRICHLOROETHANE	UG/KG	0/3	3	0/3		3.000	6.000	7.000	
1,1,2,2-TETRACHLOROETHANE	UG/KG	0/3	3	0/3		3.000	6.000	7.000	
1,1,2-TRICHLOROETHANE	UG/KG	0/3	3	0/3		3.000	6.000	7.000	
1,1-DICHLOROETHANE	UG/KG	0/3	3	0/3		3.500	6.000	7.000	
1,1-DICHLOROETHENE	UG/KG	0/3	3	0/3		3.000	6.000	7.000	
1,2-DICHLOROETHANE	UG/KG	0/3	3	0/3		3.500	6.000	7.000	
1,2-DICHLOROETHENE (TOTAL)	UG/KG	0/3	3	0/3		3.000	6.000	7.000	
1,2-DICHLOROPROPANE	UG/KG	0/3	3	0/3		3.500	6.000	7.000	
2-BUTANONE	UG/KG	0/3	3	0/3		6.000	12.000	15.000	
2-HEXANONE	UG/KG	1/3	3	1/3	11.000-11.000	7.500	12.000	15.000	
4-METHYL-2-PENTANONE	UG/KG	0/3	3	0/3		6.000	12.000	15.000	
ACETONE	UG/KG	0/3	3	0/3		7.500	8.000	15.000	
BENZENE	UG/KG	0/3	3	0/3		3.000	6.000	7.000	
BROMODICHLOROMETHANE	UG/KG	0/3	3	0/3		3.500	6.000	7.000	
BROMOFORM	UG/KG	0/3	3	0/3		3.500	6.000	7.000	
BROMOMETHANE	UG/KG	0/3	3	0/3		6.000	12.000	15.000	
CARBON DISULFIDE	UG/KG	0/3	3	0/3		3.000	6.000	7.000	
CARBON TETRACHLORIDE	UG/KG	0/3	3	0/3		3.500	6.000	7.000	
CHLOROBENZENE	UG/KG	0/3	3	0/3		3.500	6.000	7.000	
CHLOROETHANE	UG/KG	0/3	3	0/3		7.500	12.000	15.000	
CHLOROFORM	UG/KG	0/3	3	0/3		3.000	6.000	7.000	

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AREA: PADDY'S RUN - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
CHLOROMETHANE	UG/KG	0/3	3	0/3		7.500	12.000	15.000	
CIS-1,3-DICHLOROPROPENE	UG/KG	0/3	3	0/3		3.000	6.000	7.000	
DIBROMOCHLOROMETHANE	UG/KG	0/3	3	0/3		3.500	6.000	7.000	
ETHYLBENZENE	UG/KG	1/3	3	0/3	1.000-1.000	3.000	6.000	6.000	
METHYLENE CHLORIDE	UG/KG	0/3	3	0/3		3.000	6.000	15.000	
STYRENE	UG/KG	0/3	3	0/3		3.000	6.000	7.000	
TETRACHLOROETHENE	UG/KG	0/3	3	0/3		3.500	6.000	7.000	
TOLUENE	UG/KG	0/3	3	0/3		3.500	6.000	7.000	
TRANS-1,3-DICHLOROPROPENE	UG/KG	0/3	3	0/3		3.000	6.000	7.000	
TRICHLOROETHENE	UG/KG	0/3	3	0/3		3.500	6.000	7.000	
VINYL ACETATE	UG/KG	0/3	3	0/3		6.000	12.000	15.000	
VINYL CHLORIDE	UG/KG	0/3	3	0/3		6.000	12.000	15.000	
XYLENES, TOTAL	UG/KG	0/3	3	0/3		3.000	6.000	7.000	

000567

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AREA: PADDY'S RUN - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
1,2,4-TRICHLOROBENZENE	UG/KG	0/3	3	0/3		195.000	390.000	480.000	
1,2-DICHLOROBENZENE	UG/KG	0/3	3	0/3		240.000	390.000	480.000	
1,3-DICHLOROBENZENE	UG/KG	0/3	3	0/3		240.000	390.000	480.000	
1,4-DICHLOROBENZENE	UG/KG	0/3	3	0/3		195.000	390.000	480.000	
2,4,5-TRICHLOROPHENOL	UG/KG	0/3	3	0/3		950.000	1900.000	2300.000	
2,4,6-TRICHLOROPHENOL	UG/KG	0/3	3	0/3		240.000	390.000	480.000	
2,4-DICHLOROPHENOL	UG/KG	0/3	3	0/3		195.000	390.000	480.000	
2,4-DIMETHYLPHENOL	UG/KG	0/3	3	0/3		240.000	390.000	480.000	
2,4-DINITROPHENOL	UG/KG	0/3	3	0/3		950.000	1900.000	2300.000	
2,4-DINITROTOLUENE	UG/KG	0/3	3	0/3		240.000	390.000	480.000	
2,6-DINITROTOLUENE	UG/KG	0/3	3	0/3		195.000	390.000	480.000	
2-CHLORONAPHTHALENE	UG/KG	0/3	3	0/3		195.000	390.000	480.000	
2-CHLOROPHENOL	UG/KG	0/3	3	0/3		240.000	390.000	480.000	
2-METHYLNAPHTHALENE	UG/KG	0/3	3	0/3		240.000	390.000	480.000	
2-METHYLPHENOL	UG/KG	0/3	3	0/3		195.000	390.000	480.000	
2-NITROANILINE	UG/KG	0/3	3	0/3		1150.000	1900.000	2300.000	
2-NITROPHENOL	UG/KG	0/3	3	0/3		195.000	390.000	480.000	
3,3'-DICHLOROBENZIDINE	UG/KG	0/3	3	0/3		480.000	790.000	960.000	
3-NITROANILINE	NONE	0/3	3	0/3		950.000	1900.000	2300.000	
4,6-DINITRO-2-METHYLPHENOL	UG/KG	0/3	3	0/3		950.000	1900.000	2300.000	
4-BROMOPHENYL PHENYL ETHER	UG/KG	0/3	3	0/3		240.000	390.000	480.000	

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AREA: PADDY'S RUN - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
4-CHLORO-3-METHYLPHENOL	UG/KG	0/3	3	0/3		195.000	390.000	480.000	
4-CHLOROPHENYLPHENYL ETHER	UG/KG	0/3	3	0/3		240.000	390.000	480.000	
4-METHYLPHENOL	UG/KG	0/3	3	0/3		240.000	390.000	480.000	
4-NITROANILINE	UG/KG	0/3	3	0/3		950.000	1900.000	2300.000	
4-NITROPHENOL	UG/KG	0/3	3	0/3		1150.000	1900.000	2300.000	
ACENAPHTHENE	UG/KG	0/3	3	0/3		195.000	390.000	480.000	
ACENAPHTHYLENE	UG/KG	0/3	3	0/3		240.000	390.000	480.000	
ANTHRACENE	UG/KG	0/3	3	0/3		195.000	390.000	480.000	
BENZO(A)ANTHRACENE	UG/KG	0/3	3	0/3		240.000	390.000	480.000	
BENZO(A)PYRENE	UG/KG	0/3	3	0/3		195.000	390.000	480.000	
BENZO(B)FLUORANTHENE	UG/KG	0/3	3	0/3		240.000	390.000	480.000	
BENZO(G,H,I)PERYLENE	UG/KG	0/3	3	0/3		195.000	390.000	480.000	
BENZO(K)FLUORANTHENE	UG/KG	0/3	3	0/3		240.000	390.000	480.000	
BENZOIC ACID	UG/KG	0/3	3	0/3		950.000	1900.000	2300.000	
BENZYL ALCOHOL	UG/KG	0/3	3	0/3		240.000	390.000	480.000	
BIS(2-CHLOROETHOXY)METHANE	UG/KG	0/3	3	0/3		200.000	390.000	480.000	
BIS(2-CHLOROETHYL)ETHER	UG/KG	0/3	3	0/3		200.000	390.000	480.000	
BIS(2-CHLOROISOPROPYL) ETHER	UG/KG	0/3	3	0/3		200.000	390.000	480.000	
BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	0/3	3	0/3		250.000	400.000	590.000	
BUTYL BENZYL PHTHALATE	UG/KG	0/3	3	0/3		195.000	390.000	480.000	
CHRYSENE	UG/KG	0/3	3	0/3		195.000	390.000	480.000	

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000563

AREA: PADDY'S RUN - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
DI-N-BUTYL PHTHALATE	UG/KG	0/3	3	0/3		25.500	51.000	390.000	
DI-N-OCTYL PHTHALATE	UG/KG	0/3	3	0/3		195.000	390.000	480.000	
DIBENZO(A,H)ANTHRACENE	UG/KG	0/3	3	0/3		195.000	390.000	480.000	
DIBENZOFURAN	UG/KG	0/3	3	0/3		240.000	390.000	480.000	
DIETHYL PHTHALATE	UG/KG	0/3	3	0/3		195.000	390.000	480.000	
DIMETHYL PHTHALATE	UG/KG	0/3	3	0/3		240.000	390.000	480.000	
FLUORANTHENE	UG/KG	0/3	3	0/3		195.000	390.000	480.000	
FLUORENE	UG/KG	0/3	3	0/3		240.000	390.000	480.000	
HEXACHLOROBENZENE	UG/KG	0/3	3	0/3		195.000	390.000	480.000	
HEXACHLOROBUTADIENE	UG/KG	0/3	3	0/3		240.000	390.000	480.000	
HEXACHLOROCYCLOPENTADIENE	UG/KG	0/3	3	0/3		195.000	390.000	480.000	
HEXACHLOROETHANE	UG/KG	0/3	3	0/3		240.000	390.000	480.000	
INDENO(1,2,3-CD)PYRENE	UG/KG	0/3	3	0/3		195.000	390.000	480.000	
ISOPHORONE	UG/KG	0/3	3	0/3		195.000	390.000	480.000	
N-NITROSO-DI-N-PROPYLAMINE	UG/KG	0/3	3	0/3		195.000	390.000	480.000	
N-NITROSODIPHENYLAMINE	UG/KG	0/3	3	0/3		240.000	390.000	480.000	
NAPHTHALENE	UG/KG	0/3	3	0/3		195.000	390.000	480.000	
NITROBENZENE	UG/KG	0/3	3	0/3		195.000	390.000	480.000	
P-CHLOROANILINE	UG/KG	0/3	3	0/3		200.000	390.000	480.000	
PENTACHLOROPHENOL	UG/KG	0/3	3	0/3		950.000	1900.000	2300.000	
PHENANTHRENE	UG/KG	0/3	3	0/3		240.000	390.000	480.000	

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000570

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AREA: PADDY'S RUN - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
PHENOL	UG/KG	0/3	3	0/3		195.000	390.000	480.000	
PYRENE	UG/KG	0/3	3	0/3		200.000	390.000	480.000	

000571

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AREA: PADDY'S RUN - 1988/89
SEDIMENT DATA

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
PESTICIDES									
4,4'-DDD	UG/KG	0/3	3	0/3		9.500	19.000	24.000	
4,4'-DDE	UG/KG	0/3	3	0/3		9.500	19.000	24.000	
4,4'-DDT	UG/KG	0/3	3	0/3		12.000	19.000	24.000	
ALDRIN	UG/KG	0/3	3	0/3		6.000	9.600	12.000	
ALPHA-BHC	UG/KG	0/3	3	0/3		4.950	9.600	12.000	
ALPHA-CHLORDANE	UG/KG	0/3	3	0/3		49.500	96.000	120.000	
AROCLOR-1016	UG/KG	0/3	3	0/3		60.000	96.000	120.000	
AROCLOR-1221	UG/KG	0/3	3	0/3		48.000	96.000	120.000	
AROCLOR-1232	UG/KG	0/3	3	0/3		60.000	96.000	120.000	
AROCLOR-1242	UG/KG	0/3	3	0/3		48.000	96.000	120.000	
AROCLOR-1248	UG/KG	0/3	3	0/3		48.000	96.000	120.000	
AROCLOR-1254	UG/KG	0/3	3	0/3		120.000	190.000	240.000	
AROCLOR-1260	UG/KG	0/3	3	0/3		95.000	190.000	240.000	
BETA-BHC	UG/KG	0/3	3	0/3		85.000	9.600	170.000	
DELTA-BHC	UG/KG	0/3	3	0/3		4.950	9.600	12.000	
DIELDRIN	UG/KG	0/3	3	0/3		12.000	19.000	24.000	
ENDOSULFAN II	UG/KG	0/3	3	0/3		12.000	19.000	24.000	
ENDOSULFAN SULFATE	UG/KG	0/3	3	0/3		9.500	19.000	24.000	
ENDOSULFAN-I	UG/KG	0/3	3	0/3		6.000	9.600	12.000	
ENDRIN	UG/KG	0/3	3	0/3		9.500	19.000	24.000	
ENDRIN KETONE	UG/KG	0/3	3	0/3		12.000	19.000	24.000	

06/06/94

AREA: PADDY'S RUN - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
PESTICIDES									
GAMMA-BHC (LINDANE)	UG/KG	0/3	3	0/3		4.950	9.600	12.000	
GAMMA-CHLORDANE	UG/KG	0/3	3	0/3		49.500	96.000	120.000	
HEPTACHLOR	UG/KG	0/3	3	0/3		4.800	9.600	12.000	
HEPTACHLOR EPOXIDE	UG/KG	0/3	3	0/3		6.000	9.600	12.000	
METHOXYCHLOR	UG/KG	0/3	3	0/3		48.000	96.000	120.000	
TOXAPHENE	UG/KG	0/3	3	0/3		100.000	190.000	240.000	

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C.3.0 GREAT MIAMI RIVER AND ASSOCIATED DRAINAGES

The Great Miami River, the principal surface water feature near the FEMP, is a receptor for groundwater and surface water discharge from the FEMP. There are four principal pathways for FEMP discharges to enter the river: groundwater discharge, the effluent from the outfall line, surface water flow from Paddys Run, and a drainage that flows toward the Great Miami River from the northeast corner of FEMP property. This section summarizes the nature and extent of contamination in the northeast drainage ditch, the effluent line, and the Great Miami River. Samples were collected for the RI/FS during the 1988/89 RI/FS program and the 1993 RI/FS program. Additional total uranium data are provided by routine sampling conducted as part of the Environmental Monitoring (EM) Program.

C.3.1 NORTHEAST DRAINAGE DITCH

The northeast drainage ditch receives surface water runoff from a small portion of the northeast corner of the FEMP, as well as a larger area to the north of State Route 126 (Figure C-8). The ditch transports the runoff and its associated sediments east towards the Great Miami River. A portion of the ditch flows directly into the Great Miami Aquifer; however, the extent to which this drainage interacts with the aquifer prior to flowing into the Great Miami River is not currently known. The drainage ditch lies in the prevailing wind direction (southwest to northeast) of the FEMP. Elevated levels of total uranium have been confirmed in surface soils in the northeast corner of FEMP property as a result of the deposition of airborne contaminants (Section 4.6, Soils). The ditch was sampled in 1993 at location SWS-13, approximately 300 yards off-property as shown on Figure C-8, to evaluate contamination levels in surface water runoff and the associated sediments from this area of the FEMP.

Data summary tables of the results of the surface water and sediment analytical investigation at this location are presented following Section C.3. Complete analytical results for the surface water and sediment samples analyzed for this location in 1993 are listed in Appendix G.10.

Surface Water

Three surface water samples were collected at location SWS-13 during the 1993 sampling program. Samples were analyzed for total uranium, total thorium, and isotopic uranium, thorium and radium. One surface water sample was analyzed for HSL metals and cyanide, volatiles, semivolatiles, and general water quality parameters.

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The maximum concentrations of unfiltered total uranium, shown on Figure C-5, and uranium-234 in surface water exceed five times the background concentration for these radionuclides. The maximum total uranium detected in filtered surface water was 2.8 μg/L. In addition, isotopic thorium was detected in unfiltered surface water at two times background concentration. Total thorium was also detected; however, no background concentration from the Great Miami River is available for this parameter to serve as a point of comparison.

As shown in the summary tables, several metals including arsenic, barium, calcium, cyanide, lead, magnesium, manganese, potassium, sodium, and zinc were all detected at slightly greater than background concentrations for these parameters. Manganese and zinc were detected at greater than five times their respective surface water backgrounds.

No volatile organics were detected in the surface water from this location; however, one semivolatile organic, di-n-butyl phthalate, was detected at a concentration of 2 μg/L. Phthalates are components of plastics and are also common laboratory contaminants.

Sediment

Five sediment samples were collected at SWS-13 during the 1993 sampling program. The samples were analyzed for total uranium, total thorium and isotopic thorium, uranium, and radium. In addition, one sediment sample was analyzed for HSL metals, volatiles, and semivolatiles.

Total uranium was detected in two of the five sediment samples from this location at concentrations of 3.9 mg/kg and 4.3 mg/kg. Both concentrations are slightly higher than background. Total thorium, thorium-230, and thorium-232 were each detected at maximum concentrations that exceeded two times their respective background concentrations.

Two volatile organics, as well as several semivolatile organic compounds, were detected in the sediment from SWS-13. Maximum detected concentrations were 110 μg/kg and 210 μg/kg, respectively. Of the semivolatiles detected, all were PAHs except di-n-butyl phthalate. PAHs are typically residual by-products of incomplete combustion.

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Several metals, including iron, calcium, aluminum, barium, and potassium were detected at concentrations two to five time background. Concentrations of beryllium, manganese, and zinc were detected at greater than five times background sediment for the Great Miami River.

Summary - Northeast Drainage Ditch

Based on the data collected during 1993, the following can currently be determined:

- Surface water samples had elevated levels of total uranium, uranium-234, and a few metals. The source of the uranium is most likely runoff originating from nearby contaminated surface soils.
- Sediment samples from this location have elevated concentrations of total uranium, metals and several semivolatiles.
- The source of the semivolatiles in sediments from this location is indeterminate based on current information.

Detailed interpretation of the data is limited because of the lack of pre-1993 data to provide a longer record of the levels of contamination in the drainage ditch. Furthermore, the sample was collected well off of FEMP property, making it difficult to determine whether or not the organic contamination is FEMP-related or the result of agricultural activity in the vicinity of the ditch.

C.3.2 FEMP EFFLUENT - MANHOLE 175

Manhole 175 is the final monitoring point in the FEMP wastewater system where effluent is sampled before it leaves the site and is discharged to the Great Miami River. Data is collected from Manhole 175 on a routine bases in order to maintain compliance with National Pollutant Discharge Elimination System (NPDES) requirements and DOE Order 5400.5 guidelines for discharges from the FEMP. Although regulated, effluent from the FEMP is a source of contamination to the Great Miami River. This section provides an overview of contaminants associated with effluent from the FEMP. Regulated discharges from the FEMP are discussed in Sections 1.3.1.2 and 1.3.1.3.

In addition to the compliance related sampling, the RI/FS program collected effluent samples at Manhole 175, as well as well as samples of the solids that had accumulated over the years.

A summary of the analytical results for Manhole 175 is presented following Section C.3. Complete analytical results are presented in Appendix G.

Effluent Data

Data collected during 1993 compliance sampling indicated that a total of 474 kg, or 1044 pounds, of uranium was discharged to the Great Miami River. This was an increase of 7 percent on a mass basis of uranium discharged to the river during 1992.

In 1988, the RI/FS program collected filtered and unfiltered effluent samples for analyses of radiological and HSL inorganic parameters. In addition, unfiltered grab effluent samples were analyzed for HSL volatiles, semivolatiles and pesticides/PCBs. Compliance monitoring is accomplished by collection and analysis of composited samples. Duration composite sampling produces flow-weighted data, which is representative of a time-weighted annual average discharge to the Great Miami River.

Although concentrations of effluent constituents in a single grab sample may not be representative of an annual average discharge, results of the 1988 RI/FS effluent grab sampling for radionuclides are compared below to composited sample results from the EM program. Since the RI/FS effluent grab sample was collected in 1988, while the site was still operating, and no additional RI/FS effluent sampling has occurred, the RI/FS samples are compared to compliance data for two of the years, 1990 and 1992, following process shutdown.

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Effluent Data From Manhole 175

Radionuclide	1988 RI/FS pCi/g[a]	1990 EM pCi/g[b]	1992 EM pCi/g[c]	Standard pCi/g[d]
Technetium-99	11327	<1690	<1900	100,000
Thorium-230	1.2	0.7	0.58	300
Thorium-232	4.7	<0.5	<0.26	50
Uranium-234	269	285.4	130	500
Uranium-235/236[e]	29	18.1[d]	13.0[d]	1100[d]
Uranium-238	257	267	180	600

[a]Value is average of samples collected from Manhole 175 in 1988 RI/FS Sampling Program.
[b]Data taken from the 1990 Annual Environmental Monitoring Report, Appendix A, Table 7.
[c]Data taken from the 1992 Site Environmental Report, Appendix A, Table 11.
[d]As stated in DOE Order 5400.5, "Radiation Protection of the Public and Environment."
[e]Value is the sum of activities for individual isotopes U-235 and U-236.

As shown above, uranium activity levels, as well as those for technetium-99 and thorium-232 have decreased in FEMP wastewater since 1988.

Metals including copper, iron, lead, magnesium, manganese, mercury, potassium, sodium and zinc were detected at concentration that were significantly higher than background in the 1988 RI/FS sample.

No organic compounds were detected in the 1988 RI/FS effluent water.

Sludge Data

Sludge samples collected for the RI/FS investigation at Manhole 175 were analyzed for full radiological contaminants, HSL inorganics, volatiles, and semivolatile and pesticides/PCBs. RI/FS analysis of sludge samples collected at Manhole 175 in 1988 resulted in data with elevated concentrations of uranium, thorium, radium, technetium, strontium, plutonium, and cesium isotopes. Maximum total uranium and technetium-99 concentrations detected in the sludge were 614 μg/g and 692 pCi/g, respectively.

Metals including aluminum, barium, calcium, copper, lead, mercury, silver, and zinc were detected at concentrations that were significantly higher than background concentrations for sediment.

No volatile organics were detected in the sludge sample. Many semivolatiles were detected in the solid deposits of the outfall line as were, one pesticide (endosulfan sulfate) and two PCBs (aroclor-1254 and aroclor-1260). Concentrations ranged from 120 mg/kg to 5200 mg/kg.

Data Summary

The FEMP effluent meets DOE Order 5400.5 guidelines and complies with FEMP NPDES effluent standards. The FEMP effluent line is, however, one of the primary pathways for the transport of contaminated surface water runoff from the FEMP to the Great Miami River. The impact of FEMP effluent on contamination levels in surface water and sediment in the Great Miami River is present in Section C.3.3.

C.3.3 GREAT MIAMI RIVER

The Great Miami River is the primary feature in the vicinity of the FEMP. There are four principal pathways for FEMP discharges to enter the river: groundwater discharge, the effluent line, the northeast drainage ditch, and Paddys Run. The Great Miami River receives discharge from the Great Miami Aquifer; however, this mechanism has not been shown to be a source of contamination to the river. Effluent from the FEMP is discharged to the river east of the site via the outfall line. All uncontrolled surface water from the FEMP eventually flows into the river. There are two surface water drainage features that receive FEMP surface water runoff and transport it to the Great Miami River: the northeast drainage ditch, discussed earlier in this section; and Paddys Run, discussed in detail in Section C.2.

Numerous site sampling programs have investigated the Great Miami River. Surface water and sediment samples were collected under the RI/FS program during the 1988/89 and the 1993 RI/FS programs. Additional data have been collected as part of routine monitoring for the FEMP EM program. Data from the 1993 RI/FS investigation program will be used to describe the extent of contamination in the Great Miami River. The earlier RI/FS data will be used to illustrate temporal trends in total uranium concentrations. Complete RI/FS analytical results are listed in Appendix G. Data summary tables for each of the RI/FS sampling programs follow Section C.3. Summary statistics tables for the EM data are also included following Section C.3.

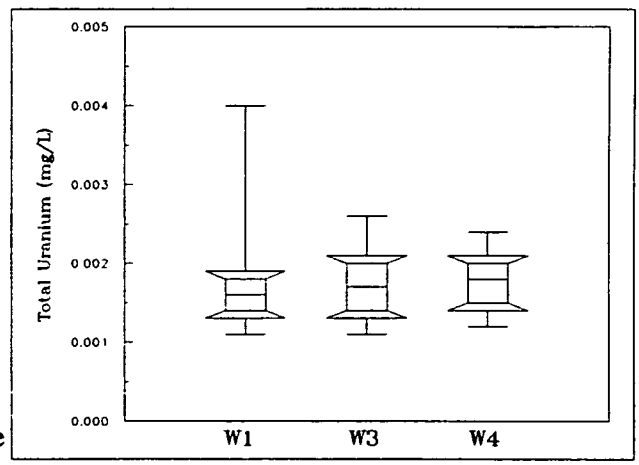
Surface Water

Surface water samples were collected at five locations for the 1993 RI/FS: W-1, upstream of the outfall line, and the northeast drainage ditch; GMR-2, immediately downstream from the effluent line; GMR-5, immediately upstream of the confluence with Paddys Run; GMR-4, immediately downstream of the confluence with Paddys Run; and W-4, 4.7 miles downstream of Paddys Run. All samples collected in 1993 were analyzed for total uranium, isotopic uranium, thorium, radium, metals, volatile and semivolatile organic chemicals, and general water chemistry. In addition, weekly surface water samples were collected during the 1993 EM program at locations W-1, W-3, and W-4. All locations are shown on Figure C-9.

Total uranium was detected in each of the surface water samples collected from the Great Miami River during the RI/FS investigation in 1993. The maximum undetected total uranium concentration at each location is shown on Figure C-9. The maximum concentration was detected at GMR-2, immediately downstream of the outfall line, and GMR-4, immediately upstream of Paddys Run. In 1988, the maximum detected unfiltered concentration from both locations was 5 μg/L. This value, the maximum detected concentration in the Great Miami River in 1988, was also detected at W-3, which is approximately halfway between the outfall line and Paddys Run. A comparison of the 1988 and 1993 RI/FS data indicates an apparent decrease in uranium levels in the Great Miami River.

During the 1993 EM Program, total uranium was detected at EM sampling locations at concentrations ranging from 1.1 to 4.0 μg/L. The minimum value was detected at both W-1 and W-3, and the maximum value was detected at W-1. The following figure is a graph showing box plots of EM total uranium data from all three river locations for 1993.

The figure shows that total uranium values in the river are fairly consistent from one location to another, with the maximum value detected at the upstream location.



Box Plots of EM Total Uranium Data - 1993

The summary statistics shown in Tables C-10, C-11 and C-12 indicate that the average, the UCL on the median, and 95th percentile background values for W-3 and W-4 have decreased during the last 8 years, and that current backgrounds at all

three locations are similar. This is a positive indication that impacts from the FEMP to uranium levels in the Great Miami River are minimal.

Radium-226 was also detected at greater backgrounds at GMR-5, just upstream of Paddys Run, and also at W.4, 4.7 miles downstream of Paddys Run. Total thorium was also detected at W-4 in 1993; background is not available for this radionuclide.

Metals aluminum, iron, lead, manganese, and silicon were each detected at greater than five times background at all sampling locations in 1993. In addition, cadmium and chromium were detected at W-4, and beryllium was detected at GMR-5.

One VOC, trichloroethene, was detected in a sample from GMR-4 at 2 μg/L. Phthalates (bis[2-ethylhexyl]-, di-n-butyl-, and di-n-octyl-) were detected in one surface water sample from GMR-5 and W-4. Concentrations ranged from 2 to 160 μg/L.

Sediment

Sediment samples collected during the 1993 RI/FS investigation from locations GMR-2, GMR-4, GMR-5, and W-4 were analyzed for radionuclides, metals, and volatile and semivolatile organics. The EM Program collected samples from nine locations on the Great Miami River, which included stations upstream, downstream, and at of the confluence with Paddys Run; upstream and downstream of the outfall line; midway between Paddys Run and the outfall line near surface location W-3; and upstream of the outfall line near surface water sampling location W-1.

Total uranium was detected in 1993 RI/FS samples at concentrations ranging from 2 to 3.3 mg/kg. The maximum concentration was detected at location GMR-4, immediately downstream of the confluence with Paddys Run. This was the only location with a concentration greater than background. Total uranium concentrations detected in Great Miami River sediments during the 1993 EM Program ranged from 0.3 to 0.82 mg/kg. The maximum concentration was detected at two locations: immediately upstream of the outfall line and immediately downstream of the confluence with Paddys Run. These values were well below background.

Aluminum, barium, and zinc were detected in Great Miami River sediment at concentrations greater than five times background. Maximum concentrations for aluminum and barium were at GMR-2. The maximum concentration for zinc was detected at GMR-4.

Three volatile organics, chlorobenzene, carbon disulfide, and toluene were detected in the sediment from downstream location W-4 at concentrations ranging from 2 μg/kg to 73 μg/kg. A number of semivolatiles, specifically PAHs, were as detected at each location in 1993. The highest concentrations were detected at GMR-2 immediately downstream of the outfall line, whereas 15 PAHs were detected at concentrations ranging from 63 to 5500 mg/kg.

Summary - Great Miami River

The following is a summary of contaminants and their concentrations detected in the surface waters and sediments of the Great Miami River as a result of FEMP activities:

- Surface water immediately downstream of the confluence with Paddys Run has elevated concentrations of total uranium and metals.
- Surface water immediately downstream of the outfall has elevated concentration of total uranium and metals.
- Total uranium in sediment (both downstream of the Great Miami River confluence with Paddys Run and downstream of the outfall line) was elevated.
- Isotopic radium and thorium were detected in surface water and sediment, respectively, immediately downstream of the confluence with Paddys Run.
- Volatiles and semivolatiles were detected at very low concentrations, in both surface waters and sediments from the Great Miami River.

Total uranium is present in surface water and sediment in the Great Miami River. The data indicate that these levels have decreased during the last several years to near to, or below background levels.

TABLE C-10

SUMMARY STATISTICS FOR ENVIRONMENTAL MONITORING DATA
GREAT MIAMI RIVER
SAMPLE LOCATION W-1
TOTAL URANIUM (mg/L)

Year	Number of Samples	Distribution	Range	Average	Upper Confidence Limit on Media	95th Percentile
1986	52	undefined	0.0011-0.0042	0.0018	0.0017	0.0026
1987	52	lognormal	0.0011-0.0033	0.0017	0.0018	0.0025
1988	52	undefined	0.0009-0.0023	0.0015	0.0015	0.0021
1989	51	undefined	0.0014-0.0033	0.002	0.0021	0.0024
1990	52	undefined	0.0012-0.0029	0.0018	0.0019	0.0023
1991	52	lognormal	0.0011-0.0022	0.0016	0.0017	0.0021
1992	51	lognormal	0.0012-0.0023	0.0017	0.0017	0.0021
1993	52	undefined	0.0011-0.0040	0.0017	0.0017	0.0021

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TABLE C-11

SUMMARY STATISTICS FOR ENVIRONMENTAL MONITORING DATA
GREAT MIAMI RIVER
SAMPLE LOCATION W-3
TOTAL URANIUM (mg/L)

Year	Number of Samples	Distribution	Range	Average	Upper Confidence Limit on Media	95th Percentile
1986	52	lognormal	0.0010-0.0036	0.002	0.0021	0.003
1987	52	undefined	0.0013-0.0058	0.0023	0.0024	0.0035
1988	52	lognormal	0.0012-0.0042	0.0022	0.0022	0.0031
1989	51	lognormal	0.0015-0.0036	0.0022	0.0023	0.0029
1990	52	lognormal	0.0013-0.0030	0.002	0.0020	0.0026
1991	52	lognormal	0.0012-0.0028	0.0018	0.0019	0.0024
1992	51	normal	0.0012-0.0025	0.0018	0.0020	0.0023
1993	52	lognormal	0.0011-0.0026	0.0017	0.0018	0.0023

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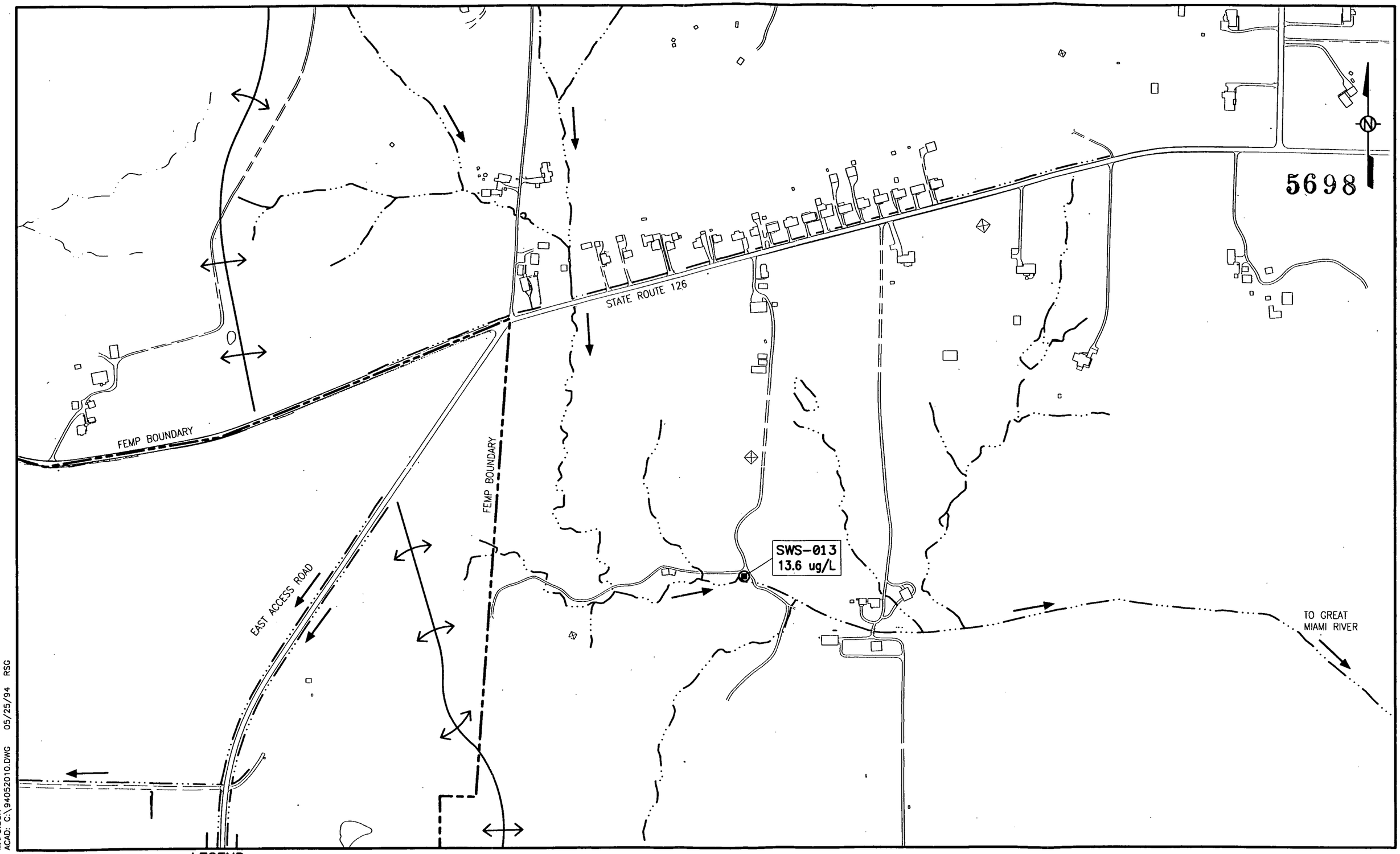
TABLE C-12

SUMMARY STATISTICS FOR ENVIRONMENTAL MONITORING DATA
GREAT MIAMI RIVER
SAMPLE LOCATION W-4

Year	Number of Samples	Distribution	Range	Average	Upper Confidence Limit on Median	95th Percentile
1986	52	undefined	0.0011-0.0069	0.0021	0.0022	0.0033
1987	52	lognormal	0.0015-0.0045	0.0025	0.0026	0.0037
1988	52	lognormal	0.0012-0.0043	0.0021	0.0022	0.003
1989	38	lognormal	0.0015-0.0033	0.0022	0.0023	0.003
1990	50	normal	0.0012-0.0026	0.0019	0.0020	0.0024
1991	52	lognormal	0.0013-0.0026	0.0019	0.0019	0.0024
1992	51	normal	0.0013-0.0025	0.0019	0.0020	0.0023
1993	52	normal	0.0012-0.0024	0.0018	0.0019	0.0023



MAP3.SCR
ACAD: C:\94052010.DWG 05/25/94 RSG

LEGEND

- SURFACE WATER AND SEDIMENT (RI/FS)
- DIRECTION OF SURFACE WATER
- APPROXIMATE DRAINAGE DIVIDE

SCALE
0 300 600 FEET

DRAFT

FIGURE C-8
NORTHEAST DRAINAGE
1993 UNFILTERED SURFACE WATER TOTAL URANIUM DATA

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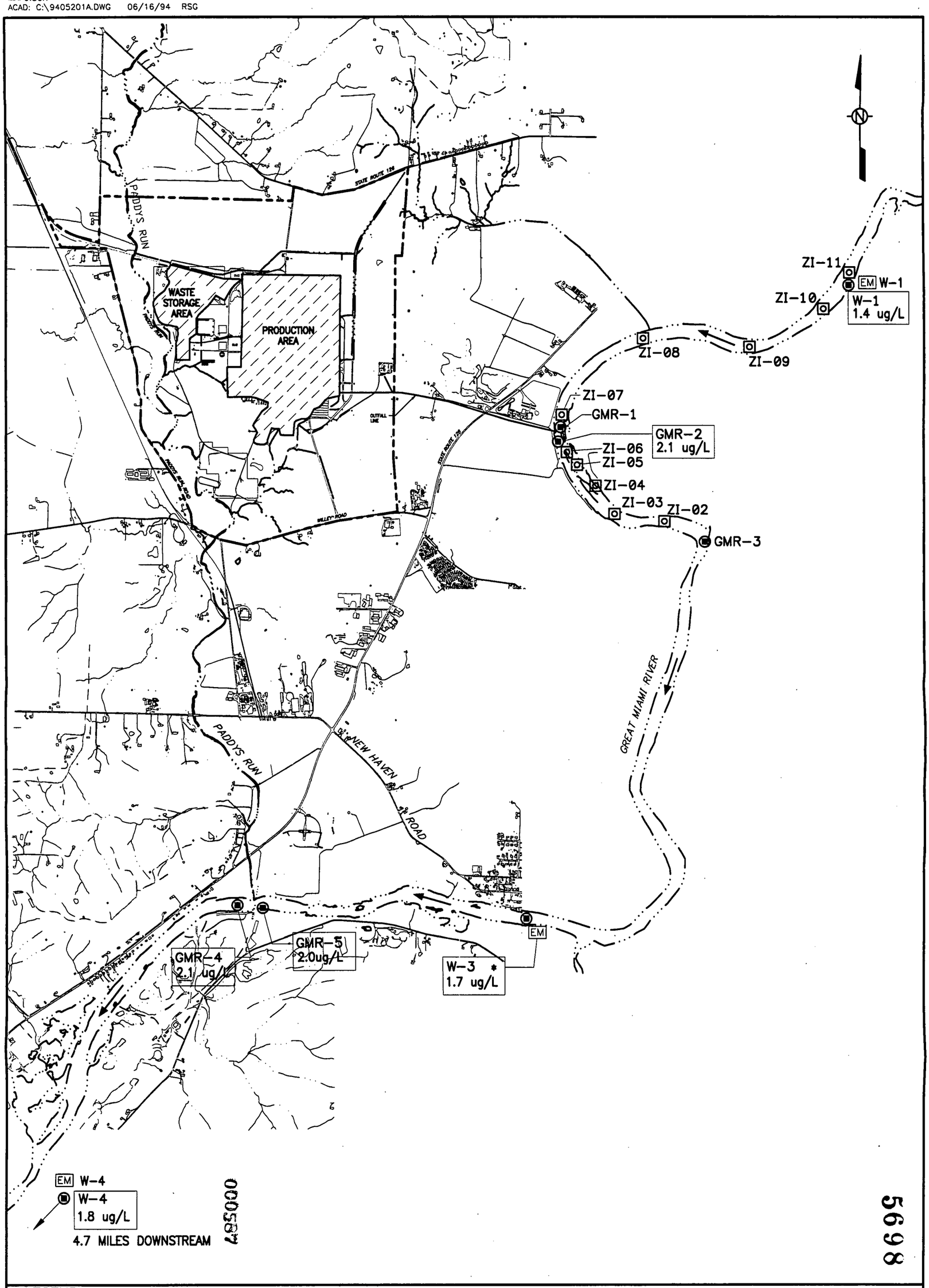
MAP9.SCR
ACAD: C:\9405201A.DWG 06/16/94 RSG



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LEGEND
- SURFACE WATER ONLY (RI/FS)
- SURFACE WATER AND SEDIMENT (RI/FS)
- EM ENVIRONMENTAL MONITORING LOCATION
- DIRECTION OF SURFACE WATER
- CONTROLLED RUNOFF AREA

* 95TH PERSENTILE ON THE MEDIAN

SCALE
0 2000 4000 FEET

DRAFT

FIGURE C-9
GREAT MIAMI RIVER
1993 UNFILTERED SURFACE
WATER TOTAL URANIUM DATA

Great Miami River and Associated Drainages/Discharges

NORTHEAST DRAINAGE DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/L	1/1	1	1/1	4.30000-4.30000	4.30000			0.73
URANIUM, TOTAL	UG/L	5/5	3	5/5	8.00000-13.60000	10.60000			1.1
URANIUM-234	PCI/L	1/1	1	1/1	3.20000-3.20000	3.20000			0.70
THORIUM-230	PCI/L	1/2	2	1/2	0.40000-0.40000	0.27500	0.30000	0.30000	ND
RADIUM-226	PCI/L	1/2	2	1/2	2.40000-2.40000	1.45000	1.00000	1.00000	0.35
URANIUM-235/236	PCI/L	1/1	1	1/1	0.40000-0.40000	0.40000			ND
THORIUM-232	PCI/L	0/2	2	0/2		0.10000	0.20000	0.20000	ND
THORIUM, TOTAL	UG/L	1/1	0	1/1	1.82406-1.82406	1.82406			ND
RADIUM-228	PCI/L	0/2	2	0/2		1.50000	3.00000	3.00000	2.1
THORIUM-228	PCI/L	1/2	2	1/2	0.30000-0.30000	0.20000	0.20000	0.20000	ND
GROSS ALPHA	PCI/L	2/3	0	1/3	3.50000-54.90000	54.90000	110.00000	110.00000	3.7
GROSS BETA	PCI/L	2/3	0	2/3	7.40000-86.70000	86.70000	350.00000	350.00000	6.8

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NORTHEAST DRAINAGE DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/L	0/1	1	0/1		0.27950	0.55900	0.55900	0.640
ANTIMONY	MG/L	0/1	1	0/1		0.00700	0.01400	0.01400	ND
ARSENIC	MG/L	1/1	1	1/1	0.00320-0.00320	0.00320			ND
BARIUM	MG/L	1/1	1	1/1	0.07730-0.07730	0.07730			0.0534
BERYLLIUM	MG/L	0/1	1	0/1		0.00250	0.00500	0.00500	ND
CADMIUM	MG/L	0/1	1	0/1		0.00250	0.00500	0.00500	ND
CALCIUM	MG/L	1/1	1	1/1	124.00000-124.00000	124.00000			107
CHROMIUM	MG/L	0/1	1	0/1		0.00300	0.00600	0.00600	ND
COBALT	MG/L	0/1	1	0/1		0.00850	0.01700	0.01700	ND
COPPER	MG/L	0/1	1	0/1		0.00450	0.00900	0.00900	ND
CYANIDE	MG/L	1/1	1	1/1	0.03190-0.03190	0.03190			ND
IRON	MG/L	1/1	1	1/1	0.93500-0.93500	0.93500			0.513
LEAD	MG/L	1/1	1	1/1	0.01580-0.01580	0.01580			ND
MAGNESIUM	MG/L	1/1	1	1/1	33.10000-33.10000	33.10000			27.8
MANGANESE	MG/L	1/1	1	1/1	0.78600-0.78600	0.78600			0.035
MERCURY	MG/L	0/1	1	0/1		0.00005	0.00010	0.00010	ND
MOLYBDENUM	MG/L	0/1	1	0/1		0.00850	0.01700	0.01700	ND
NICKEL	MG/L	0/1	1	0/1		0.00900	0.01800	0.01800	ND
POTASSIUM	MG/L	1/1	1	1/1	3.96000-3.96000	3.96000			3.58
SELENIUM	MG/L	0/1	1	0/1		0.00050	0.00100	0.00100	ND
SILICON	MG/L	1/1	1	0/1	2.59000-2.59000	2.59000			3.36
SILVER	MG/L	0/1	1	0/1		0.00100	0.00200	0.00200	ND

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NORTHEAST DRAINAGE DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
SODIUM	MG/L	1/1	1	1/1	28.70000-28.70000	28.70000			18.2
THALLIUM	MG/L	0/1	1	0/1		0.00050	0.00100	0.00100	ND
VANADIUM	MG/L	0/1	1	0/1		0.01200	0.02400	0.02400	ND
ZINC	MG/L	1/1	1	1/1	0.51000-0.51000	0.51000			ND

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NORTHEAST DRAINAGE DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
1,1,1-TRICHLOROETHANE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
1,1,2,2-TETRACHLOROETHANE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
1,1,2-TRICHLOROETHANE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
1,1-DICHLOROETHANE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
1,1-DICHLOROETHENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
1,2-DICHLOROETHANE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
1,2-DICHLOROETHENE (TOTAL)	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
1,2-DICHLOROPROPANE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
2-BUTANONE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
2-HEXANONE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
4-METHYL-2-PENTANONE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
ACETONE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
BENZENE	UG/L	0/1	1	0/1		8.00000	16.00000	16.00000	
BROMODICHLOROMETHANE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
BROMOFORM		0/1	1	0/1		5.00000	10.00000	10.00000	
BROMOMETHANE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
CARBON DISULFIDE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
CARBON TETRACHLORIDE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
CHLOROBENZENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
CHLOROETHANE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
CHLOROFORM	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
CHLOROMETHANE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	

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NORTHEAST DRAINAGE DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
CIS-1,3-DICHLOROPROPENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
DIBROMOCHLOROMETHANE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
ETHYLBENZENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
METHYLENE CHLORIDE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
STYRENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
TETRACHLOROETHENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
TOLUENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
TRANS-1,3-DICHLOROPROPENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
TRICHLOROETHENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
VINYL ACETATE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
VINYL CHLORIDE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
XYLENES, TOTAL	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	

NORTHEAST DRAINAGE DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
1,2,4-TRICHLOROBENZENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
1,2-DICHLOROBENZENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
1,3-DICHLOROBENZENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
1,4-DICHLOROBENZENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
2,4,5-TRICHLOROPHENOL	UG/L	0/1	1	0/1		12.50000	25.00000	25.00000	
2,4,6-TRICHLOROPHENOL	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
2,4-DICHLOROPHENOL	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
2,4-DIMETHYLPHENOL	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
2,4-DINITROPHENOL	UG/L	0/1	1	0/1		12.50000	25.00000	25.00000	
2,4-DINITROTOLUENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
2,6-DINITROTOLUENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
2-CHLORONAPHTHALENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
2-CHLOROPHENOL	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
2-METHYLNAPHTHALENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
2-METHYLPHENOL	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
2-NITROANILINE	UG/L	0/1	1	0/1		12.50000	25.00000	25.00000	
2-NITROPHENOL	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
3,3'-DICHLOROBENZIDINE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
3-NITROANILINE	NONE	0/1	1	0/1		12.50000	25.00000	25.00000	
4,6-DINITRO-2-METHYLPHENOL	UG/L	0/1	1	0/1		12.50000	25.00000	25.00000	
4-BROMOPHENYL PHENYL ETHER	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
4-CHLORO-3-METHYLPHENOL	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	

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NORTHEAST DRAINAGE DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
4-CHLOROPHENYLPHENYL ETHER	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
4-METHYLPHENOL	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
4-NITROANILINE	UG/L	0/1	1	0/1		12.50000	25.00000	25.00000	
4-NITROPHENOL	UG/L	0/1	1	0/1		12.50000	25.00000	25.00000	
ACENAPHTHENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
ACENAPHTHYLENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
ANTHRACENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
BENZO(A)ANTHRACENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
BENZO(A)PYRENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
BENZO(B)FLUORANTHENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
BENZO(G,H,I)PERYLENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
BENZO(K)FLUORANTHENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
BENZOIC ACID	UG/L	0/1	1	0/1		12.50000	25.00000	25.00000	
BENZYL ALCOHOL	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
BIS(2-CHLOROETHOXY)METHANE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
BIS(2-CHLOROETHYL)ETHER	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
BIS(2-CHLOROISOPROPYL) ETHER	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
BIS(2-ETHYLHEXYL)PHTHALATE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
BUTYL BENZYL PHTHALATE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
CHRYSENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
DI-N-BUTYL PHTHALATE	UG/L	1/1	1	1/1	2.00000-2.00000	2.00000			
DI-N-OCTYL PHTHALATE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	

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NORTHEAST DRAINAGE DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
DIBENZO(A,H)ANTHRACENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
DIBENZOFURAN	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
DIETHYL PHTHALATE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
DIMETHYL PHTHALATE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
FLUORANTHENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
FLUORENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
HEXACHLOROBENZENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
HEXACHLOROBUTADIENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
HEXACHLOROCYCLOPENTADIENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
HEXACHLOROETHANE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
INDENO(1,2,3-CD)PYRENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
ISOPHORONE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
N-NITROSO-DI-N-PROPYLAMINE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
N-NITROSODIPHENYLAMINE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
NAPHTHALENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
NITROBENZENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
P-CHLOROANILINE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
PENTACHLOROPHENOL	UG/L	0/1	1	0/1		12.50000	25.00000	25.00000	
PHENANTHRENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
PHENOL	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	
PYRENE	UG/L	0/1	1	0/1		5.00000	10.00000	10.00000	

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NORTHEAST DRAINAGE DITCH - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							95% Background Concentration Value
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	
GENERAL CHEMISTRY									
ALKALINITY AS CACO3	MG/L	1/1	1	1/1	350.00000-350.00000	350.00000			342
AMMONIA	MG/L	1/1	1	1/1	0.06820-0.06820	0.06820			0.0387
CHLORIDE	MG/L	1/1	1	0/1	28.40000-28.40000	28.40000			31.6
FLUORIDE	MG/L	1/1	1	1/1	0.30000-0.30000	0.30000			0.22
NITRATE/NITRITE	MG/L	0/1	1	0/1		0.01000	0.02000	0.02000	
PHENOLS	UG/L	0/1	1	0/1		0.00250	0.00500	0.00500	ND
PHOSPHATE	MG/L	1/1	1	1/1	0.29200-0.29200	0.29200			
SULFATE	MG/L	1/1	1	1/1	79.30000-79.30000	79.30000			55.7
SULFIDE	MG/L	0/1	1	0/1		0.50000	1.00000	1.00000	ND
TOTAL KJELDAHL NITROGEN	MG/L	1/1	1	1/1	0.50000-0.50000	0.50000			0.288
TOTAL ORGANIC CARBON	MG/L	1/1	1	1/1	8.20000-8.20000	8.20000			5.35
TOTAL ORGANIC HALIDES	MG/L	1/1	1	1/1	0.04110-0.04110	0.04110			0.011
TOTAL ORGANIC NITROGEN	MG/L	1/1	1	1/1	0.43200-0.43200	0.43200			0.288

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NORTHEAST DRAINAGE DITCH - 1993
SURFACE WATER DATA - FILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/L	1/1	1	1/1	3.10000-3.10000	3.10000			0.50
URANIUM, TOTAL	UGI/L	1/1	1	1/1	8.80000-8.80000	8.80000			1.1
URANIUM-234	PCI/L	1/1	1	1/1	3.10000-3.10000	3.10000			0.70
THORIUM-230	PCI/L	0/1	1	0/1		0.15000	0.30000	0.30000	0.28
RADIUM-226	PCI/L	0/1	1	0/1		0.50000	1.00000	1.00000	ND
URANIUM-235/236	PCI/L	0/1	1	0/1		0.10000	0.20000	0.20000	ND
THORIUM-232	PCI/L	0/1	1	0/1		0.10000	0.20000	0.20000	ND
THORIUM, TOTAL	UG/L	1/1	0	1/1	0.91201-0.91201	0.91201			ND
RADIUM-228	PCI/L	0/1	1	0/1		1.50000	3.00000	3.00000	ND
THORIUM-228	PCI/L	0/1	1	0/1		0.10000	0.20000	0.20000	ND
GROSS ALPHA	PCI/L	0/1	0	0/1		2.95000	5.90000	5.90000	5.3
GROSS BETA	PCI/L	1/1	0	1/1	6.40000-6.40000	6.40000			5.8

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NORTHEAST DRAINAGE DITCH - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/G	1/1	1	1/1	0.500-0.500	0.500			
URANIUM, TOTAL	MG/KG	2/5	2	2/5	3.900-4.300	4.300	11.000	11.000	1.67
URANIUM-234	PCI/G	1/1	1	1/1	0.600-0.600	0.600			
THORIUM-230	PCI/G	2/2	2	2/2	0.900-1.200	1.050			
RADIUM-226	PCI/G	2/2	2	0/2	0.500-0.700	0.600			1.93
URANIUM-235/236	PCI/G	0/1	1	0/1		0.050	0.100	0.100	
THORIUM-232	PCI/G	2/2	2	2/2	0.700-0.800	0.750			
THORIUM, TOTAL	MG/KG	2/2	0	2/2	6.384-7.296	6.840			
RADIUM-228	PCI/G	0/2	2	0/2		0.250	0.500	0.500	ND
THORIUM-228	PCI/G	2/2	2	2/2	0.800-0.800	0.800			
GROSS ALPHA	PCI/G	1/2	0	1/2	13.000-13.000	9.750	13.000	13.000	
GROSS BETA	PCI/G	0/2	0	0/2		18.750	36.000	39.000	

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NORTHEAST DRAINAGE DITCH - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/KG	1/1	1	1/1	4870.000-4870.000	4870.000			1970
ANTIMONY	MG/KG	0/1	1	0/1		1.900	3.800	3.800	
ARSENIC	MG/KG	1/1	1	1/1	11.700-11.700	11.700			7
BARIUM	MG/KG	1/1	1	1/1	90.400-90.400	90.400			21
BERYLLIUM	MG/KG	1/1	1	1/1	3.000-3.000	3.000			0.50
CADMIUM	MG/KG	0/1	1	0/1		0.800	1.600	1.600	3.7
CALCIUM	MG/KG	1/1	1	1/1	120000.000-120000.000	120000.000			25900
CHROMIUM	MG/KG	1/1	1	0/1	9.200-9.200	9.200			18.3
COBALT	MG/KG	1/1	1	1/1	12.100-12.100	12.100			4.9
COPPER	MG/KG	1/1	1	1/1	13.500-13.500	13.500			10.8
CYANIDE	MG/KG	1/1	1	1/1	0.390-0.390	0.390			
IRON	MG/KG	1/1	1	1/1	21000.000-21000.000	21000.000			6700
LEAD	MG/KG	1/1	1	1/1	78.400-78.400	78.400			
MAGNESIUM	MG/KG	1/1	1	1/1	20900.000-20900.000	20900.000			18300
MANGANESE	MG/KG	1/1	1	1/1	1400.000-1400.000	1400.000			411
MERCURY	MG/KG	0/1	1	0/1		0.040	0.080	0.080	ND
MOLYBDENUM	MG/KG	0/1	1	0/1		2.700	5.400	5.400	ND
NICKEL	MG/KG	1/1	1	1/1	17.700-17.700	17.700			13.7
POTASSIUM	MG/KG	1/1	1	1/1	713.000-713.000	713.000			307
SILICON	MG/KG	1/1	1	1/1	1140.000-1140.000	1140.000			
SODIUM	MG/KG	0/1	1	0/1		65.000	130.000	130.000	197

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NORTHEAST DRAINAGE DITCH - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
THALLIUM	MG/KG	0/1	1	0/1		0.160	0.320	0.320	ND
VANADIUM	MG/KG	1/1	1	1/1	24.300-24.300	24.300			12.4
ZINC	MG/KG	1/1	1	1/1	86.100-86.100	86.100			13.5

NORTHEAST DRAINAGE DITCH - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
1,1,1-TRICHLOROETHANE	UG/KG	0/1	1	0/1		8.000	16.000	16.000	
1,1,2,2-TETRACHLOROETHANE	UG/KG	0/1	1	0/1		8.000	16.000	16.000	
1,1,2-TRICHLOROETHANE	UG/KG	0/1	1	0/1		8.000	16.000	16.000	
1,1-DICHLOROETHANE	UG/KG	0/1	1	0/1		8.000	16.000	16.000	
1,1-DICHLOROETHENE	UG/KG	0/1	1	0/1		8.000	16.000	16.000	
1,2-DICHLOROETHANE	UG/KG	0/1	1	0/1		8.000	16.000	16.000	
1,2-DICHLOROETHENE (TOTAL)	UG/KG	0/1	1	0/1		8.000	16.000	16.000	
1,2-DICHLOROPROPANE	UG/KG	0/1	1	0/1		8.000	16.000	16.000	
2-BUTANONE	UG/KG	0/1	1	0/1		8.000	16.000	16.000	
2-HEXANONE	UG/KG	0/1	1	0/1		8.000	16.000	16.000	
4-METHYL-2-PENTANONE	UG/KG	0/1	1	0/1		8.000	16.000	16.000	
ACETONE	UG/KG	0/1	1	0/1		24.500	49.000	49.000	
BENZENE	UG/KG	0/1	1	0/1		8.000	16.000	16.000	
BROMODICHLOROMETHANE	UG/KG	0/1	1	0/1		8.000	16.000	16.000	
BROMOFORM	UG/KG	0/1	1	0/1		8.000	16.000	16.000	
BROMOMETHANE	UG/KG	0/1	1	0/1		8.000	16.000	16.000	
CARBON DISULFIDE	UG/KG	0/1	1	0/1		8.000	16.000	16.000	
CARBON TETRACHLORIDE	UG/KG	0/1	1	0/1		8.000	16.000	16.000	
CHLOROBENZENE	UG/KG	0/1	1	0/1		8.000	16.000	16.000	
CHLOROETHANE	UG/KG	0/1	1	0/1		8.000	16.000	16.000	
CHLOROFORM	UG/KG	0/1	1	0/1		8.000	16.000	16.000	

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NORTHEAST DRAINAGE DITCH - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
CHLOROMETHANE	UG/KG	0/1	1	0/1		8.000	16.000	16.000	
CIS-1,3-DICHLOROPROPENE	UG/KG	0/1	1	0/1		8.000	16.000	16.000	
DIBROMOCHLOROMETHANE	UG/KG	0/1	1	0/1		8.000	16.000	16.000	
ETHYLBENZENE	UG/KG	1/1	1	1/1	5.000-5.000	5.000			
METHYLENE CHLORIDE	UG/KG	0/1	1	0/1		8.000	16.000	16.000	
STYRENE	UG/KG	0/1	1	0/1		8.000	16.000	16.000	
TETRACHLOROETHENE	UG/KG	0/1	1	0/1		8.000	16.000	16.000	
TOLUENE	UG/KG	1/1	1	1/1	110.000-110.000	110.000			
TRANS-1,3-DICHLOROPROPENE	UG/KG	0/1	1	0/1		8.000	16.000	16.000	
TRICHLOROETHENE	UG/KG	0/1	1	0/1		8.000	16.000	16.000	
VINYL CHLORIDE	UG/KG	0/1	1	0/1		8.000	16.000	16.000	
XYLENES, TOTAL	UG/KG	0/1	1	0/1		8.000	16.000	16.000	

NORTHEAST DRAINAGE DITCH - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
1,2,4-TRICHLOROBENZENE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
1,2-DICHLOROBENZENE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
1,3-DICHLOROBENZENE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
1,4-DICHLOROBENZENE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
2,4,5-TRICHLOROPHENOL	UG/KG	0/1	1	0/1		650.000	1300.000	1300.000	
2,4,6-TRICHLOROPHENOL	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
2,4-DICHLOROPHENOL	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
2,4-DIMETHYLPHENOL	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
2,4-DINITROPHENOL	UG/KG	0/1	1	0/1		650.000	1300.000	1300.000	
2,4-DINITROTOLUENE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
2,6-DINITROTOLUENE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
2-CHLORONAPHTHALENE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
2-CHLOROPHENOL	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
2-METHYLNAPHTHALENE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
2-METHYLPHENOL	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
2-NITROANILINE	UG/KG	0/1	1	0/1		650.000	1300.000	1300.000	
2-NITROPHENOL	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
3,3'-DICHLOROBENZIDINE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
3-NITROANILINE	NONE	0/1	1	0/1		650.000	1300.000	1300.000	
4,6-DINITRO-2-METHYLPHENOL	UG/KG	0/1	1	0/1		650.000	1300.000	1300.000	
4-BROMOPHENYL PHENYL ETHER	UG/KG	0/1	1	0/1		260.000	520.000	520.000	

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NORTHEAST DRAINAGE DITCH - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
4-CHLORO-3-METHYLPHENOL	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
4-CHLOROPHENYLPHENYL ETHER	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
4-METHYLPHENOL	UG/KG	1/1	1	1/1	200.000-200.000	200.000			
4-NITROANILINE	UG/KG	0/1	1	0/1		650.000	1300.000	1300.000	
4-NITROPHENOL	UG/KG	0/1	1	0/1		650.000	1300.000	1300.000	
ACENAPHTHENE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
ACENAPHTHYLENE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
ANTHRACENE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
BENZO(A)ANTHRACENE	UG/KG	1/1	1	1/1	83.000-83.000	83.000			
BENZO(A)PYRENE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
BENZO(B)FLUORANTHENE	UG/KG	1/1	1	1/1	82.000-82.000	82.000			
BENZO(G,H,I)PERYLENE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
BENZO(K)FLUORANTHENE	UG/KG	1/1	1	1/1	81.000-81.000	81.000			
BENZOIC ACID	UG/KG	1/1	1	1/1	210.000-210.000	210.000			
BENZYL ALCOHOL	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
BIS(2-CHLOROETHOXY)METHANE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
BIS(2-CHLOROETHYL)ETHER	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
BIS(2-CHLOROISOPROPYL) ETHER	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
BUTYL BENZYL PHTHALATE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
CHRYSENE	UG/KG	1/1	1	1/1	84.000-84.000	84.000			

NORTHEAST DRAINAGE DITCH - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
DI-N-BUTYL PHTHALATE	UG/KG	1/1	1	1/1	81.000-81.000	81.000			
DI-N-OCTYL PHTHALATE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
DIBENZO(A,H)ANTHRACENE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
DIBENZOFURAN	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
DIETHYL PHTHALATE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
DIMETHYL PHTHALATE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
FLUORANTHENE	UG/KG	1/1	1	1/1	180.000-180.000	180.000			
FLUORENE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
HEXACHLOROBENZENE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
HEXACHLOROBUTADIENE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
HEXACHLOROCYCLOPENTADIENE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
HEXACHLOROETHANE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
INDENO(1,2,3-CD)PYRENE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
ISOPHORONE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
N-NITROSO-DI-N-PROPYLAMINE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
N-NITROSODIPHENYLAMINE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
NAPHTHALENE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
NITROBENZENE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
P-CHLOROANILINE	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
PENTACHLOROPHENOL	UG/KG	0/1	1	0/1		650.000	1300.000	1300.000	
PHENANTHRENE	UG/KG	1/1	1	1/1	110.000-110.000	110.000			

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NORTHEAST DRAINAGE DITCH - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
PHENOL	UG/KG	0/1	1	0/1		260.000	520.000	520.000	
PYRENE	UG/KG	1/1	1	1/1	130.000-130.000	130.000			

AREA: FEMP EFFLUENT - 1988/89
SURFACE WATER DATA - UNFILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect
RADIONUCLIDES							
URANIUM-238	PCI/L	3/3	3	168.0000-339.0000	263.0000		
URANIUM, TOTAL	UG/L	3/3	3	715.0000-1021.0000	760.0000		
URANIUM-234	PCI/L	3/3	3	153.0000-375.0000	278.0000		
THORIUM-230	PCI/L	1/3	3	1.2000-1.2000	0.5000	1.000	1.000
RADIUM-226	PCI/L	0/3	3		0.5000	1.000	1.000
URANIUM-235/236	PCI/L	3/3	3	16.5000-37.0000	33.5000		
THORIUM-232	PCI/L	1/3	3	4.7000-4.7000	0.5000	1.000	1.000
THORIUM, TOTAL	UG/L	1/1	0	42.8640-42.8640	42.8640		
RADIUM-228	PCI/L	0/2	2		1.5000	3.000	3.000
THORIUM-228	PCI/L	0/3	3		0.5000	1.000	1.000
NEPTUNIUM-237	PCI/L	0/3	3		0.5000	1.000	1.000
PLUTONIUM-239/240	PCI/L	0/3	3		0.5000	1.000	1.000
PLUTONIUM-238	PCI/L	0/3	3		0.5000	1.000	1.000
STRONTIUM-90	PCI/L	0/3	3		2.5000	5.000	5.000
TECHNETIUM-99	PCI/L	2/2	2	766.0000-21887.0000	11326.5000		

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AREA: FEMP EFFLUENT - 1988/89
SURFACE WATER DATA - UNFILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect
INORGANICS							
ALUMINUM	MG/L	1/1	1	1.3300-1.3300	1.3300		
ANTIMONY	MG/L	1/1	1	0.0110-0.0110	0.0110		
ARSENIC	MG/L	0/2	2		0.0020	0.002	0.005
BARIUM	MG/L	2/2	2	0.0400-0.0580	0.0490		
BERYLLIUM	MG/L	0/1	1		0.0010	0.001	0.001
CADMIUM	MG/L	0/2	2		0.0010	0.002	0.002
CALCIUM	MG/L	2/2	2	42.3000-46.4000	44.3500		
CHROMIUM	MG/L	0/2	2		0.0100	0.020	0.020
COBALT	MG/L	0/1	1		0.0050	0.010	0.010
COPPER	MG/L	2/2	2	0.0200-0.0330	0.0270		
CYANIDE	MG/L	0/1	1		0.0050	0.010	0.010
IRON	MG/L	2/2	2	1.5000-2.0000	1.7500		
LEAD	MG/L	1/2	2	0.1260-0.1260	0.0660	0.010	0.010
MAGNESIUM	MG/L	2/2	2	175.0000-209.0000	192.0000		
MANGANESE	MG/L	2/2	2	0.5000-0.5250	0.5130		
MERCURY	MG/L	0/2	2		0.0000	0.000	0.000
MOLYBDENUM	MG/L	0/2	2		0.0110	0.020	0.022
NICKEL	MG/L	0/2	2		0.0100	0.020	0.020
POTASSIUM	MG/L	1/1	1	13.8000-13.8000	13.8000		
SELENIUM	MG/L	0/2	2		0.0010	0.002	0.002
SILVER	MG/L	0/1	1		0.0050	0.010	0.010
SODIUM	MG/L	2/2	2	117.0000-196.0000	156.5000		

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AREA: FEMP EFFLUENT - 1988/89
SURFACE WATER DATA - UNFILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect
INORGANICS							
THALLIUM	MG/L	0/1	1		0.0010	0.001	0.001
VANADIUM	MG/L	0/1	1		0.0050	0.010	0.010
ZINC	MG/L	1/1	1	0.2030-0.2030	0.2030		

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AREA: FEMP EFFLUENT - 1988/89
SURFACE WATER DATA - UNFILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect
VOLATILES							
1,1,1-TRICHLOROETHANE	UG/L	0/1	1		2.5000	5.000	5.000
1,1,2,2-TETRACHLOROETHANE	UG/L	0/1	1		2.5000	5.000	5.000
1,1,2-TRICHLOROETHANE	UG/L	0/1	1		2.5000	5.000	5.000
1,1-DICHLOROETHANE	UG/L	0/1	1		2.5000	5.000	5.000
1,1-DICHLOROETHENE	UG/L	0/1	1		2.5000	5.000	5.000
1,2-DICHLOROETHANE	UG/L	0/1	1		2.5000	5.000	5.000
1,2-DICHLOROETHENE (TOTAL)	UG/L	0/1	1		2.5000	5.000	5.000
1,2-DICHLOROPROPANE	UG/L	0/1	1		2.5000	5.000	5.000
2-BUTANONE	UG/L	0/1	1		2.5000	5.000	5.000
2-HEXANONE	UG/L	0/1	1		5.0000	10.000	10.000
4-METHYL-2-PENTANONE	UG/L	0/1	1		5.0000	10.000	10.000
ACETONE	UG/L	0/1	1		5.0000	10.000	10.000
BENZENE	UG/L	0/1	1		2.5000	5.000	5.000
BROMODICHLOROMETHANE	UG/L	0/1	1		2.5000	5.000	5.000
BROMOFORM	UG/L	0/1	1		2.5000	5.000	5.000
BROMOMETHANE	UG/L	0/1	1		5.0000	10.000	10.000
CARBON DISULFIDE	UG/L	0/1	1		2.5000	5.000	5.000
CARBON TETRACHLORIDE	UG/L	0/1	1		2.5000	5.000	5.000
CHLOROBENZENE	UG/L	0/1	1		2.5000	5.000	5.000
CHLOROETHANE	UG/L	0/1	1		5.0000	10.000	10.000
CHLOROFORM	UG/L	0/1	1		2.5000	5.000	5.000
CHLOROMETHANE	UG/L	0/1	1		5.0000	10.000	10.000

AREA: FEMP EFFLUENT - 1988/89
SURFACE WATER DATA - UNFILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect
VOLATILES							
CIS-1,3-DICHLOROPROPENE	UG/L	0/1	1		2.5000	5.000	5.000
DIBROMOCHLOROMETHANE	UG/L	0/1	1		2.5000	5.000	5.000
ETHYLBENZENE	UG/L	0/1	1		2.5000	5.000	5.000
METHYLENE CHLORIDE	UG/L	0/1	1		3.0000	6.000	6.000
STYRENE	UG/L	0/1	1		2.5000	5.000	5.000
TETRACHLOROETHENE	UG/L	0/1	1		2.5000	5.000	5.000
TOLUENE	UG/L	0/1	1		2.5000	5.000	5.000
TRANS-1,3-DICHLOROPROPENE	UG/L	0/1	1		2.5000	5.000	5.000
TRICHLOROETHENE	UG/L	0/1	1		2.5000	5.000	5.000
VINYL ACETATE	UG/L	0/1	1		5.0000	10.000	10.000
VINYL CHLORIDE	UG/L	0/1	1		5.0000	10.000	10.000
XYLENES, TOTAL	UG/L	0/1	1		2.5000	5.000	5.000

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AREA: FEMP EFFLUENT - 1988/89
SURFACE WATER DATA - UNFILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect
SEMIVOLATILES							
2-CHLOROETHYLVINYL ETHER	UG/L	0/1	1		5.0000	10.000	10.000

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AREA: FEMP EFFLUENT - 1988/89
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections					
		Freq. of Detection	Total Validated Samples	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect
GENERAL CHEMISTRY							
AMMONIA	MG/L	1/1	1	0.2100-0.2100	0.2100		
CHLORIDE	MG/L	1/1	1	26.0000-26.0000	26.0000		
FLUORIDE	MG/L	1/1	1	7.2000-7.2000	7.2000		
NITRATE	MG/L	1/1	1	23.8000-23.8000	23.8000		
PHENOLS	MG/L	1/1	1	0.0200-0.0200	0.0200		
PHOSPHORUS	MG/L	1/1	1	0.7250-0.7250	0.7250		
SULFATE	MG/L	1/1	1	352.0000-352.0000	352.0000		
TOTAL ORGANIC HALIDES	MG/L	0/1	1		0.0250	0.050	0.050
TOTAL ORGANIC NITROGEN	MG/L	1/1	1	0.5000-0.5000	0.5000		

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FEMP EFFLUENT - 1988/89
SURFACE WATER DATA - FILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections					
		Freq. of Detection	Total Validated Samples	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect
RADIONUCLIDES							
URANIUM-238	PCI/L	2/2	2	252.0000-255.0000	253.5000		
URANIUM, TOTAL	UG/L	2/2	2	740.0000-788.0000	764.0000		
URANIUM-234	PCI/L	2/2	2	263.0000-284.0000	273.5000		
THORIUM-230	PCI/L	0/2	2		0.5000	1.000	1.000
RADIUM-226	PCI/L	0/2	2		0.5000	1.000	1.000
URANIUM-235/236	PCI/L	2/2	2	26.6000-30.2000	28.4000		
THORIUM-232	PCI/L	1/2	2	2.2000-2.2000	1.3500	1.000	1.000
THORIUM, TOTAL	UG/L	1/1	0	20.0640-20.0640	20.0640		
RADIUM-228	PCI/L	0/1	1		1.5000	3.000	3.000
THORIUM-228	PCI/L	0/2	2		0.5000	1.000	1.000
NEPTUNIUM-237	PCI/L	0/2	2		0.5000	1.000	1.000
PLUTONIUM-239/240	PCI/L	0/2	2		0.5000	1.000	1.000
PLUTONIUM-238	PCI/L	0/2	2		0.5000	1.000	1.000
STRONTIUM-90	PCI/L	0/2	2		2.5000	5.000	5.000
TECHNETIUM-99	PCI/L	1/1	1	7692.0000-7692.0000	7692.0000		

AREA: FEMP EFFLUENT - 1988/89
SURFACE WATER DATA - FILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect
INORGANICS							
ARSENIC	MG/L	0/1	1		0.0030	0.005	0.005
BARIUM	MG/L	1/1	1	0.0300-0.0300	0.0300		
CADMIUM	MG/L	0/1	1		0.0010	0.002	0.002
CALCIUM	MG/L	1/1	1	42.0000-42.0000	42.0000		
CHROMIUM	MG/L	0/1	1		0.0100	0.020	0.020
COPPER	MG/L	0/1	1		0.0050	0.010	0.010
IRON	MG/L	0/1	1		0.0030	0.005	0.005
MAGNESIUM	MG/L	1/1	1	165.0000-165.0000	165.0000		
MANGANESE	MG/L	1/1	1	0.0200-0.0200	0.0200		
MERCURY	MG/L	0/1	1		0.0000	0.000	0.000
MOLYBDENUM	MG/L	0/1	1		0.0100	0.020	0.020
NICKEL	MG/L	0/1	1		0.0100	0.020	0.020
POTASSIUM	MG/L	1/1	1	12.7000-12.7000	12.7000		
SELENIUM	MG/L	0/1	1		0.0010	0.002	0.002
SILVER	MG/L	0/1	1		0.0050	0.010	0.010
SODIUM	MG/L	1/1	1	189.0000-189.0000	189.0000		

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AREA: FEMP EFFLUENT - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections					
		Freq. of Detection	Total Validated Samples	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect
RADIONUCLIDES							
URANIUM-238	PCI/G	2/2	2	180.000-244.000	212.000		
URANIUM, TOTAL	MG/KG	2/2	2	595.000-614.000	604.500		
URANIUM-234	PCI/G	2/2	2	126.000-174.000	150.000		
THORIUM-230	PCI/G	1/2	2	28.200-28.200	14.250	0.600	0.600
RADIUM-226	PCI/G	2/2	2	5.500-6.800	6.150		
URANIUM-235/236	PCI/G	2/2	2	9.600-12.100	10.850		
THORIUM-232	PCI/G	2/2	2	2.200-3.400	2.800		
THORIUM, TOTAL	MG/KG	2/2	0	20.065-31.013	25.539		
RADIUM-228	PCI/G	2/2	2	16.800-24.500	20.650		
THORIUM-228	PCI/G	2/2	2	4.400-32.000	18.200		
NEPTUNIUM-237	PCI/G	0/2	2		0.300	0.600	0.600
PLUTONIUM-239/240	PCI/G	1/2	2	0.600-0.600	0.450	0.600	0.600
PLUTONIUM-238	PCI/G	0/2	2		0.300	0.600	0.600
STRONTIUM-90	PCI/G	2/2	2	2.600-3.400	3.000		
TECHNETIUM-99	PCI/G	2/2	2	365.000-692.000	528.500		
RUTHENIUM-106	PCI/G	0/2	2		0.625	1.000	1.500
CESIUM-137	PCI/G	2/2	2	2.400-6.000	4.200		

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AREA: FEMP EFFLUENT - 1988/89
SEDIMENT DATA

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect
INORGANICS							
ALUMINUM	MG/KG	1/1	0	3160.000-3160.000	3160.000		
ANTIMONY	MG/KG	0/2	1		0.075	0.100	0.200
ARSENIC	MG/KG	1/1	0	9.400-9.400	9.400		
BARIUM	MG/KG	1/1	0	1450.000-1450.000	1450.000		
BERYLLIUM	MG/KG	0/2	1		0.100	0.100	0.300
CADMIUM	MG/KG	1/1	0	1.200-1.200	1.200		
CALCIUM	MG/KG	1/1	0	00000.000-300000.000	300000.000		
CHROMIUM	MG/KG	1/1	0	31.500-31.500	31.500		
COBALT	MG/KG	1/1	0	8.500-8.500	8.500		
COPPER	MG/KG	1/1	0	328.000-328.000	328.000		
CYANIDE	MG/KG	0/2	1		0.625	0.900	1.600
IRON	MG/KG	1/1	0	6820.000-6820.000	6820.000		
LEAD	MG/KG	1/1	0	94.700-94.700	94.700		
MAGNESIUM	MG/KG	1/1	0	8240.000-8240.000	8240.000		
MANGANESE	MG/KG	1/1	0	645.000-645.000	645.000		
MERCURY	MG/KG	1/1	0	1.600-1.600	1.600		
MOLYBDENUM	MG/KG	0/2	1		2.375	2.900	6.600
NICKEL	MG/KG	1/1	0	30.800-30.800	30.800		
POTASSIUM	MG/KG	1/1	0	620.000-620.000	620.000		
SELENIUM	MG/KG	0/2	1		0.300	0.500	0.700
SILVER	MG/KG	1/1	0	0.600-0.600	0.600		

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AREA: FEMP EFFLUENT - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections					
		Freq. of Detection	Total Validated Samples	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect
INORGANICS							
SODIUM	MG/KG	1/1	0	387.000-387.000	387.000		
THALLIUM	MG/KG	0/2	1		0.150	0.300	0.300
VANADIUM	MG/KG	1/1	0	14.400-14.400	14.400		
ZINC	MG/KG	1/1	0	267.000-267.000	267.000		

AREA: FEMP EFFLUENT - 1988/89
SEDIMENT DATA

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect
VOLATILES							
1,1,1-TRICHLOROETHANE	UG/KG	0/1	1		4.000	8.000	8.000
1,1,2,2-TETRACHLOROETHANE	UG/KG	0/1	1		4.000	8.000	8.000
1,1,2-TRICHLOROETHANE	UG/KG	0/1	1		4.000	8.000	8.000
1,1-DICHLOROETHANE	UG/KG	0/1	1		4.000	8.000	8.000
1,1-DICHLOROETHENE	UG/KG	0/1	1		4.000	8.000	8.000
1,2-DICHLOROETHANE	UG/KG	0/1	1		4.000	8.000	8.000
1,2-DICHLOROETHENE (TOTAL)	UG/KG	0/1	1		4.000	8.000	8.000
1,2-DICHLOROPROPANE	UG/KG	0/1	1		4.000	8.000	8.000
2-HEXANONE	UG/KG	0/1	1		7.500	15.000	15.000
4-METHYL-2-PENTANONE	UG/KG	0/1	1		7.500	15.000	15.000
BENZENE	UG/KG	0/1	1		4.000	8.000	8.000
BROMODICHLOROMETHANE	UG/KG	0/1	1		4.000	8.000	8.000
BROMOFORM	UG/KG	0/1	1		4.000	8.000	8.000
BROMOMETHANE	UG/KG	0/1	1		7.500	15.000	15.000
CARBON DISULFIDE	UG/KG	0/1	1		4.000	8.000	8.000
CARBON TETRACHLORIDE	UG/KG	0/1	1		4.000	8.000	8.000
CHLOROBENZENE	UG/KG	0/1	1		4.000	8.000	8.000
CHLOROETHANE	UG/KG	0/1	1		7.500	15.000	15.000
CHLOROFORM	UG/KG	0/1	1		4.000	8.000	8.000
CHLOROMETHANE	UG/KG	0/1	1		7.500	15.000	15.000
CIS-1,3-DICHLOROPROPENE	UG/KG	0/1	1		4.000	8.000	8.000

AREA: FEMP EFFLUENT - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections					
		Freq. of Detection	Total Validated Samples	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect
VOLATILES							
DIBROMOCHLOROMETHANE	UG/KG	0/1	1		4.000	8.000	8.000
ETHYLBENZENE	UG/KG	0/1	1		4.000	8.000	8.000
METHYLENE CHLORIDE	UG/KG	0/1	1		4.000	8.000	8.000
STYRENE	UG/KG	0/1	1		4.000	8.000	8.000
TETRACHLOROETHENE	UG/KG	0/1	1		4.000	8.000	8.000
TOLUENE	UG/KG	0/1	1		4.000	8.000	8.000
TRANS-1,3-DICHLOROPROPENE	UG/KG	0/1	1		4.000	8.000	8.000
TRICHLOROETHENE	UG/KG	0/1	1		4.000	8.000	8.000
VINYL ACETATE	UG/KG	0/1	1		7.500	15.000	15.000
VINYL CHLORIDE	UG/KG	0/1	1		7.500	15.000	15.000
XYLENES, TOTAL	UG/KG	0/1	1		4.000	8.000	8.000

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AREA: FEMP EFFLUENT - 1988/89
SEDIMENT DATA

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect
SEMIVOLATILES							
1,2,4-TRICHLOROBENZENE	UG/KG	0/1	0		550.000	1100.000	1100.000
1,2-DICHLOROBENZENE	UG/KG	0/1	0		550.000	1100.000	1100.000
1,3-DICHLOROBENZENE	UG/KG	0/1	0		550.000	1100.000	1100.000
1,4-DICHLOROBENZENE	UG/KG	0/1	0		550.000	1100.000	1100.000
2,4,5-TRICHLOROPHENOL	UG/KG	0/1	0		2750.000	5500.000	5500.000
2,4,6-TRICHLOROPHENOL	UG/KG	0/1	0		550.000	1100.000	1100.000
2,4-DICHLOROPHENOL	UG/KG	0/1	0		550.000	1100.000	1100.000
2,4-DIMETHYLPHENOL	UG/KG	0/1	0		550.000	1100.000	1100.000
2,4-DINITROPHENOL	UG/KG	0/1	0		2750.000	5500.000	5500.000
2,4-DINITROTOLUENE	UG/KG	0/1	0		550.000	1100.000	1100.000
2,6-DINITROTOLUENE	UG/KG	0/1	0		550.000	1100.000	1100.000
2-CHLORONAPHTHALENE	UG/KG	0/1	0		550.000	1100.000	1100.000
2-CHLOROPHENOL	UG/KG	0/1	0		550.000	1100.000	1100.000
2-METHYLNAPHTHALENE	UG/KG	0/1	0		550.000	1100.000	1100.000
2-METHYLPHENOL	UG/KG	0/1	0		550.000	1100.000	1100.000
2-NITROANILINE	UG/KG	0/1	0		2750.000	5500.000	5500.000
2-NITROPHENOL	UG/KG	0/1	0		550.000	1100.000	1100.000
3,3'-DICHLOROBENZIDINE	UG/KG	0/1	0		1100.000	2200.000	2200.000
3-NITROANILINE	NONE	0/1	0		2750.000	5500.000	5500.000
4,6-DINITRO-2-METHYLPHENOL	UG/KG	0/1	0		2750.000	5500.000	5500.000
4-BROMOPHENYL PHENYL ETHER	UG/KG	0/1	0		550.000	1100.000	1100.000

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AREA: FEMP EFFLUENT - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections					
		Freq. of Detection	Total Validated Samples	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect
SEMIVOLATILES							
4-CHLORO-3-METHYLPHENOL	UG/KG	0/1	0		550.000	1100.000	1100.000
4-CHLOROPHENYLPHENYL ETHER	UG/KG	0/1	0		550.000	1100.000	1100.000
4-METHYLPHENOL	UG/KG	0/1	0		550.000	1100.000	1100.000
4-NITROANILINE	UG/KG	0/1	0		2750.000	5500.000	5500.000
4-NITROPHENOL	UG/KG	0/1	0		2750.000	5500.000	5500.000
ACENAPHTHENE	UG/KG	1/1	0	560.000-560.000	560.000		
ACENAPHTHYLENE	UG/KG	0/1	0		550.000	1100.000	1100.000
ANTHRACENE	UG/KG	1/1	0	1000.000-1000.000	1000.000		
BENZO(A)ANTHRACENE	UG/KG	1/1	0	1900.000-1900.000	1900.000		
BENZO(A)PYRENE	UG/KG	1/1	0	1700.000-1700.000	1700.000		
BENZO(B)FLUORANTHENE	UG/KG	1/1	0	2500.000-2500.000	2500.000		
BENZO(G,H,I)PERYLENE	UG/KG	1/1	0	1200.000-1200.000	1200.000		
BENZO(K)FLUORANTHENE	UG/KG	1/1	0	1400.000-1400.000	1400.000		
BENZOIC ACID	UG/KG	0/1	0		2750.000	5500.000	5500.000
BENZYL ALCOHOL	UG/KG	0/1	0		550.000	1100.000	1100.000
BIS(2-CHLOROETHOXY)METHANE	UG/KG	0/1	0		550.000	1100.000	1100.000
BIS(2-CHLOROETHYL)ETHER	UG/KG	0/1	0		550.000	1100.000	1100.000
BIS(2-CHLOROISOPROPYL) ETHER	UG/KG	0/1	0		550.000	1100.000	1100.000
BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	1/1	0	1700.000-1700.000	1700.000		
BUTYL BENZYL PHTHALATE	UG/KG	0/1	0		550.000	1100.000	1100.000
CHRYSENE	UG/KG	1/1	0	2400.000-2400.000	2400.000		

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5698

AREA: FEMP EFFLUENT - 1988/89
SEDIMENT DATA

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect
SEMIVOLATILES							
DI-N-BUTYL PHTHALATE	UG/KG	1/1	0	4800.000-4800.000	4800.000		
DI-N-OCTYL PHTHALATE	UG/KG	0/1	0		550.000	1100.000	1100.000
DIBENZO(A,H)ANTHRACENE	UG/KG	0/1	0		550.000	1100.000	1100.000
DIBENZOFURAN	UG/KG	1/1	0	290.000-290.000	290.000		
DIETHYL PHTHALATE	UG/KG	1/1	0	120.000-120.000	120.000		
DIMETHYL PHTHALATE	UG/KG	0/1	0		550.000	1100.000	1100.000
FLUORANTHENE	UG/KG	1/1	0	5200.000-5200.000	5200.000		
FLUORENE	UG/KG	1/1	0	490.000-490.000	490.000		
HEXACHLOROBENZENE	UG/KG	0/1	0		550.000	1100.000	1100.000
HEXACHLOROBUTADIENE	UG/KG	0/1	0		550.000	1100.000	1100.000
HEXACHLOROCYCLOPENTADIENE	UG/KG	0/1	0		550.000	1100.000	1100.000
HEXACHLOROETHANE	UG/KG	0/1	0		550.000	1100.000	1100.000
INDENO(1,2,3-CD)PYRENE	UG/KG	0/1	0		550.000	1100.000	1100.000
ISOPHORONE	UG/KG	0/1	0		550.000	1100.000	1100.000
N-NITROSO-DI-N-PROPYLAMINE	UG/KG	0/1	0		550.000	1100.000	1100.000
N-NITROSODIPHENYLAMINE	UG/KG	1/1	0	210.000-210.000	210.000		
NAPHTHALENE	UG/KG	0/1	0		550.000	1100.000	1100.000
NITROBENZENE	UG/KG	0/1	0		550.000	1100.000	1100.000
P-CHLOROANILINE	UG/KG	0/1	0		550.000	1100.000	1100.000
PENTACHLOROPHENOL	UG/KG	0/1	0		2750.000	5500.000	5500.000
PHENANTHRENE	UG/KG	1/1	0	4800.000-4800.000	4800.000		

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AREA: FEMP EFFLUENT - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections					
		Freq. of Detection	Total Validated Samples	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect
SEMIVOLATILES							
PHENOL	UG/KG	0/1	0		550.000	1100.000	1100.000
PYRENE	UG/KG	1/1	0	4500.000-4500.000	4500.000		

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AREA: FEMP EFFLUENT - 1988/89
SEDIMENT DATA

Parameter	Units	Freq. of Detection	Total Validated Samples	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect
		Summary of Positive/Nonpositive Detections					
PESTICIDES							
4,4'-DDD	UG/KG	0/2	0		20.250	27.000	54.000
4,4'-DDE	UG/KG	0/2	0		24.750	28.000	71.000
4,4'-DDT	UG/KG	0/2	0		105.000	210.000	210.000
ALDRIN	UG/KG	0/2	0		16.000	28.000	36.000
ALPHA-BHC	UG/KG	0/2	0		10.250	14.000	27.000
ALPHA-CHLORDANE	UG/KG	0/2	0		102.500	140.000	270.000
AROCLOR-1016	UG/KG	0/2	0		102.500	140.000	270.000
AROCLOR-1221	UG/KG	0/2	0		102.500	140.000	270.000
AROCLOR-1232	UG/KG	0/2	0		102.500	140.000	270.000
AROCLOR-1242	UG/KG	0/2	0		102.500	140.000	270.000
AROCLOR-1248	UG/KG	0/2	0		102.500	140.000	270.000
AROCLOR-1254	UG/KG	2/2	0	2000.000-2600.000	2300.000		
AROCLOR-1260	UG/KG	2/2	0	420.000-660.000	540.000		
BETA-BHC	UG/KG	0/2	0		140.000	250.000	310.000
DELTA-BHC	UG/KG	0/2	0		10.250	14.000	27.000
DIELDRIN	UG/KG	0/2	0		26.250	27.000	78.000
ENDOSULFAN II	UG/KG	0/2	0		20.250	27.000	54.000
ENDOSULFAN SULFATE	UG/KG	2/2	0	310.000-330.000	320.000		
ENDOSULFAN-I	UG/KG	0/2	0		10.250	14.000	27.000
ENDRIN	UG/KG	0/2	0		20.250	27.000	54.000
ENDRIN KETONE	UG/KG	0/2	0		20.250	27.000	54.000

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AREA: FEMP EFFLUENT - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections					
		Freq. of Detection	Total Validated Samples	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect
PESTICIDES							
GAMMA-BHC (LINDANE)	UG/KG	0/2	0		10.250	14.000	27.000
GAMMA-CHLORDANE	UG/KG	0/2	0		102.500	140.000	270.000
HEPTACHLOR	UG/KG	0/2	0		10.250	14.000	27.000
HEPTACHLOR EPOXIDE	UG/KG	0/2	0		10.250	14.000	27.000
METHOXYCHLOR	UG/KG	0/2	0		102.500	140.000	270.000
TOXAPHENE	UG/KG	0/2	0		1675.000	3300.000	3400.000

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5698

AREA: FEMP EFFLUENT - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections					
		Freq. of Detection	Total Validated Samples	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect
ORGANOPHOSPHORUS PESTICIDES							
AZINPHOSMETHYL	UG/KG	0/1	0		250.000	500.000	500.000
DEMETON	UG/KG	0/1	0		25.000	50.000	50.000
DIAZINON	UG/KG	0/1	0		25.000	50.000	50.000
DISULFOTON	UG/KG	0/1	0		25.000	50.000	50.000
ETHION	UG/KG	0/1	0		25.000	50.000	50.000
MALATHION	UG/KG	0/1	0		25.000	50.000	50.000
METHYL PARATHION	UG/KG	0/1	0		25.000	50.000	50.000
PARATHION	UG/KG	0/1	0		25.000	50.000	50.000

000627

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AREA: FEMP EFFLUENT - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections					
		Freq. of Detection	Total Validated Samples	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect
GENERAL CHEMISTRY							
AMMONIA	MG/KG	1/1	0	32.200-32.200	32.200		
CHLORIDE	MG/KG	1/1	0	12.500-12.500	12.500		27.8
FLUORIDE	MG/KG	1/1	0	7.500-7.500	7.500		0.22
NITRATE	MG/KG	1/1	0	26.900-26.900	26.900		1.70
PHENOLS	UG/KG	1/1	0	1.000-1.000	1.000		
PHOSPHORUS	MG/KG	1/1	0	3.750-3.750	3.750		
SULFATE	MG/KG	1/1	0	190.000-190.000	190.000		55.7
TOTAL ORGANIC NITROGEN	MG/KG	1/1	0	174.000-174.000	174.000		0.29

000628

GREAT MIAMI RIVER - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/L	4/4	4	1/4	0.50000-0.80000	0.50000			0.76
URANIUM, TOTAL	UG/L	9/9	5	8/9	1.30000-2.10000	2.00000			1.4
URANIUM-234	PCI/L	4/4	4	0/4	0.50000-0.70000	0.70000			1.1
THORIUM-230	PCI/L	1/3	3	1/3	0.40000-0.40000	0.15000	0.30000	0.30000	0.36
RADIUM-226	PCI/L	1/5	5	1/5	1.60000-1.60000	0.50000	1.00000	1.00000	0.41
URANIUM-235/236	PCI/L	0/4	4	0/4		0.10000	0.20000	0.20000	0.25
THORIUM-232	PCI/L	0/3	3	0/3		0.10000	0.20000	0.20000	ND
THORIUM, TOTAL	UG/L	1/1	0	1/1	1.82401-1.82401	1.82401			NA
RADIUM-228	PCI/L	0/5	5	0/5		1.50000	3.00000	3.00000	2.2
THORIUM-228	PCI/L	0/3	3	0/3		0.10000	0.20000	0.20000	0.62
TECHNETIUM-99	PCI/L	0/3	3	0/3		7.50000	15.00000	15.00000	ND
GROSS ALPHA	PCI/L	2/4	0	2/4	0.80000-3.30000	2.12500	4.20000	4.30000	
GROSS BETA	PCI/L	1/4	0	1/4	11.00000-11.00000	2.45000	4.20000	4.90000	

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GREAT MIAMI RIVER - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/L	4/6	6	1/6	0.66800-19.10000	0.67100	0.08450	0.53400	1.89
ANTIMONY	MG/L	0/6	6	0/6		0.00700	0.01400	0.01400	ND
ARSENIC	MG/L	2/6	6	1/6	0.00290-0.00620	0.00050	0.00100	0.00100	0.0036
BARIUM	MG/L	6/6	6	2/6	0.08850-0.22800	0.09465			0.100
BERYLLIUM	MG/L	1/6	6	1/6	0.00770-0.00770	0.00250	0.00500	0.00500	ND
CADMIUM	MG/L	2/6	6	1/6	0.00570-0.01840	0.00250	0.00500	0.00500	0.0098
CALCIUM	MG/L	6/6	6	5/6	75.60000-123.00000	81.55000			77.0
CHROMIUM	MG/L	1/6	6	1/6	0.02640-0.02640	0.00300	0.00600	0.00600	ND
COBALT	MG/L	0/6	6	0/6		0.00850	0.01700	0.01700	ND
COPPER	MG/L	1/6	6	1/6	0.03080-0.03080	0.00450	0.00900	0.00900	0.0118
CYANIDE	MG/L	2/4	4	2/4	0.00610-0.02140	0.00430	0.00500	0.00500	0.0052
IRON	MG/L	5/6	6	1/6	0.62100-18.70000	0.72100	0.02200	0.02200	2.23
LEAD	MG/L	4/6	6	2/6	0.00690-0.04420	0.00735	0.00270	0.00540	0.010
MAGNESIUM	MG/L	6/6	6	2/6	27.20000-47.50000	32.00000			33.9
MANGANESE	MG/L	6/6	6	3/6	0.00440-0.56100	0.08210			0.082
MERCURY	MG/L	0/6	6	0/6		0.00005	0.00010	0.00010	ND
MOLYBDENUM	MG/L	0/6	6	0/6		0.00850	0.01700	0.01700	0.02
NICKEL	MG/L	1/6	6	1/6	0.02590-0.02590	0.00900	0.01800	0.01800	0.023
POTASSIUM	MG/L	6/6	6	1/6	3.64000-6.82000	3.78000			6.08
SELENIUM	MG/L	0/6	6	0/6		0.00050	0.00100	0.00500	ND
SILICON	MG/L	6/6	6	1/6	2.26000-51.70000	2.82000			5.90
SILVER	MG/L	0/6	6	0/6		0.00100	0.00200	0.00200	ND

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GREAT MIAMI RIVER - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
SODIUM	MG/L	5/5	5	0/5	31.30000-36.60000	32.60000			75.8
THALLIUM	MG/L	0/6	6	0/6		0.00050	0.00100	0.00100	ND
VANADIUM	MG/L	0/6	6	0/6		0.01200	0.02400	0.02400	ND
ZINC	MG/L	1/5	5	1/5	0.11200-0.11200	0.01365	0.01970	0.03060	0.0446

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GREAT MIAMI RIVER - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
1,1,1-TRICHLOROETHANE	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
1,1,2,2-TETRACHLOROETHANE	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
1,1,2-TRICHLOROETHANE	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
1,1-DICHLOROETHANE	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
1,1-DICHLOROETHENE	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
1,2-DICHLOROETHANE	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
1,2-DICHLOROETHENE (TOTAL)	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
1,2-DICHLOROPROPANE	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
2-BUTANONE	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
2-HEXANONE	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
4-METHYL-2-PENTANONE	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
ACETONE	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
BENZENE	UG/L	0/4	4	0/4		5.50000	10.00000	13.00000	
BROMODICHLOROMETHANE	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
BROMOFORM		0/4	4	0/4		5.00000	10.00000	10.00000	
BROMOMETHANE	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
CARBON DISULFIDE	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
CARBON TETRACHLORIDE	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
CHLOROBENZENE	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
CHLOROETHANE	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
CHLOROFORM	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
CHLOROMETHANE	UG/L	0/3	3	0/3		5.00000	10.00000	10.00000	

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GREAT MIAMI RIVER - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
CIS-1,3-DICHLOROPROPENE	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
DIBROMOCHLOROMETHANE	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
ETHYLBENZENE	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
METHYLENE CHLORIDE	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
STYRENE	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
TETRACHLOROETHENE	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
TOLUENE	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
TRANS-1,3-DICHLOROPROPENE	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
TRICHLOROETHENE	UG/L	1/4	4	1/4	2.00000-2.00000	5.00000	10.00000	10.00000	
VINYL ACETATE	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
VINYL CHLORIDE	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	
XYLENES, TOTAL	UG/L	0/4	4	0/4		5.00000	10.00000	10.00000	

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GREAT MIAMI RIVER - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
1,2,4-TRICHLOROBENZENE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
1,2-DICHLOROBENZENE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
1,3-DICHLOROBENZENE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
1,4-DICHLOROBENZENE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
2,4,5-TRICHLOROPHENOL	UG/L	0/4	4	0/4		12.75000	25.00000	50.00000	
2,4,6-TRICHLOROPHENOL	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
2,4-DICHLOROPHENOL	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
2,4-DIMETHYLPHENOL	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
2,4-DINITROPHENOL	UG/L	0/4	4	0/4		12.75000	25.00000	50.00000	
2,4-DINITROTOLUENE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
2,6-DINITROTOLUENE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
2-CHLORONAPHTHALENE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
2-CHLOROPHENOL	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
2-METHYLNAPHTHALENE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
2-METHYLPHENOL	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
2-NITROANILINE	UG/L	0/4	4	0/4		12.75000	25.00000	50.00000	
2-NITROPHENOL	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
3,3'-DICHLOROBENZIDINE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
3-NITROANILINE	NONE	0/4	4	0/4		12.75000	25.00000	50.00000	
4,6-DINITRO-2-METHYLPHENOL	UG/L	0/4	4	0/4		12.75000	25.00000	50.00000	
4-BROMOPHENYL PHENYL ETHER	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
4-CHLORO-3-METHYLPHENOL	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	

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GREAT MIAMI RIVER - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
4-CHLOROPHENYLPHENYL ETHER	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
4-METHYLPHENOL	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
4-NITROANILINE	UG/L	0/4	4	0/4		12.75000	25.00000	50.00000	
4-NITROPHENOL	UG/L	0/4	4	0/4		12.75000	25.00000	50.00000	
ACENAPHTHENE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
ACENAPHTHYLENE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
ANTHRACENE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
BENZO(A)ANTHRACENE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
BENZO(A)PYRENE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
BENZO(B)FLUORANTHENE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
BENZO(G,H,I)PERYLENE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
BENZO(K)FLUORANTHENE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
BENZOIC ACID	UG/L	0/4	4	0/4		12.75000	25.00000	50.00000	
BENZYL ALCOHOL	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
BIS(2-CHLOROETHOXY)METHANE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
BIS(2-CHLOROETHYL)ETHER	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
BIS(2-CHLOROISOPROPYL) ETHER	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
BIS(2-ETHYLHEXYL)PHTHALATE	UG/L	2/4	4	2/4	2.00000-160.00000	7.50000	10.00000	20.00000	
BUTYL BENZYL PHTHALATE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
CHRYSENE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
DI-N-BUTYL PHTHALATE	UG/L	1/4	4	1/4	3.00000-3.00000	5.25000	10.00000	20.00000	
DI-N-OCTYL PHTHALATE	UG/L	1/4	4	1/4	2.00000-2.00000	5.00000	10.00000	20.00000	

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GREAT MIAMI RIVER - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
DIBENZO(A,H)ANTHRACENE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
DIBENZOFURAN	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
DIETHYL PHTHALATE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
DIMETHYL PHTHALATE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
FLUORANTHENE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
FLUORENE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
HEXACHLOROBENZENE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
HEXACHLOROBUTADIENE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
HEXACHLOROCYCLOPENTADIENE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
HEXACHLOROETHANE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
INDENO(1,2,3-CD)PYRENE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
ISOPHORONE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
N-NITROSO-DI-N-PROPYLAMINE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
N-NITROSODIPHENYLAMINE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
NAPHTHALENE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
NITROBENZENE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
P-CHLOROANILINE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
PENTACHLOROPHENOL	UG/L	0/4	4	0/4		12.75000	25.00000	50.00000	
PHENANTHRENE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
PHENOL	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	
PYRENE	UG/L	0/4	4	0/4		5.25000	10.00000	20.00000	

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GREAT MIAMI RIVER - 1993
SURFACE WATER DATA - UNFILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
GENERAL CHEMISTRY									
ALKALINITY AS CACO3	MG/L	4/4	4	0/4	215.00000-242.00000	239.00000			245
AMMONIA	MG/L	2/4	4	0/4	0.03220-0.03940	0.02360	0.03000	0.03000	0.11
CHLORIDE	MG/L	4/4	4	0/4	28.20000-50.90000	47.60000			325
FLUORIDE	MG/L	4/4	4	0/4	0.25000-0.34000	0.30500			0.900
NITRATE	MG/L	1/1	1	0/1	3.68000-3.68000	3.68000			6.58
NITRATE/NITRITE	MG/L	3/3	3	3/3	3.50000-6.30000	6.02000			
PHENOLS	UG/L	0/4	4	0/4		0.00250	0.00500	0.00500	0.01
PHOSPHATE	MG/L	4/4	4	4/4	0.10000-0.15500	0.13100			
SULFATE	MG/L	4/4	4	0/4	61.00000-66.80000	61.35000			138
SULFIDE	MG/L	0/4	4	0/4		0.50000	1.00000	1.00000	ND
TOTAL KJELDAHL NITROGEN	MG/L	4/4	4	0/4	0.44600-0.69500	0.61550			1.84
TOTAL ORGANIC CARBON	MG/L	4/4	4	4/4	4.90000-5.50000	5.15000			3.06
TOTAL ORGANIC HALIDES	MG/L	3/4	4	0/4	0.02390-0.05020	0.03425	0.01380	0.01380	0.25
TOTAL ORGANIC NITROGEN	MG/L	4/4	4	0/4	0.40700-0.69500	0.59950			1.73

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GREAT MIAMI RIVER - 1993
SURFACE WATER DATA - FILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/L	3/3	3	2/3	0.40000-0.80000	0.60000			0.50
URANIUM, TOTAL	UG/L	6/6	3	5/6	0.40000-2.80000	1.85000			1.10
URANIUM-234	PCI/L	3/3	3	3/3	0.60000-0.80000	0.70000			0.50
THORIUM-230	PCI/L	3/3	3	1/3	0.40000-0.70000	0.40000			0.62
RADIUM-226	PCI/L	3/3	3	3/3	1.20000-2.80000	2.50000			ND
URANIUM-235/236	PCI/L	0/3	3	0/3		0.10000	0.20000	0.20000	ND
THORIUM-232	PCI/L	0/3	3	0/3		0.10000	0.20000	0.20000	0.27
THORIUM, TOTAL	UG/L	1/1	0	1/1	0.91202-0.91202	0.91202			NA
RADIUM-228	PCI/L	3/3	3	3/3	3.20000-4.60000	4.00000			ND
THORIUM-228	PCI/L	0/3	3	0/3		0.10000	0.20000	0.20000	0.86
TECHNETIUM-99	PCI/L	0/2	2	0/2		7.50000	15.00000	15.00000	ND
GROSS ALPHA	PCI/L	0/3	0	0/3		1.45000	1.90000	3.10000	
GROSS BETA	PCI/L	2/3	0	2/3	3.20000-6.00000	3.20000	2.70000	2.70000	

GREAT MIAMI RIVER - 1993
SURFACE WATER DATA - FILTERED

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Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/L	1/4	4	1/4	0.85600-0.85600	0.02000	0.04000	0.04000	0.115
ANTIMONY	MG/L	0/4	4	0/4		0.00700	0.01400	0.01400	ND
ARSENIC	MG/L	3/4	4	0/4	0.00110-0.00240	0.00125	0.00100	0.00100	0.0024
BARIUM	MG/L	4/4	4	0/4	0.08340-0.09800	0.08985			0.100
BERYLLIUM	MG/L	0/4	4	0/4		0.00250	0.00500	0.00500	ND
CADMIUM	MG/L	1/4	4	1/4	0.00530-0.00530	0.00250	0.00500	0.00500	ND
CALCIUM	MG/L	4/4	4	1/4	76.20000-82.60000	77.85000			79.3
CHROMIUM	MG/L	0/4	4	0/4		0.00300	0.00600	0.00600	ND
COBALT	MG/L	0/4	4	0/4		0.00850	0.01700	0.01700	ND
COPPER	MG/L	0/4	4	0/4		0.00450	0.00900	0.00900	ND
CYANIDE	MG/L	1/5	5	1/5	0.01680-0.01680	0.00250	0.00500	0.00500	0.0041
IRON	MG/L	1/4	4	1/4	0.86900-0.86900	0.04075	0.02200	0.14100	ND
LEAD	MG/L	1/4	4	1/4	0.00440-0.00440	0.00375	0.00610	0.00910	ND
MAGNESIUM	MG/L	4/4	4	0/4	30.50000-32.20000	30.85000			34.9
MANGANESE	MG/L	2/4	4	2/4	0.04910-0.08300	0.02638	0.00400	0.00730	ND
MERCURY	MG/L	0/4	4	0/4		0.00005	0.00010	0.00010	ND
MOLYBDENUM	MG/L	0/4	4	0/4		0.00850	0.01700	0.01700	ND
NICKEL	MG/L	0/4	4	0/4		0.00900	0.01800	0.01800	ND
POTASSIUM	MG/L	4/4	4	0/4	3.62000-3.78000	3.69500			6.2
SELENIUM	MG/L	0/4	4	0/4		0.00050	0.00100	0.00100	ND
SILICON	MG/L	4/4	4	0/4	2.02000-2.82000	2.35500			3.04
SILVER	MG/L	0/4	4	0/4		0.00100	0.00200	0.00200	ND

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GREAT MIAMI RIVER - 1993
SURFACE WATER DATA - FILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
SODIUM	MG/L	4/4	4	0/4	31.20000-33.30000	31.90000			77.2
THALLIUM	MG/L	0/4	4	0/4		0.00050	0.00100	0.00100	ND
VANADIUM	MG/L	0/4	4	0/4		0.01200	0.02400	0.02400	ND
ZINC	MG/L	0/4	4	0/4		0.00945	0.01630	0.03320	ND

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GREAT MIAMI RIVER - 1988/89
SURFACE WATER DATA - UNFILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/L	7/33	33	7/33	1.00000-2.00000	0.50000	1.00000	1.20000	0.76
URANIUM, TOTAL	UG/L	30/33	33	27/33	1.00000-5.00000	2.00000	1.00000	1.00000	1.4
URANIUM-234	PCI/L	11/33	33	7/33	1.00000-2.20000	0.50000	1.00000	1.10000	1.1
THORIUM-230	PCI/L	1/33	33	1/33	1.30000-1.30000	0.50000	1.00000	1.00000	0.36
RADIUM-226	PCI/L	1/33	33	1/33	2.40000-2.40000	0.50000	1.00000	1.00000	0.41
URANIUM-235/236	PCI/L	0/33	33	0/33		0.50000	1.00000	1.10000	0.25
THORIUM-232	PCI/L	0/33	33	0/33		0.50000	1.00000	1.00000	ND
RADIUM-228	PCI/L	1/33	33	1/33	5.00000-5.00000	1.50000	3.00000	3.90000	2.2
THORIUM-228	PCI/L	4/33	33	4/33	1.50000-2.60000	0.50000	1.00000	1.00000	0.62
NEPTUNIUM-237	PCI/L	0/31	31	0/31		0.50000	1.00000	1.00000	ND
PLUTONIUM-239/240	PCI/L	0/32	32	0/32		0.50000	1.00000	1.00000	ND
PLUTONIUM-238	PCI/L	0/32	32	0/32		0.50000	1.00000	1.00000	ND
STRONTIUM-90	PCI/L	0/29	29	0/29		2.50000	5.00000	5.00000	ND
TECHNETIUM-99	PCI/L	2/32	32	2/32	40.10000-95.90000	15.00000	30.00000	30.00000	ND
RUTHENIUM-106	PCI/L	0/3	3	0/3		75.00000	150.00000	150.00000	ND
CESIUM-137	PCI/L	0/3	3	0/3		10.00000	20.00000	20.00000	ND

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GREAT MIAMI RIVER - 1988/89
SURFACE WATER DATA - UNFILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ARSENIC	MG/L	3/18	18	2/18	0.00210-0.00600	0.00425	0.00200	0.20000	0.0036
BARIUM	MG/L	18/18	18	4/18	0.03790-0.10800	0.10000			0.100
CADMIUM	MG/L	6/18	18	0/18	0.00170-0.00500	0.00250	0.00200	0.00500	0.0098
CALCIUM	MG/L	18/18	18	6/18	48.60000-89.00000	72.65000			77.0
CHROMIUM	MG/L	2/18	18	2/18	0.00370-0.00610	0.01000	0.00020	0.02000	ND
COPPER	MG/L	1/18	18	1/18	0.01190-0.01190	0.00500	0.00560	0.01050	0.0118
IRON	MG/L	18/18	18	0/18	0.17500-1.80000	0.38000			2.23
LEAD	MG/L	3/18	18	1/18	0.00210-0.09000	0.00675	0.00290	0.05000	0.010
MAGNESIUM	MG/L	18/18	18	7/18	16.40000-36.90000	30.30000			33.9
MANGANESE	MG/L	18/18	18	7/18	0.00850-0.11000	0.07500			0.082
MERCURY	MG/L	3/18	18	3/18	0.00060-0.00190	0.00010	0.00020	0.00020	ND
MOLYBDENUM	MG/L	7/18	18	2/18	0.00700-0.04000	0.01000	0.00300	0.02000	0.02
NICKEL	MG/L	6/18	18	0/18	0.00720-0.02000	0.01000	0.00600	0.02000	0.023
POTASSIUM	MG/L	18/18	18	6/18	2.17000-8.00000	4.08500			6.08
SELENIUM	MG/L	0/16	16	0/16		0.00125	0.00200	0.20000	ND
SILVER	MG/L	0/18	18	0/18		0.00500	0.00050	0.02000	ND
SODIUM	MG/L	18/18	18	5/18	12.20000-84.90000	73.35000			75.8

GREAT MIAMI RIVER - 1988/89
SURFACE WATER DATA - UNFILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
GENERAL CHEMISTRY									
AMMONIA	MG/L	15/19	19	14/19	0.10000-1.90000	0.22900	0.10000	0.20000	0.11
CHLORIDE	MG/L	19/19	19	0/19	10.00000-252.00000	135.00000			325
FLUORIDE	MG/L	19/19	19	0/19	0.25000-0.90000	0.82000			0.900
NITRATE	MG/L	17/18	18	4/18	0.40000-8.27000	3.00000	0.10000	0.10000	6.58
PHENOLS	UG/L	8/13	13	4/13	0.01000-0.03000	0.01000	0.01000	0.01000	0.01
PHOSPHORUS	MG/L	19/19	18	5/19	0.05000-4.90000	0.56000			1.10
SULFATE	MG/L	19/19	19	3/19	78.22000-191.90000	110.00000			138
TOTAL KJELDAHL NITROGEN	MG/L	6/6	6	2/6	1.25000-3.12400	1.47750			1.84
TOTAL ORGANIC CARBON	MG/L	2/2	2	2/2	21.95000-25.70000	23.82500			3.06
TOTAL ORGANIC HALIDES	MG/L	13/19	19	0/19	0.01590-0.25000	0.03000	0.05000	0.06000	0.25
TOTAL ORGANIC NITROGEN	MG/L	16/19	19	2/19	0.10000-2.70700	1.00000	0.10000	0.10000	1.73

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GREAT MIAMI RIVER - 1988/89
SURFACE WATER DATA - FILTERED

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/L	25/59	49	25/59	1.00000-1.90000	0.50000	1.00000	1.00000	0.50
URANIUM, TOTAL	UG/L	46/59	49	42/59	1.00000-7.00000	3.00000	1.00000	1.00000	1.10
URANIUM-234	PCI/L	28/59	49	28/59	1.10000-2.30000	0.50000	1.00000	1.00000	0.50
THORIUM-230	PCI/L	0/49	49	0/49		0.50000	1.00000	1.50000	0.62
RADIUM-226	PCI/L	0/26	16	0/26		0.50000	1.00000	1.00000	ND
URANIUM-235/236	PCI/L	0/59	49	0/59		0.50000	1.00000	1.00000	ND
THORIUM-232	PCI/L	0/49	49	0/49		0.50000	1.00000	1.50000	0.27
THORIUM, TOTAL	UG/L	0/33	33	0/33		1.50000	2.00000	14.00000	NA
RADIUM-228	PCI/L	1/26	16	1/26	5.00000-5.00000	1.50000	3.00000	5.10000	ND
THORIUM-228	PCI/L	3/49	49	3/49	1.10000-2.40000	0.50000	1.00000	1.50000	0.86
NEPTUNIUM-237	PCI/L	0/16	16	0/16		0.50000	1.00000	1.00000	ND
PLUTONIUM-239/240	PCI/L	0/14	14	0/14		0.50000	1.00000	1.00000	ND
PLUTONIUM-238	PCI/L	0/14	14	0/14		0.50000	1.00000	1.00000	ND
STRONTIUM-90	PCI/L	0/54	44	0/54		2.50000	5.00000	5.00000	ND
TECHNETIUM-99	PCI/L	17/49	49	17/49	31.40000-57.20000	15.00000	30.00000	30.00000	ND
RUTHENIUM-106	PCI/L	0/11	1	0/11		75.00000	150.00000	150.00000	ND
CESIUM-137	PCI/L	0/11	1	0/11		10.00000	20.00000	20.00000	ND
GROSS ALPHA	PCI/L	26/43	0	26/43	2.00000-8.00000	3.00000	1.00000	4.00000	
GROSS BETA	PCI/L	30/43	0	30/43	12.00000-70.00000	16.00000	11.00000	19.00000	

GREAT MIAMI RIVER - 1988/89
SURFACE WATER DATA - FILTERED

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ARSENIC	MG/L	0/14	14	0/14		0.05050	0.00200	0.20000	0.0024
BARIUM	MG/L	14/14	14	0/14	0.04850-0.10000	0.09000			0.100
CADMIUM	MG/L	1/14	14	1/14	0.00270-0.00270	0.00250	0.00200	0.00500	ND
CALCIUM	MG/L	14/14	14	0/14	60.60000-77.90000	70.90000			79.3
CHROMIUM	MG/L	0/14	14	0/14		0.01000	0.00200	0.02000	ND
COPPER	MG/L	0/14	14	0/14		0.00500	0.01000	0.01420	ND
IRON	MG/L	5/14	14	5/14	0.09000-0.60000	0.02500	0.01000	0.05000	ND
LEAD	MG/L	3/14	14	3/14	0.05000-0.08000	0.01325	0.00200	0.05000	ND
MAGNESIUM	MG/L	14/14	14	4/14	21.30000-36.10000	32.10000			34.9
MANGANESE	MG/L	5/14	14	5/14	0.00200-0.01100	0.01000	0.00100	0.02000	ND
MERCURY	MG/L	2/14	14	2/14	0.00020-0.00100	0.00010	0.00020	0.00030	ND
MOLYBDENUM	MG/L	6/14	14	6/14	0.02400-0.06000	0.01000	0.00300	0.02000	ND
NICKEL	MG/L	1/14	14	1/14	0.01130-0.01130	0.01000	0.02000	0.02000	ND
POTASSIUM	MG/L	14/14	14	6/14	2.09000-7.95000	6.11000			6.2
SELENIUM	MG/L	0/14	14	0/14		0.05050	0.00200	0.20000	ND
SILVER	MG/L	1/14	14	1/14	0.13000-0.13000	0.00500	0.00050	0.03000	ND
SODIUM	MG/L	14/14	14	5/14	12.70000-80.10000	75.35000			77.2

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GREAT MIAMI RIVER - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/G	4/4	4	1/4	0.200-0.600	0.400			0.445
URANIUM, TOTAL	MG/KG	4/8	4	4/8	2.000-3.300	4.400	11.000	11.000	1.5
URANIUM-234	PCI/G	4/4	4	0/4	0.200-0.400	0.300			0.520
THORIUM-230	PCI/G	4/4	4	3/4	0.300-1.000	0.750			0.485
RADIUM-226	PCI/G	4/4	4	3/4	0.400-0.800	0.650			0.455
URANIUM-235/236	PCI/G	0/4	4	0/4		0.050	0.100	0.100	ND
THORIUM-232	PCI/G	4/4	4	3/4	0.200-0.600	0.450			0.333
THORIUM, TOTAL	MG/KG	4/4	0	3/4	1.824-5.472	4.104			3
RADIUM-228	PCI/G	0/4	4	0/4		0.250	0.500	0.500	ND
THORIUM-228	PCI/G	4/4	4	4/4	0.300-0.700	0.550			ND
GROSS ALPHA	PCI/G	0/2	0	0/2		7.500	15.000	15.000	
GROSS BETA	PCI/G	0/2	0	0/2		19.000	38.000	38.000	

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GREAT MIAMI RIVER - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
ALUMINUM	MG/KG	4/4	4	4/4	4590.000-11600.000	6205.000			
ANTIMONY	MG/KG	0/4	4	0/4		1.675	2.800	4.000	
ARSENIC	MG/KG	4/4	4	4/4	1.700-4.400	3.350			
BARIUM	MG/KG	4/4	4	4/4	57.800-130.000	78.400			
BERYLLIUM	MG/KG	2/4	4	2/4	1.400-2.100	1.125	1.300	1.700	
CADMIUM	MG/KG	0/4	4	0/4		0.700	1.300	1.700	
CALCIUM	MG/KG	4/4	4	4/4	44700.000-79300.000	65200.000			
CHROMIUM	MG/KG	4/4	4	4/4	9.600-15.900	12.550			
COBALT	MG/KG	4/4	4	4/4	4.700-12.700	6.200			
COPPER	MG/KG	4/4	4	4/4	14.900-36.900	18.200			
CYANIDE	MG/KG	0/3	3	0/3		0.170	0.320	0.350	
IRON	MG/KG	4/4	4	4/4	10500.000-19800.000	14550.000			
LEAD	MG/KG	4/4	4	4/4	16.000-39.700	19.900			
MAGNESIUM	MG/KG	4/4	4	4/4	12300.000-21500.000	18250.000			
MANGANESE	MG/KG	4/4	4	4/4	402.000-729.000	581.000			
MERCURY	MG/KG	0/4	4	0/4		0.038	0.070	0.210	
MOLYBDENUM	MG/KG	0/4	4	0/4		2.375	4.400	5.700	
NICKEL	MG/KG	4/4	4	4/4	12.900-19.800	15.750			
POTASSIUM	MG/KG	4/4	4	4/4	698.000-1410.000	912.000			
SELENIUM	MG/KG	1/1	1	1/1	0.750-0.750	0.750			
SILICON	MG/KG	4/4	4	4/4	135.000-1060.000	560.500			

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GREAT MIAMI RIVER - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
INORGANICS									
SILVER	MG/KG	0/2	2	0/2		0.203	0.260	0.550	
SODIUM	MG/KG	1/4	4	1/4	91.100-91.100	71.300	69.200	188.000	
THALLIUM	MG/KG	0/4	4	0/4		0.155	0.280	0.670	
VANADIUM	MG/KG	4/4	4	4/4	11.100-22.100	16.050			
ZINC	MG/KG	4/4	4	4/4	61.000-171.000	99.950			

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GREAT MIAMI RIVER - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
1,1,1-TRICHLOROETHANE	UG/KG	0/3	3	0/3		7.000	13.000	17.000	
1,1,2,2-TETRACHLOROETHANE	UG/KG	0/3	3	0/3		7.000	13.000	17.000	
1,1,2-TRICHLOROETHANE	UG/KG	0/3	3	0/3		7.000	13.000	17.000	
1,1-DICHLOROETHANE	UG/KG	0/4	4	0/4		7.000	13.000	17.000	
1,1-DICHLOROETHENE	UG/KG	0/4	4	0/4		7.000	13.000	17.000	
1,2-DICHLOROETHANE	UG/KG	0/4	4	0/4		7.000	13.000	17.000	
1,2-DICHLOROETHENE (TOTAL)	UG/KG	0/4	4	0/4		7.000	13.000	17.000	
1,2-DICHLOROPROPANE	UG/KG	0/3	3	0/3		8.500	13.000	17.000	
2-BUTANONE	UG/KG	0/3	3	0/3		8.500	14.000	17.000	
2-HEXANONE	UG/KG	0/2	2	0/2		7.750	14.000	17.000	
4-METHYL-2-PENTANONE	UG/KG	0/2	2	0/2		7.750	14.000	17.000	
ACETONE	UG/KG	1/4	4	1/4	37.000-37.000	23.000	14.000	110.000	
BENZENE	UG/KG	0/3	3	0/3		7.000	13.000	17.000	
BROMODICHLOROMETHANE	UG/KG	0/3	3	0/3		8.500	13.000	17.000	
BROMOFORM	UG/KG	0/3	3	0/3		7.000	13.000	17.000	
BROMOMETHANE	UG/KG	0/4	4	0/4		7.000	13.000	17.000	
CARBON DISULFIDE	UG/KG	1/4	4	1/4	2.000-2.000	6.750	13.000	17.000	
CARBON TETRACHLORIDE	UG/KG	0/3	3	0/3		7.000	13.000	17.000	
CHLOROBENZENE	UG/KG	1/3	3	1/3	2.000-2.000	2.000	13.000	17.000	
CHLOROETHANE	UG/KG	0/4	4	0/4		7.000	13.000	17.000	
CHLOROFORM	UG/KG	0/4	4	0/4		7.000	13.000	17.000	

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GREAT MIAMI RIVER - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
VOLATILES									
CHLOROMETHANE	UG/KG	0/4	4	0/4		7.000	13.000	17.000	
CIS-1,3-DICHLOROPROPENE	UG/KG	0/3	3	0/3		7.000	13.000	17.000	
DIBROMOCHLOROMETHANE	UG/KG	0/3	3	0/3		8.500	13.000	17.000	
ETHYLBENZENE	UG/KG	0/3	3	0/3		7.000	13.000	17.000	
METHYLENE CHLORIDE	UG/KG	0/4	4	0/4		7.000	13.000	17.000	
STYRENE	UG/KG	0/3	3	0/3		7.000	13.000	17.000	
TETRACHLOROETHENE	UG/KG	0/3	3	0/3		8.500	13.000	17.000	
TOLUENE	UG/KG	1/3	3	1/3	2.000-2.000	8.500	13.000	17.000	
TRANS-1,3-DICHLOROPROPENE	UG/KG	0/3	3	0/3		7.000	13.000	17.000	
TRICHLOROETHENE	UG/KG	0/3	3	0/3		7.000	13.000	17.000	
VINYL ACETATE	UG/KG	0/1	1	0/1		6.500	13.000	13.000	
VINYL CHLORIDE	UG/KG	0/4	4	0/4		7.000	13.000	17.000	
XYLENES, TOTAL	UG/KG	0/3	3	0/3		7.000	13.000	17.000	

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GREAT MIAMI RIVER - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
1,2,4-TRICHLOROBENZENE	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
1,2-DICHLOROBENZENE	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
1,3-DICHLOROBENZENE	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
1,4-DICHLOROBENZENE	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
2,4,5-TRICHLOROPHENOL	UG/KG	0/4	4	0/4		600.000	1100.000	1400.000	
2,4,6-TRICHLOROPHENOL	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
2,4-DICHLOROPHENOL	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
2,4-DIMETHYLPHENOL	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
2,4-DINITROPHENOL	UG/KG	0/3	3	0/3		600.000	1200.000	1400.000	
2,4-DINITROTOLUENE	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
2,6-DINITROTOLUENE	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
2-CHLORONAPHTHALENE	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
2-CHLOROPHENOL	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
2-METHYLNAPHTHALENE	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
2-METHYLPHENOL	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
2-NITROANILINE	UG/KG	0/4	4	0/4		600.000	1100.000	1400.000	
2-NITROPHENOL	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
3,3'-DICHLOROBENZIDINE	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
3-NITROANILINE	NONE	0/4	4	0/4		600.000	1100.000	1400.000	
4,6-DINITRO-2-METHYLPHENOL	UG/KG	0/4	4	0/4		600.000	1100.000	1400.000	
4-BROMOPHENYL PHENYL ETHER	UG/KG	0/4	4	0/4		232.500	430.000	560.000	

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GREAT MIAMI RIVER - 1993
SEDIMENT DATA

Summary of Positive/Nonpositive Detections

Parameter	Units	Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
4-CHLORO-3-METHYLPHENOL	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
4-CHLOROPHENYLPHENYL ETHER	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
4-METHYLPHENOL	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
4-NITROANILINE	UG/KG	0/4	4	0/4		600.000	1100.000	1400.000	
4-NITROPHENOL	UG/KG	0/4	4	0/4		600.000	1100.000	1400.000	
ACENAPHTHENE	UG/KG	1/4	4	1/4	120.000-120.000	232.500	460.000	560.000	
ACENAPHTHYLENE	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
ANTHRACENE	UG/KG	1/4	4	1/4	470.000-470.000	257.500	460.000	560.000	
BENZO(A)ANTHRACENE	UG/KG	4/4	4	4/4	51.000-2600.000	85.500			
BENZO(A)PYRENE	UG/KG	3/4	4	3/4	77.000-2100.000	156.500	470.000	470.000	
BENZO(B)FLUORANTHENE	UG/KG	4/4	4	4/4	74.000-2700.000	120.000			
BENZO(G,H,I)PERYLENE	UG/KG	1/4	4	1/4	1300.000-1300.000	257.500	460.000	560.000	
BENZO(K)FLUORANTHENE	UG/KG	4/4	4	4/4	86.000-2100.000	130.000			
BENZOIC ACID	UG/KG	2/4	4	2/4	65.000-73.000	311.500	1100.000	1200.000	
BENZYL ALCOHOL	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
BIS(2-CHLOROETHOXY)METHANE	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
BIS(2-CHLOROETHYL)ETHER	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
BIS(2-CHLOROISOPROPYL) ETHER	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	0/4	4	0/4		260.000	430.000	560.000	
BUTYL BENZYL PHTHALATE	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
CHRYSENE	UG/KG	4/4	4	4/4	70.000-2700.000	125.000			

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GREAT MIAMI RIVER - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
DI-N-BUTYL PHTHALATE	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
DI-N-OCTYL PHTHALATE	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
DIBENZO(A,H)ANTHRACENE	UG/KG	1/4	4	1/4	580.000-580.000	257.500	460.000	560.000	
DIBENZOFURAN	UG/KG	1/4	4	1/4	63.000-63.000	232.500	460.000	560.000	
DIETHYL PHTHALATE	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
DIMETHYL PHTHALATE	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
FLUORANTHENE	UG/KG	4/4	4	4/4	150.000-5500.000	240.000			
FLUORENE	UG/KG	1/4	4	1/4	130.000-130.000	232.500	460.000	560.000	
HEXACHLOROBENZENE	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
HEXACHLOROBUTADIENE	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
HEXACHLOROCYCLOPENTADIENE	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
HEXACHLOROETHANE	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
INDENO(1,2,3-CD)PYRENE	UG/KG	2/4	4	2/4	58.000-1600.000	257.500	470.000	560.000	
ISOPHORONE	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
N-NITROSO-DI-N-PROPYLAMINE	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
N-NITROSODIPHENYLAMINE	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
NAPHTHALENE	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
NITROBENZENE	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
P-CHLOROANILINE	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
PENTACHLOROPHENOL	UG/KG	0/4	4	0/4		600.000	1100.000	1400.000	
PHENANTHRENE	UG/KG	4/4	4	4/4	78.000-2200.000	120.000			

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GREAT MIAMI RIVER - 1993
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
SEMIVOLATILES									
PHENOL	UG/KG	0/4	4	0/4		232.500	430.000	560.000	
PYRENE	UG/KG	4/4	4	4/4	130.000-4400.000	215.000			

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AREA: GREAT MIAMI RIVER - 1988/89
SEDIMENT DATA

Parameter	Units	Summary of Positive/Nonpositive Detections							
		Freq. of Detection	Total Validated Samples	Freq. of Detection Above Bckg.	Range of Positive Detections	Median of All Values	Minimum Nondetect	Maximum Nondetect	95% Background Concentration Value
RADIONUCLIDES									
URANIUM-238	PCI/G	8/24	24	8/24	0.600-1.100	0.300	0.600	0.600	0.445
URANIUM, TOTAL	MG/KG	15/18	18	8/18	1.000-3.000	1.000	1.000	1.000	1.5
URANIUM-234	PCI/G	8/24	24	8/24	0.600-1.400	0.300	0.600	0.600	0.520
THORIUM-230	PCI/G	16/24	24	16/24	0.600-2.300	0.800	0.600	0.600	0.485
RADIUM-226	PCI/G	18/18	18	5/18	0.385-0.912	0.400			0.455
URANIUM-235/236	PCI/G	0/24	24	0/24		0.300	0.600	0.600	ND
THORIUM-232	PCI/G	0/24	24	0/24		0.300	0.600	0.600	0.333
THORIUM, TOTAL	MG/KG	6/6	6	0/6	2.000-3.000	2.000			3
RADIUM-228	PCI/G	0/18	18	0/18		0.250	0.500	0.500	ND
THORIUM-228	PCI/G	0/24	24	0/24		0.300	0.600	0.600	ND
NEPTUNIUM-237	PCI/G	0/24	24	0/24		0.300	0.600	0.600	ND
PLUTONIUM-239/240	PCI/G	0/24	24	0/24		0.300	0.600	0.600	ND
PLUTONIUM-238	PCI/G	0/24	24	0/24		0.300	0.600	0.600	ND
STRONTIUM-90	PCI/G	1/18	18	1/18	0.800-0.800	0.250	0.500	0.500	ND
TECHNETIUM-99	PCI/G	0/24	24	0/24		0.500	1.000	1.000	ND
RUTHENIUM-106	PCI/G	0/18	18	0/18		0.500	1.000	1.000	ND
CESIUM-137	PCI/G	0/18	18	0/18		0.100	0.200	0.200	ND

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LIST OF ACRONYMS

AEC	U.S. Atomic Energy Commission
ARAR	applicable or relevant and appropriate requirement
ASL	analytical support level
ASTM	American Society for Testing Materials
AWWT	advanced wastewater treatment
BMP	best management practices
BSL	biodenitrification surge lagoon
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIS	Characterization Investigation Study
CLP	Contract Laboratory Program [U.S.EPA]
CMSA	Consolidated Metropolitan Statistical Area
COC	constituent of concern
COPC	constituent of potential concern
CPC	constituent of potential concern
CPID	closure plan information and data
CRDL	contract required detection limit
CWA	Clean Water Act
D&D	decontamination and decommissioning
DBH	diameter at breast height
DC	detected constituent
DFO	Director's Findings and Orders
DOE	U.S. Department of Energy
DOW	Division of Wildlife [Ohio]
DQO	data quality objective
EE/CA	engineering evaluation/cost analysis
EIS	environmental impact statement
EM	Environmental Monitoring [Program]
EO	Executive Order

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LIST OF ACRONYMS
(Continued)

EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ET	evapotranspiration
eV	electron volt
EWMF	Engineered Waste Management Facility
FEMP	Fernald Environmental Management Project
FERMCO	Fernald Environmental Restoration Management Corporation
FFCA	Federal Facility Compliance Agreement
FICWD	Federal Interagency Committee for Wetland Delineation
FIDLER	field instrument for detecting low energy radiation
FMPC	Feed Materials Production Center
FOC	fractional organic carbon
FR	Federal Register
FS	feasibility study
FWS	Fish and Wildlife Service
FY	fiscal year
GIS	geographical information system
GMP	groundwater monitoring plan
GO/UGMAS	glacial overburden/Great Miami Aquifer system
gpd	gallons per day
gpm	gallons per minute
HELP	Hydrolic Evaluation of Landfill Performance
HSL	Hazardous Substance List
HWMU	hazardous waste management unit
IAWWT	Interim Advanced Wastewater Treatment
IDW	investigation derived waste
ISA	Initial Screening of Alternatives
IT	IT Corporation
keV	kiloelectron volt
LRA	leading remedial alternative

LIST OF ACRONYMS
(Continued)

MDC	minimum detectable concentration
MMI	Modified Mercalli Intensity
msl	mean sea level
MUSLE	Modified Universal Soil Loss Equation
NAAQS	National Ambient Air Quality Standards
NBS	National Bureau of Standards
NEPA	National Environmental Policy Act
NFS	Nuclear Fuel Service
NISM	National Institute of Standard Measures
NLO	National Lead Company of Ohio
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPL	National Priority List
NRHP	National Register of Historic Places
NTS	Nevada Test Site
NTU	nephelometric turbidity unit
NWS	National Weather Service
OAC	Ohio Administrative Code
ODH	Ohio Department of Health
ODNR	Ohio Department of Natural Resources
OEPA	Ohio Environmental Protection Agency
ORAU	Oak Ridge Associated Universities
OSA	Ohio Administrative Code
OSP	Ohio State Planar
OU	operable unit
PAH	polynuclear aromatic hydrocarbon
PASA	Production and Additional Suspect Areas
PCB	polychlorinated biphenyl
PCE	tetrachloroethene

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LIST OF ACRONYMS
(Continued)

PET	potential evaporation transpiration
PIC	Pressurized Ionization Chamber
PP	proposed plan
PRRS	Paddys Run Road Site
PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
QAPP	Quality Assurance Project Plan
QC	quality control
RAGS	Risk Assessment Guidance for Superfund
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
RI/FS	Remedial Investigation/Feasibility Study
RM	river miles
RME	reasonable maximum exposure
RMI	Reactive Metals, Inc.
ROD	Record of Decision
S.R.	state route
SCQ	Sitewide CERCLA Quality Assurance Project Plan
SCS	Soil Conservation Service
SED	sitewide environmental database
SHPO	State Historic Preservation Officer
SOWC	Southwestern Ohio Water Company
SPIT	South Plume interim treatment [facility]
SSOD	storm sewer outfall ditch
STAR	stability array
SWIFT	Sandia Waste Isolation Flow and Transport
SWOAPCA	Southwestern Ohio Air Pollution Control Agency
SWRB	storm water retention basin
TAL	target analyte list
TCA	1,1,1-trichloroethane

LIST OF ACRONYMS
(Continued)

TBC	to be considered
TCE	trichloroethene
TCLP	toxicity characteristic leaching procedure
TDS	total dissolved solid
TFV	threshold friction velocity
THQ	target hazard quotient
TKN	total Kjeldahl nitrogen
TLD	thermoluminescent dosimeter
TOC	total organic carbon
TON	total organic nitrogen
TOX	total organic halogens
TSIL	Task Sample Inventory List
TSS	total suspended solids
UCL	upper confidence limit
UNH	dilute uranyl/nitrate
USCS	Unified Soil Classification System
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
USLE	Universal Soil Loss Equation
UST	underground storage tank
VOC	volatile organic compound
WEMCO	Westinghouse Environmental Management Company of Ohio
WMCO	Westinghouse Materials Company of Ohio

D.0 SOIL

This section describes the nature and extent of contamination in the surface and subsurface soils at the FEMP with regard to constituents detected and areas of significant contamination. A comprehensive soil sampling program was conducted at the FEMP from 1987 through 1993 with various phases described in Section 2.0. The objectives of this program include characterizing the nature and extent of surface and subsurface soils contamination, identifying probably sources of contamination,a nd examining the potential for migration of contamination to the groundwater. For site characterization, however, all data collected were combined and analyzed as a whole. Samples collected for the FEMP soil sampling program were analyzed for radionuclide, inorganic, and organic constituents.

Appendix D provides a detailed discussion of the nature and extent of contamination in soil. It is not intended to be read as a complete document, but to be used as a reference to support Section 4.0.

Section D.1 provides an overview of the constituents detected in the soil at the site. In this section, individual radionuclide and chemical parameters are discussed in relation to laboratory detection levels and naturally occurring background concentrations. Corresponding site areas where the constituents were detected at highly elevated levels are discussed.

Section D.2, on the other hand, discusses the individual geographic areas of soil contamination at the FEMP. Distinct areas are identified regarding site history, sampling programs, analytical results, and potential source areas. FEMP geographic areas, depicted in Figure D-1 and Plate D-1, are as follows:

- Plant 1 area
- Plant 2/3 area
- Plant 4/5/7 area
- Plant 6 area
- Plant 8 area
- Plant 9 area
- Sewage treatment plant area
- Pilot plant area
- Laboratory area
- Administration area
- Electrical substation area
- Maintenance building area
- Tank farm and boiler house
- D&D building and drum baling area
- KC-2 warehouse
- Fire training area
- Trap range
- Area west of K-65 silos
- K-65/Clearwell line west
- Clearwell line east
- Outfall pipeline
- Great Miami riverbank characterization
- Southwest Field area
- Northeastern area of FEMP
- Southern area of FEMP
- Western area of FEMP
- Northwestern area of FEMP
- Area outside of FEMP adjacent to boundary

- Scrap metal pile, decontamination building, and Buildings 64 and 65
- Graphite furnace, oil burner, and coal pile area
- Area 2-5 miles from FEMP boundary

The soil at the FEMP was segregated into surface (depths of 0 to 1.5 feet) or subsurface (depths greater than 1.5 feet) and subsequently subdivided into eight depth intervals, as follows:

Surface Soil	Subsurface Soil
• 0 to 0.5 foot	• 1.5 to 3.0 feet
• 0.5 to 1.0 foot	• 3.0 to 5.0 feet
• 1.0 to 1.5 feet	• 5.0 to 10.0 feet
	• 10.0 to 15.0 feet
	• 15.0 to 20.0 feet

Although use of these depth intervals allows for analysis of the vertical extent of soil contamination, the reader must be cautioned about misinterpretation of the results. For some of the parameters, the amount of data varies according to the depth interval. This factor must be considered in reviewing the maps or statistics used in analysis. Generally, the deeper the sampling interval, the more sparse the data.

Analysis of Data

In preparing Appendix D, various tools were used to analyze the data and support the discussions of nature and extent of contamination. These tools, as discussed below, include isoconcentration maps, statistical summaries, and summary tables by area and are used to indicate where significant levels of contaminants were detected.

Soil Isoconcentration Maps: Based on soil samples collected at the FEMP, soil isoconcentration maps were created for each parameter by sampling depth interval. These maps are located in the plate volume (Plates). Not all depths are included for each parameter. Because of the quantity of plates, not all maps are included. These plates are frequently referenced in the detailed parameter discussions in D.1.

In reviewing the plates, the reader should understand how the lack of data at specific depths may affect the isoconcentration maps. For instance, a contour may appear on the 0- to 0.5-foot map of a given parameter. However, in the 0.5- to 1.0-foot interval, no samples may have been collected. If

samples were subsequently collected in the 1.0- to 1.5-foot sampling interval and contamination was detected, the contour line would reappear. In such cases, interpolation of the data would suggest that contamination exists in the intermediate level, although no data were collected to verify its presence.

Statistical Summaries: Statistical summaries for analyzed constituents are presented throughout this appendix. Tables D.1-1 and D.1-2 are typical examples. These tables provide statistical summaries of the constituents detected in surface and subsurface soils, respectively, site wide at the FEMP. The statistics present the number of positive detections for a parameter, the number of validated samples (see Section 2.12) in the data set, the range of sample concentrations detected, the average concentration for samples having a positive detection, the range of nondetected samples, and the 95th percentile background value.

Summary Tables: The summary tables used throughout this appendix provide the reader with a quick reference to contamination by geographic area according to sampling depth intervals. The tables indicate whether a sample from a geographic area was or was not analyzed in a depth interval, analyzed but not detected, detected at levels less than background, detected above but less than two times background, detected between two and five times background, or detected more than five times background. For parameters that were not detected or determined in the background study, positive detections are indicated with no reference to a background value.

The eight depth intervals are also indicated in the summary tables. The reader can best understand the extent of vertical contamination of the soil by visualizing the table as a summarized cross section of the top 20 feet of soil. However, the reader must be cautioned that use of this table may exaggerate the degree or the impression of contamination, since contamination at five times background may be represented by a single sample rather than a preponderance of samples. Thus, to understand the frequency of occurrence for a detection at a specific depth, the statistical summaries should be used.

Analytical Data

The above-mentioned "tools" are used consistently throughout the soil discussion. It is important that the reader understand how the tables were generated and their meaning to fully understand the soil discussions in this appendix. The analytical data-set for FEMP soil available for compilation of this report spans from 1987 to 1993. Tabulated validated data is located in Appendix H. Priority was

given to validated data, since the validation process provides higher quality data. Where more than one analysis was performed on the same sample, all results are provided in Appendix H.

As environmental restoration continues at the FEMP, soil has been removed and thus the most immediate environmental threats have been eliminated. Therefore, for an accurate portrayal of the current nature and extent of contamination, samples relate to excavated soil have been removed from this soil analysis. These samples are included, however, in Appendix H at the end of the geographic areas in which they were collected.

Soil samples collected during the 1987 to 1993 sampling program predominantly were analyzed for the full radiological, and HSL (TCL) inorganic and organic parameters. As one would expect, the majority of analyses were performed for radiological parameters, since these parameters are of most concern at the FEMP. Uranium was thought to be the principal contaminant in soil, and was therefore the primary contaminant investigated during the RI. The analytical data support this assumption. Total uranium was analyzed for in 2807 surface and 1898 subsurface soil samples. For inorganic parameters, approximately 450 surface and 380 subsurface soil samples were analyzed, whereas for organics approximately 380 surface and 425 subsurface soil samples were analyzed. The analyses were specified in accordance with expected contamination, based on historical operations as well as verification that unexpected constituents were not present in the surface and subsurface soils.

Uranium Envelope

As expected, uranium was identified as the principal contaminant in soil at the FEMP. The following discussion regarding the extent of uranium contamination at the FEMP provides a thorough description of the horizontal and vertical extent of uranium contamination. Where known, the probable sources of uranium contamination are discussed. The remaining parameters are discussed in less detail, either because their sources and distribution are generally governed by the same or similar processes described for uranium, or because the levels and extent of contamination are minimal and contained within the area of uranium contamination.

From the review of the data, it appears that the areas of total uranium contamination encompass the other areas of site-related contamination. This boundary of uranium contamination will be referred to as the "uranium envelope." Therefore, all parameters will be discussed relative to uranium

contamination, or the uranium envelope. This phenomenon is attributable to the wide use of uranium at the FEMP.

Two values of total uranium are used in this discussion. The first value is 5 mg/kg for total uranium, which is slightly above background (3.73 mg/kg). The value of 5 mg/kg approximates the 10^{-6} risk level for total uranium (Appendix A.7). This value is a summation of background and the 10^{-6} level. The second value is 20 mg/kg, approximately five times background, which approximates the 10^{-5} risk level for total uranium. The 20 mg/kg value is the summation of the background value and the 10^{-5} level. The 20 mg/kg contour line will be used to determine whether a constituent is elevated above background outside this envelope. The 5 mg/kg contour line encompasses all of the FEMP property as well as some off-property areas. In this discussion, the 20 mg/kg contour line is presented on all of the soil plates (see Plates) to depict areas of contamination resulting from other parameters in relation to the established uranium envelope. Note that the contour line considers only risk associated with total uranium in the surface soil. Impacts from other constituents or additional media are not represented by these lines.

Potential sources of contamination in the FEMP are listed in Table D-1. The table provides a summary of expected contaminants from each of the source areas. Figure D-2 shows additional specific locations within the FEMP source areas that are potential sources of contamination.

Tables D-2 and D-3 provide a summary of background levels of the constituents at the site. The 95th percentile value calculated for the background data set is used in the following text as a benchmark for the comparison of contaminant concentrations to background in the FEMP study area. The value is calculated as shown in Appendix A.II.0. Ninety-five percent of the background data set falls at or below this value. The value is often used in statistical analysis (e.g., the 95th Percentile Test) to determine whether any sample measurement from a study area exceeds background. The use of the 95th percentile background value does not constitute a formal, statistical comparison to background (e.g., the T-test or the Wilcoxin Rank Sum Test), but is provided only as a point of reference. In the following discussions, for example, sampling results are frequently described as "below background" or "five times above background."

Figures supporting the text in this appendix were generated for illustration purposes only. Although, to scale, the sizes of areas of coverage did not lend themselves toward inclusion of the site

coordination system at standard increments. Ties of sampling locations to the site coordinate system are shown in figures showing boring and sampling locations included in Section 2.0.

D.1 OVERVIEW OF FEMP SOIL CONTAMINATION

FEMP soil data are presented for individual radionuclide, inorganic, and organic parameters on a site-wide basis. This section is not intended to identify specific sources responsible for the contaminants present but to provide an overview of the prevalence of various contaminants. The discussion will address which constituents are at or below background level, elevated above background, or elevated above a reference level of five times background. The discussion will also delineate the contamination with depth. Additionally, the discussion will address whether the contamination present is confined to the surface or whether the contaminant is found within the subsurface soil as well. Furthermore, the discussion will address whether the parameter is elevated above background concentrations laterally over broad areas of the FEMP or confined to a few select locations.

Tables D.1-1 and D.1-2 provide summary statistics of the constituents detected in the surface and subsurface soils, respectively, site wide at the FEMP. For purposes of this report, surface soil is defined as soil located at a depth of 0 to 1.5 feet, whereas subsurface soil is defined as soil at depths of greater than 1.5 feet. The above-referenced tables present the number of positive detections for a parameter, the range of detected sample concentrations, the mean concentration of the samples, and background levels. The mean concentration of the samples is calculated by averaging the concentrations of all the analyzed soil samples within the specified depth range. In cases of a nondetected result, one-half of the detection limit is used to calculate the average.

The following text discusses radionuclide, inorganic, and organic parameters at the FEMP. The surface soil results are categorized according to three depth intervals: 0 to 0.5 feet, 0.5 to 1.0 feet, and 1.0 to 1.5 feet below the ground surface. Similarly, subsurface soil results are categorized in depth intervals of 1.5 to 3.0 feet, 3.0 to 5.0 feet, 5.0 to 10.0 feet, 10 to 15 feet, and 15 to 20 feet. The following parameter discussions present the statistics of sampling and analytical results, major area(s) of contamination, and horizontal and vertical extent of contamination. For each parameter, a matrix is provided that summarizes the concentration levels across the site. The matrix indicates whether the parameter is limited to a few isolated areas or whether it is found site wide.

As discussed in Section D.0, total uranium contamination typically encompasses the other areas of site-related contamination. This boundary of uranium contamination is referred to as the "uranium envelope." The parameters will be discussed in relation to uranium contamination, or the uranium envelope. A contamination level of 20 mg/kg, approximately five times background for total

uranium, will be the reference used. The 20 mg/kg contour is presented on all the plates depicting isoconcentrations of the site contaminants.

Tables D.1-3 through D.1-88 alternately present the distribution of constituents throughout the FEMP with respect to the 95th percentile background levels (background) for radionuclides and inorganics and the minimum and maximum detected levels of each constituent by depth interval. Tables D.1-89 through D.1-94 present the minimum and maximum detected levels by depth interval of selected volatile organic compounds.

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D.1.1 RADIONUCLIDE PARAMETERS

To address data needs for this RI, various soil investigation work plans, as discussed in Section 2.0, were developed and implemented in the known or suspected areas of contamination throughout the FEMP. Numerous surface and subsurface soil samples, as many as 856 and 1752 samples, respectively, were collected and analyzed for various radionuclide analytes. A list of the radionuclides is presented by decay series, activation products, and fission products. The radionuclides that were included in these categories and an explanation of the decay series were provided in Section 4.

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D.1.1.1 Uranium Decay Series

The uranium decay series includes the following constituents: uranium-238, total uranium, uranium-234, thorium-230, and radium-226. The individual isotopes result from the decay process of alpha emission beginning with the parent, uranium-238.

D.1.1.1.1 Uranium-238

In the production of uranium metal products for the DOE, the FEMP used various chemical processes to convert uranium hexafluoride or other source materials to uranium metal. Production practices resulted in the release of limited amounts of uranium compounds at the FEMP. Since natural uranium, depleted uranium, and slightly enriched uranium were processed, the principal uranium isotope (by weight) detected in surface and subsurface soil samples was uranium-238, an alpha emitter with a 4.468×10^9 year half-life. Airborne releases from the various manufacturing operations resulted in deposition on surface soil with subsequent migration to subsurface soil. Leaking subgrade equipment might have also contributed to uranium-238 contamination of subsurface soil and groundwater. Table D-1 highlights areas that are probable sources of uranium-238 contamination.

A summary of uranium-238 contamination, as defined by sample concentration relative to the 95th percentile background levels (background) in surface and subsurface soils, is presented in Table D.1-3. Table D.1-4 summarizes geographic areas that had elevated uranium-238 levels and provides the range of activity levels for each depth interval in surface and subsurface soils. Details for uranium-238 contamination in the geographic areas and in areas surrounding the former production plant are provided in Section D.2.

Surface Soil

Background activities for uranium-238 in the surface soil ranged from 0.85 pCi/g to 1.33 pCi/g, based on a total of 30 samples collected during the background study. The background activity for uranium-238 in the surface soil was calculated as 1.24 pCi/g, as indicated in Table D-2.

Uranium-238 activity was positively identified above the background activity of 1.24 pCi/g in 1948 of 2555 surface samples collected at depths of 0 to 1.5 feet. Uranium-238 activity levels ranged from 0.218 pCi/g to 19,067 pCi/g. A statistical summary of sampling and analytical results for uranium-238 in the surface soil at the FEMP is presented in Table D.1-1. Uranium-238 activity in surface soil across the FEMP is depicted in Plates D-2 (A, B, and C), D-3, and D-4.

The majority of uranium-238 contamination in FEMP surface soil is found in the following areas. In these areas, uranium-238 activity was detected at levels of at least 6.2 pCi/g which is five times background. The detected levels of uranium-238 were generally at least an order of magnitude greater than the background.

- Plant 1 area
- Plant 2/3 area
- Plant 4/5/7 area
- Plant 6 area
- Plant 8 area
- Plant 9 area
- Sewage treatment plant area
- Pilot plant area
- Laboratory area
- Administration area
- Electrical substation area
- Maintenance building area
- Tank farm and boiler house
- D&D Building and drum baling area
- Scrap metal pile/decon building/Building 64 and 65
- Graphite furnace, oil burner, and coal pile area
- KC-2 warehouse area
- Fire training area
- Trap range
- Outfall pipeline
- Northeastern area of FEMP
- Southern area of FEMP
- Western area of FEMP
- Northwestern area of FEMP
- Area outside FEMP adjacent to boundary

Subsurface Soil

Background activities for uranium-238 in the subsurface soil ranged from 0.60 to 1.23 pCi/g for most of the subsurface soil samples (48 of 51 samples) collected during the background study. The background activity for uranium-238 in the subsurface soil was calculated as 1.12 pCi/g, as presented in Table D-3.

Uranium-238 activity was positively detected above background in a large majority of the FEMP subsurface soil samples (243 of 558 samples) collected from depths of 1.5 feet to greater than 20 feet. Uranium-238 activity ranged from 0.2 pCi/g to 317 pCi/g. A statistical summary of sampling and analytical results for uranium-238 in the subsurface soil is presented in Table D.1-2. Uranium-238 activity in the subsurface soil is depicted in Plates D-5 through D-9.

The majority of uranium-238 contamination in subsurface soil at the FEMP is found in the following areas. Uranium-238 activity was present in these areas at levels of 5.60 pCi/g or greater which is five times background.

- Plant 1 area
- Plant 2/3 area
- Plant 4/5/7 area
- Plant 6 area
- D&D building and drum baling area
- Scrap metal pile/decon building/Buildings 64 and 65
- Graphite furnace/oil burner/coal pile area
- Area west of K-65 silos

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- Plant 8 area
- Plant 9 area
- Sewage treatment plant area
- Pilot plant area
- Laboratory area
- Administration area
- K-65 Clearwell line west
- Great Miami riverbank characterization
- Northeast area of FEMP
- Western area of FEMP
- Area outside of FEMP adjacent to boundary

D.1.1.1.2 Total Uranium

By weight, natural uranium, depleted uranium, and slightly enriched uranium are mostly uranium-238. Thus total uranium in products and waste materials produced at the FEMP is mostly uranium-238. The total uranium in environmental samples is also mostly uranium-238. The uranium-238 activity in pCi/g can be converted to mass units in mg/kg by multiplying the activity by 2.98. Thus a simple comparison can be made by multiplying the uranium-238 activity in pCi/g by 3 to obtain the total uranium in mg/kg. Uranium-238 activity is determined by alpha counting techniques, whereas total uranium activity is determined by chemical analysis.

As explained, uranium contamination from FEMP activities is mostly uranium-238. Thus the characterization and behavior of total uranium and uranium-238 should be analogous unless sampling or analytical problems exist. Total uranium is the major indicator of uranium contamination in the environmental media. Contamination in subsurface soil could be attributed to contaminant migration from surface soil or leaking process equipment, with subsequent contamination of groundwater. Table D-1 highlights areas that are probable sources of total uranium.

A summary of total uranium contamination, as defined by sample concentration relative to the 95th percentile background levels (background) in surface and subsurface soils, is presented in Table D.1-5. Table D.1-6 summarizes the geographic areas that exhibited elevated total uranium concentrations and provides the range of concentrations for each depth interval in surface and subsurface soils. Details of total uranium contamination in the geographic areas and in the areas surrounding the former production plant are provided in Section D.2.

Surface Soil

Background concentrations for total uranium in the surface soil ranged from 2.56 to 4.03 mg/kg, based on a total of 30 samples collected during the background study. Background for total uranium in the surface soil is approximately 3.73 mg/kg, as indicated in Table D-2.

Total uranium concentrations were detected above background in 2983 of 3777 surface soil samples collected at depths from 0-1.5 feet below the ground surface. Total uranium concentrations ranged from 0.824 mg/kg to 90,350.00 mg/kg. A statistical summary of sampling and analytical results for total uranium concentrations in the surface soil is presented in Table D.1-1. Total uranium concentrations in surface soil across the FEMP are depicted in Plates D-10 (A, B, C and D), D-12 (A and B), and D-13 (A and B).

The majority of total uranium contamination in FEMP surface soil is present in the following areas. Total uranium concentrations were detected at levels of at least 18.7 mg/kg or higher in these areas. The level of 18.7 mg/kg is five times the background level of total uranium in the surface soil.

- Plant 1 area
- Plant 2/3 area
- Plant 4/5/7 area
- Plant 6 area
- Plant 8 area
- Plant 9 area
- Sewage treatment plant area
- Pilot plant area
- Laboratory area
- Administration area
- Electrical substation area
- Tank farm and boiler house
- D&D building and drum baling area
- Scrap metal pile/decon building/ Buildings 64 and 65
- Graphite furnace/oil burner/coal pile area
- KC-2 warehouse area
- Fire training area
- Trap range
- Area west of K-65 silos
- K-65/Clearwell line west
- K-65/Clearwell line east
- Outfall pipeline
- Great Miami riverbank characterization
- Southern area of FEMP
- Western area of FEMP
- Northwestern area of FEMP
- Area outside FEMP adjacent to boundary

Shallow Surface Soil

To characterize the extent of on- and off-site surface contamination by radioactive substances, shallow surface soil samples were collected outside the fenced areas, along the FEMP site boundary, and at off-site locations in accordance with the site-wide RI/FS Work Plan (DOE 1988) and under the litigation study program. These samples were collected for radiochemical analysis at 2-inch-depth increments from the ground surface, i.e., 0 to 2 inches, 2 to 4 inches, and 4 to 6 inches. The two

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deeper samples were analyzed only if the 0- to 2-inch sample exhibited radiological activity exceeding the reference levels of radiological parameters.

Concentrations of total uranium in the shallow surface soil samples were obtained by chemical analysis, as well as by calculation from activities of uranium isotopes (primarily uranium-238). Total uranium concentrations were positively identified in ranges of 1.0 to 7086 mg/kg, 2.5 to 1140 mg/kg, and 1.6 to 921 mg/kg in the shallow surface soil sampling intervals of 0 to 2 inches, 2 to 4 inches, and 4 to 6 inches, respectively. A statistical summary of sampling and analytical results for total uranium concentrations in the shallow surface soils is presented in Table D.1-1. Total uranium concentrations at the soil sampling locations are depicted in Plate D-11.

Total uranium was detected in every one of the 397 samples taken from the 0- to 2-inch depth. The range of concentrations detected was 1.00 to 7086 mg/kg. Of a total of 397 samples, 241 (which constitute approximately 61 percent of the total) contained total uranium at levels that exceeded background. The most significantly elevated concentrations in the samples taken within the FEMP boundary were detected in samples from the following areas:

- Sewage treatment plant area
- Fire training area
- Area west of the K-65 silos
- Southwest Field area
- Western area of the FEMP (around the waste pits)

Elevated concentrations were also measured in samples taken along the northern and eastern fence line of the FEMP.

Total uranium was also detected in every one of the 43 samples taken from the 2- to 4-inch depth. The range of concentrations that were detected was: 2.52 to 1140 mg/kg. Of a total of 43 samples, as many as 37 (approximately 86 percent of the total) contained total uranium at levels that exceeded background. The most significantly elevated concentrations in the samples taken within the FEMP boundary were detected in samples from the sewage treatment plant area. Other significantly elevated concentrations (in samples taken within the FEMP boundary) were also measured in samples in scattered locations in the area west of the K-65 silos and the western area of the FEMP (around the waste pits).

Total uranium was again detected in every one of the 39 samples taken from the 4- to 6-inch depth. The range of concentrations that were detected was 1.55 to 921 mg/kg. Of the total of 39 samples, as many as 30 (approximately 77 percent of the total) contained total uranium at levels that exceeded background. The most significantly elevated concentrations in samples taken within the FEMP boundary were detected in samples from the sewage treatment plant area.

In summary, of approximately 241 sampling locations where total uranium concentrations exceeded background in the 0- to 2-inch interval, a relatively small fraction of these surface soil locations contained significant contamination at deeper levels (2-inches to 6-inches). Total uranium concentrations exceeded background in approximately 37 locations (approximately 15 percent of the total) in the 2- to 4-inch depth; and at approximately 30 locations (approximately 12 percent of the total) in the 4- to 6-inch depth.

Subsurface Soil

Background concentrations for total uranium in the subsurface soil ranged from 1.81 to 3.69 mg/kg, based on a total of 51 samples collected during the background study. Background for total uranium in the subsurface soil is 3.69 mg/kg, as presented in Table D-3.

Total uranium concentrations were detected above background in 859 of 1680 subsurface soil samples collected from 1.5 feet to greater than 20 feet below the ground surface. Total uranium concentrations ranged from 0.5 to 54,000 μg/g. A statistical summary of sampling and analytical results for total uranium concentrations in the subsurface soil is presented in Table D.1-2.

The majority of the total uranium contamination in the FEMP subsurface soil is found in the following areas. Total uranium concentrations were detected at levels of at least 18.4 mg/kg or greater in these areas. The level of 18.4 mg/kg is five times the background for total uranium in the subsurface soil.

- Plant 1 area
- Plant 2/3 area
- Plant 4/5/7 area
- Plant 6 area
- Plant 8 area
- Plant 9 area
- Sewage treatment plant
- Pilot plant
- D&D building and drum baling area
- Scrap metal pile, decon building, and Buildings 64 and 65
- Graphite furnace, oil burner, and coal pile area
- Fire training area
- Area west of K-65 silos
- K-65/Clearwell line west
- Outfall pipeline

- Laboratory area
- Administration area
- Maintenance building area
- Great Miami riverbank characterization
- Western area of the FEMP

In the 1.5- to 3.0-foot depth (see Plates D-14A and D-14B), the following were the maximum concentrations in each of the selected areas:

- Plant 1 area: 121 mg/kg
- Plant 2/3 area: 558 mg/kg
- Plant 8 area: 349 mg/kg
- Plant 9 area: 354 mg/kg
- Sewage treatment plant area: 310 mg/kg
- Pilot plant area: 637 mg/kg

Elevated concentrations were also detected in the K-65/Clearwell line west and the maintenance building area at maximum levels of 116 and 137 mg/kg, respectively. In this depth interval, not more than two sample concentrations exceeded 100 mg/kg in any of the listed areas, and most were within 10 to 100 mg/kg.

In the 3.0- to 5.0-foot depth (see Plate D-15), the following were the maximum concentrations in each of the selected areas:

- Plant 1 area: 91 mg/kg
- Plant 2/3 area: 285 mg/kg
- Plant 8 area: 191 mg/kg
- Plant 9 area: 158 mg/kg
- Sewage treatment plant area: 58 mg/kg
- Pilot plant area: 170 mg/kg

Elevated concentrations were also detected in the D&D building and drum baling area and the Plant 4/5/7 area at maximum levels of 190 and 191 mg/kg, respectively. In this depth interval, not more than three sample concentrations exceeded 100 mg/kg in any of the listed areas. Most of the detected concentrations in the Plant 2/3 area and Plant 8 areas were within 10 to 100 mg/kg. Several of the detected concentrations in the sewage treatment plant area were within 10 to 20 mg/kg, and in the Plant 9 and pilot plant areas were less than 10 mg/kg.

In the 5.0- to 10.0-foot depth (see Plate D-17), the following were the maximum concentrations of total uranium in each of the selected areas:

- Plant 1 area: 73 mg/kg
- Plant 2/3 area: 711 mg/kg
- Plant 8 area: 386 mg/kg
- Plant 9 area: 292 mg/kg
- Sewage treatment plant area: 69.6 mg/kg
- Pilot plant area: 703 mg/kg

Elevated concentrations were also detected in the D&D building and drum baling area, which evidenced a maximum level of 265 mg/kg.

In the 10.0- to 15.0-foot depth (see Plate D-18), the following were the maximum concentrations in each of the selected areas:

- Plant 1 area: 22 mg/kg
- Plant 2/3 area: 467 mg/kg
- Plant 8 area: 328 mg/kg
- Plant 9 Area: 79 mg/kg
- Sewage treatment plant area: 214 mg/kg
- Pilot plant area: 629 mg/kg

Elevated concentrations were also detected in the D&D building and drum baling area, with a maximum level of 174 mg/kg. However, several sample concentrations were also below detection limits. Unlike sample concentrations in the former depths, several sample concentrations at various locations at the Plant 2/3 area and the pilot plant area exceeded 100 mg/kg. Conversely, several of the sample concentrations in the sewage treatment plant area were at low levels (less than 10 mg/kg) and in the Plant 9 area were below detection limits.

In the 15.0- to 20.0-foot depth (see Plate D-19), the following were the maximum concentrations in each of the selected areas:

- Plant 1 area: 68 mg/kg
- Plant 2/3 area: 735 mg/kg
- Plant 8 area: 136 mg/kg
- Plant 9 area: 115 mg/kg
- Sewage treatment plant area: 37.9 mg/kg
- Pilot plant area: 103 mg/kg

Several sample concentrations in Plant 2/3 were elevated above the 100 mg/kg level, as observed in the 10.0- to 15.0-foot depth samples. However, almost all sample concentrations in the pilot plant area were less than 100 mg/kg, and several sample concentrations in Plant 1 and 9 areas (especially toward the northern end) were below detection limits.

In the laboratory area and the maintenance building area, the maximum concentrations of total uranium were detected at the 1.5- to 3.0-foot depth at levels of 72 and 136 mg/kg respectively, and sample concentrations decreased progressively with depth. In all of the other areas (both inside and outside the FEMP), sample concentrations of total uranium at all subsurface depths were at low levels, or generally less than 20 mg/kg.

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D.1.1.1.3 Uranium-234

Uranium in nature is 0.0055 percent uranium-234, an alpha emitter with a 2.445 x 10^5 year half-life. The uranium-234 activity in natural uranium is approximately equal to the uranium-238 activity. (The relatively shorter half-life of uranium-234 and lower natural abundance account for the nearby equal activity level relative to uranium-238.) Material processed at the FEMP may have contained different levels of uranium-234 relative to natural uranium because of changes in isotopic abundances in feed material from the gaseous diffusion plants. However, the weight fraction in total uranium is relatively small, although the activity fraction may not reflect the fraction in natural uranium.

Uranium-234 from FEMP activities will be in the same chemical form as uranium-238. (This is not exactly true for uranium-234 in nature.) Thus the only difference in uranium-234 relative to uranium-238 or total uranium in contaminated soil can be explained by variable feed materials processed at the FEMP rather than by any intrinsic property of uranium-234. Processes that released uranium-238 to the environment would have released uranium-234 at its relative isotopic concentration in the process stream at the time of release. Table D-1 highlights the areas that may be probable sources of uranium-234.

A summary of uranium-234 contamination, as defined by sample concentration relative to the 95th percentile background levels (background) in surface and subsurface soils, is presented in Table D.1-7. Table D.1-8 summarizes the geographic areas that exhibited elevated uranium-234 activities and provides the ranges of activities for each depth interval in the surface and subsurface soil. Details for uranium-234 contamination in the geographic areas and the areas surrounding the former production plant are provided in Section D.2.

Surface Soil

Background levels for uranium-234 in the surface soil ranged from 0.67 pCi/g to 1.31 pCi/g, based on a total of 30 samples collected during the background study. Background for uranium-234 in the surface soil was calculated as 1.24 pCi/g, as indicated in Table D-2.

Uranium-234 activity in surface soil across the FEMP is depicted in Plates D-20, D-21, D-22, and D-23. Uranium-234 activity was detected above background activity in 944 of 1100 surface soil samples collected at depths of 0- to 1.5-feet below the ground surface. Uranium-234 activity ranged

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from 0.20 pCi/g to 18,093.00 pCi/g. A statistical summary of sampling and analytical results for uranium-234 in the surface soil at the FEMP is presented in Table D.1-1.

The majority of uranium-234 contamination was detected at levels of at least two orders of magnitude higher than the background level. Uranium-234 activity was detected at levels of at least 6.20 pCi/g in almost all of the study areas. The level 6.20 pCi/g is five times background for uranium-234 in the surface soil. The only areas where uranium-234 activities did not exceed 6.20 pCi/g were as follows: the trap range, the Great Miami riverbank characterization area, and the area 2-5 miles outside the FEMP boundary. Samples taken from the Clearwell line east were not analyzed for uranium-234.

Subsurface Soil

Background levels for uranium-234 in the subsurface soil ranged from 0.48 pCi/g to 1.30 pCi/g for most of the subsurface soil samples (48 of 51 samples) collected during the background study. Background for uranium-234 in the subsurface soil was calculated to be 1.04 pCi/g, as indicated in Table D-3.

Uranium-234 activity was positively detected above background in 223 of 492 subsurface soil samples collected from 1.5 feet to greater than 20 feet below the ground surface. Uranium-234 activity ranged from 0.20 to 319.0 pCi/g. A statistical summary of sampling and analytical results for uranium-234 in the subsurface soil is presented in Table D.1-2.

Uranium-234 activity was present in the following areas at levels of 5.20 pCi/g or greater. This level represents five times background activity for uranium-234.

- Plant 1 area
- Plant 2/3 area
- Plant 4/5/7 area
- Plant 6 area
- Plant 8 area
- Plant 9 area
- Sewage treatment plant area
- Pilot plant area
- Laboratory area
- Scrap metal pile, decon building and Buildings 64 and 65
- Graphite furnace, oil burner, coal pile area
- Area west of K-65 silos
- K-65/Clearwell line west
- Great Miami riverbank characterization
- Northeastern area of FEMP
- Western area of FEMP
- Area outside FEMP adjacent to boundary

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D.1.1.1.4 Thorium-230

Based on the data in the following discussion, it was determined that thorium-230 is a significant contaminant of the FEMP. Except for an isolated area south of the South Field, activities of thorium-230 are located within the 20 mg/kg uranium envelope as discussed in D.1.

Thorium-230, an alpha emitter with a 7.7 x 10^4 year half-life, is a progeny of uranium-234 decay. In nature, its activity level is approximately equal to that of uranium-234 unless natural processes have selectively removed a decay member. Thorium-230 would be present in the ores and residues processed at the FEMP during early operations (circa 1953). Processed material would not contain thorium-230 in the same relative abundance with respect to uranium-234. Ore processing is thought to account for a major portion of the thorium-230 releases from FEMP activities. Feed material from the gaseous diffusion plants or recycled material would contain relatively little thorium-230, since the material would have been chemically separated during refining steps. Trace levels of thorium-230 would be present from incomplete refining steps, with a very minor level from uranium-234 decay. Unless the level of thorium-232 is very low and the thorium-230 is high from processing, total thorium in environmental contamination would contain relatively little thorium-230 in terms of mass (e.g., 1 pCi/g corresponds to only 0.00005 mg/kg as total thorium). Table D-1 highlights areas that may be probable sources of thorium-230 contamination.

A summary of thorium-230, as defined by sample concentration relative to background levels in surface and subsurface soils, is presented in Table D.1-9. Table D.1-10 summarizes the geographic areas that exhibited elevated thorium-230 activities and provides the ranges of activity for each depth interval in surface and subsurface soils. Details of thorium-230 contamination in the geographic areas and in areas surrounding the former production plant are provided in Section D.2.

Surface Soil

Background levels for thorium-230 in the surface soil ranged from nondetectable to 2.01 pCi/g, based on a total of 30 samples collected during the background study. The background activity for thorium-230 in the surface soil was calculated as 1.97 pCi/g, as indicated in Table D-2.

Thorium-230 activities were detected above background in 499 of 970 surface soil samples collected at depths of 0- to 1.5-feet below the ground surface. Thorium-230 activity ranged from

0.20 to 7901.00 pCi/g. A statistical summary of sampling and analytical results for thorium-230 in the surface soil at the FEMP is presented in Table D.1-1.

The majority of thorium-230 contamination in FEMP surface soil is found in the following areas. Thorium-230 activity was detected at levels of at least 9.9 pCi/g in these areas, which is five times background.

- Plant 1 area
- Plant 2/3 area
- Plant 4/5/7 area
- Plant 9 area
- Sewage treatment plant area
- Pilot plant area
- Laboratory area FEMP
- Maintenance building area
- D&D building and drum baling area
- Scrap metal pile, decon building, and Buildings 64 and 65
- Graphite furnace, oil burner and coal pile area
- Fire training area
- K-65/Clearwell line west
- Northeastern area of FEMP
- Southern area of FEMP
- Western area of FEMP

As shown in Plates D-24 (A and B), D-25, and D-26, thorium-230 activity was detected in surface soil samples throughout the production area as well as areas surrounding the production area. The majority of the samples collected at the 0- to 0.5-foot depth interval exceeded the background level for thorium-230, mainly those collected from inside the former production area. Elevated thorium-230 activity does not appear to be as prevalent in the 0.5- to 1.0-foot depth interval as compared to the 0- to 5.0-foot depth. The areas of elevated thorium-230 activity concentrations present in the 1.0- to 1.5-foot depth interval were limited and scattered, mainly throughout the former production area. The areas where surface soil contamination at elevated levels occurred in more than one depth interval were the Plant 1 area, Plant 2/3 area, sewage treatment plant area, and the laboratory area.

Subsurface Soil

Background levels for thorium-230 in the subsurface soil ranged from 0.07 to 2.34 pCi/g for the subsurface soil samples (48 out of 51 samples) collected during the background study. The background activity for thorium-230 in the subsurface soil was calculated as 1.91 pCi/g, as presented in Table D-3.

Thorium-230 activity was positively detected above background in 64 of 566 subsurface samples collected from 1.5 to greater than 20 feet below the ground surface. Thorium-230 activity ranged

from 0.30 to 153.0 pCi/g. A statistical summary of sampling and analytical results for thorium-230 in the subsurface soil is presented in Table D.1-2.

Thorium-230 activity was present in the following areas at levels of 9.6 pCi/g or greater, a level which is five times background.

- Plant 2/3 area
- Plant 6 area
- Plant 8 area
- Sewage treatment plant
- K-65/Clearwell line west

Only one subsurface soil sample collected from a depth of greater than 20 feet exhibited an elevated thorium-230 activity concentration. This sample was located east of the Plant 6 area and had a concentration of 153 pCi/g.

D.1.1.1.5 Radium-226

Based on the data in the following discussion, it was determined that radium-226 is a significant contaminant of the FEMP. Except for an isolated area southwest of the sewage treatment plant, activities of radium-226 are located within the 20 mg/kg uranium envelope as discussed in D.1.

Radium-226, an alpha emitter with a 1600-year half-life, is a progeny of thorium-230 decay. In nature, its activity level is approximately equal to that of uranium-238, uranium-234, and other members in the uranium series, a natural decay chain, unless natural processes have selectively removed a decay member. Radium-226 would be present in ores and residues processed at the FEMP during early operations (circa 1951) and in yellowcake processed beginning in 1956. The yellowcake prepared by the carbonate leach process contained significant radium-226, which was not completely removed by refining steps. Thus waste and residues from processing ores and yellowcake from approximately 1951 through 1960 would account for radium-226 contamination to the environment. Table D-1 highlights the areas that are probable sources of radium-226.

A summary of radium-226 contamination, as defined by sample activity relative to background levels in surface and subsurface soils, is presented in Table D.1-11. Table D.1-12 summarizes the geographic areas that exhibited elevated radium-226 activities and provides ranges of activities for each depth interval in surface and subsurface soils. Details of radium-226 contamination in the geographic areas and the areas surrounding the former production plant are provided in Section D.2.

Surface Soil

Background levels for radium-226 in the surface soil ranged from 0.85 pCi/g to 1.48 pCi/g, based on a total of 30 samples collected during the background study. Background for radium-226 in the surface soil was calculated as 1.42 pCi/g, as indicated in Table D-2.

Radium-226 activity was positively detected above background activity in 346 of 1251 surface samples collected at depths from 0- to 1.5-feet below the ground surface. Radium-226 activity ranged from 0.10 pCi/g to 2,950.00 pCi/g. A statistical summary of sampling and analytical results for radium-226 in the surface soil at the FEMP is presented in Table D.1-1.

Radium-226 activity in surface soil across the FEMP is depicted in Plates D-27 (A, B, and C), D-28, and D-29. The majority of radium-226 contamination in surface soil at the FEMP is found in the following areas. Radium-226 activity was detected at levels of a least 7.10 pCi/g in these areas, which is five times background.

- Plant 1 area
- Plant 2/3 area
- Sewage treatment plant
- Pilot plant area
- D&D building and drum baling area
- Scrap metal pile, decon building, and Buildings 64 and 65
- K-65/Clearwell line
- Area west of K-65 silos
- Southern area of the FEMP
- Western area of the FEMP

Subsurface Soil

Background concentrations for radium-226 in the subsurface soil ranged from 0.59 pCi/g to 1.61 pCi/g for a total of 51 samples collected during the background study. The background activity for radium-226 in the subsurface soil was calculated to be 1.47 pCi/g, as presented in Table D-3.

Radium-226 activity was positively detected above background activity in 36 of 501 surface samples collected from 1.5 feet to greater than 20 feet below the ground surface. Radium-226 activity ranged from 0.30 pCi/g to 137.0 pCi/g. A statistical summary of sampling and analytical results for radium-226 in the subsurface soil is presented in Table D.1-2.

Radium activity in the subsurface soil across the FEMP is depicted in Plates D-30 through D-34. The majority of radium-226 activity in FEMP surface soil was present at levels that were below background. With the exception of the area west of the K-65 silos, the maximum concentration at all

other areas barely exceeded background. At the area west of K-65 silos, the maximum activity exceeded background significantly in the 3.0- to 5.0-foot depth, and the range of detected activities in this depth was 0.30 to 137.0 pCi/g.

No radium-226 activity was detected in samples from depths greater than 20 feet. Details for radium-226 activity in the above-mentioned geographic areas and in the surrounding production area are provided in Section D.2.

D.1.1.2 Actinium Series

Uranium-235 is the only member of the actinium series routinely characterized at the FEMP. Uranium-235 is an alpha emitter with a 7.038 x 10^8 year half-life. Natural uranium contains 0.72 percent (on an atom basis) of uranium-235, whereas enriched uranium contains the uranium-235 isotopes in greater abundance (typically, 0.95 percent to 1.25 percent at the FEMP), and depleted uranium contains less than 0.72 percent of uranium-235 (typically, 0.14 percent to 0.20 percent for material processed at the FEMP). Approximately 54 percent of the shipments received at the FEMP were natural uranium, approximately 20 percent were enriched uranium (some processing of 2-percent uranium-235 occurred in the 1960s), and approximately 26 percent were depleted uranium.

Beginning in October 1962, the FEMP processed recycled uranium, which is uranium that had been returned to the FEMP from other weapons materials processing facilities. The recycled materials had been irradiated in production reactors where finished uranium products were used. The recycled material contained uranium activation products and fission products. Uranium-236, an alpha emitter with a 2.3415 x 10^7-year half-life, is a neutron activation product of uranium-235. The factor of 30 less in half-life equates to uranium-236 activity being the same order as the uranium-235 activity. Its concentration in recycled material was on the order of 0.02 percent. (The isotopic level is a function of the neutron flux spectrum and irradiation time.) The alpha spectroscopy assay method used did not resolve the principal alpha from these two uranium isotopes; thus the activity is reported as uranium-235/236. (Some analyses were performed by thermal emission mass spectrometry, which did not have this limitation.)

The uranium-235 and uranium-236 released to the environment from FEMP activities is in the same chemical form as uranium-238. Thus the only difference in uranium-235/236 relative to uranium-238 or total uranium in contaminated soil can be explained by variable feed materials processed at the FEMP rather than by any intrinsic property of uranium-235 or uranium-236. Processes that released uranium-238 to the environment would have released uranium-235 and uranium-236 at their relative isotopic concentrations in the process stream at the time of release. Table D-1 highlights areas that are probable sources of uranium 235/236.

A summary of uranium-235/236 contamination, as defined by sample activity relative to the 95th percentile background levels (background) in surface and subsurface soil, is presented in Table D.1-13. Table D.1-14 summarizes the geographic areas that exhibited uranium-235/236 activity and

provides the range of each depth interval in the surface and subsurface soils. Details of uranium-235/236 in the geographic areas and in the surrounding areas of the former production plant are provided in Section D.2.

Surface Soil

Background levels for uranium-235/236 in the surface soil ranged from 0.03 to 0.20 pCi/g, based on a total of 30 samples collected during the background study. The background activity for uranium-235/236 in the surface soil was calculated as 0.156 pCi/g, as indicated in Table D-2.

Uranium-235/236 activity in surface soil across the FEMP is depicted in Plates D-35A, D-35B, D-36, and D-37. Uranium-235/236 was detected above background in 694 of 1171 surface soil samples collected at depths from 0 to 1.5 feet below the ground surface. Uranium-235/236 activity in surface soil samples ranged from 0.018 to 1021.0 pCi/g. A statistical summary of sampling and analytical results for uranium-235/236 in the surface soil at the FEMP is presented in Table D.1-1.

The majority of uranium-235/236 contamination in FEMP surface soil is found in the following areas. Uranium-235/236 activities were detected at levels of at least 0.78 pCi/g in these areas, which is five times background.

- Plant 1 area
- Plant 2/3 area
- Plant 4/5/7 area
- Plant 6 area
- Plant 8 area
- Plant 9 area
- Sewage treatment plant area
- Pilot plant area
- Laboratory area
- Administration area
- Maintenance building area
- D&D building and drum baling area
- Scrap metal pile area, decon building and Buildings 64 and 65
- Graphite furnace area, oil burner and coal pile area
- KC-2 warehouse area
- Fire training area
- Trap range
- Area west of K-65 silos
- K-65/Clearwell line west
- Northeastern area of the FEMP
- Southern area of the FEMP
- Western area of the FEMP
- Northwestern area of the FEMP
- Area outside FEMP adjacent to boundary

The highest detected activities of uranium-235/236 in the surface soil of the FEMP were found in the Plant 6 area (1021 pCi/g at 0 to 0.5 feet), the laboratory area (950 pCi/g at 0 to 0.5 feet), the Plant 2/3 area (310 pCi/g at 0 to 0.5 feet), the Plant 1 area (204 pCi/g at 0 to 0.5 feet), and the sewage treatment plant area (145 pCi/g at 0 to 0.5 feet). The majority of the uranium-235/236 contamination

present in the top 6 inches of surface soil of the above-mentioned areas is most likely attributable to miscellaneous spills of process material (i.e., Plant 6 and Plant 2/3 areas) or leaks from storage drums (i.e., Plant 1 and laboratory areas). The surface contamination seen in the area of the sewage treatment plant is probably linked to airborne deposition of uranium-contaminated particles from the former incinerator in the area.

Subsurface Soil

Background levels for uranium-235/236 in the subsurface soil ranged from 0.03 to 0.20 pCi/g, based on 51 samples collected during the background study. The background activity for uranium-235/236 in the subsurface soil was calculated to be 0.50 pCi/g, as presented in Table D-3.

Uranium-235/236 activity was detected above the background activity in 89 of 496 subsurface soil samples collected from 1.5 to greater than 20 feet below the ground surface. Uranium-235/236 activity ranged from 0.048 to 36.2 pCi/g. A statistical summary of sampling and analytical results for uranium-235/236 in the subsurface soil is presented in Table D.1-2.

The majority of uranium-235/236 contamination in the FEMP subsurface soil is found in the following areas at levels of at least 0.75 pCi/g, which is five times background.

- Plant 2/3 area
- Plant 4/5 area
- Plant 6 area
- Plant 8 area
- Plant 9 area
- Sewage treatment plant area
- Pilot plant area
- Laboratory area
- Scrap metal pile, decon building and Buildings 64 and 65
- Graphite furnace oil burner and coal pile area
- K-65/Clearwell line west
- Western area of FEMP

The majority of the significantly elevated levels of uranium-235/236 detected in the subsurface soils were present in the 1.5- to 3.0-foot depth interval. The highest detected activities of uranium-235/236 in the subsurface soil of the FEMP were found in the Plant 9 area (36.2 pCi/g at 1.5 to 3.0 feet), the Plant 2/3 area (33.0 pCi/g at 1.5 to 3.0 feet), the pilot plant area (14.8 pCi/g at 1.5 to 3.0 feet) and the Plant 6 area (12.6 pCi/g at 1.5 to 3.0 feet). The majority of the uranium-235/236 contamination present in the subsurface soil of the above-mentioned areas is most likely attributable to leaks from subgrade piping and sumps of process material. A number of these areas routinely handled acids, and uranium was present in the soluble form.

D.1.1.3 Thorium Decay Series

The thorium decay series is a natural alpha emission decay series. Members of the series include thorium-232, total thorium, radium-228, and thorium-228.

D.1.1.3.1 Thorium-232

The FEMP was the national repository for thorium, the first member of a natural decay series with a 1.405 x 10^{10}-year half-life that decays by alpha emission. Thorium production occurred intermittently from 1954 through 1975 and then continued through 1980. Thorium was an impurity in uranium concentrates used as feed material and in uranium ore. The Canadian concentrates used as refinery feed from 1956 through 1960 contained sufficient thorium impurity to require blending so that the feed solutions did not exceed 0.5-percent thorium on a uranium basis (0.55 μCi thorium per kg of uranium). Thus uranium production and thorium production processes provided release paths of thorium to the environment. However, thorium production provided the most significant releases to the environment. The past plant operations involved storage and processing of thorium materials in Plants 1, 4, 6, 8, and 9; the pilot plant; and the laboratory. Table D-1 highlights the areas that are probable sources of thorium-232.

Based on the data in the following discussion, it was determined that thorium-232 is not a significant contaminant of the FEMP. Furthermore, all activities of thorium-232 are located within the 20 mg/kg uranium envelope as discussed in D.1.

A summary of thorium-232 contamination, as defined by sample activity relative to the 95th percentile background levels (background) in surface and subsurface soils, is presented in Table D.1-15. Table D.1-16 summarizes the geographic areas that exhibited thorium-232 activity and provides a range of activity for each depth interval of the surface and subsurface soils. Details for thorium-232 contamination in the geographic areas and in the areas surrounding the former production plant are provided in Section D.2.

Surface Soil

Background activity for thorium-232 in the surface soil ranged from 0.64 to 1.52 pCi/g, based on a total of 30 samples collected during the background study. The background activity for thorium-232 in the surface soil was calculated to be 1.36 pCi/g, as indicated in Table D-2.

Thorium-232 activity in surface soil across the FEMP is depicted in Plates D-38 (A, B, C,), D-39, and D-40. Thorium-232 activity was positively detected above the background activity in 457 of 1667 surface soil samples collected from 0 to 1.5 feet. Thorium-232 activity ranged from 0.111 to 283.0 pCi/g. A statistical summary of sampling and analytical results for thorium-232 in the surface soil at the FEMP is presented in Table D.1-1.

The majority of thorium-232 contamination in FEMP surface soil is found in the following areas. Thorium-232 activity was detected at levels of at least 6.80 pCi/g, which is five times background, in these areas.

- Plant 1 area
- Plant 9 area
- Sewage treatment plant area
- Pilot plant area
- Laboratory area
- D&D building and drum baling area
- Scrap metal pile, decon building and Buildings 64 and 65
- K-65/Clearwell line west
- Northern area of FEMP
- Western area of FEMP

The highest detected activities of thorium-232 in the surface soils of the FEMP were found in the laboratory area (283 pCi/g at 0 to 0.5 foot, 57.4 pCi/g at 0.5 to 1.0 foot and 61.6 pCi/g at 1.0 to 1.5 foot), the scrap metal pile area (194 pCi/g at 0 to 0.5 foot), the northeastern area of the FEMP (104.6 pCi/g at 0 to 0.5 foot), the Plant 9 area (84.9 pCi/g at 0 to 0.5 foot and 35.6 pCi/g at 1.0 to 1.5 foot), and the Plant 1 area (31.4 pCi/g at 0 to 0.5 foot and 18.8 pCi/g at 0.5 to 1.0 ft). The majority of the thorium-232 contamination in the surface soil of the above-mentioned areas is most likely attributable to miscellaneous spills of process material or leaks from storage containers. The contamination in the surface soil of the northeastern area of the FEMP is most likely attributable to airborne deposition from past plant emissions.

Subsurface Soil

Background thorium-232 activity in the subsurface soil ranged from 0.35 to 1.35 pCi/g, based on a total of 50 samples collected during the background study. The background activity of thorium-232 in the subsurface soil was calculated as 1.26 pCi/g, as presented in Table D-3.

Thorium-232 activity in subsurface soil across the FEMP is depicted in Plates D-41 through D-45. Thorium-232 activity was positively detected above the background activity in 45 of 635 subsurface soil samples collected from 1.5 to greater than 10 feet below the ground surface. Thorium-232

activity ranged from 0.200 to 17.470 pCi/g. A statistical summary of sampling and analytical results for thorium-232 in the subsurface soil is presented in Table D.1-2.

The only area to exhibit significantly elevated activities of thorium-232 in the subsurface soil of the FEMP was the pilot plant area. An activity of 8.07 pCi/g was detected at the 5.0- to 10-foot depth interval in this area. Thorium-232 contamination at this depth interval is most likely attributable to leaks from subsurface piping and sumps, which could have migrated through groundwater transport to deeper depths.

D.1.1.3.2 Total Thorium

Total thorium consists essentially of thorium-232. Because of levels and half-lives, thorium-234 (24.10-day half-life, progeny of uranium-238), thorium-231 (25.52-hour half-life, progeny of uranium-235), thorium-227 (18.718-day half-life, progeny product of uranium-235 decay), and thorium-228 (1.9132-year half-life, progeny product of thorium-232 decay) do not significantly contribute to the mass in the total thorium assay. However, thorium-230, the decay product of uranium-234, has a 7.7 x 10^4-year half-life and can possibly contribute to the total thorium measurement if the thorium-232 level is low and the thorium-230 is high as a result of refining steps. The thorium-232 activity in pCi/g can be converted to mass units in mg/kg by multiplying the activity by 9.12. (This is sometimes rounded to 10 for an easy conversion.) The thorium-232 is determined by alpha counting techniques, whereas the total thorium is determined by chemical analysis.

Thorium contamination from FEMP activities is mostly from thorium-232. Thus the characterization and behavior of total thorium and thorium-232 should be analogous unless there are sampling or analytical problems, or if thorium-230 levels are significant. Total thorium is the major indicator of thorium contamination in the environmental media. Contamination in subsurface soil could be attributed to contamination migration from surface soil or leaking process equipment, with subsequent contamination of the groundwater. Table D-1 highlights the areas that are probable sources of total thorium.

Based on the data in the following discussion, it was determined that total thorium is not a significant contaminant of the FEMP. Furthermore, concentrations of total thorium are located within the 20 mg/kg uranium envelope as discussed in D.1.

A summary of total thorium contamination, as defined by sample concentration relative to the 95th percentile background levels (background) in surface and subsurface soils, is presented in Table D.1-17. Table D.1-18 summarizes the geographic areas that exhibited total thorium concentrations and provides the range of concentrations for each depth interval in the surface and subsurface soils. Details for total thorium concentrations in the geographic areas and in the areas surrounding the former production plant are provided in Section D.2.

Surface Soil

Background concentrations for total thorium in the surface soil ranged from 5.84 mg/kg to 13.86 mg/kg, based on 30 samples collected during the background study. The background for total thorium in the surface soil is 12.4 mg/kg, as indicated in Table D-2.

Total thorium concentrations in surface soil across the FEMP are depicted in Plates D-46 (A, B, C), D-47 (A, B), and D-48 (A, B). Total thorium concentrations were detected above background in 656 of 2202 surface soil samples collected from 0 to 1.5 feet below the ground surface. Total thorium concentrations ranged from 1.01 to 2581 mg/kg. A statistical summary of sampling and analytical results for total thorium concentrations in the surface soil is presented in Table D.1-1.

The majority of total thorium contamination in surface soil at the FEMP is presented in the following areas. Total thorium concentrations were detected at levels of at least five times background (62.0 mg/kg) in these areas.

- Plant 1 area
- Plant 2/3 area
- Plant 6 area
- Plant 9 area
- Sewage treatment plant area
- Pilot plant area
- Laboratory area
- D&D building and drum baling area
- Scrap metal pile, decon building and Buildings 64 and 65
- Fire training area
- K-65/Clearwell line west
- Northeastern area of FEMP
- Western area of FEMP

Elevated concentrations of total thorium are widespread throughout the Operable Unit 5 study area in the top 6 inches of soil. A large number of areas exceeded background for total thorium at the 1.0 to 1.5 foot depth interval.

The highest detected activities of total thorium in the surface soils of the FEMP were found in the laboratory area (2581 mg/kg at 0 to 0.5 foot, 523.5 mg/kg at 0.5 to 1.0 foot, and 561.8 mg/kg at

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1.0 to 1.5 foot), the scrap metal pile area (1769.29 mg/kg at 0 to 0.5 foot), the northeastern area of the FEMP (954.35 mg/kg at 0 to 0.5 foot), the Plant 9 area (766 mg/kg at 0 to 0.5 foot and 321 mg/kg at 1.0 to 1.5 foot), and the Plant 1 area (286.5 mg/kg at 0 to 0.5 foot and 171.6 mg/kg at 0.5 to 1.0 foot). The majority of the total thorium contamination present in the surface soils of the above-mentioned areas is most likely attributable to miscellaneous spills of process material or leaks from storage containers. The contamination in the surface soils of the northeastern area of the FEMP is most likely attributable to airborne deposition from past plant emissions. The thorium storage warehouse is located in the northeastern portion of the former production area.

Subsurface Soil

Background concentrations for total thorium in the subsurface soil ranged from 2.83 to 12.3 mg/kg, based on a total of 50 samples collected during the background study. The background concentration for total thorium in the subsurface soil is 11.1 mg/kg, as presented in Table D-3.

Total thorium concentrations in subsurface soil across the FEMP are depicted in Plates D-49 (A, B) and D-50 through -53. Total thorium concentrations were detected above the background in 155 of 1680 subsurface soil samples collected from 1.5 to greater than 20 feet below the ground surface. Total thorium concentrations ranged from 0.912 to 290.00 mg/kg. A statistical summary of sampling and analytical results for total thorium concentration in the subsurface soil is presented in Table D.1-2.

The majority of the total thorium contamination in the FEMP subsurface soil is found in the following areas. Total thorium concentrations were detected at levels of at least 55.5 mg/kg, which is five times the background value.

- Plant 9 area
- Pilot plant area
- Scrap metal pile, decon building, and Buildings 64 and 65

The highest concentration of total thorium at depths of greater than 20 feet was located southeast of the former production area at 63 mg/kg. Several other areas had elevated concentrations, as presented in Table D.1-18. Based on the locations and depth of these samples, it is most likely that the total thorium contamination at the FEMP is attributable to groundwater transport.

The only areas which exhibited significantly elevated concentrations of total thorium in the subsurface soils of the FEMP were the pilot plant area (290 mg/kg at 5.0 to 10.0 feet and 88 mg/kg at 3.0 to 5.0 feet), the scrap metal pile area (72 mg/kg at 3.0 to 5.0 feet and 69 mg/kg at 1.5 to 3.0 feet), and the Plant 9 area (66 μg/kg at 1.5 to 3.0 feet). The total thorium contamination present in the areas of the pilot plant and Plant 9 may have been caused by leaks from subgrade process piping and sumps. Leaks or releases from the thorium storage warehouse, which is located in the area of the scrap metal pile, are the probable causes for thorium in the scrap metal pile area.

D.1.1.3.3 Radium-228

Radium-228, a beta emitter with a 5.75-year half-life, is the progeny of thorium-232 decay. Its level in environmental media is associated with thorium-232 activity and is not related to radium-226 activity. In nature, its activity level is approximately equal to that of thorium-232 and other members in the thorium series, a natural decay chain, unless natural processes have selectively removed thorium-232 or radium-228. The radium-228 activity in environmental media from FEMP activities will be in secular equilibrium with thorium-232 within approximately 25 years of release unless natural processes provide a removal mechanism. Thus radium-228 levels in environmental media from FEMP activities should be related to thorium-232 levels. Table D-1 highlights the areas that are probable sources of radium-228.

Based on the data in the following discussion, it was determined that radium-228 is not a significant contaminant of the FEMP. Furthermore, all activities of radium-228 are located within the 20 mg/kg uranium envelope as discussed in D.1.

A summary of radium-228 contamination, as defined by sample concentration relative to background levels in surface and subsurface soils, is presented in Table D.1-19. Table D.1-20 summarizes the geographic areas that exhibited radium-228 activity and provides a range of activities for each depth interval in the surface and subsurface soils. Details for radium-228 contamination in the geographic areas and in the areas surrounding the former production plant are provided in Section D.2.

Surface Soil

Background levels for radium-228 in the surface soil ranged from 0.8 to 1.27 pCi/g for a total of 30 samples collected during the background study. The background activity for radium-228 in the surface soil was calculated to be 1.25 pCi/g, as indicated in Table D-2.

Radium-228 activity in surface soil across the FEMP is depicted in Plates D-54, -55, and -56. Radium-228 activity was positively detected above the background activity in 193 of 775 surface soil samples collected at depths from 0 to 1.5 feet below the ground surface. Radium-228 activity ranged from 0.520 to 558 pCi/g. A statistical summary of sampling and analytical results for radium-228 in the surface soil at the FEMP is presented in Table D.1-1.

The majority of radium-228 contamination in FEMP surface soil is found in the following areas. Radium-228 activity was detected at levels of at least 6.25 pCi/g in these areas. The level of 2.54 pCi/g is five times the background activity for radium-228.

- Plant 1 area
- Plant 2/3 area
- Plant 9 area
- Sewage treatment plant area
- Pilot plant area
- Laboratory area
- D&D building and drum baling area
- Scrap metal pile, decon building, and Buildings 64 and 65
- Northeastern area of the FEMP
- Western area of the FEMP

The highest detected activities of radium-228 in the surface soil were found in the northeastern area of the FEMP (558 pCi/g at 0 to 0.5 foot), the laboratory area (546 pCi/g at 0 to 0.5 foot and 217 pCi/g at 0.5 to 1.0 foot), the scrap metal pile area (105 pCi/g at 1.0 to 1.5 feet), the Plant 9 area (50.37 pCi/g at 1.0 to 1.5 feet and 27.9 pCi/g at 0 to 0.5 feet), and the Plant 1 area (56.2 pCi/g at 0 to 0.5 foot). The majority of the radium-228 contamination present in the surface soils of the above-mentioned areas is most likely attributable to miscellaneous spills of process material or leaks from storage containers. The contamination in the surface soils of the northeastern area of the FEMP is most likely attributable to airborne deposition from past plant emissions.

Subsurface Soil

Background levels for radium-228 in the surface soil ranged from 0.36 to 1.37 pCi/g for a total of 51 samples collected during the background study. The background activity for radium-228 in the surface soil was calculated to be 1.31 pCi/g, as indicated in Table D-3.

Radium-228 activity was detected above the background activity in 42 of 569 subsurface soil samples collected from 1.5 to greater than 20 feet below the ground surface. Radium-228 activity ranged from 0.510 to 23.900 pCi/g. A statistical summary of sampling and analytical results for radium-228 in the surface soil at the FEMP is presented in Table D.1-2.

The only areas which exhibited significantly elevated radium-228 activities in the subsurface soils of the FEMP were the scrap metal pile area (23.9 pCi/g at 1.5 to 3.0 feet), the pilot plant area (17.6 pCi/g at 5.0 to 10.0 feet) and the Plant 1 area (8.62 pCi/g at 1.5 to 3.0 feet). The subsurface soil contamination present in the pilot plant area is most likely attributable to leaks from subgrade process piping and sumps, whereas the contamination present in the Plant 1 area and scrap metal pile area is probable the result of spills from stored materials containing radium-228.

D.1.1.3.4 Thorium-228

Thorium-228, an alpha emitter with a 1.913-year half-life, is the fourth member of the thorium series and the progeny of actinium-228, the decay product of thorium-228. Its level in environmental media is associated with thorium-232 activity. In nature, its activity level is approximately equal to that of thorium-232 and other members of the thorium series, a natural decay chain, unless natural processes have selectively removed precursor activities. The thorium-228 in environmental media will be in secular equilibrium with thorium-232 within approximately 30 years of release unless natural processes provide a removal mechanism. Thus thorium-228 levels in environmental media from FEMP activities should be related to thorium-228 levels. Table D-1 highlights the areas that are probable sources of thorium-228.

Based on the data in the following discussion, it was determined that thorium-228 is not a significant contaminant of the FEMP. Furthermore, all activities of thorium-228 are located within the 20 mg/kg uranium envelope as discussed in D.1.

A summary of thorium-228 contamination, as defined by sample activity relative to the 95th percentile background levels (background) in surface and subsurface soils, is presented in Table D.1-21. Table D.1-22 summarizes the geographic areas that exhibited thorium-228 activity and the range of activities for each depth interval of the surface and subsurface soils. Details for thorium-228 contamination in the geographic areas and in the area surrounding the former production plant are provided in Section D.2.

Surface Soil

Background activity for thorium-228 in the surface soil ranged from 0.68 to 1.43 pCi/g, based on a total of 30 samples collected during the background study. The background activity for thorium-228 in the surface soil was calculated as 1.43 pCi/g, as indicated in Table D-2.

Thorium-228 activity in surface soil across the FEMP is depicted in Plates D-57, D-58, and D-59. Thorium-228 activity was positively detected above the representative background activity in 317 of 986 surface soil samples collected from 0 to 1.5 feet below the ground surface. Thorium-228 activity ranged from 0.136 to 315.00 pCi/g. A statistical summary of sampling and analytical results for thorium-228 in the surface soil at the FEMP is presented in Table D.1-1.

The majority of thorium-228 contamination in FEMP surface soil is found in the following areas. Thorium-228 activity was detected at levels of at least 7.15 pCi/g in these areas, which is five times background.

- Plant 1 area
- Plant 2/3 area
- Plant 6 area
- Plant 9 area
- Sewage treatment plant area
- Pilot plant area
- Sewage treatment plant
- Laboratory area
- D&D building and drum baling area
- Scrap metal pile, decon building, and Buildings 64 and 65
- K-65/Clearwell line west
- Northeastern area of FEMP
- Western area of FEMP

The highest detected activities of thorium-228 in the surface soils of the FEMP were found in the laboratory area (315 pCi/g at 0 to 0.5 feet, 67 pCi/g at 0.5 to 1.0 feet, and 55.8 pCi/g at 1.0 to 1.5 feet), the K-65/Clearwell line west of the former production area (62.7 pCi/g at 0 to 0.5 feet), the D&D building and drum baling area (40 pCi/g at 0 to 0.5 feet) and the northeastern area of the FEMP (39.2 pCi/g at 0 to 0.5 feet). The majority of the thorium-228 contamination present in the surface soils of the above mentioned areas is most likely attributable to miscellaneous spills of process material or leaks from storage containers or pipes. The contamination in the surface soils of the northeastern area of the FEMP is most likely attributable to airborne deposition from past plant emissions.

Subsurface Soil

Background activity for thorium-228 in the subsurface soil ranged from 0.47 to 1.39 pCi/g, based on a total of 50 samples collected during the background study. The background activity for thorium-228 in the subsurface soil was calculated at 1.38 pCi/g, as presented in Table D-3.

Thorium-228 activity was positively detected above the background activity in 68 of 622 subsurface soil samples collected from 1.5 to greater than 20 feet below the ground surface. Thorium-228

activity ranged from 0.200 to 20.300 pCi/g. A statistical summary of sampling and analytical results for thorium-228 in the subsurface soil is presented in Table D.1-2.

The only area to exhibit significantly elevated activity of thorium-228 in the subsurface soil was the pilot plant area (14.6 pCi/g at 5.0 to 10.0 feet). The contamination seen here is most likely the result of leaks from subgrade piping and sumps found in this area.

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D.1.1.4 Uranium Activation Products

Beginning in October 1962, the FEMP started processing recycled uranium. The recycled uranium had been irradiated in production reactors to produce weapons-grade materials. Although the reactor material was processed to remove most uranium activation products and fission products, residual levels remained.

D.1.1.4.1 Neptunium-237

Neptunium-237, an alpha emitter with a 2.14 x 10^6-year half-life, is a product of neutron activation of uranium. The principal production mode is through uranium-235 capturing two successive neutrons to form uranium-237 and then decay by beta emissions to neptunium-237. The level of neptunium-237 in recycled uranium is variable and is related to the neutron flux spectrum, irradiation time, and chemical processing steps prior to shipment to the FEMP. Table D-1 highlights the areas that are probable sources of neptunium-237.

Based on the data in the following discussion, it was determined that neptunium-237 is not a significant contaminant of the FEMP. Except for some isolated locations around the waste pits, activities of neptunium-237 are located within the 20 mg/kg uranium envelope as discussed in D.1.

A summary of neptunium-237 contamination, as defined by sample activity relative to background levels in surface and subsurface soils, is presented in Table D.1-23. Table D.1-24, which summarizes the geographic areas that exhibited neptunium-237 activities, also provides the range of activities in each depth interval of the surface and subsurface soils. Details for neptunium-237 contamination in the geographic areas in and around the former production plant are provided in Section D.2.

Surface Soil

As indicated in Table D-2, background activity for neptunium-237 in the surface soil was not analyzed. All data that were determined to be detected are treated as elevated above the background activity and are included in the following discussion of surface soil contamination.

Neptunium-237 activities were positively detected above background activity in 19 of 615 surface soil samples. Neptunium-237 activities ranged from 0.214 to 2.630 pCi/g. A statistical summary of sampling and analytical results for neptunium-237 in the surface soil is presented in Table D.1-1.

Neptunium-237 activity in the surface soil across the FEMP is depicted in Plate D-60. Because neptunium-237 activity is minimal, this is the only map included in the plates.

Elevated neptunium-237 levels primarily were detected in the 0- to 5-foot depth interval in the surface soil. The detected neptunium-237 activities ranged from 0.21 pCi/g (K-65/Clearwell line west area) to 2.63 pCi/g (northern portion of Plant 2/3 area). A few locations in the western and northwestern areas of the FEMP, near the waste pit area, detected neptunium-237 activities ranging from 0.33 to 1.10 pCi/g. In addition, neptunium-237 activity was detected at one location in 0.5- to 1.0-foot depth in the Plant 9 area. It appears that neptunium-237 contamination in these areas resulted from spills or releases of contaminated materials during waste placement and plant operations.

Subsurface Soil

As indicated in Table D-3, background activity for neptunium-237 in the subsurface soil was not analyzed. All data that were determined to be detected are treated as elevated above the background activity and are included in the following discussion of subsurface soil contamination.

Neptunium-237 activities were detected in 11 of 375 FEMP subsurface soil samples collected from 1.5 feet to greater than 20 feet below the ground surface at the FEMP. Neptunium-237 activities ranged from 0.267 to 0.553 pCi/g. A statistical summary of sampling and analytical results for neptunium-237 in the subsurface soil is presented in Table D.1-2.

Neptunium-237 activities were limited to the K-65/Clearwell line west and Clearwell line east. Neptunium-237 activities were detected in a few samples from the 5.0- to 10.0-foot depth interval in these areas. The detection of neptunium-237 activities may be attributable to leaks in the K-65 slurry and Clearwell lines.

D.1.1.4.2 Plutonium-239/240

Plutonium was not processed at the FEMP. During processing of the recycled materials, trace levels of plutonium may have been released to the environment. Plutonium-239, an alpha emitter with a 24,131-year half-life, is produced by neutron activation of uranium-238 to uranium-239, which decays by beta emission to plutonium-239. Higher plutonium isotopes including plutonium-240 (alpha emitter, 6569-year half-life), plutonium-241 (beta emitter, 14.4-year half-life), and plutonium-242 (alpha emitter, 3.758 x 10^5-year half-life) are produced during the irradiation through successive

neutron capture by plutonium-239. The high plutonium isotopes are limited because of the relatively short irradiation times in the production reactors. The alpha spectroscopy assay method used to analyze soil samples cannot resolve the principal alphas from plutonium-239 and plutonium-240. However, most of the reported plutonium-239/240 activity is expected to be plutonium-239 activity. Table D-1 highlights the areas that are probable sources of plutonium-239/240.

Based on the data in the following discussion, it was determined that plutonium-239/240 is not a significant contaminant of the FEMP. Except for an isolated location at the trap range, activities of plutonium-239/240 are located within the 20 mg/kg uranium envelope as discussed in D.1.

A summary of plutonium-239/240 contamination, as defined by sample concentration relative to the 95th percentile background levels (background) in surface and subsurface soil, is presented in Table D.1-25. Table D.1-26 summarizes the geographic areas that exhibited plutonium-239/240 activities and provides the range of activities in each depth interval of the surface and subsurface soils. Details for plutonium-239/240 contamination in the geographic areas in and around the former production plant are provided in Section D-2.

Surface Soil

Background activity for plutonium-239/240 in the surface soil was not analyzed, as indicated in Table D-2. All data that were determined to be detected are treated as elevated above the background activity and are included in the following discussion of surface soil contamination.

Plutonium-239/240 activities were detected in 34 of 695 surface soil samples collected at depths from 0 to 1.5 feet below the ground surface. Plutonium-239/240 activity ranged from 0.215 to 12.90 pCi/g. A statistical summary of sampling and analytical results for plutonium-239/240 in the surface soil is presented in Table D.1-1. Plutonium-239/240 activities in the 0- to 0.5-foot depth interval of the surface soil across the FEMP are depicted in Plate D-61. Because plutonium-238/234 activities were minimal at depth, this map is the only one included in the plates.

Plutonium-239/240 activities were detected in the surface soil of the following geographic areas:

- Sewage treatment plant
- Pilot plant area
- Laboratory area
- Area west of K-65 silos
- K-65/Clearwell line west
- Southern area of FEMP

- Maintenance building area
- Fire training area
- Trap range
- Western area of FEMP
- Area outside of FEMP adjacent to boundary

The majority of plutonium-239/240 activities were detected in the 0- to 0.5-foot depth interval of the surface soil. Plutonium-239/240 activities were detected in the 0- to 0.5-foot depth interval in the laboratory area at levels ranging from 1.80 to 12.90 pCi/g, the highest activity of plutonium-239/240 observed. In the fire training area, plutonium-239/240 activities were detected at levels ranging from 1.90 to 2.90 pCi/g. Other areas in the former production area, including the sewage treatment plant, pilot plant, and K-65 slurry line and Clearwell line west, also detected elevated activities of plutonium-239/240. Plutonium was not intentionally used or processed in the former production processes. Plutonium in the environmental media is thought to result from releases from production activities during processing of recycled material or from accidental spills. In addition, contamination at the old incinerator in the sewage treatment plant may be attributed to wind dispersion of contaminated materials that were incinerated.

Subsurface Soil

Similar to the surface soil, background activity for plutonium-239/240 in the subsurface soil was not analyzed, as presented in Table D-3. All data that were determined to be detected are treated as elevated above the background activity and are included in the following discussion of subsurface soil contamination.

Plutonium-239/240 activity was positively detected in 18 of 433 surface soil samples collected in 1.5- to 20.0-foot depth intervals in the subsurface soil. Plutonium-239/240 activities ranged from 0.30 to 5.50 pCi/g. A statistical summary of sampling and analytical results for plutonium-239/240 in the subsurface soil is presented in Table D.1-2.

Plutonium-239/240 activities in the subsurface soil were detected in the Plant 6 area, the area west of K-65 silos, and the western area of FEMP.

The majority of plutonium-239/240 activities in the subsurface soil was detected in the area west of K-65 silos. Plutonium-239/240 activities were detected in the depth intervals of 1.5 to 15.0 feet below the ground surface, with the maximum level (5.50 pCi/g) detected in the 5.0- to 10.0-foot depth interval. One sample each from the depth intervals of 10.0 to 15.0 feet and 15.0 to 20.0 feet in

Western Area of FEMP (at location near the waste pit area) detected plutonium-239/240 activities of 0.62 and 2.44 pCi/g, respectively. Plutonium-239/240 activity was also detected in the 5.0- to 10.0-foot depth interval in the Plant 6 area. Plutonium was not intentionally used or processed in the former production processes. The presence of plutonium-239/240 in the subsurface soil is believed to result from either vertical migration or horizontal transport of the recycled materials that were utilized in the former production processes.

D.1.1.4.3 Plutonium-238

Plutonium-238, an alpha emitter with an 87.75-year half-life, is associated with recycled materials and laboratory operations. Its principal mode of production is by neutron activation of neptunium-237. (Neutron irradiation of plutonium-239 is also a possible production mode.) Its level in recycled materials is variable and typically low. When detected in environmental media, plutonium-238 levels are low and usually near detection levels. Table D-1 highlights the areas that are probable sources of plutonium-238.

Based on the data in the following discussion, it was determined that plutonium-238 is not a significant contaminant of the FEMP. Furthermore, all activities of plutonium-238 are located within the 20 mg/kg uranium envelope as discussed in D.1.

A summary of plutonium-238 contamination, as defined by sample level concentration relative to the 95th percentile background levels (background) in the surface and subsurface soils, is presented in Table D.1-27. Table D.1-28 summarizes the geographic areas that exhibited plutonium-238 activities and provides the range of activities in each depth interval of surface and subsurface soils. Details for plutonium-238 contamination in the areas in and around the former production plant are provided in Section D-2.

Surface Soil

Background activity for plutonium-238 in the surface soil was not analyzed, as indicated in Table D-2. All data that were determined to be detected are treated as elevated above the background activity and are included in the following discussion of surface soil contamination.

Plutonium-238 activities were positively detected in 40 of 696 surface soil samples collected at depths from 0 to 1.5 feet. Plutonium-238 activities ranged from 0.207 to 151 pCi/g. A statistical summary

of sampling and analytical results for plutonium-238 in the surface soil is presented in Table D.1-1. Plutonium-238 activities in surface soil across the FEMP are depicted in Plates D-62, D-63, and D-64 for the 0- to 0.5-, 0.5 to 1.0-, and 1.0- to 1.5-foot depth intervals, respectively.

Plutonium-238 activities in the surface soil were detected in the following geographic areas.

- Plant 2/3 area
- Plant 4/5 area
- Plant 6 area
- Sewage treatment plant area
- Pilot plant area
- Laboratory area
- Administration area
- Fire training area
- Western area of FEMP
- K-65/Clearwell line west

The majority of plutonium-238 activities were detected in the laboratory area. Plutonium-238 activities were present at levels of 0.70 to 151.00 pCi/g, 4.70 to 67.40 pCi/g, and 0.80 to 8.20 pCi/g in the surface soil depth intervals of 0 to 0.5, 0.5 to 1.0, and 1.0 to 1.5 feet, respectively. Except in the areas of laboratory and Plant 2/3, all plutonium-238 activities that were detected in the surface soil depth intervals were present in the 0- to 0.5-foot depth interval. In the western area of the FEMP, plutonium-238 activities were detected in the 0- to 0.5-foot depth interval with levels ranging from 0.24 to 4.10 pCi/g. It appears that high levels of plutonium-238 contamination in the former production area (especially the laboratory area and the pilot plant area) and the western area of the FEMP resulted from releases or spills of the recycled materials. Other areas, e.g., the trailer area at the southern edge of the Plant 4 area, the Plant 6 salt-oil heat treat building, the service and heavy equipment buildings, and the K-65 slurry line and Clearwell line west, had detections with low but measurable plutonium-238 activities in soil samples that may be related to contaminated materials.

Subsurface Soil

Similar to the surface soil, background activity for plutonium-238 in the subsurface soil was not analyzed as presented in Table D-3. All data that were determined to be detected are treated as elevated above the background activity and are included in the following discussion of subsurface soil contamination.

Plutonium-238 activities were positively detected in 9 of 434 subsurface soil samples collected in 1.5- to 15.0-foot depth intervals. Plutonium-238 activities ranged from 0.0283 to 158 pCi/g. A statistical summary of sampling and analytical results for plutonium-238 in the subsurface soil is presented in Table D.1-2.

High levels of plutonium-238 activity were present at 1.27 to 158.00 pCi/g in the 5.0- to 10.0-foot depth interval in the Plant 6 area. In the laboratory area, plutonium-238 activity was detected at level of 2.77 pCi/g only in the 1.5- to 3.0-foot depth interval. It appears that the plutonium-238 contamination in the Plant 6 area and laboratory area may result from releases or spills of the recycled materials in the sumps of these areas. In addition, low levels of plutonium-238 activity ranging from 0.34 to 0.94 pCi/g were detected in the areas west of K-65 silos, K-65 slurry line and Clearwell line west, and southern and western areas of FEMP. Based on the isolated locations and levels of the plutonium-238 detections, plutonium-238 contamination in these areas may result from releases of the contaminated material.

D.1.1.5 Fission Products

Beginning in October 1962, the FEMP started processing recycled uranium. The recycled materials had been irradiated in production reactors to produce weapons-grade materials. Products from the fissioning of uranium and plutonium accumulated in the irradiated uranium. The uranium was chemically processed to remove the fission products, but residual levels remained. The fission products in recycled materials processed at the FEMP were at low levels, but some have long half-lives. Radiological contamination of the fission products is presented below.

D.1.1.5.1 Strontium-90

Strontium-90, a beta emitter with a 28.6-year half-life, decays to yttrium-90, a beta emitter with a 64.1-hour half-life. When strontium-90 is quantified in environmental samples, the yttrium-90 is known to be present but is not reported. In the environment, yttrium-90 is considered to be equal to that of strontium-90. Its release to the environment is attributed to uranium production activities using recycled material. Trace levels of strontium-90 in environmental media are also results of past atmospheric nuclear weapons testing. The partitioning coefficient for strontium in soils is relatively low, resulting in poor retention of strontium-90 in soil. However, the partitioning coefficient for strontium is about a factor of 1.7 to 5.6 higher than that for uranium, so that a direct relationship between strontium and uranium in environmental media relative to the source material may not be evident. Table D-1 highlights the areas that are probable sources of strontium-90.

Based on the data in the following discussion, it was determined that strontium-90 is not a significant contaminant of the FEMP. Except for scattered locations in the southern and northwestern areas and an isolated area southwest of the K-65 silos, activities of strontium-90 are located within the 20 mg/kg uranium envelope as discussed in D.1.

A summary of strontium-90 contamination, as defined by sample activity relative to the 95th percentile background levels (background) in the surface and subsurface soils, is presented in Table D.1-29. Table D.1-30 summarizes the geographic areas that exhibited strontium-90 activities and provides the range of activities for each depth interval of the surface and subsurface soils.

Details for strontium-90 contamination in the geographic areas in and around the production plant are provided in Section D.2.

Surface Soil

Background activities for strontium-90 in the surface soil ranged from 0.084 to 0.250 pCi/g, based on 4 detections out of 30 samples collected during the background study. As presented in Table D-2, the background activity for strontium-90 in the surface soil was calculated as 0.424 pCi/g.

Strontium-90 activities were positively detected above background activity in 239 of 694 surface soil samples collected from 0 to 1.5 feet below the ground surface. Strontium-90 activity ranged from 0.508 to 26.30 pCi/g. A statistical summary of sampling and analytical results for strontium-90 in the surface soil at the FEMP is presented in Table D.1-1. Strontium-90 activities in the surface soil across the FEMP are depicted in Plates D-65, D-66, and D-67 for the 0- to 0.5-, 0.5- to 1.0-, and 1.0- to 1.5-foot depth intervals, respectively.

The majority of strontium-90 contamination in the surface soil at the FEMP was present in the following areas. Strontium-90 activities were detected at levels above 2.12 pCi/g in one or more of the surface soil depth intervals in these areas. The level of 2.12 pCi/g is five times background for strontium-90 in the surface soil.

- Plant 1 area
- Plant 2/3 area
- Plant 9 area
- Sewage treatment plant
- Laboratory area
- D&D building and drum baling area
- Scrap metal pile, decon building, and Buildings 64 and 65
- Graphite furnace, oil burner, and coal pile area
- Fire training area
- Northeastern area of FEMP
- Southern area of FEMP
- Western area of FEMP
- Northwestern area of FEMP

The maximum activities in these areas ranged from 2.20 pCi/g (the 1.0- to 1.5-foot interval in the scrap metal pile area) to 26.30 pCi/g (the 0- to 0.5-foot interval in the laboratory area). The majority of these high strontium-90 activities were scatteringly detected in the 0- to 0.5-foot depth interval in the surface soil, as shown in Plate D-65. Strontium-90 activities were found in the areas of Plant 1, Plant 2/3, Plant 9, and laboratory, where strontium-90 activities were expected in the ore and products that were processed. Strontium-90 contamination in these areas may have resulted from spills or releases of ore and products to the surface soil. As indicated by the levels of strontium-90

activity, releases of contaminated material may attribute to the strontium-90 activities that were detected in the sewage treatment plant; fire training area; graphite furnace, oil burner and coal pile area; drum baling area, and northeastern and western areas of the FEMP. The past storage operations which took place in the scrap metal pile and KC-2 warehouse areas may potentially contribute to the relatively lower levels of strontium-90 activity in the surface soil of these areas versus the other areas mentioned above. In addition, wind dispersion may be the main pathway of strontium-90 contamination in the top interval of surface soil in the former production area and the surrounding areas of the FEMP.

Subsurface Soil

Background activities for strontium-90 in the subsurface soil were detected in 2 of 51 samples collected during the background study. The background activity for strontium-90 in the subsurface soil was calculated as 0.436 pCi/g, as presented in Table D-3.

Strontium-90 activities were positively detected above background activity in 107 of 433 subsurface samples collected from 1.5 feet to greater than 10 feet below the ground surface. Strontium-90 activity that was positively detected ranged from 0.51 to 47.60 pCi/g. A statistical summary of sampling and analytical results for strontium-90 in the subsurface soil is presented in Table D.1-2.

The majority of strontium-90 contamination in the subsurface soil at the FEMP was present in the following areas. Strontium-90 activities were detected at levels above 2.18 pCi/g in one or more of the subsurface soil depth intervals in these areas. The level of 2.18 pCi/g is five times the background activity for strontium-90 in the subsurface soil.

- Plant 1 area
- Plant 2/3 area
- Plant 6 area
- Plant 8 area
- Plant 9 area
- Sewage treatment plant area
- Scrap metal pile, decon building, and Buildings 64 and 65
- Area west of K-65 silos
- Northeastern area of FEMP
- Western area of FEMP
- Northwestern area of FEMP
- Area outside FEMP adjacent to boundary

Major subsurface soil contamination of strontium-90 was found in the areas of Plant 6 and sewage treatment plant. The highest activities of strontium-90 in the subsurface soil of these areas were detected at levels as high as 47.60 pCi/g in a 1.5- to 3.0-foot interval of the Plant 6 area and 10.10 pCi/g in the 10.0- to 15.0-foot interval of the sewage treatment plant. Strontium-90 activities

were also detected at levels of 1.95 to 2.44 pCi/g in the 15- to 20-foot depth interval of the Plant 6 area. The detections of strontium-90 in these areas, as well as in the areas of Plant 1, 2/3, 8, and 9, may have resulted from spills and releases of contaminated materials into the process equipment and sumps in these areas where strontium-90 activities were expected in the ore and products that were processed. In the areas where storage activities took place, vertical migration of strontium-90 from the surface soil contamination and/or horizontal transport by the perched groundwater may have occurred. These areas include the scrap metal pile, the area west of K-65 silos, and northern and western areas of the FEMP.

D.1.1.5.2 Technetium-99

Technetium-99 is a beta emitter with a 2.13 x 10^5-year half-life. It is a fission product associated with recycled material. Because of its volatile nature, it is carried in the enrichment stages in the gaseous diffusion plants and thus is found in recycled materials in proportions greater than its fission yield relative to other fission products. Technetium-99 has a partitioning coefficient approximately 15 to 21 times less than that of uranium. Consequently, it readily migrates through soil, and its level in environmental media cannot be related to uranium levels when recycled materials are released during processing activities. Table D-1 highlights the areas that are probable sources of technetium-99.

Based on the data in the following discussion, it was determined that technetium-99 is not a significant contaminant of the FEMP. Furthermore, all activities of technetium-99 are located within the 20 mg/kg uranium envelope as discussed in D.1.

A summary of technetium-99 contamination, as defined by sample activity relative to the 95th percentile background levels (background) in the surface and subsurface soils, is presented in Table D.1-31. Table D.1-32 summarizes the geographic areas that exhibited technetium-99 activities and provides the range of activities for each depth interval of the surface and subsurface soils. Details for technetium-99 contamination in the geographic areas in and around the former production plant are provided in Section D.2.

Surface Soil

Technetium-99 was not detected in any of the 30 surface soil samples collected in the background study, as presented in Table 4-1.1. All data that were determined to be detected are considered

elevated above the background activity and are included in the following discussion of surface soil contamination.

Technetium-99 activities were positively identified in 125 of 706 surface soil samples collected from 0 to 1.5 feet below the ground surface. Technetium-99 activities ranged from 1.10 to 602.00 pCi/g. A statistical summary of sampling and analytical results for technetium-99 in surface soil at the FEMP is presented in Table D.1-1. Technetium-99 activities in the surface soil across the FEMP are depicted in Plates D-68, D-69, and D-70 for the of 0- to 0.5-, 0.5- to 1.0-, and 1.0- to 1.5-foot depth intervals, respectively.

Technetium-99 activities were detected above the background activity in the following areas .

- Plant 1 area
- Plant 2/3 area
- Plant 6 area
- Plant 8 area
- Plant 9 area
- Northeastern area of FEMP
- Sewage treatment plant area
- Pilot plant area
- Laboratory area
- Administration area
- Maintenance building area
- D&D building and drum baling area
- Scrap metal pile, decon building, and Buildings 64 and 65
- Graphite furnace, oil burner, and coal pile area
- Fire training area
- Area west K-65 silos
- K-65/Clearwell line west
- Outfall pipeline
- Southern area of FEMP
- Western area of FEMP
- Northwestern area of FEMP
- Area outside FEMP adjacent to boundary

Almost all identified potential sources in and around the former production area had detections with elevated levels of technetium-99. The majority of technetium-99 contamination in the surface soil was detected in the depth interval of 0 to 0.5 feet. As shown in Plate D-68, high levels of technetium-99 activity were present within the former production area in the areas of northwest of Plant 1 (up to 93 pCi/g), Plant 1 pad (up to 118.20 pCi/g), graphite furnace (up to 18.50 pCi/g), northern portion of Plant 6 (up to 210.00 pCi/g), central portion of Plant 8 (up to 37.40 pCi/g), southwest of laboratory (up to 320.00 pCi/g), central portion of KC-65 slurry line and Clearwell line west (up to 602.00 pCi/g), fire training area (up to 27.30 pCi/g), and sewage treatment plant (up to 228.00 pCi/g).

In addition, high levels of technetium-99 contamination were also detected in the depth intervals of 0.5 to 1.0 and 1.0 to 1.5 feet in the areas of sewage treatment plant (up to 56.90 pCi/g), pilot plant

(up to 27.80 pCi/g), and laboratory (up to 10.20 pCi/g). Technetium-99 is a fission product associated with recycled material that was used in the uranium metal production. Its presence in the top interval of the surface soil may result from spills or releases of recycled material and cross-contamination by the contaminated material handled in the uranium production processes. Due to its volatile nature, technetium-99 activities in the lower depth intervals of the surface soil generally decrease as the depths increase.

Subsurface Soil

Technetium-99 was not detected in any of the 51 subsurface soil samples collected in the background study, as presented in Table 4-1.2. All data that were determined to be detected are considered elevated above the background activity and are included in the following discussion of subsurface soil contamination.

Technetium-99 activity was positively identified in 43 of 478 subsurface soil samples collected from 1.5 to greater than 10 feet below the ground surface. Technetium-99 activities ranged from 1.02 to 205.00 pCi/g. A statistical summary of sampling and analytical results for technetium-99 in the subsurface soil at the FEMP is presented in Table D.1-2.

Technetium-99 activities were detected above the background activity in the following areas:

- Plant 1 area
- Plant 2/3 area
- Plant 6 area
- Plant 8 area
- Plant 9 area
- Sewage treatment plant area
- Pilot plant area
- Graphite furnace, oil burner, and coal pile area
- Area west of K-65 silos
- K-65/Clearwell line west
- Western area of FEMP
- Northwestern area of FEMP
- Area outside FEMP adjacent to boundary

Technetium-99 activities were found in one or more subsurface soil depth intervals in most geographic areas throughout the FEMP. Major technetium-99 activities were found in the areas of Plant 6 (up to 37.90 pCi/g), Plant 8 (up to 205.00 pCi/g), pilot plant (up to 15.30 pCi/g), and west of K-65 silos (up to 18.60 pCi/g). Most of the technetium-99 contamination was detected in the depth intervals between 1.5 and 15.0 feet, except that technetium-99 activities were still detected in the 15.0- to 20.0-foot depth interval in the areas of Plant 6, Plant 8, and K-65 slurry line/Clearwell line west of production area. While some of the subsurface soil contamination may have resulted from vertical migration of contamination in the surface soil, the high-level technetium-99 activities more

likely resulted from releases of recycled and contaminated material that was handled in the underground structures, e.g., sumps, tanks, and pipelines. Note that technetium-99 activity was detected at Boring 2560, located approximately 1.5 mile south of the FEMP, with 43.60 pCi/g in the 5.0- to 10.0-foot depth interval. No confirmed sources in the area of Boring 2560 would be attributable to the contamination of technetium-99.

D.1.1.5.3 Ruthenium-106

Ruthenium-106, a beta emitter with a 368.2-day half-life, is associated with recycled uranium. Because of its relatively short half-life when compared to cesium-137 or technetium-99, ruthenium-106 was only detected in a limited number of surface soil samples in and around the former production area. Table D-1 highlights the areas that are probable sources of ruthenium-106.

Based on the data in the following discussion, it was determined that ruthenium-106 is not a significant contaminant of the FEMP. Furthermore, all activities of ruthenium-106 are located within the 20 mg/kg uranium envelope as discussed in D.1.

A summary of ruthenium-106 contamination, as defined by sample activity relative to the 95th percentile background levels (background) in the surface and subsurface soils, is presented in Table D.1-33. Table D.1-34 summarizes the geographic areas that exhibited ruthenium-106 activities and provides the range of activities for each depth interval of the surface and subsurface soils. Details for ruthenium-106 contamination in the geographic areas in and around the former production plant are provided in Section D.2.

Surface Soil

Background activity for ruthenium-106 in the surface soil was not detected in any of the 30 surface soil samples collected in the background study, as indicated in Table D-2. All data that were determined to be detected are considered elevated above the background activity and are included in the following discussion of surface soil contamination.

Ruthenium-106 activities were positively detected in 28 of 1277 surface soil samples collected from 0 to 1.5 feet. Ruthenium-106 activities ranged from 1.879 to 37.0 pCi/g. A statistical summary of sampling and analytical results for ruthenium-106 in the surface soil at the FEMP is presented in Table D.1-1. Ruthenium-106 activities in the surface soil across the FEMP are depicted in Plate

D-71A (validated ruthenium-106), Plate D-71B (nonvalidated ruthenium-106) and Plate D-71C (inset), for the 0- to 0.5-foot depth intervals.

Ruthenium-106 activities were only detected in the 0- to 0.5-foot depth interval at levels of 2.25 to 10.55 pCi/g and 3.07 pCi/g in the areas of K-65 slurry line/Clearwell line west of production area and western area of FEMP, respectively. Ruthenium-106 is a fission product, having a short half-life, associated with recycled material that was used in the uranium metal production. Its presence in the top interval of the surface soil may have resulted from spills or releases of recycled material handled near the K-65 slurry line and Clearwell line west of the production area.

Subsurface Soil

Background activity for ruthenium-106 in the subsurface soil was not detected in any of the 51 subsurface soil samples collected in the background study, as indicated in Table D-3. All data that were determined to be detected are considered elevated above the background activity and are included in the following discussion of subsurface soil contamination.

No ruthenium-106 activity was detected in 392 subsurface soil samples collected in the depth intervals of 1.5 to 20.0 feet below the ground surface, as indicated in Table D.1-2. This may be due to the short half-life of ruthenium-106.

D.1.1.5.4 Cesium-137

Cesium-137 is a beta emitter with a 30.17-year half-life. It is a fission product associated with recycled material. Trace levels of cesium-137 in environmental media may also be a result of fallout from weapons testing in other parts of the world. The partitioning coefficient for cesium is approximately 1000 times higher than that for uranium, which means that cesium activity is effectively retained by soil. Cesium-137 in environmental media is associated with the processing of recycled materials at the FEMP, but levels in environmental samples may not be related to uranium levels because of different partitioning coefficients. Table D-1 highlights the areas that are probable sources of cesium-137.

Based on the data in the following discussion, it was determined that cesium-137 is not a significant contaminant of the FEMP. Except for isolated locations in the control portion of the southern area

and adjacent to Route 126 in the northeastern area, all activities of cesium-137 are located within the 20 mg/kg uranium envelope as discussed in D.1.

A summary of cesium-137 contamination, as defined by sample activity relative to the 95th percentile background levels (background) in the surface and subsurface soils, is presented in Table D.1-35. Table D.1-36 summarizes the geographic areas that exhibited cesium-137 activities and provides the range of activities for each depth interval of the surface and subsurface soils. Details for cesium-137 contamination in the geographic areas in and around the former production plant are provided in Section D.2.

Surface Soil

Background activities for cesium-137 in the surface soil were detected in a range of 0.16 to 0.71 pCi/g, based on 30 samples collected during the background study. The background activity for cesium-137 in the surface soil was calculated as 0.711 pCi/g, as indicated in Table D-2.

Cesium-137 activities were positively detected above the background activity in 127 of 1335 surface soil samples collected from 0 to 1.5 feet. Cesium-137 activities ranged from 0.209 to 4.380 pCi/g. A statistical summary of sampling and analytical results for cesium-137 in the surface soil at the FEMP is presented in Table D.1-1. Cesium-137 activities in the 0- to 0.5-foot depth surface soil across the FEMP are depicted in Plate D-74. Because cesium-137 activity was minimal, this is the only map included in the plates.

As shown in Plates D-74A and D-74B, cesium-137 activities were detected in surface soil samples at low levels, except in the Plant 1 area, throughout the former production area. The majority of cesium-137 contamination in the surface soil was detected in the 0- to 0.5-foot depth interval. Cesium-137 was identified to potentially exist at most of the plants in the production areas. Although cesium-137 activities were detected above the background level in a number of the geographic areas, the only area that exhibited cesium-137 at levels above five times the background activity is the Plant 1 area. Cesium-137 in the Plant 1 area may have resulted from spills of recycled material handled in the area. A low partitioning coefficient for cesium-137 supports the decreases in activity levels and number of detections observed for cesium-137 in lower depths in the surface soil.

Subsurface Soil

Background activity for cesium-137 in the subsurface soil was not detected, based on a total of 51 samples collected during the background study, as presented in Table D-3. All data that were determined to be detected are considered elevated above the background activity and are included in the following discussion of subsurface soil contamination.

Cesium-137 activities were positively detected in 18 of 473 subsurface soil samples collected from 1.5 to greater than 10 feet below the ground surface. Cesium-137 activities ranged from 0.227 to 2.94 pCi/g. A statistical summary of sampling and analytical results for cesium-137 in the subsurface soil at the FEMP is presented in Table D.1-2.

Cesium-137 activities were detected in the subsurface soil of the following areas:

- Plant 2/3 area
- Plant 8 area
- Plant 9 area
- Sewage treatment plant area
- Area west of K-65 silos
- Outfall pipeline
- Great Miami riverbank characterization
- Western area of FEMP
- Area outside FEMP adjacent to boundary

Although a number of geographic areas showed cesium-137 activities in the subsurface soil, the majority of cesium-137 contamination in the subsurface soil was present in the depth intervals up to 10.0 feet below ground surface. High levels of cesium-137 were detected in the area of Plant 8, west of K-65 silos, and at the outfall pipeline. It appears that cesium-137 contamination in these areas may have resulted from releases of contaminated materials in the process equipment and sumps in these areas.

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D.1.2 INORGANIC PARAMETERS

Numerous surface and subsurface soil samples, as many as 484 and 382 samples, respectively, were collected and analyzed for various inorganic analytes. The inorganics that are included are provided in the introduction to Section 4.0.

Based on the data collected, the inorganic analytes that are present at significant levels throughout most of the former production area are listed below.

- Beryllium
- Cadmium
- Calcium
- Copper
- Lead
- Magnesium
- Molybdenum
- Silver
- Sodium
- Zinc

The following is a discussion of each of the 26 inorganic analytes for which sampling and analyses were performed, presented in alphabetical order.

D.1.2.1 Aluminum

Based on the data in the following discussion, it was determined that aluminum is not a significant contaminant of the FEMP. Furthermore, all concentrations of aluminum are located within the 20 mg/kg uranium envelope as discussed in D.1. Aluminum is a major constituent in the earth's crust, and a constituent of coal and its resulting flyash when burned. Aluminum has been identified as one of the potential contaminants from the Zirnlo process (Plant 9) and the process of decladding fuel elements (pilot plant). In addition, aluminum oxide was reportedly stored on the Plant 2 west pad before being used. Consequently, elevated aluminum concentrations may be expected in surface soil throughout the production area due to releases from historic plant operations. Additionally, aluminum might have been released as part of the incinerator residues from the graphite furnace/oil burner and sewage treatment plant. Table D-1 highlights the areas that may be probable sources of aluminum.

A summary of aluminum contamination, as defined by sample concentration relative to the 95th percentile background values (background) in surface and subsurface soils, is presented in Table D.1-37. Table D.1-38 summarizes the geographic areas that exhibited aluminum concentrations and provides the range of concentrations for each depth interval in the surface and subsurface soils.

Details for aluminum contamination in the geographic areas and in the surrounding areas of the former production plant are provided in Section D.2.

Surface Soil

Background concentrations for aluminum in the surface soil ranged from 5350 to 15,000 mg/kg, based on a total of 30 samples collected during the background study. Background was calculated as 11,900 mg/kg, as indicated in Table D-2.

Aluminum concentrations were positively detected above background in 106 of 428 surface soil samples collected at depths of 0 to 1.5 feet. Aluminum concentrations ranged from 483 to 25,700 mg/kg. A statistical summary of sampling and analytical results for aluminum in the surface soil at the FEMP is presented in Table D.1-1. Aluminum concentrations in the 0- to 0.5-foot depth interval across the FEMP are depicted in Plate D-75. Because aluminum contamination was minimal, this is the only map for aluminum included in the plates.

As shown in Plate D-75, isolated detections of aluminum slightly exceeded background in several areas. However, aluminum concentrations exceeded twice background in surface soil samples only at the 1.0- to 1.5-foot depth at the sewage treatment plant. The range of concentrations of aluminum detected at the sewage treatment plant surface soil was 6280 to 25,700 mg/kg as indicated in Table D.1-38.

Subsurface Soil

Background concentrations for aluminum in the subsurface soil ranged from 3250 to 16,100 mg/kg, based on a total of 51 samples collected during the background study. Background was calculated as 16,100 mg/kg, as indicated in Table D-3.

Aluminum concentrations were detected at concentrations that exceeded background in 25 of 338 subsurface soil samples collected from 1.5 to 20.0 feet. Concentrations of aluminum ranged from 1100 to 142,000 mg/kg. A statistical summary of sampling and analytical results for aluminum in subsurface soil at the FEMP is presented in Table D.1-2.

The frequency of aluminum detection, at concentrations exceeding background in the subsurface was significantly less than in surface soil. However, the concentrations of aluminum exceeded five times

background (80,500 mg/kg) in samples at two areas: the graphite furnace, oil burner, and coal pile area, and at the area west of K-65 silos. The range of all detected concentrations in the 3.0- to 5.0-foot samples at the graphite furnace area was 4710 to 142,000 mg/kg and in the 5.0- to 10.0-foot samples of the area west of K-65 silos was 3900 to 87,000 mg/kg.

Probable sources of aluminum contamination, as previously identified, were primarily the pilot plant; Plant 2; the graphite furnace, oil burner, and coal pile area; sewage treatment plant and Plant 9. Accordingly, concentrations of aluminum in surface and subsurface soils exceeded background in the pilot plant area; Plant 2/3 area; and the graphite furnace, oil burner, and coal pile area. However, concentrations of aluminum in surface and subsurface soils at Plant 9 were less than background. The source of the elevated levels of aluminum detected in the area west of the K-65 silos may be from the K-65 decant tank. The elevated levels of aluminum in surface and subsurface soils at the pilot plant and Plant 2/3 area could potentially be contributing to the aluminum levels detected above background for the perched groundwater in the southwest quadrant of the production area, as discussed in Appendix E.

D.1.2.2 Antimony

Based on the following discussion, it was determined that antimony is not a significant contaminant of the FEMP. Furthermore, with the exception of an area south and west of the K-65 silos all concentrations of antimony were located within the 20 mg/kg uranium envelope as discussed in D.1. Antimony is a trace element in the earth's crust, a minor impurity in uranium ore, and a constituent of coal and its resulting flyash when burned. Antimony or its compounds were not reported to have been used in processes at the FEMP. Positive detections of antimony in the soil of the Operable Unit 5 study area were very limited. Table D-1 highlights the areas that may be potential sources of antimony.

The limited positive detections of antimony in soil at the FEMP resulted primarily from a number of rejected validated data. Antimony is commonly rejected because of extremely low recovery of the matrix spike or analytical spike. The low recoveries may be a consequence of the ease with which antimony forms precipitates when in solution. The low matrix spike recovery may result from losses during sample digestion, or from matrix effects in which a portion of the analyte becomes bound to the substrate matrix. The matrix-bound analyte is therefore not available to the analyzing instrument and is not detected. Low analytical spike recovery may result from matrix effects.

A summary of antimony contamination, as defined by sample concentration relative to the 95th percentile background values (background) in surface and subsurface soils, is presented in Table D.1-39. Table D.1-40 summarizes the geographic areas that exhibited antimony concentrations and provides the range of concentrations for each depth interval in the surface and subsurface soils. Details for antimony contamination in the geographic areas and in the surrounding areas of the former production plant are provided in Section D.2.

Surface Soil

Antimony was not detected in any of the 22 samples collected in the background study at the FEMP, as indicated in Table D-2. Therefore, any detections of antimony would be above background.

Antimony concentrations were positively detected in 40 of 233 samples collected from 0 to 1.5 feet. Antimony concentrations ranged from 2.8 to 59.8 mg/kg. A statistical summary of sampling and analytical results for antimony in the surface soil at the FEMP is presented in Table D.1-1. Antimony concentrations in surface soil across the FEMP are depicted in Plate D-76. Because antimony concentrations were minimal, this is the only map included in the plates.

The surface soil at the FEMP with the most significant concentrations of antimony is found in the Plant 1, Plant 2/3, Plant 8, K-65 silo, and sewage treatment plant areas.

The most significant concentrations of antimony in surface soil are summarized below:

- Plant 1 area (0-0.5 feet): . . . . . 59.80 mg/kg
- Sewage treatment plant (0-0.5 feet): . . . . . 21.5 mg/kg
- Near K-65 silos (0-0.5 feet): . . . . . 26.3-32.3 mg/kg

Details for antimony contamination in the above-mentioned geographic areas and in the surrounding former production area are provided in Section D.2.

Subsurface Soil

There is no statistical background for antimony in subsurface soil, since antimony was not detected in any of the 37 background samples, as indicated in Table D-3. Therefore, any detections of antimony would be above background.

Antimony concentrations were positively detected in 11 of 145 subsurface soil samples collected from 1.5 to greater than 10 feet. Positively detected concentrations of antimony ranged from 1.2 to 22.1 mg/kg. A statistical summary of sampling and analytical results for antimony in the subsurface soil is presented in Table D.1-2.

The most significant concentrations of antimony contamination in each depth interval of subsurface soil at the FEMP are summarized as follows:

- Plan #9 (1.5-3.0 feet) . . . . . 7.30 mg/kg
- Plant 6 area (3.0-5.0 feet): . . . . . 22.0 mg/kg
- K-65 Clearwell line west
  - (5.0-10.0 feet): . . . . . 21.8 mg/kg

The only artificial potential source of antimony contamination at the FEMP are the coal and flyash piles. Air dispersion of antimony particles, followed by surficial deposition, is a potential pathway of surface soil contamination. Subsurface soil contamination is likely the result of subsequent rain water infiltration and transport.

D.1.2.3 Arsenic

Based on the data in the following discussion, arsenic is a significant contaminant at the FEMP. Except for isolated locations at the trap range and an area south of the K-65 silos, the elevated levels of arsenic are located within the 20 mg/kg envelope discussed in D.1. Arsenic is a trace element in the earth's crust and is a trace constituent of coal and its resulting in flyash when burned. Arsenic is also a minor impurity in uranium ores and ore concentrates. Arsenic or its compounds were not reported to have been used in production activities at the FEMP.

A summary of arsenic contamination, as defined by sample concentration relative to the 95th percentile background values (background) in surface and subsurface soils, is presented in Table D.1-41. Table D.1-42 summarizes the geographic areas that exhibited arsenic concentrations and provides the range of concentrations for each depth interval in the surface and subsurface soils. Details for arsenic contamination in the geographic areas and in the surrounding areas of the former production plant are provided in Section D.2.

Surface Soil

Background concentrations for arsenic in the surface soil ranged from 3.40 to 9.2 mg/kg, based on 30 samples collected during the background study. Background was calculated as 8.2 mg/kg, as indicated in Table D-2.

Arsenic concentrations were positively identified above background in 64 of 400 surface samples collected at depths of 0-1.5 feet. Arsenic concentrations ranged from 0.77 to 81.9. A statistical summary of sampling and analytical results for arsenic in the surface soil at the FEMP is presented in Table D.1-1. Arsenic concentrations in surface soil across the FEMP are depicted in Plates D-77, D-78, and D-79.

Arsenic concentrations in surface soil exceeded background in most areas of the FEMP. However, most of the arsenic contamination in FEMP surface soil was detected at levels of less than 16.4 mg/kg which is two times background. Arsenic concentration in surface soil across the FEMP is depicted in Plates D-77, D-78, and D-79. The only location where arsenic concentrations in surface soil exceeded five times backyard was in the 0.5- to 1.0-foot samples at the graphite furnace, oil burner, and coal pile area, where the range of all detected concentrations was 3.7 to 81.9 mg/kg. Other areas where arsenic exceeded twice background were the trap range and an area south of the K-65 silos where concentrations ranged from 2.0 to 25.3 mg/kg and 1.6 to 32.5 mg/kg, respectively.

Subsurface Soil

Background concentrations for arsenic in the subsurface soil ranged from 1.60 to 14.5 mg/kg, based on 51 samples collected during the background study. Background was calculated as 9.57 mg/kg, as indicated in Table D-3.

Arsenic concentrations were positively identified above background in 36 of 312 subsurface samples collected at depths of 1.5 to greater than 10 feet. Arsenic concentrations ranged from 0.03 to 74.2 mg/kg. A statistical summary of sampling and analytical results for arsenic in subsurface soil at the FEMP is presented in Table D.1-2.

The concentration of arsenic in subsurface soils at the FEMP exceeded background at a few locations. The majority of arsenic contamination was detected at concentrations that were less than twice background (19.14 mg/kg). The only location where arsenic concentrations exceeded twice

background was in the 3.0- to 5.0-foot and 5.0- to 10.0-foot samples at the area west of the K-65 silos. The range of all detected concentration in these samples was 2.8 to 74.2 mg/kg.

The widespread occurrence of arsenic at concentrations that exceeded background may be attributed to the dispersion by air of particles from the coal and flyash piles, followed by surficial deposition.

D.1.2.4 Barium

Based on the data in the following discussion, it was determined that barium is not a significant contaminant of the FEMP. Except for some isolated locations in the area northwest of the former production area and at the trap range, the concentrations of barium are located within the 20 mg/kg uranium envelope as discussed in D.1. Barium is a trace element in the earth's crust and a trace constituent in coal and its resulting flyash when burned. Barium carbonate was used to treat the raffinate in thorium extractions in the pilot plant. Barium compounds were involved in plant operations which included handling of ore and processed materials at Plant 1; the graphite furnace, oil burner, and coal pile area; the pilot plant; and the laboratory. Samples of ore from ore silos (Plant 1) and samples of contaminated soil from spill logs (e.g., Plants 2 and 6, pilot plant) indicated the presence of barium in these media. Maintenance operations performed in the areas of the main maintenance building and the electrical station possibly involved handling of barium contaminated materials. Barium contamination in the grassy area south of the occupational safety and health building is reported to have resulted from a past accidental spill. Table D-1 highlights the areas that may be potential sources of barium.

A summary of barium contamination, as defined by sample concentration relative to the 95th percentile background values (background) in surface and subsurface soil, is presented in Table D.1-43. Table D.1-44 summarizes the geographic areas that exhibited barium concentrations and provides the range of concentrations for each depth interval in the surface and subsurface soils. Details for barium contamination in the geographic areas and in the surrounding areas of the former production plant are provided in Section D.2.

Surface Soil

Background concentrations for barium in the surface soil ranged from 31.0 to 94.1 mg/kg, based on 29 samples collected during the background study. Please note that the background value listed in the

statistics table, 95.7 mg/kg, is an error. The correct background value for barium is 94.1, as indicated in Table D-2.

Barium concentrations were positively identified above background in 148 of 452 surface samples collected at depths of 0 to 1.5 feet. Barium concentrations ranged from 11.40 to 587.0 mg/kg. A statistical summary of sampling and analytical results for barium in surface soil at the FEMP is presented in Table D.1-1. Barium concentrations in surface soil across the FEMP are depicted in Plates D-80, -81, and -82.

The concentration of barium in surface soil exceeded background at several locations. However, most of the barium contamination was detected at levels that were less than 188.2 mg/kg, which is two times background. The only locations where barium concentrations were detected at levels that exceeded five times background were the laboratory area where the range of all detected concentration was 59.1 to 587.0 mg/kg and the graphite furnace, oil burner, and coal pile area where the range of all detected concentrations was 24.5 to 523.0 mg/kg.

Subsurface Soil

Background concentrations for barium in the subsurface soil ranged from 13.7 to 134 mg/kg, based on 51 samples collected during the background study. Background was calculated as 119 mg/kg, as indicated in Table D-3.

Barium concentrations were positively identified above background in 50 of 342 subsurface samples collected at depths of 1.5 to greater than 10 feet. Barium concentrations ranged from 9.90 to 3610 mg/kg. A statistical summary of sampling and analytical results for barium in subsurface soil at the FEMP is presented in Table D.1-2. Barium concentrations in the 1.5- to 3.0-foot internal of subsurface soil across the FEMP are depicted in Plate D-83.

The concentration of barium in subsurface soil exceeded background at several locations. However, the majority of barium contamination was detected at levels that were less than 238 mg/kg, which is two times background. The only locations where barium concentrations were detected at levels that exceeded five times background were the pilot plant area with a range of 23.4 to 3610.0 mg/kg, the maintenance building area with a range of 16.0 to 1200.0 mg/kg, and the area west of the K-65 silos with a range of 14.9 to 872 mg/kg.

Probable sources of barium contamination, as previously identified, were mainly the pilot plant; Plant 1; the graphite furnace, oil burner, and coal pile area; the laboratory; Plant 2; and the maintenance building; and Plant 6. Accordingly, concentrations of barium in surface and subsurface soils at these locations exceeded background. The elevated levels of barium present in soil at these locations could be contributing to the perched groundwater plumes of barium, as discussed in Appendix E.

D.1.2.5 Beryllium

Based on the data in the following discussion, it was determined that beryllium is a significant contaminant of the FEMP. Except for some isolated locations in the area northwest of the former production area and the active flyash pile, concentrations of beryllium are located within the 20 mg/kg uranium envelope as discussed in D.1. Beryllium is a trace element in the earth's crust and is a trace constituent in coal and the resulting flyash when burned. Beryllium or its compounds were not reported to have been used in operations at the FEMP. Raw materials and products that were handled in Plant 1, Plant 8, the pilot plant, the laboratory, and the main maintenance building could potentially have contributed to beryllium contamination in the surface soil. In addition, incineration residues from the contaminated oil/graphite burn pad and slag recycling building possibly were spread into the surrounding areas. Table D-1 highlights the areas that may be potential sources of beryllium.

A summary of beryllium contamination, as defined by sample concentration relative to the 95th percentile background values (background) in surface and subsurface soil, is presented in Table D.1-45. Table D.1-46 summarizes the geographic areas that exhibited beryllium concentrations and provides the range of concentrations for each depth interval in the surface and subsurface soils. Details for beryllium contamination in the geographic areas and in the surrounding areas of the former production plant are provided in Section D.2.

Surface Soil

Background for beryllium in the surface soil was 0.60 mg/kg, based on one of 30 samples collected during the background study. Background was calculated as 0.60 mg/kg, as indicated in Table D-2.

Beryllium concentrations were positively identified above background in 197 of 424 surface samples collected at depths of 0 to 1.5 feet. Beryllium concentrations ranged from 0.28 to 5.70. A statistical summary of sampling and analytical results for beryllium in the surface soil at the FEMP is presented

in Table D.1-1. Beryllium concentrations in the 0.1- to 0.5-foot interval of surface soil across the FEMP are depicted in Plate D-84.

The majority of FEMP had beryllium contamination in surface soil detected at levels that exceeded background. About half of the geographic areas of the FEMP had detected levels greater than twice background. Beryllium concentrations exceeded five times background only at the following locations:

- Plant 2/3 area: . . . . . 3.20 mg/kg
- Plant 8 area: . . . . . 3.50 mg/kg
- Northeast area of FEMP: . . . . . 5.70 mg/kg

Concentrations of beryllium in samples from the 1.0- to 1.5-foot depth interval from certain areas within the former production plant were higher than concentrations in the shallower samples. These areas include locations in the areas of Plant 2/3; Plant 8; the graphite furnace, oil burner, and coal pile; and Plant 9.

Subsurface Soil

Background concentrations for beryllium in the subsurface soil ranged from 0.48 to 0.68 mg/kg, based on 15 of 51 samples collected during the background study. Background was calculated as 0.62 mg/kg, as indicated in Table D-3.

Beryllium concentrations were positively identified above background in 185 of 333 subsurface samples collected at depths of 1.5 to 15.0 feet below the ground surface. Beryllium concentrations ranged from 0.29 to 5.20 mg/kg. A statistical summary of sampling and analytical results for beryllium in the subsurface soil at the FEMP is presented in Table D.1-2.

The majority of beryllium contamination in subsurface soil at the FEMP was detected at levels that exceeded background. Generally, there were detections greater than twice background throughout the farm production area to a depth of 3.0 feet. Beryllium concentrations exceeded five times background (3.10 mg/kg) only at the following locations:

- Plant 1 area: . . . . . 3.50 mg/kg
- Plant 4/5/7 area: . . . . . 3.90 mg/kg
- Area west of K-65 silos . . . . . 5.20 mg/kg

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These levels were typically at depths of 5.0 to 10.0 feet.

Probable sources of beryllium contamination, as previously identified, were mainly the pilot plant; Plant 1; the graphite furnace, oil burner, and coal pile area; the laboratory, and the maintenance building. Low-level beryllium contamination is widespread at the FEMP, potentially because of dispersion from the coal and flyash piles. However, the concentrations of beryllium in the surface and subsurface soils at several locations exceeded five times background. The elevated levels of beryllium present in the soils at Plant 1 and the graphite furnace, oil burner, and coal pile area could be contributing to the perched groundwater plumes of beryllium as discussed in Appendix E. The soil contamination in other areas, such as Plant 2/3 and Plant 8, where beryllium concentrations exceeded background, could be contributing to the large perched groundwater plume that is also discussed in Appendix E.

D.1.2.6 Cadmium

Based on the data in the following discussion, it was determined that cadmium is a significant contaminant in the FEMP. Except for isolated locations near the K-65 silos, all concentrations of cadmium were located within the 20 mg/kg uranium envelope as discussed in D.1. Cadmium is a trace element in the earth's crust and is a trace constituent in coal and its resulting flyash when burned. Cadmium or its compounds were not reported to have been used in operations at the FEMP. However, cadmium was a minor imprinting in the uranium ore processed at the FEMP. Table D-1 highlights the areas that may be potential sources of cadmium.

A summary of cadmium contamination, as defined by sample concentration relative to the 95th percentile background values (background) in surface and subsurface soils, is presented in Table D.1-47. Table D.1-48 summarizes the geographic areas that exhibited cadmium concentrations and provides the range of concentrations for each depth interval in the surface and subsurface soils. Details for cadmium contamination in the geographic areas and in the surrounding areas of the former production plant are provided in Section D.2.

Surface Soil

Background concentrations for cadmium in the surface soil ranged from 0.52 to 0.95 mg/kg, based on 30 samples collected during the background study. Background was calculated as 0.87 mg/kg, as indicated in Table D-2.

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Cadmium concentrations were positively identified above background in 154 of 442 surface samples collected at depths from 0 to 1.5 feet below the ground surface. Cadmium concentrations ranged from 0.49 to 12.40 mg/kg. A statistical summary of sampling and analytical results for cadmium in the surface soil at the FEMP is presented in Table D.1-1. Cadmium concentrations in surface soil across the FEMP are depicted in Plates D-85, -86, and -87.

Most of the cadmium contamination in surface soils at the FEMP was detected at levels exceeding background. The concentrations of cadmium in surface soils exceeded five times background (4.35 mg/kg) at the locations as listed below:

- Plant 1 area: 6.70 mg/kg
- Plant 2/3 area: 6.90 mg/kg
- Plant 6 area: 4.60 mg/kg
- Plant 9 area: 6.30 mg/kg
- Pilot plant area: 5.40 mg/kg
- Laboratory area: 4.90 mg/kg
- Maintenance building area: 8.00 mg/kg
- Tank farm and boiler house: 5.40 mg/kg
- Graphite furnace, Oil burner, and coal pile area: 12.40 mg/kg
- Fire training area: 7.60 mg/kg
- Area west of K-65 silos: 4.90 mg/kg
- Western area of FEMP: 6.70 mg/kg

Subsurface Soil

Background concentrations for cadmium in the subsurface soil ranged from 0.47 to 1.30 mg/kg, based on 51 samples collected during the background study. Background was calculated as 0.91 mg/kg, as indicated in Table D-3.

Cadmium concentrations were positively identified above background in 172 of 320 subsurface samples collected at depths of 1.5 to greater than 10 feet below the ground surface. Cadmium concentrations ranged from 0.92 to 8.0. A statistical summary of sampling and analytical results for cadmium in the subsurface soil at the FEMP is presented in Table D.1-2. Cadmium concentrations in subsurface soil across the FEMP are depicted in Plates D-88 and D-89.

The majority of cadmium contamination in subsurface soil at the FEMP was detected at concentrations that exceeded background. Location where concentrations of cadmium exceeded five times its background and the maximum concentrations at each location are listed below:

- Plant 1 area: . . . . . 6.40 mg/kg
- Plant 6 area: . . . . . 7.0 mg/kg
- Pilot plant: . . . . . 7.90 mg/kg
- Maintenance building area: . . . . . 8.0 mg/kg

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- Tank farm and boiler house: . . . . . 7.60 mg/kg
- Graphite furnace, oil burner, and coal pile area: . . . 7.70 mg/kg
- Western area of FEMP: . . . . . 4.80 mg/kg

The probable sources of cadmium contamination at the FEMP are the coal and flyash piles and impurities in uranium ore. Air dispersion of cadmium, followed by surficial deposition, is a potential pathway for surface soil contamination. This is a possible explanation for the widespread presence of cadmium at the FEMP at concentrations exceeding background. Subsequent infiltration of cadmium by rainwater is a potential pathway for subsurface soil contamination.

Soil contamination in the areas of Plant 1; Plant 2/3; the pilot plant; and the graphite furnace, oil burner, and coal pile could be contributing to the cadmium concentrations in the perched groundwater at these locations, where cadmium was detected at levels that exceeded background for groundwater.

D.1.2.7 Calcium

Based on the data in the following discussion, it was determined that calcium is not a significant contaminant of the FEMP. Most of the concentrations of calcium were located within the 20 mg/kg uranium envelope as discussed in D.1. Isolated areas outside the envelope include the trap range, northwestern area of the FEMP, southwest of the K-65 silos, northwest of the wastepits and portions of the area surrounding the South Field (OU2). Calcium is a relatively abundant element in nature. Calcium metal was used to reduce thorium tetrafluoride to metallic thorium in the pilot plant and in Plant 9. Lime was used in various processes during the operation of the production facility, and the wastes were discharged through the general sump. Furthermore, the Lime Sludge Ponds that are located west of the former production area might also be a significant, continuing source of contamination. Table D-1 highlights the areas that may be potential sources of calcium.

A summary of calcium contamination, as defined by sample concentration relative to the 95th percentile background values (background) in surface and subsurface soils, is presented in Table D.1-49. Table D.1-50 summarizes the geographic areas that exhibited calcium concentrations and provides the range of concentrations for each depth interval in the surface and subsurface soils. Details for calcium contamination in the geographic areas and in the surrounding areas of the former production plant are provided in Section D.2.

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Surface Soil

Background concentrations for calcium in the surface soil ranged from 856 to 5340 mg/kg, based on 30 samples collected during the background study. Background was calculated as 4340 mg/kg, as indicated in Table D-2.

Calcium concentrations were positively identified above background in 365 of 428 surface samples collected at depths of 0 to 1.5 feet. Calcium concentrations ranged from 778 to 347,000 mg/kg. A statistical summary of sampling and analytical results for calcium in the surface soil at the FEMP is presented in Table D.1-1. Calcium concentrations in the 0-0.5 foot interval in surface soil across the FEMP are depicted in Plate D-90.

Calcium contamination is wide spread in the surface soil. Concentrations of calcium exceed 21,700 mg/kg, which is five times background in virtually every area inside the FEMP boundary. In fact, the concentrations at several locations exceed background by a factor of 10 or more.

The following is a summary of the highest concentrations of calcium in each sampling depth in surface soil:

- Plant 1 area (0-0.5 feet): . . . . . 347,000 mg/kg
- Maintenance building area (0.5-1.0 feet): . . . . . 260,000 mg/kg
- Laboratory area (1.0-1.5 feet): . . . . . 170,000 mg/kg

It must be noted that (as discussed in detail in Section 2) the "surface soil" in some of the areas may actually be subsurface soils transported from elsewhere at the FEMP as part of this initial site grading. The background levels of calcium in subsurface soil exceed those in surface soil by a factor of at least 10, as a comparison of Tables D-2 and D-3 indicates. Therefore, the elevated levels of calcium observed in "surface soil" at several areas may be within the range of background concentrations, subsurface soil, and might not be the result of artificial sources.

Subsurface Soil

Background concentrations for calcium in the subsurface soil ranged from 3310 mg/kg to 335,000 mg/kg, based on 51 samples collected during the background study. Background was calculated as 150,000 mg/kg, as indicated in Table D-3.

Calcium concentrations were positively identified above background in 20 of 338 subsurface samples collected at depths of 1.5 to greater than 10-feet. Calcium concentrations ranged from 2180 to 314,000 mg/kg. A statistical summary of sampling and analytical results for calcium in the subsurface soil at the FEMP is presented in Table D.1-2.

Calcium in subsurface soil exceeded background at the following locations:

- Plant 1 area . . . . . 186,000 mg/kg
- Pilot plant area . . . . . 200,000 mg/kg
- Laboratory area . . . . . 154,000 mg/kg
- Maintenance building area . . . . . 221,000 mg/kg
- Scrap metal pile, decontamination building, and Buildings 64 and 65 . . . . 168,000 mg/kg
- Graphite furnace, oil burner, and coal pile area . . . . . 211,000 mg/kg
- Area west of K-65 silos . . . . . 314,000 mg/kg
- Northeast area of FEMP . . . . . 240,000 mg/kg

The highest concentrations of calcium in subsurface soils were detected in the area west of the K-65 silos. The maximum concentration (314,000 mg/kg) at this location was detected in the 5.0- to 10.0-foot depth, and this concentration was twice background.

Calcium (as lime) was widely used in various processes at the FEMP and is also a primary constituent of flyash. Consequently, calcium was frequently detected at widespread locations at concentrations exceeding background in surface and subsurface soils. The fact that calcium concentrations in surface and subsurface soils at the Plant 1 area exceeded background levels could result in the elevated calcium concentrations in the perched groundwater at that location. However, although the concentrations of calcium in the subsurface soil in some areas such as Plant 6; Plant 9; the sewage treatment plant; the KC-2 warehouse; and the graphite furnace, oil burner, and coal pile area were less than background, its concentrations in the perched groundwater in these areas exceeded its background level for groundwater. Therefore, calcium contamination in the perched groundwater at the latter areas might be attributable to migration of the groundwater from other upgradient sources.

D.1.2.8 Chromium

Based on the data in the following discussion, it was determined that chromium is a significant contaminant of the FEMP. Except for two isolated areas east of the K-65 sites and at the trap range, concentrations of chromium were located within the 20 mg/kg uranium envelope as discussed in D.1. Chromium is a trace constituent in the earth's crust and is a trace constituent in coal and its resulting

flyash when burned. Chromium or its compounds were not reported to have been used in production processes at the FEMP. Chromium is a minor impurity in the uranium ore processed at the FEMP. Chromium is a major constituent in stainless steel, and corrosion of process equipment could be a source of chromium in waste streams. Past plant production and maintenance operations such as releases from ore, intermediate products, final products, and process wastes that were handled in most of the plants could potentially have contributed to chromium contamination. Incineration residues from the contaminated oil/graphite burn pad and scrap metal in the scrap metal pile areas could have contaminated the surface soils in the northern portion of northeastern production area. In addition, chromium could have been released into the surface soil near the elevated water storage tanks as a result of sandblasting of paint on the tank. Table D-1 highlights the areas that may be potential sources of chromium.

A summary of chromium contamination, as defined by sample concentration relative to the 95th percentile background values (background) in surface and subsurface soils, is presented in Table D.1-51. Table D.1-52 summarizes the geographic areas that exhibited chromium concentrations and provides the range of concentrations for each depth interval in the surface and subsurface soils. Details for chromium contamination in the geographic areas and in the surrounding areas of the former production plant are provided in Section D.2.

Surface Soil

Background concentrations for chromium in the surface soil ranged from 6.70 to 17.70 mg/kg, based on 30 samples collected during the background study. Background was calculated as 15.5 mg/kg, as indicated in Table D-2.

Chromium concentrations were positively identified above the background in 212 of 446 surface samples collected at depths from 0 to 1.5 feet. Chromium concentrations ranged from 1.60 to 80.1 mg/kg. A statistical summary of sampling and analytical results for calcium in the surface soil at the FEMP is presented in Table D.1-1. Chromium concentrations in surface soil across the FEMP are depicted in Plates D-91, D-92, and D-93.

The contamination resulting from chromium in the surface soil is widespread. Concentrations of chromium exceeded background in surface soil in virtually every area inside the FEMP boundary.

However, the only area where the concentrations exceeded five times background was the Plant 1 area. The range of chromium concentration in this area was 7.0 to 80.10 mg/kg.

Subsurface Soil

Background concentrations for chromium in the subsurface soil ranged from 4.5 to 22.4 mg/kg, based on 51 samples collected during the background study. Background for chromium in the subsurface soil was calculated as 20.7 mg/kg, as indicated in Table D-3.

Chromium concentrations were positively identified above background in 51 of 329 subsurface samples collected at depths from 1.5 to 15 feet below the ground surface. Chromium concentrations ranged from 4.7 to 115.0 mg/kg. A statistical summary of sampling and analytical results for calcium in the subsurface soil at the FEMP is presented in Table D.1-2. Chromium concentrations in subsurface soil are depicted in Plate D-94.

The majority of chromium contamination in subsurface soil at the FEMP was detected at levels that exceeded background. The only location where the chromium concentrations in subsurface soils exceeded five times background was in the area west of the K-65 silos. The concentrations of chromium at this location ranged from 6.20 to 115.0 mg/kg.

The presence of chromium as a trace constituent in coal flyash accounts for its wide spread occurrence by airborne deposition in surface soil at the FEMP at concentrations that exceeding background. The presence of chromium in both surface and subsurface soils in the Plant 1 area, the Plant 2/3 area, and the pilot plant at concentrations that exceeded background could be a potential cause for the large chromium plume in the perched groundwater in the southwest quadrant of the former production area, which is discussed in Appendix E. However, although the concentrations of chromium in subsurface soil at several other locations such as the graphite furnace, oil burner, and coal pile; the maintenance building; and Plant 9 were less than background, the concentrations in the perched groundwater at these locations exceeded background. Therefore, the chromium contamination in the perched groundwater at the latter areas might be attributed to migration of the groundwater from other upgradient sources.

D.1.2.9 Cobalt

Based on the data in the following discussion, it was determined that cobalt is not a significant contamination of the FEMP. Except for an isolated location just east of the sewage treatment plant, all concentrations of cobalt are located within the 20 mg/kg envelope as discussed in D.1. Cobalt is a trace element in the earth's crust and is a trace constituent in coal and its resulting flyash when burned. Cobalt or its compounds were not reported to have been used in production activities at the FEMP. Table D-1 highlights the areas that may be potential sources of cobalt.

A summary of cobalt contamination, as defined by sample concentration relative to the 95th percentile background values (background) in surface and subsurface soils, is presented in Table D.1-53. Table D.1-54 summarizes the geographic areas that exhibited cobalt concentrations and provides the range of concentrations for each depth interval in the surface and subsurface soils. Details for cobalt contamination in the geographic areas and in the surrounding areas of the former production plant are provided in Section D.2.

Surface Soil

Background concentrations for cobalt in the surface soil ranged from 4.30 to 16.50 mg/kg, based on 30 samples collected during the background study. Background was calculated as 14.2 mg/kg, as indicated in Table D-2.

Cobalt concentrations were positively identified above background in 41 of 428 surface samples collected at depths from 0 to 1.5 feet. Cobalt concentrations ranged from 1.80 to 32.90 mg/kg. A statistical summary of sampling and analytical results for cobalt in the surface soil at the FEMP is presented in Table D.1-1. Cobalt concentrations in the 0- to 0.5-foot interval in surface soil across the FEMP are depicted in Plate D-95. Because cobalt contamination was minimal, this is the only map for cobalt included in the plates.

Concentrations of cobalt exceeded background but was typically less than twice background at about half the geographic locations at the FEMP in the 0- to 0.5-foot depth. Concentrations of cobalt exceeded background in the deeper surface soil at relatively few locations. The highest concentrations of cobalt in surface soil was detected at the Plant 1 area, Plant 2/3 area, and just east of the sewage treatment plant. The range of highest concentrations of cobalt in the surface soil in these areas was 30.0 to 32.9 mg/kg.

Subsurface Soil

Background concentrations for cobalt in the subsurface soil ranged from 3.6 mg/kg to 17.90 mg/kg, based on 51 samples collected during the background study. Background for cobalt in the subsurface soil was calculated as 15.7 mg/kg, as indicated in Table D-3.

Cobalt concentrations were positively identified above background in 34 of 338 subsurface samples collected at depths from 1.5 to greater than 10 feet. Cobalt concentrations ranged from 2.60 to 105.0 mg/kg. A statistical summary of sampling and analytical results for cobalt in the subsurface soil at the FEMP is presented in Table D.1-2.

Concentrations of cobalt exceeded background but were less than twice background at several locations. The only location where the concentration exceeded five times background was at the area west of K-65 silos at a depth of 5.0 to 10.0 feet. The range of concentrations of cobalt at this location was 2.90 to 105.0 mg/kg.

The presence of cobalt as a trace constituent in flyash explains its occurrence at several locations in surface soil at the FEMP at concentrations exceeding background. The presence of cobalt in both surface and subsurface soils in the Plant 2/3 area and the pilot plant at concentrations exceeding background could be a potential cause for the large cobalt plume in the perched groundwater the southwest quadrant of the former production area, which is discussed in Appendix E. Similarly, the presence of cobalt in the surface and subsurface soils in the Plant 1 area at concentrations exceeding background could be a cause for its presence in the perched groundwater at elevated levels. However, although the concentrations of cobalt in the subsurface soil at several other locations (mainly the graphite furnace, oil burner, and coal pile; the maintenance building; and Plant 9) were less than background, its concentrations in the perched groundwater at these locations exceeded background levels for groundwater. Therefore, the cobalt contamination in the perched groundwater at the latter areas might be attributed to migration of the groundwater from other upgradient sources.

D.1.2.10 Copper

Based on the data in the following discussion, it was determined that copper is a significant contaminant of the FEMP. Except for isolated locations in the northwestern area of the FEMP, southeast of the active flyash pile, around the K-65 silos, and at the trap range, concentrations of copper were located within the 20 mg/kg uranium envelope as discussed in D.1. Copper is a trace

element in the earth's crust and is a trace constituent in coal and its resulting flyash when burned. Copper was present on Zircallloy-2 cladding from coextrusion sections received from Hanford and was dissolved during processing at Plant 9. Copper sulfate was also used in the WINLO process in Plant 8 in the conversion of black oxide (UO_2) to uranium tetrafluoride. Copper components are a part of most switchgear assemblies. Table D-1 highlights the areas that may be potential sources of copper.

A summary of copper contamination, as defined by sample concentration relative to the 95th percentile background values (background) in surface and subsurface soils, is presented in Table D.1-55. Table D.1-56 summarizes the geographic areas that exhibited copper concentrations and provides the range of concentrations for each depth interval in the surface soil. Details for copper contamination in the geographic areas and in the surrounding areas of the former production plant are provided in Section D.2.

Surface Soil

Background concentrations for copper in the surface soil ranged from 3.20 to 17.30 mg/kg, based on 30 samples collected during the background study. Background was calculated as 14.1 mg/kg, as indicated in Table D-2.

Copper concentrations were positively identified above background in 278 of 428 surface samples collected at depths of 0 to 1.5 feet. Copper concentrations ranged from 3.80 to 695.00 mg/kg. A statistical summary of sampling and analytical results for copper in the surface soil at the FEMP is presented in Table D.1-1. Copper concentration in the 0- to 0.5-foot interval surface soil (the internal of the majority of copper contamination) across the FEMP is depicted in Plate D-96.

Most of the copper contamination in surface soil at the FEMP is found in the following areas. Copper concentrations were detected at levels of at least 70.5 mg/kg in these areas, or five times background.

- Electrical substation area
- D&D building and drum baling area
- Scrap metal pile, decontamination building, and Buildings 64 and 65

Copper was detected at concentrations five times above background in the surface soil at the central portion of the electrical substation area and northern portions of the scrap metal pile and D&D building and drum baling area. Copper concentrations in these areas ranged from 695 mg/kg at the drum baling area to 184 mg/kg at the electrical substation area.

Subsurface Soil

Background concentrations for copper in the subsurface soil ranged from 6.80 to 24.30 mg/kg, based on 51 samples collected during the background study. Background was calculated as 20.0 mg/kg, as indicated in Table D-3.

Copper concentrations were positively identified above background in 103 of 336 subsurface samples collected at depths from 1.5 to 20 feet. Copper concentrations ranged from 5.00 to 171.00 mg/kg. A statistical summary of sampling and analytical results for copper in the subsurface soil at the FEMP is presented in Table D.1-2.

The highest copper contamination in FEMP subsurface soil was found in the 5.0- to 10.0-foot interval in the area west of the K-65 silos. Copper concentrations were detected at levels of at least 100 mg/kg. The level of 100 mg/kg is five times background.

No specific processes are identified in the area that would contribute to the contamination of copper. It appears that the copper contamination in the scrap metal pile and drum baling area resulted from storage operations in these areas. However, it appears that previous disposal operations in the area west of the K-65 silos may have contributed to the copper contamination in the subsurface.

D.1.2.11 Cyanide

Based on the data in the following discussion, it was determined that cyanide is not a significant contaminant of the FEMP. Except for isolated areas at the trap range, south of the trap range, and in the northwestern area of the FEMP concentrations of cyanide are located within the 20 mg/kg uranium envelope as discussed in D.1. Cyanide can be produced in furnace operations in the production of steel, but was not reported to be associated with oxidation furnace operations at the FEMP. Table D-1 highlights the areas that may be potential sources of cyanide.

A summary of cyanide contamination, as defined by sample concentration relative to the 95th percentile background values (background) in surface and subsurface soils, is presented in Table D.1-57. Table D.1-58 summarizes the geographic areas that exhibited cyanide concentrations provides the range of concentrations for each depth interval in the surface soil. Details for cyanide contamination in the geographic areas and in the surrounding areas of the former production plant are provided in Section D.2.

Surface Soil

Background concentrations for cyanide in the surface soil ranged from 0.14 to 0.29 mg/kg, based on a total of 30 samples collected during the background study. Background was calculated as 0.27 mg/kg, as indicated in Table D-2.

Cyanide concentrations were positively detected above background in 66 of 384 surface soil samples collected at depths from 0 to 1.5 feet. Cyanide concentrations ranged from 0.11 to 22.80 mg/kg. A statistical summary of the analytical results for cyanide in the surface soil at the FEMP is presented in Table D.1-1. Cyanide concentration in surface soil across the FEMP is depicted in Plate D-97. Because cyanide concentration typically decreased significantly with depth, this is the only map included in the plates.

The majority of cyanide contamination in surface soil at the FEMP was detected in the 0- to 0.5-foot interval, as depicted in Plate D-97. Therefore, this was the only map included in the plates. Cyanide concentrations were detected at levels of at least 1.35 mg/kg or five times background in the following areas.

- Plant 1 area
- Maintenance building
- Graphite furnace, oil burner, and coal pile area
- Trap range
- Northwestern area of FEMP

The highest levels of cyanide were detected at depths of 0 to 0.5 feet and 0.5 to 1.0 feet in the area of the maintenance building at concentrations of 0.59 to 22.80 mg/kg and 0.14 to 20.60 mg/kg, respectively. In other areas, including the Plant 9 area; sewage treatment plant, scrap metal piles; the fire training area; and the southern and western areas of the FEMP, cyanide was also detected at concentrations greater than twice background.

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Subsurface Soil

Background concentration for cyanide in the subsurface soil was detected in one sample at a concentration of 5.60 mg/kg, based on a total of 51 samples collected during the background study. Background was calculated as 0.17 mg/kg, as indicated in Table D-3.

Cyanide concentrations were positively detected above background in 26 of 313 samples collected from the subsurface soil. Cyanide concentrations ranged from 0.11 to 9.8 mg/kg. A statistical summary of the analytical results for cyanide in the subsurface soil at the FEMP is presented in Table D.1-2.

Most of the cyanide contamination in subsurface soil at the FEMP was found in the following areas. Cyanide concentrations were detected at levels of at least 0.85 mg/kg in these areas, or five times background.

- Plant 6 area
- Maintenance building
- Graphite furnace, oil burner, and coal pile area
- Area west of K-65 silos

The highest levels of cyanide were detected at depth intervals of 1.5 to 3.0 feet in the maintenance building area, 3.0 to 5.0 feet in the Plant 6 area and 5.0 to 10.0 feet west of K-65 silos and at the graphite furnace.

No specific processes are identified that would contribute to the cyanide contamination. Such contamination may have resulted from releases during the performance of maintenance and storage activities in these areas.

D.1.2.12 Iron

Based on the data in the following discussion, it was determined that iron is not a significant contaminant of the FEMP. Except for an isolated area at the trap range, concentrations of iron were located with the 20 mg/kg uranium envelope as discussed in D.1. Iron is a relatively abundant element in nature and is a constituent in coal and its resulting flyash when burned. Processing equipment at the FEMP was primarily constructed of steel, and corrosion could be a source of iron in waste products. Table D-1 highlights the areas that may be potential sources of iron.

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A summary of iron contamination, as defined by sample concentration relative to the 95th percentile background values (background) in surface and subsurface soils, is presented in Table D.1-59. Table D.1-60 summarizes the geographic areas that exhibited iron concentrations and provides the range of concentrations for each depth interval in the surface and subsurface soils. Details for iron contamination in the geographic areas and in the surrounding areas of the former production plant are provided in Section D.2.

Surface Soil

Background concentrations for iron in the surface soil ranged from 9370 to 24,900 mg/kg, based on a total of 30 samples collected during the background study. Background was calculated as 21,700 mg/kg, as indicated in Table D-2.

Iron concentrations were positively detected above background in 127 of 428 surface soil samples collected at depths of 0 to 1.5 feet. Iron concentrations ranged from 24.50 to 45,100 mg/kg. A statistical summary of the analytical results for iron in the surface soil at the FEMP is presented in Table D.1-1.

As shown in Plate D-98, elevated levels of iron are widespread. Iron in surface soil at the FEMP was elevated above background but less than twice background in most of the areas. The highest concentration (45,100 mg/kg) of iron was greater than twice background and was detected at depths of 0 to 0.5 feet in the northeastern area of FEMP. Concentration ranges of iron at the trap range and the graphite furnace, oil burner, and coal pile area were almost twice background, with the highest detections of 40,600 mg/kg and 41,800 mg/kg, respectively.

Subsurface Soil

Background for iron in the subsurface soil ranged from 8970 to 30,700 mg/kg, based on a total of 51 samples collected during the background study. Background was calculated as 30,700 mg/kg, as indicated in Table D-3.

Iron concentrations were positively detected above background in 36 of 338 subsurface soil samples at concentrations ranging from 4000 to 193,000 mg/kg. A statistical summary of the analytical results for iron in the subsurface soil at the FEMP is presented in Table D.1-2.

The majority of iron contamination in subsurface soil at the FEMP was detected in the area west of the K-65 silos and the graphite furnace, oil burner, and coal pile area. Iron was detected at levels exceeding five times background in the area west of K-65 silos. Elevated concentrations of iron ranged from 8060 to 193,000 mg/kg at depths of 5.0 to 10.0 feet in the area west of the K-65 silos, while ranging from 13,700 to 66,600 mg/kg at depths of 3.0 to 5.0 feet in the graphite furnace, oil burner, and coal pile area.

Iron contamination in the graphite furnace, oil burner, and coal pile area may be attributed to the coal pile that was used to serve the nearby boiler house. The boiler house is identified as a potential source of iron contamination. No specific processes were identified in the northwestern area of FEMP that would contribute to iron contamination. Although no specific processes are identified in the area west of the K-65 silos as contributing to iron contamination, it appears that the K-65 decant sump tank and construction debris in this area past storage operations, may be responsible for the iron contamination.

D.1.2.13 Lead

Based on data in the following discussion, it was determined that lead is a significant contaminant of the FEMP. Except for the trap range and an isolated location in the northwestern area of the FEMP, concentrates of lead are located within the 20 mg/kg uranium envelope as discussed in D.1. Lead has been identified as a potential contaminant in operations of ore preparation and refinery (Plants 1 and 2), metal production and fabrication (Plants 5 and 6), decontamination (decontamination building), and maintenance (service building). Lead shot was used at the trap range. Lead concentrates in the K-65 silos were detected as high as 199,000 mg/kg. Table D-1 highlights the areas that may be potential sources of lead contamination.

A summary of lead contamination, as defined by sample concentrations relative to the 95th percentile background values (background) in surface and subsurface soils, is presented in Table D.1-61. Table D.1-62 summarizes the geographic areas that exhibited lead concentrations and provides the range of concentrations for each depth interval in the surface and subsurface soils. Details for lead contamination in the geographic areas and in the surrounding areas of the former production plant are provided in Section D.2.

Surface Soil

Background concentrations for lead in the surface soil ranged from 11.00 to 36.40 mg/kg, based on a total of 30 samples collected during the background study. Background was calculated as 26.40 mg/kg, as indicated in Table D-2.

Lead concentrations were positively detected above background in 114 of 415 surface soil samples at concentrations ranging from 2.88 to 2180.00 mg/kg. A statistical summary of the analytical results for lead in the surface soil at the FEMP is presented in Table D.1-1.

As depicted in Plates D-99, D-100, and D-101, the majority of lead contamination in FEMP surface soil was found in the 0- to 0.5-foot interval in areas throughout the FEMP. Lead concentrations were detected at levels of at least 132 mg/kg in these areas. The level of 132 mg/kg is five times background. These areas include:

- Plant 2/3 area
- Plant 6 area
- Sewage treatment plant area
- Electrical substation area
- D&D building and drum baling area
- Maintenance building area
- Scrap metal pile, decontamination building, and Buildings 64 and 65
- KC-2 warehouse area
- Trap range
- K-65/Clearwell line west of production area

As expected, the highest level of lead (2180 mg/kg) was detected at the trap range.

Subsurface Soil

Background concentrations for lead in the subsurface soil ranged from 3.00 to 18.40 mg/kg, based on a total of 51 samples collected during the background study. Background was calculated as 15.60 mg/kg, as indicated in Table D-3.

Lead concentrations were positively detected above background in 85 of 339 subsurface soil samples at lead concentrations ranging from 0.47 to 139 mg/kg. A statistical summary of the analytical results for lead in the subsurface soil at the FEMP is presented in Table D.1-2.

The majority of lead contamination in FEMP subsurface soil was detected in the area west of K-65 silos. Lead concentrations were detected at levels of at least 78.00 mg/kg in this area. The level of 78.00 mg/kg is five times background. Lead was detected in the area west of K-65 silos at

concentrations ranging from 8.90 to 139.00 mg/kg. Lead was detected in the fire training area with concentrations as high as 71.00 mg/kg and may be attributable to the use of waste solvents and oils in that area. The probable sources for lead are lead shot at the trap range and impurities in uranium ores.

D.1.2.14 Magnesium

Based on the data is the following discussion, it was determined that magnesium is a significant contaminant of the FEMP. Most concentrations of magnesium fall within the 20 mg/kg uranium envelope as discussed in D.1. Isolated areas outside the envelope are south and southwest of the K-65 silos, northwest of the waste pits, near the south field (OU2), the trap range, and in the northwestern area of the FEMP. Magnesium is a common element in soil and is wide spread in the environment. Magnesium is a trace constituent in flyash. It was used heavily at the FEMP in the form of magnesium fluoride (MgF_2) as part of uranium processing. Magnesium oxide was used to recover uranium in Plant 2/3. Magnesium metal was used in the reduction of uranium tetrafluoride to uranium metal in Plant 5. The magnesium fluoride slag was processed in Plant 8. Table D-1 highlights the areas that may be potential sources of magnesium.

A summary of magnesium contamination, as defined by sample concentration relative to the 95th percentile background values (background) in surface and subsurface soils, is presented in Table D.1-63. Table D.1-64 summarizes representative geographic areas that exhibited magnesium concentrations and provides the range of concentrations for each depth interval in the surface and subsurface soils. Details for magnesium contamination in the above geographic areas and in the surrounding areas of the former production plant are provided in Section D.2.

Surface Soil

Background concentrations for magnesium in the surface soil ranged from 1020 to 3590 mg/kg, based on a total of 30 samples collected during the background study. Background was calculated as 2780 mg/kg, as indicated in Table D-2.

Magnesium concentrations were positively detected above background value in 361 of 428 surface soil samples. Magnesium concentrations ranged from 227 to 65,300 mg/kg. A statistical summary of the analytical results for magnesium in surface soil at the FEMP is presented in Table D.1-1. Magnesium concentration in surface soil across the FEMP is depicted in Plate D-102.

Most of the magnesium contamination in surface soil at the FEMP was detected in the former production area. Magnesium concentrations were detected at levels above 13,900 mg/kg in these areas. The level of 13,900 mg/kg is five times background.

- Plant 1 area
- Plant 2/3 area
- Plant 4/5/7 area
- Plant 6 area
- Plant 8 area
- Plant 9 area
- Sewage treatment plant
- Pilot plant area
- Laboratory area
- Administration area
- Electrical substation area
- Maintenance building area
- Tank farm and boiler house
- D&D building and drum baling area
- Scrap metal pile, decontamination building, and buildings 64 and 65
- Graphite furnace and oil burner, and coal pile area
- KC-2 warehouse
- Fire training area
- Trap range
- Area west of K-65 silos
- K-65/clearwell line
- Northeastern area of FEMP
- Southern area of FEMP
- Western area of FEMP
- Northwestern area of FEMP

Magnesium was found elevated 10 times above background in most of the geographic areas within the former production plant, as well as the surrounding areas. In particular, magnesium was detected near or above 20 times background in the areas of Plant 9 (1.0-to 1.5-foot interval), maintenance building (0- to 0.5-foot and 0.5- to 1.0-foot intervals), and graphite furnace area (0.5-to 1.0-foot interval). Releases from the past plant production and maintenance operations appear to have contributed to magnesium contamination in the surface soil in the areas of Plant 9; the maintenance building, and the graphite furnace, oil burner, and coal pile. In addition, at one location each in the northeastern and western areas of the FEMP, high levels of magnesium (65,300 mg/kg/at each location) were detected in the 0- to 0.5-foot interval. No specific, known processes would contribute to the magnesium contamination in these areas. Cross-contamination, however, during placement of waste materials in the waste pit area may be the source of magnesium in the western area of the FEMP.

Subsurface Soil

Background concentrations for magnesium in the subsurface soil ranged from 2930 to 54,100 mg/kg, based on a total of 51 samples collected during the background study. Background for magnesium in the subsurface soil was calculated as 42,600 mg/kg, as indicated in Table D-3.

Magnesium concentrations were positively detected above background in 11 of 338 subsurface soil samples at concentrations ranging from 1390 to 93,200 mg/kg. A statistical summary of the analytical results for magnesium in the subsurface soil at the FEMP is presented in Table D.1-2.

None of the magnesium concentrations in FEMP subsurface soil exceeded 213,000 mg/kg, or five times background. Most sampled locations in the subsurface soil revealed concentrations of magnesium near or slightly above background. Magnesium was detected at 93,200 mg/kg, exceeding two times background, only in the 5.0- to 10.0-foot depth interval in the area west of K-65 silos. Past storage operations in the area may be attributable to the magnesium contamination.

D.1.2.15 Manganese

Based on the data in the following discussion, it was determined that manganese is not a significant contaminant of the FEMP. Except for an isolated area just east of the sewage treatment plant, all concentrations of manganese were located within the 20 mg/kg uranium envelope as discussed in D.1. Manganese is a minor constituent in the earth's crust and is a constituent in flyash. Manganese or its compounds were not reported to have been used in operations, at the FEMP. Table D-1 highlights the areas that may be potential sources of manganese.

A summary of manganese contamination, as defined by sample concentration relative to the 95th percentile background values (background) in surface and subsurface soils, is presented in Table D.1-65. Table D.1-66 summarizes the geographic areas that exhibited manganese concentrations and provides the range of concentrations for each depth interval in the surface and subsurface soils. Details for manganese contamination in the geographic areas and in the surrounding areas of the former production plant are provided in Section D.2.

Surface Soil

Background concentrations for manganese in the surface soil ranged from 189 mg/kg to 1500 mg/kg, based on a total of 30 samples collected during the background study. Background concentration for manganese in the surface soil was calculated as 1350 mg/kg, as indicated in Table D-2.

Manganese concentrations were positively detected in 20 out of 413 surface soil samples at concentrations ranging from 9.90 to 4400 mg/kg. A statistical summary of the analytical results for manganese in the surface soil at the FEMP is presented in Table D.1-1. Manganese concentration in

surface soil across the FEMP is depicted in Plate D-103. Because manganese contamination was minimal, this is the only map for manganese included in the plates.

Within the 0- to 0.5-foot depth interval, there were limited locations where manganese concentrations exceeded background, as depicted in Plate D-103. Manganese concentrations were detected at levels slightly above two times background in the area east of the FEMP and the area outside the FEMP adjacent to the boundary near the sewage treatment plant. No detections exceeded five times background. Detections were recorded for samples less than twice background located in the northern portion of the Plant 1 area. Detections were recorded for samples twice background near the graphite furnace oil burner, and coal pile area.

Subsurface Soil

Background concentrations for manganese in the subsurface soil ranged from 251 to 1750 mg/kg, based on a total of 51 samples collected during the background study. Background for manganese in the subsurface soil was calculated as 1300 mg/kg, as indicated in Table D-3.

Manganese concentrations were positively detected above background in 23 of 338 subsurface soil samples at concentrations ranging from 107 to 12,200 mg/kg. A statistical summary of sampling and analytical results for manganese in the subsurface soil at the FEMP is presented in Table D.1-2.

Most of the manganese contamination in FEMP subsurface soil was detected in the 5.0- to 10.0-foot interval. Manganese concentrations were detected at levels of more than five time background (6500 mg/kg) in the pilot plant area and the area West of K-65 Silos.

Manganese was detected at levels above two times background in various areas of Plant 1 (5.0- to 10.0-foot interval); the pilot plant (1.5-to 3.0-foot interval); and the graphite furnace/oil burner, and coal pile area (1.5- to 3.0-foot interval).

Although no known processes in the FEMP production would contribute to the manganese contamination, releases from past storage and maintenance activities appear to have contributed to manganese contamination.

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D.1.2.16 Mercury

Based on the data in the following discussion was determined that mercury is a significant contaminant in the surface soil of the FEMP. Except for an isolated detection at the trap range, concentrations of mercury were located within the 20 mg/kg uranium envelope as discussed in D.1. Mercury is a trace constituent in the earth's crust and is a minor trace element in flyash. Mercury and its compounds were reported as sources of potential contaminants in Plant 4 (hydrofluorination and vaporization processes), Plant 5 (metal reduction), Plant 8 (primary calciner and oxidation furnace), the boiler plant (steam production), the maintenance building (maintenance activities), and the pilot plant (general sump). Table D-1 highlights the areas that may be potential sources of mercury.

A summary of mercury contamination, as defined by sample concentration relative to the 95th percentile background values (background) in surface and subsurface soils, is presented in Table D.1-67. Table D.1-68 summarizes the geographic areas that exhibited mercury concentrations and provides the range of concentrations for each depth interval in the surface and subsurface soils. Details for mercury contamination in the geographic areas and in the areas surrounding the former production plant are provided in Section D.2.

Surface Soil

Background concentrations for mercury in the surface soil were detected in 1 of 30 samples collected during the background study. Background for mercury in the surface soil was calculated as 0.30 mg/kg, as indicated in Table D-2.

Mercury concentrations were positively detected background in 21 of 447 surface soil samples at concentrations ranging from 0.06 to 6.30 mg/kg. A statistical summary of the analytical results for mercury in the surface soil at the FEMP is presented in Table D.1-1. Mercury concentration in surface soil across the FEMP is depicted in plates D-104, 105, and 106.

Most of the mercury in FEMP surface soil was detected in the 0.0- to 0.5-foot interval, as depicted in Plate D-104. Mercury concentrations were detected at levels above 1.50 mg/kg in the following areas: Plant 1 area, Plant 2/3 area, and the trap range. The level of 1.50 mg/kg is five times background.

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Mercury was found at concentrations ranging from 0.14 to 4.60 mg/kg, 0.08 to 2.10 mg/kg, and 0.06 to 6.30 mg/kg in the construction rubble mound (Plant 1 area), central portion of Plant 2/3, and northern portion of the trap range, respectively. No known processes in the FEMP production would contribute to the mercury contamination in these areas. The mercury contamination in the construction rubble mound may have resulted from past storage activities. In addition, mercury was detected above two times background in the areas of the pilot plant, maintenance building, and tank farm and boiler house. The mercury contamination in these areas is expected based on processes used in the areas.

Subsurface Soil

Background concentration for mercury in the subsurface soil was detected in one of 51 samples collected during the background study. Background for mercury in the subsurface soil was determined to be 0.29 mg/kg, as indicated in Table D-3.

Mercury concentrations were positively detected above background in 1 of 342 subsurface soil samples at concentrations ranging from 0.04 to 2.30 mg/kg. A statistical summary of the analytical results for mercury in the subsurface soil at the FEMP is presented in Table D.1-2.

The only mercury contamination in subsurface soil at the FEMP was detected in the Plant 2/3 area. Mercury contamination in the 1.5- to 3.0-foot interval of subsurface soil is depicted in Plate D-107. Mercury was detected at a level of 2.3 mg/kg, which is greater five times background near the incinerator building. The mercury contamination in this location may have resulted from releases from past plant operations.

D.1.2.17 Molybdenum

Based on the data in the following discussion, it was determined that molybdenum is a significant contaminant of the FEMP. Except for some isolated locations in the northeastern and northwestern area of the FEMP and near the trap range, concentrations of molybdenum are located while the 20 mg/kg uranium envelope as discussed in D.1. Molybdenum is a trace heavy metal associated with minerals present in coal deposits and resulting flyash after coal is burned. Molybdenum is a minor impurity in uranium ore and ore concentrates. The scrap metal pile is also considered a potential source of molybdenum. Table D.1 highlights other areas that may be sources of molybdenum.

A summary of molybdenum contamination, as defined by sample concentration relative to the 95th percentile background values (background) in surface and subsurface soils, is presented in Table D.1-69. Table D.1-70 summarizes the geographic areas that exhibited positive detections of molybdenum and provides the range of concentrations for each depth interval in the surface and subsurface soils. Details for molybdenum contamination in the geographic areas and in the areas surrounding the former production plant are provided in Section D.2.

Surface Soil

Molybdenum was not detected in any of the 30 surface soil samples collected during the background study. Thus any positive detection for molybdenum is considered to be elevated above background.

Molybdenum concentrations were positively detected in 142 of 403 surface soil samples. At concentrations ranging from 0.60 to 13.3 mg/kg. A statistical summary of the analytical results for molybdenum in the surface soil at the FEMP is presented in Table D.1-1. Molybdenum concentration in the 0- to 0.5-foot interval of surface soil across the FEMP is depicted in Plate D-108.

Molybdenum contamination in FEMP surface soil was detected in most of the areas in and around the FEMP. Molybdenum concentrations were positively detected in the following areas:

- Plant 1 area
- Plant 2/3 area
- Plant 4/5/7 area
- Plant 6 area
- Plant 8 area
- Plant 9 area
- Sewage treatment plant
- Laboratory area
- Electrical substation area
- Maintenance building area
- Tank farm and boiler house
- D&D building and drum baling area
- Scrap metal pile, determination building, and buildings 64 and 65
- Graphite furnace, oil burner, and coal pile area
- KC-2 warehouse area
- Fire training area
- Trap range
- Area west of K-65 silos
- K-65/Clearwell line west
- Northeastern area of FEMP
- Southeastern area of FEMP
- Western area of FEMP
- Northwestern area of FEMP

Subsurface Soil

A background concentration for molybdenum in the subsurface soil was detected in 1 of 51 samples collected during the background study. Background was calculated as 2.70 mg/kg, as indicated in Table D-3.

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Molybdenum concentrations were positively detected above background in 132 of 361 subsurface soil samples at molybdenum concentrations ranging from 1.60 to 15.80 mg/kg. A statistical summary of the analytical results for molybdenum in the subsurface soil at the FEMP is presented in Table D.1-2.

No molybdenum concentrations were found at levels exceeding five times background. The majority of molybdenum contamination in FEMP subsurface soil was found at levels above two times background (i.e., 5.40 mg/kg) in the following areas:

- Plant 1 area
- Maintenance building area
- Graphite furnace/oil burner and coal pile area
- Area west of K-65 silos
- K-65/Clearwell line west
- Northeastern area of FEMP

Molybdenum was detected primarily in the 1.5- to 3.0-foot and 3.0- to 5.0-foot depths in the subsurface soil of the above-mentioned areas. The highest level of molybdenum concentrations in the subsurface soil was 10.6 mg/kg, detected at depths in 3.0 to 5.0 feet in the tank farm and boiler house area.

No specific production processes in the FEMP have been identified to contribute to the molybdenum contamination in the subsurface soil. As with the surface soil contamination, molybdenum contamination in the subsurface soil may have resulted from airborne dispersion of flyash, which consequently mixed or leached into the subsurface soil.

D.1.2.18 Nickel

Based on the data in the following discussion, it was determined that nickel is a significant contaminant of the FEMP. Except for some isolated areas around the K-65 silos, northwest of the waste pits, and in the northeastern area of the FEMP, concentration of nickel were located within the 20 mg/kg uranium envelope as discussed in D.1. Nickel is a trace element in the earth's crust and is a trace constituent in flyash. Nickel cladding was also dissolved in the Zirnlo process in Plant 9. Nickel is a major constituent in stainless steel, and corrosion of process equipment could be a source of nickel in waste streams. Releases from ore and products that were handled in Plant 1, Plant 2/3, Plant 6, pilot plant, laboratory, main maintenance building, and west of the K-65 silos potentially contributed to nickel contamination in the surface soil. Incineration residues from the contaminated oil/graphite burn pad and the slag recycling building possibly were responsible for the nickel contamination in the surface soil surrounding the graphite furnace and oil burner. In addition, nickel

in the surface soil near the elevated water storage tanks may have resulted from sandblasting paint on the tanks. Table D-1 highlights the areas that may be potential sources of nickel.

A summary of nickel contamination, as defined by sample concentration relative to the 95th percentile background values (background) in surface and subsurface soils, is presented in Table D.1-71. Table D.1-72 summarizes the areas that exhibited nickel concentrations and provides the range of concentrations for each depth interval in the surface and subsurface soils. Details for nickel contamination in the above-mentioned geographic areas and in the surrounding area are provided in Section D.2.

Surface Soil

Background concentrations for nickel in the surface soils ranged from 5.80 to 22.70 mg/kg, based on a total of 30 samples collected during the background study. Background for nickel in the surface soil was calculated as 20.9 mg/kg, as indicated in Table D-2.

Nickel concentrations were positively detected in 171 of 422 surface soil samples at concentrations ranging from 3.80 to 72.20 mg/kg. A statistical summary of the analytical results for nickel in the surface soil at the FEMP is presented in Table D.1-1. Nickel concentrations in surface soil across the FEMP are depicted in Plates D-109, D-110, and D-111.

No nickel contamination in FEMP surface soil was detected at levels above five times background. Nickel concentrations were detected at levels above twice background (41.8 mg/kg) in the following areas.

- Plant 1 area
- Plant 2/3 area
- Pilot Plant area
- Laboratory area
- Maintenance building area
- D&D building and drum baling area
- Graphite furnace, oil burner and coal pile area
- Northeastern area of FEMP

Nickel was detected primarily in the 0.0- to 0.5 foot depth in the surface soil of the above-mentioned areas and throughout the former production plant. High levels of nickel in the surface soil, ranging from 6.10 to 72.20 mg/kg, were detected in 0.0- to 0.5-foot and 0.5- to 1.0-foot depths in the area north of the maintenance building.

Subsurface Soil

Background concentrations for nickel in the subsurface soil ranged from 8.5 to 41.90 mg/kg, based on a total of 51 samples collected during the background study. Background for nickel in the subsurface soil was calculated as 34.3 mg/kg, as indicated in Table D-3.

Nickel concentrations were positively detected above background in 44 of 325 subsurface soil samples. Nickel concentrations ranged from 6.70 to 186.00 mg/kg. A statistical summary of the analytical results for nickel in the subsurface soil at the FEMP is presented in Table D.1-2.

The majority of nickel contamination in FEMP subsurface soil was detected in the area west of K-65 silos. Nickel concentrations were present at levels above five times background (171.5 mg/kg) in the area west of K-65. High levels of nickel, ranging from 7.30 to 186.00 mg/kg, were detected in the subsurface soil at depths of 5.0 to 10.0 feet in the area West of K-65 Silos. In all other areas nickel contamination was at levels less than twice background. Nickel contamination in the surface soil, may have resulted from releases of ore and metal products that were processed in these areas. Nickel contamination in the subsurface may have resulted from migration of ore and metal products in the surface soil and from past storage operations in these areas.

D.1.2.19 Potassium

Based on the data in the following discussion, it was determined that potassium is a significant contaminant of the FEMP. Except for isolated areas near the waste pits and in the northeastern and northwestern areas of the FEMP, concentrations of potassium are located within the 20 mg/kg uranium envelope as discussed in D.1. Potassium is a common element in the earth's crust and is present in flyash. Potassium carbonate was used in heat-treating salts and was removed from metal surfaces in Plant 9. Table D-1 highlights the areas that may be potential sources of potassium.

A summary of potassium contamination, as defined by sample concentration relative to the 95th percentile background values (background) in surface and subsurface soil, is presented in Table D.1-73. Table D.1-74 summarizes the areas that exhibited potassium concentrations and provides the range of concentrations for each depth interval. Details for potassium contamination in the geographic areas and in the surrounding former production area are provided in Section D.2.

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Surface Soil

Background concentrations for potassium in surface soil ranged from 374 to 1590 mg/kg, based on a total of 30 samples collected during the background study. Background for potassium in the surface soil was calculated as 1230 mg/kg, as indicated in Table D-2.

Potassium concentrations were positively detected above background in 137 of 428 surface soil samples at concentrations ranging from 222 to 4230 mg/kg. A statistical summary of the analytical results for potassium in the surface soil at the FEMP is presented in Table D.1-1. Potassium concentration in the 0- to 0.5-foot depth of surface soil across the FEMP is depicted in Plate D-112.

No potassium contamination was present at levels above five times background. In general, potassium was wide spread in the FEMP at levels less than twice background. Potassium concentrations were found at levels slightly above two times background in the areas of Plant 1; Plant 4/5/7; sewage treatment plant, pilot plant; graphite furnace, oil burner, and isolated locations in the western area of FEMP.

Subsurface Soil

Background concentrations for potassium in the subsurface soil ranged from 340 to 2180 mg/kg, based on a total of 51 samples collected during the background study. Background for potassium in the subsurface soil was calculated as 1980 mg/kg, as indicated in Table D-3.

Potassium concentrations were positively detected above background in 28 of 338 subsurface soil samples at concentrations ranging from 204 to 10,900 mg/kg. A statistical summary of the analytical results for potassium in subsurface soil at the FEMP is presented in Table D.1-2.

Potassium concentrations were found at levels slightly above five times background in the area west of K-65 silos. Potassium concentrations were detected at levels up to 10,900 mg/kg in the 5.0- to 10.0-foot depth in this area. Detections of potassium at all other areas ranged no higher than two times background.

Potassium contamination in these areas may have resulted from releases of ore and metal products in the surface soil as well as from past storage operations in these areas. The potassium contamination in the area west of K-65 silos could have resulted from the past disposal activities.

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D.1.2.20 Selenium

Based on the data from the following discussion, it was determined that selenium is not a major contaminant of the FEMP. Except for one isolated area just north of the solid waste landfill, all concentrations of selenium were located within the 20 mg/kg uranium envelope as discussed in D.1. Selenium is a trace element in the earth's crust and a trace constituent in coal and its resulting flyash when burned. Selenium or its compounds were not reported to have been used in operations at the FEMP. Table D-1 highlights the areas that may be potential sources of selenium.

A summary of selenium contamination, as defined by sample concentration relative to the 95th percentile background values (background) in surface and subsurface soils, is presented in Table D.1-75. Table D.1-76 summarizes the geographic areas that exhibited selenium concentrations and provides the range of concentrations for each depth interval in surface and subsurface soils. Details for selenium contamination in the geographic areas and in the areas surrounding the former production area are provided in Section D.2.

Surface Soil

Background concentrations for selenium in the surface soil ranged from nondetectable to 0.72 mg/kg, based on a total of 30 samples collected during the background study. Background was calculated as 0.72 mg/kg, as indicated in Table D-2.

Selenium concentrations were positively detected in 19 of 365 surface soil samples at concentrations ranging from 0.23 to 7.70 mg/kg. A statistical summary of the analytical results for selenium in the surface soil at the FEMP is presented in Table D.1-1. Selenium concentration in surface soil across the FEMP is depicted in Plate D-113.

Most of the selenium contamination in surface soil at the FEMP was detected in the following areas: Selenium was detected at levels of at least 3.6 mg/kg, or five times background, in the graphite furnace, oil burner and coal pile area, and the western area of FEMP. The highest concentrations of selenium in the subsurface soil were detected in the graphite furnace, oil burner, and coal pile area (7.7 mg/kg at 0.5 to 1.0 feet near the coal pile) and in the western area of the FEMP (3.7 mg/kg at 0 to 0.5 feet) immediately west of Plant 8.

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Subsurface Soil

Selenium was not detected in any of the 51 subsurface soil samples collected during the background study. Thus, any positive detection for selenium is considered to be elevated above background. Selenium concentrations were positively detected in 27 of 300 subsurface soil samples, at concentrations ranging from 0.32 to 3.30 mg/kg . A statistical summary of the analytical results for selenium in the subsurface soil at the FEMP is presented in Table D.1-2.

Most of the detected selenium concentrations in FEMP subsurface soil were detected in the following areas.

- Plant 1 area
- Plant 2/3 area
- Plant 6 area
- Plant 8 area
- Pilot plant area
- Laboratory area
- Tank farm and boiler house
- Graphite furnace, oil burner, and coal pile area
- Area west of K-65 silos
- Western area of FEMP

Ten areas at the FEMP exhibited detections of selenium in the subsurface soil. The highest detections were located in the pilot plant area (2.8 mg/kg at 10.0 to 15.0 feet), north of the Solid Waste Landfill (2.3 mg/kg at 3.0 to 5.0 feet) and the maintenance building area (2.2 mg/kg at 10.0 to 15.0 feet). The source of the selenium in the pilot plant area may have been an isolated spill of selenium-contaminated material in that area. The presence of high concentrations of selenium in the maintenance building area can be attributed to the coal constituents in the coal pile runoff basin located immediately north and adjacent to the area. The contamination detected in the western area of the FEMP may be due to miscellaneous spills of selenium-containing material that was to be disposed in the landfill.

D.1.2.21 Silicon

Based on the data in the following discussion, it was determined that silicon is not a significant contaminant of the FEMP. Furthermore, all concentrations of silicon are located within the 20 mg/kg uranium envelope as discussed in D.1.

Silicon is a trace element in the earth's crust and is also a trace constituent in coal and its resulting flyash when burned. Silicon or its compounds were not reported to have been used in production activities at the FEMP. However, silicon is a significant natural component of the soil type present in

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the area and of uranium ores processed at the FEMP. Table D-1 highlights the areas that may be potential sources of silicon.

A summary of silicon contamination, as defined by sample concentration relative to the 95th percentile background values (background) in surface and subsurface soils, is presented in Table D.1-77. Table D.1-78 summarizes the geographic areas that exhibited selenium concentrations and provides the range of concentrations for each depth interval. Details for silicon contamination in the former production area are provided in Section D.2.

Surface Soil

Background concentrations for silicon in the surface soil ranged from 480 to 2230.0 mg/kg, based on 30 samples collected during the background study. Background was calculated as 1800 mg/kg, as indicated in Table D-2.

Silicon concentrations were positively identified above background in 36 of 278 surface samples collected at depths of 0 to 1.5 feet below the ground surface. Silicon concentrations ranged from 31.8 to 6660 mg/kg. A statistical summary of sampling and analytical results for silicon in the surface soil at the FEMP is presented in Table D.1-1. Silicon concentrations in surface soil across the FEMP are depicted in Plate D-114. Because silicon contamination was minimal, this is the only map included in the plates.

Silicon detections were widespread and at low concentrations, as indicated in Plate D-114. Silicon concentrations were not detected at levels greater than five times background. The highest concentrations of silicon in the surface soil were detected near the Plant 1 pad (6660 mg/kg at 0 to 0.5 feet) and the sewage treatment plant area (3960 mg/kg at 0 to 0.5 feet), both at levels greater than two times background.

Subsurface Soil

Background concentrations for silicon in the subsurface soil ranged from 449 to 1850 mg/kg, based on 51 samples collected during the background study. Background was calculated as 1590 mg/kg, as indicated in Table D-3.

Silicon concentrations were positively identified above background in 4 of 152 subsurface samples collected at depths from 1.5 feet to greater than 10 feet. Silicon concentrations ranged from 17.6 to 5950 mg/kg. A statistical summary of sampling and analytical results for cobalt in the subsurface soil at the FEMP is presented in Table D.1-2.

Silicon was not detected above five times background in the subsurface soil of the FEMP. The highest concentrations of silicon in the subsurface soils were detected in the area west of the K-65 silos (5950 mg/kg at 5.0 to 10.0 feet) and the sewage treatment plant area (2920 mg/kg at 1.5 to 3.0 feet). Concentrations from the area west of the K-65 silos were greater than two times background.

Silicon removed during ore processing is considered the primary source of the sitewide contamination.

D.1.2.22 Silver

Based on the data in the following discussion, it was determined that silver is a significant contaminant of the FEMP. Except for an area around the K-65 silos, concentrations of silver were located within the 20 mg/kg uranium envelope as discussed in D.1.

Silver is a trace element in the earth's crust and is also a trace constituent in coal and its resulting flyash when burned. Silver or its compounds were used as an algicide in the Plant 4 heat exchangers but were not associated with other production processes at the FEMP. Table D-1 highlights the areas that may be potential sources of silver.

A summary of silver contamination, as defined by sample concentration relative to the 95th percentile background values (background) in surface and subsurface soils, is presented in Table D.1-79. Table D.1-80 summarizes the geographic areas that exhibited silver concentrations and provides the range of concentrations for each depth interval. Details for silver contamination in the geographic areas and in the area surrounding the former production area are provided in Section D.2.

Surface Soil

Silver was not detected in any of the 30 surface soil samples collected during the background study. Thus, any positive detection for silver is considered to be elevated above background.

Silver concentrations were positively detected in 167 of 434 surface soil samples at concentrations ranging from 0.47 to 36.40 mg/kg. A statistical summary of the analytical results for silver in surface soil at the FEMP is presented in Table D.1-1. Silver concentrations detected in surface soil across the FEMP are depicted in Plates D-115, D-116, and D-117.

Silver concentrations were detected within the surface soils in 23 areas of the FEMP. Most of the silver contamination in surface soil at the FEMP was detected in the following areas:

- Plant 1 area
- Plant 2/3 area
- Plant 6 area
- Plant 9 area
- Pilot plant area
- Laboratory area
- Maintenance building area
- Tank farm and boiler house
- Graphite furnace, oil burner, and coal pile area
- Area west of K-65 silos
- Northeastern area of FEMP

The highest concentrations of silver in the surface soil were detected in the graphite furnace, oil burner, and coal pile area, near the burn pad (36.4 mg/kg at 0.5 to 1.0 feet) and the Plant 2/3 area, near the ore refinery (17.2 mg/kg at 0 to 0.5 feet).

Subsurface Soil

Silver was not detected in any of the 51 subsurface soil samples collected during the background study. Thus, any positive detection of silver is considered to be above background.

Silver concentrations were positively detected in 164 of 320 subsurface soil samples at concentrations ranging from 0.41 to 31.10 mg/kg. A statistical summary of the analytical results for silver in subsurface soil at the FEMP is presented in Table D.1-2. Silver concentrations in the subsurface soil across the FEMP are depicted in Plates D-118 and D-119.

Silver concentrations were detected within the subsurface soil in 15 areas of the FEMP. Most of the silver concentrations in FEMP subsurface soil were detected in the following areas:

- Plant 2/3 area
- Plant 6 area
- Plant 9 area
- Pilot plant area
- Laboratory area
- Maintenance building area
- Tank farm and boiler house
- Graphite furnace, oil burner, and coal pile area
- Area west of K-65 silos

The highest concentrations of silver were detected in the pilot plant area (31.1 mg/kg at 10.0 to 15.0 feet), the graphite furnace, oil burner, and coal pile area (30.5 mg/kg at 1.5 to 3.0 feet), and the maintenance building area (25.3 mg/kg at 1.5 to 3.0 feet and 25.0 mg/kg at 5.0 to 10.0 feet).

The concentrations of silver in the coal pile area and the maintenance building area are most likely attributable to the coal stored in the vicinity of these two areas. Plant 2/3 activities involved the handling of metals and ores in the dissolved and soluble phase. The presence of silver contamination in the subsurface soil near the pilot plant is probably linked to leaks from subgrade piping and sumps.

D.1.2.23 Sodium

Based on the data in the following discussion, it was determined that although widespread, sodium was not a significant contaminant of the FEMP. Except for some isolated locations around the waste pits and the South Field and in the northwestern area of the FEMP, concentrations of sodium were located within the 20 mg/kg uranium envelope as discussed in D.1. Sodium is a common element present in the environment and a major impurity in uranium ores and ore concentrations. Sodium chloride was used in heat treating processes. Sodium hydroxide and other sodium compounds were also used in operations at the FEMP. Table D-1 highlights the areas that may be potential sources of sodium.

A summary of sodium contamination, as defined by sample concentration relative to the 95th percentile background values (background) in surface and subsurface soils, is presented in Table D.1-81. Table D.1-82 summarizes the geographic areas that exhibited sodium concentrations greater than 255.5 mg/kg and provides the range of concentrations for each depth interval. Details for sodium contamination in the geographic areas and in the areas surrounding the former production area are provided in Section D.2.

Surface Soil

Background concentrations for sodium in the surface soil ranged from 26.90 to 54.70 mg/kg, based on a total of 30 samples collected during the background study. Background was calculated as 51.1 mg/kg, as indicated in Table D-2.

Sodium concentrations were detected above background in 303 of 428 surface soil samples at concentrations ranging from 25.20 to 2360 mg/kg. A statistical summary of the analytical results for

sodium in the surface soil at the FEMP is presented in Table D.1-1. Sodium concentrations in surface soil across the FEMP are depicted in Plate D-120. Because sodium contaminant decreases with depth, this is the only map included in the plates.

The majority of sodium contamination in surface soil at the FEMP is found in the following areas. Sodium concentrations were detected at levels of at least 255.5 mg/kg in these areas, or five times background.

- Plant 1 area
- Plant 6 area
- Plant 8 area
- Plant 9 area
- Pilot plant area
- Laboratory area
- Administration area
- Maintenance building area
- Scrap metal pile, decontamination building, and Buildings 64 and 65
- Graphite furnace, oil burner, and coal pile area
- KC-2 warehouse area
- Western area of FEMP

The highest concentrations of sodium in the surface soil were detected in the maintenance building area (2360 mg/kg at 0.5 to 1.0 feet), the pilot plant area (2220 mg/kg at 0.5 to 1.0 feet) and the laboratory area (2180 mg/kg at 0 to 0.5 feet).

Subsurface Soil

Background concentrations for sodium in the subsurface soil ranged from 53.80 to 345 mg/kg, based on a total of 51 samples collected during the background study. Background was calculated as 285 mg/kg, as indicated in Table D-3.

Sodium concentrations were detected above background in 25 of 338 subsurface soil samples at concentrations ranging from 42.2 to 1700 mg/kg. A statistical summary of the analytical results for sodium in the subsurface soil at the FEMP is presented in Table D.1-2.

Sodium was detected within the subsurface soil at elevated concentrations of at least five times background in only one area of the FEMP, the pilot plant (1700 mg/kg at 10.0 to 15.0 feet). Other areas of the FEMP that exhibited sodium concentrations above two times background in the subsurface soils were the Plant 1 area, the Plant 6 area, and the area west of the K-65 silos. Potential sources of sodium contamination are releases during ore processing and from spills or leaks during the heat treating processes.

D.1.2.24 Thallium

Based on the data in the following discussion, it was determined that thallium is not a significant contaminant of the FEMP. Furthermore, all concentrations of thallium are located within the 20 mg/kg uranium envelope as discussed in D.1. Thallium is a minor trace element in the earth's crust and is also a minor trace constituent in coal and its resulting flyash when burned. Thallium or its compounds were not used in production operations at the FEMP, but thallium is a laboratory reagent. Table D-1 highlights the areas that may be potential sources of thallium.

A summary of thallium contamination, as defined by sample concentration relative to the 95th percentile background values (background) in surface and subsurface soils, is presented in Table D.1-83. Table D.1-84 summarizes the geographic areas that exhibited thallium concentrations greater than 0.58 mg/kg and provides the range of concentrations for each depth interval. Details for thallium contamination in the geographic areas and in the areas surrounding the former production area are provided in Section D.2.

Surface Soil

Background concentrations for thallium in the surface soil ranged from nondetectable to 0.58 mg/kg, based on a total of 30 samples collected during the background study. Background was calculated as 0.58 mg/kg, as indicated in Table D-2.

Thallium concentrations were detected above background in 4 samples of 425 surface soil samples at concentrations ranging from 0.11 to 0.75 mg/kg. A statistical summary of the analytical results for thallium in the surface soil at the FEMP is presented in Table D.1-1. Thallium concentration in surface soil across the FEMP is depicted in Plate D-121. Because thallium contamination is minimal, this map is the only one included in the plates.

Thallium was detected within the surface soil of the FEMP at isolated locations, at the maintenance building in the northeast area of the FEMP and in the northwestern area.

Subsurface Soil

Background concentrations for thallium in the subsurface soil ranged from 0.49 to 0.55 mg/kg, based on a total of 51 samples collected during the background study. Background was calculated as 0.49 mg/kg, as indicated in Table D-3.

Thallium concentrations were detected above background in 4 of 337 subsurface soil samples at concentrations ranging from 0.21 to 0.72 mg/kg. A statistical summary of the analytical results for thallium in the subsurface soil at the FEMP is presented in Table D.1-2.

Thallium was detected within the subsurface soils of the FEMP at concentrations less than two times background at Plant 1 area, Plant 6, and the maintenance building.

Sources in areas other then the maintenance building are undefined. The maintenance building served as general stores for the site with thallium contamination resulting from spills in that area.

D.1.2.25 Vanadium

Based on the data in the following discussion, it was determined that vanadium is not a significant contaminant of the FEMP. Furthermore, all concentrations of vanadium are located within the 20 mg/kg uranium envelope as discussed in D.1. Vanadium is a trace element in the earth's crust and is also present in coal and its resulting flyash when burned. Vanadium or its compounds were not used in operations at the FEMP; however, vanadium is an impurity in the uranium ore processed at the plant. Table D-1 highlights areas that may be potential sources of vanadium.

A detailed summary of vanadium contamination, as defined by sample concentration relative to the 95th percentile background values (background) in surface and subsurface soils, is presented in Table D.1-85. Table D.1-86 summarizes the geographic areas that exhibited vanadium concentrations and provides the range of concentrations for each depth interval. Details for vanadium contamination in the geographic areas and in the area surrounding the former production area are provided in Section D.2.

Surface Soil

Background concentrations for vanadium in the surface soil ranged from 11.30 to 32.70 mg/kg, based on a total of 30 samples collected during the background study. Background was calculated as 30.4 mg/kg, as indicated in Table D-2.

Vanadium concentrations were detected above background in 69 of 428 surface soil samples at concentrations ranging from 4.30 to 49.00 mg/kg. A statistical summary of the analytical results for vanadium in the surface soil at the FEMP is presented in Table D.1-1. Vanadium concentration in

surface soil across the FEMP is depicted in Plate D-122. Because vanadium contamination is minimal with depth, this is the only map included in the plates.

Vanadium was not detected at levels greater than twice background within the surface soils of the FEMP. Most detections were in the Plant 1 area when initial ore processing took place.

Subsurface Soil

Background concentrations for vanadium in the subsurface soil ranged from 8.40 to 44.50 mg/kg, based on a total of 51 samples collected during the background study. Background was calculated as 37.8 mg/kg, as indicated in Table D-3.

Vanadium concentrations were detected above background in 23 of 338 subsurface soil samples at concentrations ranging from 4.7 to 190 mg/kg. A statistical summary of the analytical results for vanadium in the subsurface soil at the FEMP is presented in Table D.1-2.

Almost all detections of vanadium were below background in the subsurface soil. The only area of the FEMP that exhibited concentrations of vanadium above five times background in the subsurface soils was the area west of the K-65 silos (190 mg/kg at 5.0 to 10.0 feet). All other elevated concentrations were less than twice background.

The probable source of vanadium were released during ore processing, and construction debris deposited west of the K-65 silos from past FEMP operations and possibly the decant from the K-65 slurry stored in the underground decant tank.

D.1.2.26 Zinc

Based on the data in the following discussion, it was determined that zinc is not a significant contaminant of the FEMP. Except for several isolated areas north west of the waste pits (OU1) and in the northwestern area of the FEMP, concentrations of zinc are located within the 20 mg/kg uranium envelope as discussed in D.1. Zinc is present in the earth's crust and is also present in coal and its resulting flyash when burned. Zinc fluoride was used in the production of thorium metal in the pilot plant, and zinc chloride was used in a similar process in Plant 9. The zinc was vaporized from thorium in a furnace. Table D-1 highlights the areas that may be potential sources of zinc.

A summary of zinc contamination, as defined by sample concentration relative to the 95th percentile background values (background) in surface and subsurface soils, is presented in Table D.1-87. Table D.1-88 summarizes the geographic areas that exhibited zinc concentrations and provides the range of concentrations for each depth interval. Details for zinc contamination in the geographic areas and in the areas surrounding the former production area are provided in Section D.2.

Surface Soil

Background concentrations for zinc in the surface soil ranged from 29.40 to 70.00 mg/kg, based on a total of 30 samples collected during the background study. Background was calculated as 59.6 mg/kg, as indicated in Table D-2.

Zinc concentrations were detected above background in 162 of 420 surface soil samples at concentrations ranging from 6.20 to 2150 mg/kg. A statistical summary of the analytical results for zinc in the surface soil at the FEMP is presented in Table D.1-1. Zinc concentration in surface soil across the FEMP is depicted in Plate D-123. Because zinc contamination at depth was minimal, this map is the only one included int he plates.

The majority of zinc contamination in surface soil at the FEMP was detected in the following areas. Zinc concentrations in these areas were detected at levels of at least 298 mg/kg, or five times background.

- Plant 1 area
- KC-2 warehouse area
- Fire training area
- Sewage treatment plant area
- Maintenance building area
- Scrap metal pile, decontamination building, and Buildings 64 and 65

The highest concentrations of zinc in the surface soils of the FEMP were detected in the fire training area (2150 mg/kg at 0 to 0.5 feet), the maintenance building area (767 mg/kg at 0 to 0.5 feet) and the scrap metal pile, decontamination building, and Buildings 64 and 65 (764 mg/kg at 0 to 0.5 feet).

Subsurface Soil

Background concentrations for zinc in the subsurface soil ranged from 27.30 to 101 mg/kg, based on a total of 51 samples collected during the background study. Background was calculated as 82.0 mg/kg, as indicated in Table D-3.

Zinc concentrations were detected above background in 44 of 336 subsurface soil samples at concentrations ranging from 16.70 to 780 mg/kg. A statistical summary of the analytical results for zinc in the subsurface soil at the FEMP is presented in Table D.1-2.

Zinc was detected within the subsurface soils at elevated concentrations of at least five times background in only two areas of the FEMP. The highest concentrations were detected in the northern portion of the Plant 1 area (780 mg/kg at 3.0 to 5.0 feet) and the area west of the K-65 silos (486 mg/kg at 5.0 to 10.0 feet).

The possible source for the zinc contamination in the fire training area is the waste oils used during the fire fighting exercises. Both the maintenance area and the scrap metal pile area handled a variety of metal materials containing zinc. The majority of the significantly high levels of zinc contamination in these areas are confined to the top 6 inches of soil, a fact which indicates that the contamination is probably due to random, miscellaneous spills. The source of the zinc contamination in the Plant 1 area is not well defined, but a possible source may be the construction rubble mound located near the area where the high concentration was detected. The possible source of the high zinc concentration in the area west of the K-65 silos may be the construction debris deposited in the area, which may have contained zinc ores.

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D.1.3 ORGANIC PARAMETERS

Numerous surface and subsurface soil samples, as many as 380 and 425 samples, respectively, were collected and analyzed for various organic analytes. The organics that are included are provided in the introduction to Section 4.0.

The following is a discussion of volatile and semivolatile organic analytes for which sampling and analyses were performed.

D.1.3.1 Total Volatile Organic Compounds

Based on the data in the following discussion, it was determined that volatile organic compounds (VOCs) are not a significant contaminant of the FEMP. Except for isolated locations near the K-65 silos, northwest of the waste pits (OU1), and southwest of the South Field, all concentrations of VOCs are located within the 20 mg/kg uranium envelope as discussed in D.1. Volatile organic compounds are common constituents of solvents, degreasers, and fuels used at the FEMP. Table D-1 highlights the areas that may be potential sources of VOCs.

Since volatile organic compounds are man-made, they do not occur naturally in the environment; therefore, no background concentrations for VOCs exist. Thus, any positive detection of volatile organics are considered to be above background.

Details for volatile organic contamination in the above-mentioned geographic areas and in the areas surrounding former production plant are provided in Section D.2.

Surface Soil

Volatile organic contamination in surface soils across the FEMP is depicted in Plates D-124, D-125, and D-126. Twenty-six volatile organic compounds were detected in the surface soil within the FEMP, the most widely detected of which was toluene. The common laboratory and field decontamination solvents, methylene chloride and acetone were the second and third most widely detected volatile organic compounds in the surface soil of the FEMP, respectively. However, these detections may not be truly representative of actual site conditions, based on sample cross-contamination possibilities. Other volatile organic constituents that were detected in more than 10 samples include 1,1-dichloroethane, tetrachloroethene, trichloroethene, 1,1,1-trichloroethane, carbon disulfide, 2-butanone, 4-methyl-2-pentanone, and total xylenes.

The majority of the volatile organic contamination in the FEMP surface soil was detected in the following areas.

- Plant 1 area
- Plant 2/3 area
- Plant 4/5/7 area
- Plant 6 area
- Plant 8 area
- Plant 9 area
- Sewage treatment plant area
- Pilot plant area
- Laboratory area
- Electrical substation area
- Maintenance area
- Tank farm and boiler house
- Scrap metal pile, decontamination building, and Buildings 64 and 65
- Graphite furnace, oil burner, and coal pile area
- KC-2 warehouse area
- Fire training area
- Northeastern area of FEMP
- Southern area of FEMP
- Western area of FEMP
- Area outside FEMP adjacent to boundary

As shown in Plates D-124, D-126, and D-126, volatile organic contaminants were detected in surface soil samples throughout the former production area.

The highest concentrations of total volatile organic compounds detected in the surface soils of the FEMP were located north of the Maintenance Building (92,860 μg/kg at 0 to 0.5 feet), near the Plant 1 pad (51,380 μg/kg at 0 to 0.5 feet) and near the graphite furnace (16,764 μg/kg at 0.5 to 1.0 feet). The sources of these high detections of volatile organic constituents in these areas and at these depths is most likely attributable to isolated miscellaneous spills of solvent material or leaks from storage containers (i.e., drums).

Subsurface Soil

Twenty-nine volatile organic compounds were detected in the subsurface soil within the FEMP. Carbon disulfide, acetone, and toluene were the three most widely detected volatile organic compounds in the subsurface soil. Similar other volatile organic compounds that were detected in surface soil were detected in the subsurface soil as well.

The majority of the volatile organic contamination in the FEMP subsurface soil is found in the following areas:

- Plant 1 area
- Plant 2/3 area
- Scrap metal pile, decontamination building, and Buildings 64 and 65

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- Plant 4/5/7 area
- Plant 6 area
- Plant 9 area
- Pilot plant area
- Laboratory area
- Administration area
- Maintenance building area
- Tank farm and boiler house
- D&D building and drum baling area
- Graphite furnace, oil burner, and coal pile area
- Fire training area
- K-65/Clearwell line west
- Clearwell line east
- Northeastern area of FEMP
- Northwestern area of FEMP
- Area outside FEMP adjacent to boundary

As shown in Plates D-127, D-128, and D-129, volatile organic contaminants were detected in subsurface soil samples throughout the former production area.

The highest concentrations of total volatile organic compounds detected in the subsurface soils of the FEMP were found in the northwestern area of the maintenance building area, near the north pad (150,310 μg/kg at 3.0 to 5.0 feet and 121,600 μg/kg at 1.5 to 3.0 feet), the western portion of the pilot plant area (112,980 μg/kg at 10.0 to 15.0 feet and 22,669 μg/kg at 5.0 to 10.0 feet) and in the southern portion of the Plant 1 area (15,181 μg/kg at 10.0 to 15.0 feet). The probable sources for volatile organic soil contamination at these locations in the shallower depths (1.5 to 5.0 feet) is most likely attributable to vertical contaminant migration from solvent spills and leaking drums occurring at the surface. At deeper depth, the probable sources are leaks from subgrade piping and sumps (i.e., Pilot Plant) or vertical migration of spilled material on the surface into the perched groundwater zone, which is typically located approximately 5 feet below the ground surface in most areas of the former production area.

D.1.3.1.1 <u>1,1,1-Trichloroethane</u>

1,1,1,-Trichloroethane (1,1,1-TCA) concentrations were detected in surface and subsurface soil in and around the former production area. Based on the data in the following discussion, it was determined that 1,1,1-TCA is not a significant contaminant of the FEMP. Furthermore, all concentrations of 1,1,1-TCA are located within the 20 mg/kg uranium envelope as discussed in D.1. 1,1,1-TCA is a common constituent of solvents and degreasers used at the FEMP. 1,1,1-TCA can be transformed to 1,1,-DCA and/or 1,1,1-DCE which can be transformed to vinyl chloride and/or chloroethane. Table D-1 highlights the areas that may be potential sources of volatile organic compounds, such as 1,1,1-TCA.

Table D.1-89 summarizes the geographic areas that exhibited 1,1,1-TCA concentrations and provides the range of concentrations for each depth interval in the surface and subsurface soils. Details for 1,1,1-TCA contamination in the geographic areas and in the surrounding areas of the former production plant are provided in Section D.2. A discussion of 1,1,1-TCA contamination in the surface and subsurface soils at the FEMP is presented below.

Surface Soil

Since volatile organic compounds are man-made, they are not naturally occurring in the environment; therefore, no background concentrations of 1,1,1-TCA are available.

1,1,1-TCA concentrations were positively detected in 38 of 385 surface soil samples collected at depths from 0 to 1.5 feet below the ground surface. 1,1,1-TCA concentrations ranged from 1.0 to 9400 μg/kg. A statistical summary of the analytical results for 1,1,1-TCA in the surface soil at the FEMP is presented in Table D.1-1. Plate D-132 depicts the areas that exhibited detected concentrations of 1,1,1-TCA in the surface soils of the FEMP.

The highest concentrations of 1,1,1-trichloroethane detected in the surface soils of the FEMP were found in the Plant 6 Area (9400 μg/kg at 0 to 0.5 feet), the graphite furnace, oil burner, and coal pile area (350 μg/kg at 0.5 to 1.0 feet), the maintenance building area (210 μg/kg at 0 to 0.5 feet and 110 μg/kg at 0.5 to 1.0 feet), and the electrical substation area (100 μg/kg at 0 to 0.5 feet). The source of the 1,1,1-TCA in the surface soils of most of these areas is most likely due to miscellaneous spills or leaks from above ground storage containers. The source of the 1,1,1-TCA in the Plant 6 area is likely attributable to process-related spills and leaks in this area.

Subsurface Soil

Similar to the surface soils, there were no background concentrations of 1,1,1-TCA detected in the subsurface soils.

1,1,1-TCA concentrations were positively detected in 49 of 381 subsurface soil samples. 1,1,1-TCA concentrations ranged from 1.0 to 6600 μg/kg. A statistical summary of the analytical results for 1,1,1-TCA in the subsurface soil at the FEMP is presented in Table D.1-2. Plate D-133 depicts the areas that exhibited detected concentrations of 1,1,1-TCA in the subsurface soils (1.5 to greater than 20 feet) of the FEMP.

The highest concentrations of 1,1,1-TCA detected in the subsurface soils of the FEMP were found in the graphite furnace, oil burner and coal pile area (6600 μg/kg at 3.0 to 5.0 feet), the pilot plant area (1500 μg/kg at 5.0 to 10.0 feet and 1000 μg/kg at 3.0 to 5.0 feet), and the maintenance building (460 μg/kg to 1.5 to 3 feet). The sources of the 1,1,1-TCA detected in the above-mentioned areas is most likely attributable to leaks from subgrade piping and sumps (i.e., pilot plant), vertical migration of the contaminants from the surface (i.e., graphite furnace area), or leaking underground storage tanks (i.e. maintenance area).

D.1.3.1.2 Tetrachloroethene

Tetrachloroethene (PCE) concentrations were detected in surface and subsurface soils in and around the former production area. Based on the data in the following discussion, it was determined that PCE is not a significant contaminant of the FEMP. Except for isolated locations southwest of the South Field and in the central portion of the southern area, all concentrations of PCE are located within the 20 mg/kg uranium envelope as discussed in D.1. PCE is a common constituent of solvents and degreasers used at the FEMP. PCE can be transformed to TCE through natural degradation. Table D-1 highlights the areas that may be potential sources of volatile organic compounds, such as PCE.

Table D.1-90 summarizes the geographic areas that exhibited PCE concentrations and provides the range of concentrations for each depth interval in the surface and subsurface soils. Details for PCE contamination in the geographic areas and in the surrounding areas of the former production plant are provided in Section D.2. A discussion of PCE contamination in the surface and subsurface soils at the FEMP is presented below.

Surface Soil

Since volatile organic compounds are man-made, they are not naturally occurring in the environment; therefore, no background concentrations of PCE are available.

PCE concentrations were positively detected in 37 of 381 surface soil samples collected at depths from 0 to 1.5 feet below the ground surface. PCE concentrations ranged from 1.0 to 48,000 μg/kg. A statistical summary of the analytical results for PCE in the surface soil at the FEMP is presented in Table D.1-1. Plate D-138 depicts the areas that exhibited detected concentrations of PCE in the surface soils of the FEMP.

The highest concentrations of PCE detected in the surface soils of the FEMP were found in the Plant 1 area (48,000 μg/kg at 0 to 0.5 feet); the graphite furnace, oil burner, and coal pile area (15,000 μg/kg at 0.5 to 1.0 feet); the maintenance building area (3300 μg/kg at 0 to 0.5 feet and 2000 μg/kg at 0.5 to 1.0 feet); and the plant 6 area (1600 μg/kg at 0 to 0.5 feet). The majority of the PCE surface soil contamination in the above-mentioned areas is most likely attributable to spills or leaks of solvent materials stored and/or used in these areas.

Subsurface Soil

Similar to the surface soils, there were no background concentrations of PCE in the subsurface soils.

PCE concentrations were positively detected in 46 of 381 subsurface soil samples. PCE concentrations ranged from 1.0 to 21,000 μg/kg. A statistical summary of the analytical results for PCE in the subsurface soil at the FEMP is presented in Table D.1-2. Plate D-139 depicts the areas that exhibited detected concentrations of PCE in the subsurface soils (1.5->20 feet) of the FEMP.

The highest concentrations of tetrachloroethane detected in the subsurface soils of the FEMP were found in the pilot plant area (21,000 μg/kg at 5 to 10 feet, 17,000 μg/kg at 10 to 15 feet and 6300 μg/kg at 3 to 5 feet), the graphite furnace area (2800 μg/kg at 3.0 to 5.0 feet and 420 μg/kg at 1.5 to 3.0 feet, and the maintenance building area (1600 μg/kg at 1.5 to 3.0 feet and 1300 μg/kg at 3.0 to 5.0 feet). The PCE contamination in the subsurface soil of the pilot plant areas is most likely attributable to leaks from subsurface piping and sumps present in these areas. The contamination present in the other areas is most likely attributed to leaks from above ground or underground solvent storage containers present in these areas.

D.1.3.1.3 1,1-Dichloroethane

1,1-Dichloroethane (1,1-DCA) concentrations were detected in surface and subsurface soil in and around the former production area. Based on the data in the following discussion, it was determined that 1,1-DCA is not a significant contaminant of the FEMP. Furthermore, all concentrations of 1,1-DCA are located within the 20 mg/kg uranium envelope as discussed in D.1. 1,1-DCA is a common constituent of solvents and agents used at the FEMP. It is also a degradation product of 1,1,1-TCA. Table D-1 highlights the areas that may be potential sources of volatile organic compounds such as 1,1-DCA.

Table D.1-91 summarizes the geographic areas that exhibited 1,1-DCA concentrations and provides the range of concentrations for each depth interval in the surface and subsurface soils. Details for 1,1-DCA contamination in the geographic areas and in the surrounding areas of the former production plant are provided in Section D.2. A discussion of 1,1-DCA contamination in the surface and subsurface soils at the FEMP is presented below.

Surface Soil

Since volatile organic compounds are man-made, they are not naturally occurring in the environment, therefore, no background concentrations of 1,1-DCA are available.

1,1-DCA concentrations were positively detected in 7 of 351 surface soil samples collected at depths from 0.0 to 1.5 feet below the ground surface. 1,1-DCA concentrations ranged from 1.0 to 22 μg/kg. A statistical summary of the analytical results for 1,1-DCA in the surface soil at the FEMP is presented in Table D.1-1. Plate D-130 depicts the areas that exhibited detected concentrations of 1,1-DCA in the surface soils of the FEMP.

The highest concentrations of 1,1-dichloroethane detected in the surface soils of the FEMP were found in the graphic furnace, oil burner, and coal pile area (22 μg/kg at 0 to 0.5 feet), and the electrical substation area (16 μg/kg at 0.0 to 0.5 ft). The 1,1-DCA contamination in the surface soils of the above-mentioned areas is most likely attributable to miscellaneous spills of solvent materials, which were spilled or leaked from solvent storage containers.

Subsurface Soil

Similar to the surface soils, there were no background concentrations of 1,1-DCA in the subsurface soils.

1,1-DCA concentrations were positively detected in 39 of 378 subsurface soil samples. 1,1-DCA concentrations ranged from 1.0 to 460 μg/kg. A statistical summary of the analytical results for 1.1-DCA in the subsurface soil at the FEMP is presented in Table D.1-2. Plate D-135 depicts the areas which exhibited detected concentrations of 1,1-DCA in the subsurface soils (1.5 to >20 feet) of the FEMP.

The highest concentrations of 1,1-dichloroethane detected in the subsurface soils of the FEMP were found in the Plant 6 area (460 mg/kg at 3 to 5 feet), the maintenance building area (310 μg/kg at 3.0 to 5.0 feet), and the graphite furnace, oil burner and coal pile area (290 μg/kg at 3.0 to 5.0 feet). The 1,1-DCA contamination present in the subsurface soil of the maintenance building area is most likely attributable to vertical migration of spilled material or leaking underground tanks or drums present in this area. The presence of 1,1-DCA in the 3- to 5-foot depth in the graphite furnace, oil burner and coal pile area may be linked to vertical migration of spilled material at the surface.

D.1.3.1.4 Trichloroethene

Trichloroethene (TCE) concentrations were detected in surface and subsurface soil in and around the former production area. Based on the data in the following discussion, it was determined that TCE is not a significant contaminant of the FEMP. Except for isolated locations northwest of the waste pits and in the central portion of the southern area, all concentrations of TCE are located within the 20 mg/kg uranium envelope as discussed in D.1. TCE is a common solvent and degreaser used at the FEMP. Table D-1 highlights the areas that may be potential sources of volatile organic compounds, such as TCE.

Table D.1-92 summarizes the geographic areas that exhibited TCE concentrations and provides the range of concentrations for each depth interval in the surface and subsurface soils. Details for TCE contamination in the geographic areas and in the surrounding areas of the former production plant are provided in Section D.2. A discussion of TCE contamination in the surface and subsurface soils at the FEMP is presented below.

Surface Soil

Since volatile organic compounds are man-made, they are not naturally occurring in the environment; therefore, no background concentrations of TCE are available.

TCE concentrations were positively detected in 46 of 385 surface soil samples collected at depths from 0 to 1.5 feet below the ground surface. TCE concentrations ranged from 1.0 to 89,000 μg/kg. A statistical summary of the analytical results for TCE in the surface soil at the FEMP is presented in Table D.1-1. Plate D-140 depicts the areas that exhibited detected concentrations of TCE in the surface soils (0 to 1.5 feet) of the FEMP.

The highest concentrations of TCE detected in the surface soils of the FEMP were found in the maintenance building area (89,000 μg/kg at 0 to 0.5 feet and 56,000 μg/kg at 0.5 to 1.0 feet), and the plant 6 area (500 μg/kg at 0 to 0.5 feet). The sources of the TCE contamination in the above-mentioned areas is most likely attributable to miscellaneous spills or leaks from above ground containers of stored solvents.

Subsurface Soil

Similar to the surface soils, there were no background concentrations of TCE detected in the subsurface soils.

TCE concentrations were positively detected in 51 of 381 subsurface soil samples. TCE concentrations ranged from 1.0 to 150,000 μg/kg. A statistical summary of the analytical results for TCE in the subsurface soil at the FEMP is presented in Table D.1-2. Plate D-141 depicts the areas that exhibited detected concentrations of TCE in the subsurface soils (1.5->20 feet) of the FEMP.

The highest concentrations of TCE detected in the subsurface soils of the FEMP were found in the maintenance building area (150,000 μg/kg at 3 to 5 ft and 120,000 μg/kg at 1.5 to 3.0 feet), the plant 9 area (4400 μg/kg at 3.0 to 5.0 feet), the pilot plant area (2000 μg/kg at 10.0 to 15.0 feet), and the graphite furnace area (1300 μg/kg at 3.0 to 5.0 feet). The source of the TCE in the subsurface soils in the maintenance area is probably due to vertical migration of spilled material, since it was also detected in high concentrations in the surface soils of this area, as well and/or leaks from USTs. The high concentrations of TCE in the subsurface soils of the pilot plant and Plant 9 areas are most likely attributable to leaks from subgrade process piping and sumps in these areas. The contamination present in the graphite furnace area is most likely due to spills or leaks from solvents stored in drums in this area.

D.1.3.1.5 1,2-Dichloroethene (Total)

1,2-Dichloroethene (Total) (1,2-DCE) concentrations were detected in surface and subsurface soil in and around the former production area. Based on the data in the following discussion, it was determined that 1,2-DCE is not a significant contaminant of the FEMP. Furthermore, all concentrations of 1,2-DCE are located within the 20 mg/kg uranium envelope as discussed in D.1. 1,2-DCE is a common constituent of solvents and degreasers used at the FEMP. Table D-1 highlights the areas that may be potential sources of volatile organic compounds, such as 1,2-DCE.

Table D.1-93 summarizes the geographic areas that exhibited 1,2-DCE concentrations and provides the range of concentrations for each depth interval in the surface and subsurface soils. Details for 1,2-DCE contamination in the geographic areas and in the surrounding areas of the former production plant are provided in Section D.2. A discussion of 1,2-DCE contamination in the surface and subsurface soils at the FEMP is presented below.

Surface Soil

Since volatile organic compounds are man-made they are not naturally occurring in the environment; therefore, no background concentrations of 1,2-DCE in surface soils are available.

1,2-DCE concentrations were positively detected in 9 of 351 surface soil samples collected at depths from 0.0 to 1.5 feet below the ground surface. 1,2-DCE concentrations ranged from 1.0 to 340 μg/kg. A statistical summary of the analytical results for 1,2-DCE in the surface soil at the FEMP is presented in Table D.1-1. Plate D-134 depicts the areas which exhibited detected concentrations of 1,2-DCE in the surface soils of the FEMP.

The highest concentrations of 1,2-dichloroethene (total) detected in the surface soils of the FEMP were found in the maintenance building area (340 μg/kg at 0 to 0.5 feet), and the Plant 9 area (20 μg/kg at 0 to 0.5 feet). The 1,2-DCE contamination in the surface soils of the above-mentioned areas is most likely attributable to miscellaneous spills of solvent materials, which were accidentally spilled or leaked from solvent storage containers.

Subsurface Soil

Similar to the surface soils, there were no background concentrations of 1,2-DCE in the subsurface soils.

1,2-DCE concentrations were positively detected in 47 of 378 subsurface soil samples. 1,2-DCE concentrations ranged from 1.0 to 4300 μg/kg. A statistical summary of the analytical results for 1,2-DCE in the subsurface soil at the FEMP is presented in Table D.1-2. Plate D-135 depicts the areas that exhibited detected concentrations of 1,2-DCE in the subsurface soils (1.5 to >20 feet) of the FEMP.

The highest concentrations of 1,2-dichloroethene (total) detected in the subsurface soils of the FEMP were found in the maintenance building area (4300 μg/kg at 3 to 5 feet and 440 μg/kg at 1.5 to 3 feet), the pilot plant area (1600 μg/kg at 10 to 15 feet), and the Plant 6 area (320 μg/kg at 3.0 to 5.0 feet). The 1,2-DCE contamination present in the subsurface soil of the maintenance building area is most likely attributable to vertical migration of the spilled material found in the surface soils of this area or leaks from underground storage tanks. The presence of 1,2-DCE in the 10- to 15-foot depth interval in the pilot plant area may be attributable to leaks from subgrade piping and sumps in this area.

D.1.3.1.6 1,2-Dichloroethane

1,2-Dichloroethane (1,2-DCA) concentrations were detected in surface and subsurface soil in and around the former production area. Based on the data in the following discussion, it was determined that 1,2-DCA is not a significant contaminant of the FEMP. Furthermore, all concentrations of 1,2-DCA are located within the 20 mg/kg uranium envelope as discussed in D.1. 1,2-DCA is a common constituent of solvents and degreasers used at the FEMP. Table D-1 highlights the areas that may be potential sources of volatile organic compounds, such as 1,2-DCA.

Table D.1-94 summarizes the geographic areas that exhibited 1,2-DCA concentrations and provides the range of concentrations for each depth interval in the surface and subsurface soils. Details for 1,2-DCA contamination in the geographic areas and in the surrounding areas of the former production plant are provided in Section D.2. A discussion of 1,2-DCA contamination in the surface and subsurface soils at the FEMP is presented below.

Surface Soil

Since volatile organic compounds are man-made, they are not naturally occurring in the environment; therefore, no background concentrations of 1,2-DCA in the surface soils are available.

1,2-DCA concentrations were positively detected in 1 of 370 surface soil samples collected at depths from 0.0 to 1.5 feet below the ground surface. The concentration level of the 1,2-DCA sample was 2.0 μg/kg. A statistical summary of the analytical results for 1,2-DCA surface soil at the FEMP is presented in Table D.1-1. Plate D-136 depicts the areas that exhibited detected concentrations of 1,2-DCA in the surface soils (0 to 1.5 feet) of the FEMP.

The only concentrations of 1,2-dichloroethane detected in the surface soils of the FEMP was found in the graphite furnace, oil burner, and coal pile area (2 μg/kg at 0.5 to 1.5 feet). This low concentration is probably due to a miscellaneous spill of solvent material in this area.

Subsurface Soil

Similar to the surface soils, there were no background concentrations of 1,2-DCA in the subsurface soils.

1,2-DCA concentrations were positively detected in 6 of 377 subsurface soil samples. 1,2-DCA concentrations ranged from 2.0 to 10 μg/kg. A statistical summary of the analytical results for 1,2-DCA in the subsurface soil in the FEMP is presented in Table D.1.2. Plate D-137 depicts the areas that exhibited detected concentrations of 1,2-DCA in the subsurface soils (1.5->20 feet) of the FEMP.

The highest concentrations of 1,2-dichloroethane detected in the subsurface soils of the FEMP were found in the plant 6 (10 μg/kg at 3.0 to 5.0 feet) and maintenance building area (2 μg/kg at 3.0 to 5.0 feet). The sources of these areas of high concentrations are most likely attributable to miscellaneous spills of solvent materials. Within the maintenance building area, solvents were stored in drums which potentially could have leaked. Plant 6 housed the metals fabrication plant (6A) where metals fabrication and finishing took place. 1,2-DCA may have entered the subsurface soils via leaks from subgrade piping and sumps.

D.1.3.2 Semivolatile Organic Compounds

Based on the data in the following discussion, it was determined that semivolatile organic compounds are not a significant contaminant of the FEMP. Furthermore, all concentrations of semivolatile organic compounds are located within the 20 mg/kg uranium envelope as discussed in D.1. Table D-1 highlights the areas that are potential sources of semi-VOAs. Semivolatile organic compounds are present in a variety of materials associated with industrial applications. Typically, the semivolatile organic compounds associated with the production processes at the FEMP are polynuclear aromatic hydrocarbons (PAHs) and phthalates. PAHs are present in petroleum products and are also formed as a result of incomplete combustion of hydrocarbon fuels, which were used at the FEMP. Phthalates are present in polymers and resins used in equipment and protective coatings.

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Surface Soil

Forty-five semivolatile organic compounds were positively identified in samples collected at depths of 0 to 1.5 feet. Bis(2-ethylhexyl)phthalate was the most commonly detected semivolatile organic. It should be noted that bis(2-ethylhexyl)phthalate is a common laboratory contaminant. A statistical summary of sampling and analytical results for semivolatiles in the surface soil at the FEMP is presented in Table D.1-1. Details for semivolatile contamination in the geographic areas and in the areas surrounding the former production area are provided in Section D.2.

Background concentrations for semivolatiles in surface soil are not available. Since semivolatiles are not naturally occurring in the environment, there are no background concentrations for semivolatiles. Thus, any positive detection of semivolatiles is considered to exceed background.

The primary contaminants in the semivolatiles detected in surface soil at the FEMP were PAHs and phthalates. A variety of PAHs were detected not only frequently, but also at high concentrations. The three most frequently detected semivolatiles were bis(2-ethylhexyl)phthalate (99 of 341 samples), fluoranthene (114 of 345 samples), and pyrene (115 of 345 samples) in a range of 36 to 11,000 μg/kg, 1 to 33,000 μg/kg, and 1 to 22,000 μg/kg, respectively. Frequently detected PAHs included 2-methylnaphthalene, acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, di-n-butyl phthalate, dibenzo(a,h)anthracene, dibenzofuran, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, and phenanthrene.

Because of the number of semivolatile organic compounds detected in the soil samples, summation of all semivolatile organic compounds at each sampling location was used to represent the concentration of total semivolatiles. The semivolatiles present in the surface soil were mainly found within the production area.

The majority of semivolatile organic contamination in surface soil at the FEMP was detected in the following areas where semivolatile concentrations were detected at levels of 1,000 μg/kg or greater. Plates D-142, D-143, and D-144 illustrate the distribution of total concentrations of semivolatile organic compounds in the surface soil samples across the FEMP.

- Plant 1 area
- Plant 2/3 area
- Graphite furnace, oil burner, and coal pile area

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- Plant 4/5/7 area
- Plant 6 area
- Plant 8 area
- Plant 9 area
- Sewage treatment plant area
- Laboratory area
- Administration area
- Tank farm and boiler house
- D&D building and drum boiling area
- Scrap metal pile, decontamination building, and Building 64 and 65
- KC-2 warehouse area
- Fire training area
- Trap range area
- K-65/Clearwell line west
- Northeastern area of FEMP
- Southern area of FEMP
- Western area of FEMP
- Northwestern area of FEMP
- Area outside FEMP adjacent boundary

The highest concentrations of total semivolatile organic compounds detected in the surface soil of the FEMP were present near the scrap metal pile (362,220 μg/kg), south of the KC-2 warehouse area (121,950 and 119,470 μg/kg), and in the western portion of the pilot plant area (90,758 and 71,040 μg/kg). The majority of the semivolatile organic contamination detected in the surface soil in the above-mentioned areas is most likely attributable to miscellaneous spills of semivolatile-containing materials throughout these areas.

Subsurface Soil

Background concentrations for semivolatiles in the subsurface soil are not available. Because semivolatiles are not naturally occurring in the environment, any positive detection of a semivolatile is considered to have exceeded the background level.

Concentrations of various semivolatile organic compounds were positively detected in subsurface soil samples. Plates D-145, D-146, and D-147 illustrate the distribution of semivolatile organic compounds in subsurface soil across the FEMP. A statistical summary of sampling and analytical results for semivolatiles in the subsurface soil at the FEMP is presented in Table D.1-2.

The primary semivolatile contaminants detected in the subsurface soil at the FEMP were PAHs and phthalates. A number of PAHs were detected not only frequently, but also at high concentrations. The most frequently detected phthalate was bis(2-ethylhexyl)phthalate, which was detected in 100 of 309 samples, ranging from 3.0 to 9100 μg/kg. PAHs that were frequently detected included benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzoic acid, chrysene, di-n-butyl phthalate, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene. Because of the number of semivolatile organic compounds detected, the sum of all semivolatile

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organic compound concentrations at each sampling location was used to represent the concentration of total semivolatiles at that location.

The majority of semivolatile contamination in the subsurface soil at the FEMP is found in the following areas, where semivolatile concentrations were detected at levels of 1000 μg/kg or higher:

- Plant 1 area
- Plant 2/3 area
- Plant 4/5/7 area
- Plant 6 area
- Plant 8 area
- Plant 9 area
- Sewage treatment plant area
- Laboratory area
- Administration area
- Maintenance building area
- Tank farm and boiler house
- Scrap metal pile, decontamination building, and Buildings 64 and 65
- Graphite furnace, oil burner, and coal pile area
- Fire training area
- K-65/Clearwell line west
- Northeastern area of FEMP

The highest concentrations of total semivolatile organic compounds detected in the subsurface soil of the FEMP were present in the northern portion of the maintenance building area (53,770 μg/kg), the northern portion of the Plant 1 pad (8898 μg/kg) and near the graphite furnace (8100 μg/kg). The detection of semivolatile organic compounds in the maintenance building area is most likely attributable to leaks from former underground storage tanks in that area.

D.1.3.3 Polychlorinated Biphenyls (PCBs)

PCBs were detected in surface and subsurface soils in and around the former production area. Based on the data in the following discussion, it was determined that PCBs is not a significant contaminant of the FEMP. Furthermore, all concentrations of PCBs are located within the 20 mg/kg uranium envelope as discussed in D.1. A statistical summary of sampling and analyses and analytical results for PCBs in surface soil at the FEMP is presented in Table D.1-1. Details for PCB contamination in the geographic areas and in the areas surrounding former production area are provided in Section D.2.

Surface Soil

PCB contamination in surface soil (0-1.5 ft) across the FEMP is depicted in Plate D-148. Only two PCB constituents, aroclor-1254 and aroclor-1260, were detected in the surface soil of the FEMP. The most predominant of these was aroclor-1254, which was detected in 81 of 337 surface soil

samples with concentrations ranging from 11 to 14,000 μg/kg. Aroclor-1260 was detected in only 17 of 338 surface soil samples.

PCB contamination in the FEMP surface soil was found in the following areas.

- Plant 1 area
- Plant 2/3 area
- Pilot plant area
- Plant 8 area
- Plant 9 area
- Laboratory area
- Administration area
- Electrical substation area
- Scrap metal pile, decontamination building and Buildings 64 and 65
- Maintenance building area
- D&D building and drum baling area
- Graphite furnace, oil burner and coal pile area
- Fire training area
- KC-2 warehouse area
- Northeastern area of FEMP
- Western area of FEMP

The individual PCB concentrations are summed together and the range of concentrations are presented for each area of concern.

The highest concentrations of total PCBs in the surface soils were detected in the southern portion of Plant 2/3 area (14,000 μg/kg), near the graphite furnace (150 to 11,000 μg/kg) north of the maintenance building (59 to 10,000 μg/kg) near the drum bailing area (710 to 6200 μg/kg) and south of the KC-2 warehouse (1100 to 2100 μg/kg). The most likely sources of PCB contamination of the surface soils are miscellaneous spills of PCB contaminated waste oils from above ground storage containers or leaks in dielectric transformers present in the substation area. The PCB contamination present in the fire training area is attributable to the use of PCB-contaminated waste oils burned during fire training exercises int he area.

Subsurface Soil

Four PCB compounds were positively detected in the subsurface soil samples (> 1.5 feet) collected within the FEMP. Again, aroclor-1254 and aroclor-1260 were the most predominant PCBs, having been detected in 23 of 254 with a range of 9.9 to 1700 μg/kg and 5 of 254 with a range of 10 to 2700 μg/kg subsurface soil samples, respectively. In addition, two other aroclors were detected in a limited number of subsurface samples. These were aroclors-1242, and -1248, neither were detected in the surface soil samples at the FEMP.

The majority of the PCB contamination in FEMP subsurface soil is found in the following areas. PCBs in subsurface soil is depicted in Plate D-149.

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- Plant 1 area
- Plant 2/3 area
- Plant 8 area
- Maintenance building area
- Fire training area
- Pilot plant area
- Laboratory area
- Graphite furnace, oil burner and coal pile area

The areas exhibiting concentrations of total PCBs were the graphite furnace, oil burner and coal pile area (450 to 3100 μg/kg), north of the maintenance building (26 to 1200 μg/kg), the fire training area, near the burn trough (2700 μg/kg), the southern portion of the Plant 2/3 area (350 to 740 μg/kg), the western portion of the pilot plant area (485 μg/kg), the western portion of the Plant 1 area (120 μg/kg), the laboratory area (76 μg/kg) and the eastern part of the Plant 8 area (40 μg/kg).

The probable sources of PCBs present in the subsurface soils of the above mentioned areas is the contamination present int he surface soils in these areas has migrated vertically over time into the subsurface substrate.

D.1.3.4 Dioxins

Based on the data in the following discussion, it was determined that dioxins is not a significant contaminant of the FEMP. Furthermore, all concentrations of dioxins are located within the 20 mg/kg uranium envelope as discussed in D.1. Dioxins are formed as a by-product of incomplete combustion of petroleum products. They are not natural occurring in the environment; therefore, no background concentrations exist. Dioxins were detected only in surface soils within the FEMP. A discussion of dioxin contamination in the surface soils of the FEMP is presented below.

Six surface soil samples collected within the FEMP area revealed detections of the dioxin octachlorodipenzo-p-dioxin, with a concentration range of 240 to 1100 ng/g. Two of these samples were collected near the graphite furnace burn pad, located in the graphite furnace, oil burner and coal pile area. Two of the detected concentrations (610 and 1100 ng/g) of dioxins were located in the 0- to 0.5-foot depth interval. Only one sample collected within the 0.5- to 1.0-foot depth interval detected concentrations of dioxins. This sample, located west of the Operable Unit 1 waste pit area, had a concentration of 240 ng/g. Two other surface soil samples collected south of the waste pit area revealed total dioxin concentrations of 310 and 900 ng/g. The dioxins present in this area could

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possibly be linked to the burn pit present in this area. The burn pit was used to burn combustible material. Plate D-150 presents the locations of the detected concentrations of total dioxins in the surface soils of the FEMP. No samples collected deeper than 1 foot from the surface exhibited detections of dioxins. The detections of dioxins in the surface soils located near the graphite furnace burn pad are not unexpected, since dioxins are by-products of the incomplete combustion of oils and petroleum products burned in this area.

In addition to the area presented above, dioxins were detected in the surface soils south of the fire training area, at 270 ng/g. This occurrence may have been caused form airborne deposition of burned material combusted during fire training activities in the area.

D.1.3.5 Furans

Based on the data in the following discussion, it was determined that furans is not a significant contaminant of the FEMP. Furthermore, all concentrations of furans are located within the 20 mg/kg uranium envelope as discussed in D.1. Furans are formed as a by-product of incomplete combustion of petroleum products. They are not naturally occurring in the environment; therefore no background concentrations exist. Only two detections of total furans occurred in the soils of the FEMP. A discussion of furan contamination in the soils of the FEMP is presented below.

Surface Soil

Only one detection of total furans was detected in the surface soils (0 to 1.5 feet) of the FEMP. This sample was located near the graphite furnace burn pad at 0 to 0.5 feet with a total furan concentration of 1620 ng/g (heptachlorodibenzofurans [320 ng/g] and octachlorodibenzofuran [1300 ng/g]). This finding is expected due to the presence of dioxins in this area, since the source and cause of each is very similar. Plate D-151 depicts the location of the detected concentration of total furans in the surface soil at the FEMP.

Subsurface Soil

Only one detection of total furans was present in the subsurface soils of the FEMP. This sample was collected in the vicinity of the burn pond in the fire training area. Octachlorodibenzofuran with a concentration of 1500 ng/g was detected at the 1.5- to 3-foot depth interval in this area. This occurrence is most likely attributable to the combustion of waste oils in the subgrade fire pond and the migration of contamination through the bottom of the pond into the subsurface soil of the area.

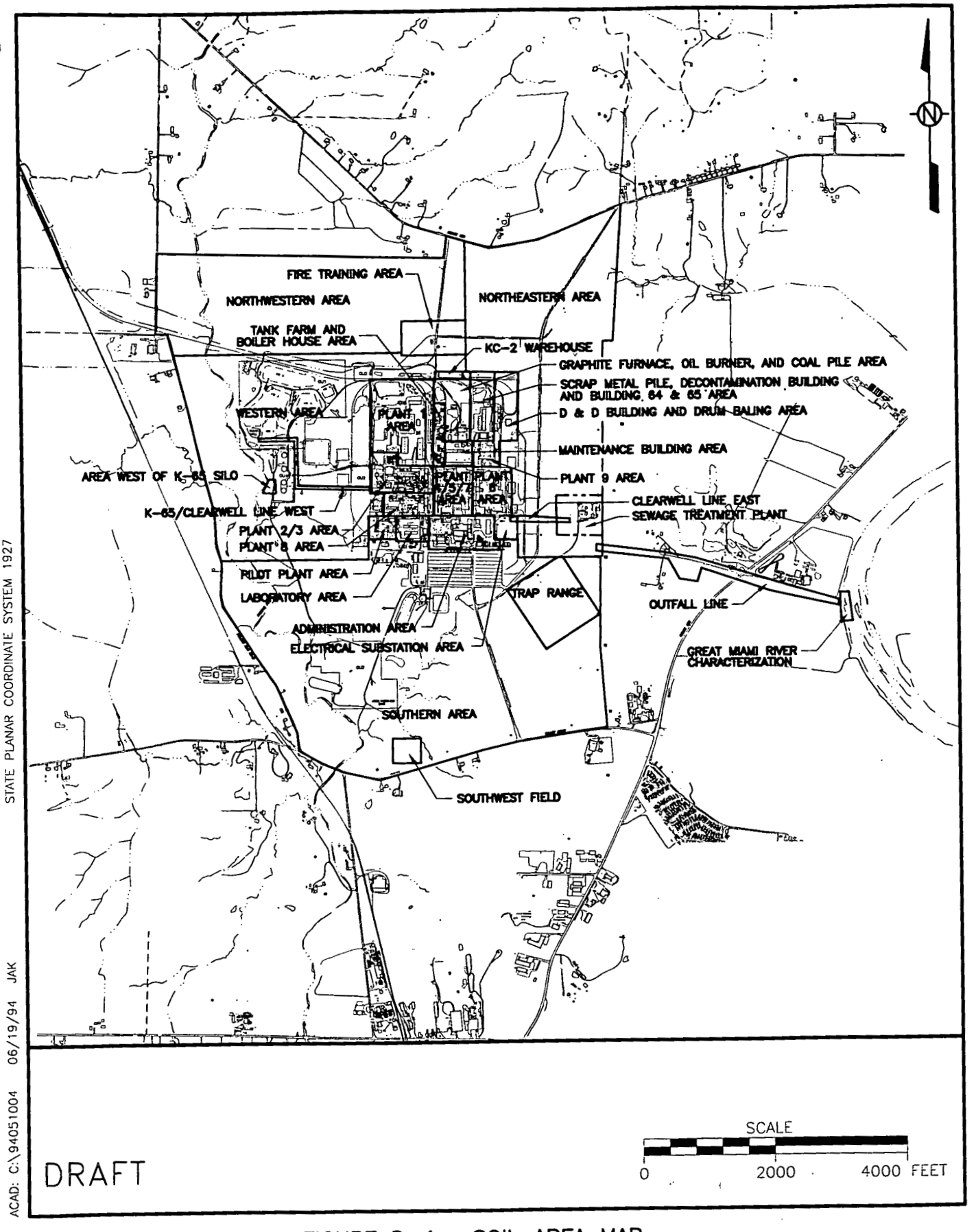
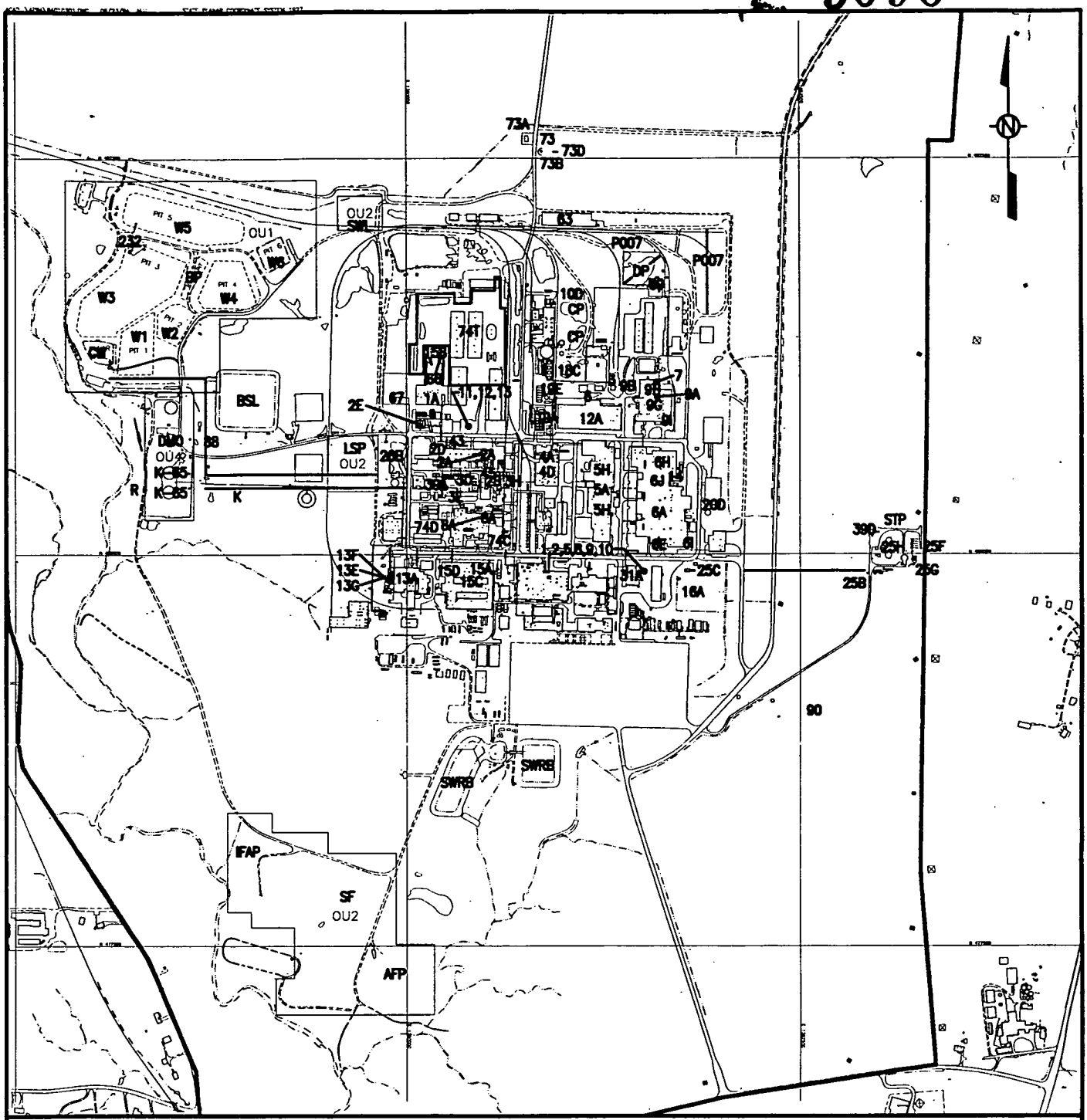


FIGURE D-1. SOIL AREA MAP



LEGEND:

UNDERGROUND STORAGE TANKS

1 TANK 1, GASOLINE, REMOVED
2 TANK 2, GASOLINE, REMOVED
3 TANK 3
4 TANK 4
5 TANK 5
6 TANK 6
7 TANK 7
8 TANK 8, GASOLINE REMOVED
9 TANK 9, DIESEL, REMOVED
10 TANK 10, GASOLINE & KEROSENE, REMOVED
11 TANK 11, GASOLINE & KEROSENE, REMOVED
12 TANK 12, GASOLINE, REMOVED
13 TANK 13, GASOLINE & KEROSENE, REMOVED
14 TANK 14, VIRGIN WATER-SOLUBLE MACHINE COOLING OIL

OPERABLE UNIT 1

B1 WASTE PIT 1
B2 WASTE PIT 2
B3 WASTE PIT 3 (HRMU 232)
B4 WASTE PIT 5 (HRMU 234)
B5 WASTE PIT 6
C2 CLEARWELL
BP BURN PIT
232 DEPOMONTAL TREATMENT FACILITY ("GREENHOUSE" HRMU 232)

OPERABLE UNIT 2

AFP ACTIVE FLYASH PILE
IFAP INACTIVE FLYASH PILE
LSP LIME SLUDGE PONDS
SF SOUTH FIELD
SWL SOLID WASTE LANDFILL

OPERABLE UNIT 3

1A PRECIPITATION PLANT
2A ORE REFINERY PLANT (INCLUDES HRMU 41 URH TANKS)
2B GENERAL SUMP REFINERY SUMP CONTROL BUILDING
2D METAL DISSOLVER BUILDING
2E NFS URH TANKS (HRMU 43)
3D NAR TORCHS
3K HOT RAFFINATE BUILDING (INCLUDES HRMU 44 URH TANKS)
3H REFINERY SUMP
4A GREEN SALT PLANT
4D KCY SUMPS
5A METALS PRODUCTION PLANT
5H KCY SUMPS
6H METALS FABRICATION PLANT
6K SALT-OIL HEAT TRACING
6H WATER TREATMENT
6J SCRAP METAL PICKLING
6J SLUG PICKLING AREA
7H UF_6 TO UF_4 REDUCTION PLANT

OPERABLE UNIT 3, CONT.

8A SCRAP REFINERY PLANT
INCLUDES: HRMU 85 BOX FURNANCE
HRMU 88 OXIDATION FURNANCE
HRMU 89 PRIMARY CALCINER
9A SPECIAL PRODUCTS PLANT
9B SUMP TREATMENT
9C SUMP AND ZIRALO PROCESS AREA
9H SUMP
9 4700 GALLON SUMP
10D OIL BURNER/GRAPHITE BURNER PAD
13A MAINTENANCE BUILDING
13A PILOT PLANT WET SIDE
13E MAIN SUMP
13F SOLVENT STORAGE
13C TANK FARM
15A LABORATORY
15C SUMP
15D FORMER DRUM STORAGE
16A MAIN ELECTRICAL SUBSTATION
16C COAL PILE RUNOFF BASIN
16A MAIN TANK FARM
16E SUMP (HRMU 303)
20D WATER TOWER SANDBLASTING RESIDUE
25B EFFLUENT LINE
25C SEWAGE LIFT STATION
25F SLUDGE DRYING BEDS (HRMU 234)
25G CLARIFIER SWRPG
25H TRICKLING FILTERS

OPERABLE UNIT 3, CONT.

28B WATER TOWER SANDBLASTING RESIDUE
31A ENGINE HOUSE/GARAGE
39A TRAVE INCINERATOR (HRMU 40)
39D INCINERATOR
43 URH TANKS (HRMU 45)
53 RC-2 WAREHOUSE
64 DRUM RECONDITION BUILDING
67 PLANT 1 THORIUM WAREHOUSE (HRMU 11)
68 FORMER DECONTAMINATION BUILDING
73 FIRE TRAINING AREA (HRMU 185)
73A TRAINING BUILDING
73B BURN POND AND DRAIN PIT
73D BURN TROUGH
74C PLANT 6 EAST DRUM STORAGE PAD (HRMU 67)
74D PLANT 6 WEST DRUM STORAGE PAD (HRMU 66)
P-1T PLANT 1 STORAGE PAD
88 CLEARWELL LINE
139 SHOTLABORATOR (HRMU 139)
BSL BIO-SURGE LAGOON (HRMU 223)
CP COAL PILE
DP DECONTAMINATION PAD
E E-65 SLURRY LINE
P007 OUTSIDE EQUIPMENT STORAGE AREAS
STP SEWAGE TREATMENT PLANT

OPERABLE UNIT 4

K-65 (INCLUDES SUBGRADE DECANT TANK)
DMO DRY METAL OXIDE SILO

OPERABLE UNIT 5

R BURNER PILE
BD TRAP RANGE

SCALE IN FEET
0 400 800

NOTE: SEE FIGURE 4-4 FOR SAME INFORMATION AT A LARGER SCALE

FIGURE D-2
LOCATION OF POTENTIAL SOURCES OF CONTAMINATION
OPERABLE UNIT 5

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Analyte	Operable Unit 1	Waste Pit Area (W1-W6, CW & BP)	Operable Unit 2	Flyash Piles (IFP & AFP)	South Field Area (SF)	Lime Sludge Ponds (LSP)	Solid Waste Landfill (SWL)	Operable Unit 3	Plant 1 Area	Plant 2/3 Area	Plant 4 Area	Plant 5 Area	Plant 6 Area	Plant 7 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area (STP)	Pilot Plant Area (13)	Laboratory Area (15)	General Sump	Administration Area (14)	Electrical Substation Area (16)	Maintenance/Stores Building (12)	Tank Farm Area (19)	Boiler House Area (10)	Drum Baling Area	Scrap Metal Pile, Decontamination Building ...	Graphite Furnace & Oil Burner (10D)	KC-2 Warehouse Area (63)	Garage	Health & Safety Building	Service Building (11)	K-65/Clearwell Line W. of Prod. Area	Clearwell Line E. of Prod. Area	Fire Training Area (73)	Outfall Pipeline	Operable Unit 4	Silos	Operable Unit 5	Area West of K-65 Silos	Trap Range (90)	Primary Sources/Uses
Radionuclides																																										
Uranium-238		●			●		●		●	●	●	●	●	●	●	●	●	●	●	●			●	●		●	●	●	●		●	●	●	●	●	●		●		●		Ores, ore concentrates, and recycled material.
Uranium-234		●			●		●		●	●	●	●	●		●	●	●	●	●	●			●	●		●	●	●			●	●	●	●	●	●		●		●		Ores, ore concentrates, and recycled material.
Thorium-230		●			●		●		●	●							●	●	●	●							●				●		●	●		●		●				Minor impurity (<1%) in ores and ore concentrates.
Radium-226		●			●		●		●	●							●	●	●	●						●	●				●		●	●		●		●				Impurity in uranium ores and ore concentrates.
Uranium-235/236		●			●		●		●	●	●	●	●	●	●	●	●	●	●	●			●	●		●	●	●			●	●	●	●	●	●		●			●	Ores, ore concentrates, and recycled material
Thorium-232		●			●		●		●	●	●	●	●		●	●		●	●	●						●	●	●			●		●	●		●		●				Feed material (thorium nitrate tetrahydrate).
Radium-228		●			●		●		●	●	●	●	●		●	●		●	●	●						●	●				●		●	●		●		●				Impurity in thorium ores and ore concentrates
Thorium-228		●			●		●		●	●	●	●	●		●	●		●	●	●						●	●	●			●		●	●		●		●				Feed material (thorium nitrate tetrahydrate).
Neptunium-237		●					●		●	●	●	●	●		●	●		●	●	●											●		●	●		●						Impurity in recycled uranium from other DOE facilities.
Plutonium-239/240		●					●		●	●	●	●	●		●	●		●	●	●											●		●	●		●						Impurity in recycled uranium from other DOE facilities.
Plutonium-238		●					●		●	●	●	●	●		●	●		●	●	●											●		●	●		●						Impurity in recycled uranium from other DOE facilities.
Strontium-90		●					●		●	●	●	●	●		●	●		●	●	●											●		●	●		●						Impurity in recycled uranium from other DOE facilities; fallout.
Technetium-99		●					●		●	●	●	●	●		●	●	●	●	●	●			●			●	●	●			●		●	●	●	●				●		Impurity in recycled uranium from other DOE facilities; fallout.
Cesium-137		●					●		●	●	●	●	●		●	●		●	●	●											●		●	●		●						Impurity in recycled uranium from other DOE facilities; fallout.
Metals																																										
Aluminum		●		●		●			●	●						●		●	●	●			●		●		●				●											Minor impurity (<1%) in ores & ore concentrates; major (>10%) component in flyash; hydrated alumina used in raffinate treatment for fluoride removal; cladding on fuel elements.
Antimony		●							●	●									●	●																						Minor impurity (<1%) in ores & ore concentrates.
Arsenic		●		●	●	●	●		●	●					●				●	●											●											Minor impurity (<1%) in ores & ore concentrates; minor component (<100 ppm) in flyash.
Barium		●		●					●	●			●					●	●	●											●											BaSO4 used in thorium raffinate treatment for radium removal; minor component (<0.5%) in flyash.
Beryllium				●	●	●	●													●											●											Minor component (<20 ppm) in flyash.
Boron		●							●	●									●	●											●											Minor impurity (<1%) in ores & ore concentrates.
Cadmium		●		●		●	●		●	●		●	●		●	●		●	●	●							●				●											Minor impurity (<1%) in ores & ore concentrates.
Calcium		●		●		●			●	●			●		●	●	●	●		●			●		●		●				●											Lime [Ca(OH)2] used for neutralization; major impurity (<3%) in ores & ore concentrates; major component (>13%) in flyash; CaCO3 used in heat treating.
Hexavalent Chrome		●																		●			●		●						●											Additive for process water treatment.
Chromium		●		●	●	●	●		●	●	●	●	●	●	●	●		●	●	●			●		●		●				●											Minor impurity (<1%) in ores & ore concentrates
Cobalt		●		●	●		●		●	●									●	●											●											Minor impurity (<1%) in ores & ore concentrates.
Copper		●		●					●	●	●	●	●	●	●	●		●	●	●			●				●				●											Minor impurity (<1%) in ores & ore concentrates; cladding on fuel elements.
Cyanide				●															●	●											●											Laboratory reagent.
Iron		●		●					●	●	●	●	●	●	●	●		●	●	●			●		●	●	●				●											Major impurity (<5%) in ores & ore concentrates; major component (>5%) in flyash.
Lead		●		●	●	●	●		●	●		●	●		●	●		●	●	●			●		●						●	●									●	Minor impurity (<1%) in ores & ore concentrates.
Lithium		●							●			●	●		●	●		●	●	●											●											LiCO3 used in heat treating.
Magnesium		●		●		●			●	●	●	●	●		●	●	●	●	●	●			●		●		●				●	●			●							Reduction of UF4 to U; major impurity (<4%) in ores and ore concentrates; major component (>4%) in flyash.
Manganese		●		●	●		●		●	●					●				●	●											●											Minor impurity (<1%) in ores & ore concentrates.
Mercury		●			●					●	●	●			●	●		●	●	●			●		●						●											Al/U alloy dissolution in Plant 2/3; laboratory uses.
Molybdenum		●		●	●				●	●									●	●							●				●											Minor impurity (<1%) in ores & ore concentrates.
Nickel		●		●					●	●	●		●	●		●		●	●	●			●								●											Minor impurity (<1%) in ores & ore concentrates; cladding on fuel elements; corrosion product.
Potassium		●							●	●	●		●	●	●	●		●	●	●			●	●							●											KCl used in heat treating; HF neutralization and residue recovery.
Selenium				●																●																							Minor component (<100 ppm) in flyash.
Silicon		●					●		●	●					●			●	●	●			●								●											Major impurity (<5%) in ores & ore concentrates.
Silver									●		●								●	●			●				●				●											Algaecide in Plant 4 heat exchangers; photographic film coating/processing.
Sodium		●							●	●			●	●	●	●		●	●	●			●				●				●											Major impurity (<10%) in ores & ore concentrates; NaCl used in heat treating; neutralization (NaOH).
Thallium				●	●		●												●	●																							Laboratory reagent.
Vanadium		●		●					●	●									●	●																							Minor impurity (<3%) in ores & ore concentrates.
Zinc		●		●					●	●						●		●	●	●							●				●											Minor impurity (<1%) in ores & ore concentrates.
Zirconium		●							●	●		●				●		●	●	●											●											Cladding on fuel elements; coating on ingot molds.

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TABLE D-1
SUMMARY OF POTENTIAL SOURCES AND EXPECTED CONTAMINANTS

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Analyte	Operable Unit 1	Waste Pit Area (W1-W6, CW & BP)	Operable Unit 2	Flyash Piles (IFP & AFP)	South Field Area (SF)	Lime Sludge Ponds (LSP)	Solid Waste Landfill (SWL)	Operable Unit 3	Plant 1 Area	Plant 2/3 Area	Plant 4 Area	Plant 5 Area	Plant 6 Area	Plant 7 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area (STP)	Pilot Plant Area (13)	Laboratory Area (15)	General Sump	Administration Area (14)	Electrical Substation Area (16)	Maintenance/Stores Building (12)	Tank Farm Area (19)	Boiler House Area (10)	Drum Baling Area	Scrap Metal Pile, Decontamination Building ...	Graphite Furnace & Oil Burner (10D)	KC-2 Warehouse Area (63)	Garage	Health & Safety Building	Service Building (11)	K-65/Clearwell Line W. of Prod. Area	Clearwell Line E. of Prod. Area	Fire Training Area (73)	Outfall Pipeline	Operable Unit 4	Silos	Operable Unit 5	Area West of K-65 Silos	Trap Range (90)	Primary Sources/Uses
Organic Compounds																																										
Acetone									●	●	●				●			●	●	●	●		●		●	●		●	●		●											Laboratory solvent.
Benzene				●								●	●					●	●	●			●								●											Laboratory solvent.
Carbon tetrachloride													●		●			●	●	●	●										●											Cleaning solvent.
Chlorobenzene													●						●	●																						Laboratory solvent.
Chloroform				●															●	●											●											Laboratory solvent.
Di-sec-butyl phenyl phosphonate																		●	●	●								●														Solvent for thorium extraction.
Ethylbenzene															●																											Laboratory solvent.
Ethylene glycol																			●	●										●	●											Antifreeze; laboratory reagent.
Methylethyl ketone (2-butanone)															●				●	●											●											Laboratory reagent.
Methylene chloride				●	●				●										●	●											●											Laboratory reagent.
Pentachlorophenol				●																																						Laboratory reagent.
Polychlorinated biphenyls									●	●		●				●		●	●	●		●						●	●		●				●							Coolant in transformers.
Solvesso-100																		●	●	●								●														Thorium extraction/purification.
Tetrachloroethene									●	●	●	●	●		●	●		●	●	●			●					●	●		●	●										Cleaning solvent; coolant in pilot plant remelt furnace
1,1,1-Trichloroethane		●		●					●	●	●	●	●		●		●	●	●	●			●		●			●	●		●				●							Cleaning solvent.
Trichloroethene		●							●	●		●	●		●	●		●	●	●			●					●			●	●											Cleaning solvent.
Toluene				●									●		●				●	●											●				●								Laboratory reagent.
Vinyl chloride				●																												●											Degradation product of trichloroethene and tetrachloroethene.
Xylene									●						●				●	●											●											Laboratory reagent.
Kerosene		●							●	●								●	●	●	●		●	●				●	●		●	●	●	●				●				Solvent for uranium/thorium extraction.
Various oils		●							●	●	●	●	●		●	●		●	●	●	●		●	●	●	●	●	●	●	●	●	●			●							Cooling, lubricating, hydraulics.
Other Compounds																																										
Ammonia		●								●	●		●	●	●	●		●	●	●				●									●	●								Minor impurity (<1%) in ores & ore concentrates: neutralization; residue from uranium recovery and UF4 production.
Carbonate		●				●			●	●			●		●	●		●	●	●			●										●	●								Major component in soil and groundwater; CaCO3 used in heat treating.
Chloride		●				●			●	●			●		●	●	●	●	●	●			●	●	●		●	●					●	●								Minor impurity (<1%) in ores & ore concentrates: NaCl & KCl used in heat treating; HCl used to dissolve U metal.
Fluoride		●							●	●	●	●	●	●	●	●		●	●	●			●	●			●	●					●	●								Minor impurity (<1%) in ores & ore concentrates: anhydrous & aqueous HF.
Nitrate		●							●	●			●		●	●	●	●	●	●			●	●			●						●	●								Nitric acid used to dissolve uranium and thorium feed materials for extraction.
Phosphate		●								●					●			●	●	●			●										●	●								Minor impurity (<1%) in ores & ore concentrates: UAP process.
Sulfate		●								●	●				●			●	●	●			●		●								●	●								Major impurity (<5%) in ores & ore concentrates: H2SO4 used for OU3 production.
Diamyl-amyl phosphonate																		●	●	●								●														Solvent for thorium extraction.
Magnesium fluoride		●							●	●		●			●	●		●	●	●							●	●					●	●								By-product of reduction of UF4 to uranium metal
Tributyl phosphate		●								●					●			●	●	●				●				●					●	●								Solvent for uranium extraction.

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TABLE D-1 (Continued)
SUMMARY OF POTENTIAL SOURCES
AND EXPECTED CONTAMINANTS

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TABLE D-2

BACKGROUND DATA FOR RADIONUCLIDES AND CHEMICALS IN SURFACE SOIL (0 - 1.5 FEET)

Constituents	Frequency of Detection	Range of Detection	Distribution	95th Percentile
Radionuclides (pCi/g)				
Actinium-227	1/30	0.09	Undefined	0.09
Cesium-137	30/30	0.16 - 0.71	Lognormal	0.71
Lead-210	30/30	0.53 - 1.30	Lognormal	1.30
Neptunium-237	NA	NA	NA	NA
Plutonium-238	NA	NA	NA	NA
Plutonium-239/240	NA	NA	NA	NA
Protactinium-231	0/30	ND	Undefined	ND
Radium-224	30/30	0.54 - 0.93	Undefined	0.90
Radium-226	30/30	0.85 - 1.48	Normal	1.42
Radium-228	30/30	0.80 - 1.27	Normal	1.25
Ruthenium-106	0/30	ND	Undefined	NA
Strontium-90	4/30	0.30 - 0.46	Undefined	0.42
Technetium-99	0/30	ND	Undefined	NA
Thorium-228	29/30	0.68 - 1.43	Normal	1.43
Thorium-230	29/30	0.90 - 2.01	Normal	1.97
Thorium-232	30/30	0.64 - 1.52	Lognormal	1.36
Uranium-234	30/30	0.67 - 1.31	Lognormal	1.24
Uranium-235/236	27/30	0.03 - 0.20	Lognormal	0.16
Uranium-238	30/30	0.85 - 1.33	Lognormal	1.24
Radionuclides (mg/kg)				
Thorium, Total	30/30	5.84 - 13.9	Lognormal	12.4
Uranium, Total	30/30	2.56 - 4.03	Lognormal	3.73

TABLE D-2 (Continued)

Constituents	Frequency of Detection	Range of Detection	Distribution	95th Percentile
Inorganics (mg/kg)				
Aluminum	30/30	5350 - 15,000	Lognormal	11,900
Antimony	0/22	ND	Undefined	NA
Arsenic	26/30	3.40 - 9.20	Normal	8.20
Barium	29/29	31.0 - 94.1	Lognormal	94.1[a]
Beryllium	1/30	0.60	Undefined	0.60
Cadmium	6/30	0.52 - 0.95	Undefined	0.87
Calcium	30/30	856 - 5340	Lognormal	4340
Chromium	30/30	6.70 - 17.7	Lognormal	15.5
Cobalt	30/30	4.30 - 16.5	Normal	14.2
Copper	27/30	3.20 - 17.3	Normal	14.1
Cyanide	12/30	0.14 - 0.29	Undefined	0.27
Iron	30/30	9370 - 24,900	Normal	21,700
Lead	28/30	0.53 - 1.3	Lognormal	26.4
Magnesium	30/30	1020 - 3590	Lognormal	2780
Manganese	29/29	189 - 1500	Lognormal	1350
Mercury	1/30	0.30	Undefined	0.30
Molybdenum	0/30	ND	Undefined	NA
Nickel	29/30	5.80 - 22.7	Lognormal	20.9
Potassium	29/30	374 - 1590	Normal	1230
Selenium	1/30	0.72	Undefined	0.72
Silicon	29/29	480 - 2230	Lognormal	1800
Silver	0/30	ND	Undefined	NA
Sodium	27/30	26.9 - 54.7	Normal	51.1
Thallium	1/30	0.58	Undefined	0.58
Vanadium	30/30	11.3 - 32.7	Lognormal	30.4
Zinc	30/30	29.4 - 70.0	Lognormal	59.6

[a]Maximum detect since 95th percentile exceeds the maximum positive detect.

ND - Not Detected
NA - Not Analyzed/Not Applicable

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TABLE D-3

BACKGROUND DATA FOR RADIONUCLIDES AND CHEMICALS
IN SUBSURFACE SOIL
(BELOW 1.5 FEET)

Constituents	Frequency of Detection	Range of Detection	Distribution	95th Percentile
Radionuclides (pCi/g)				
Actinium-227	3/51	0.06 - 0.10	Undefined	0.10
Cesium-137	0/51	ND	Undefined	ND
Lead-210	43/51	0.31 - 0.97	Normal	0.85
Neptunium-237	NA	NA	NA	NA
Plutonium-238	NA	NA	NA	NA
Plutonium-239/240	NA	NA	NA	NA
Protactinium-231	0/51	ND	Undefined	ND
Radium-224	51/51	0.28 - 1.07	Lognormal	1.01
Radium-226	51/51	0.59 - 1.61	Undefined	1.47
Radium-228	51/51	0.36 - 1.37	Lognormal	1.31
Ruthenium-106	0/51	ND	Undefined	ND
Strontium-90	2/51	0.44 - 0.56	Undefined	0.44
Technetium-99	0/51	ND	Undefined	ND
Thorium-228	49/50	0.47 - 1.39	Lognormal	1.38
Thorium-230	48/51	0.07 - 2.34	Normal	1.91
Thorium-232	44/50	0.35 - 1.35	Undefined	1.26
Uranium-234	48/51	0.48 - 1.30	Undefined	1.04
Uranium-235/236	46/51	0.03 - 0.20	Undefined	0.15
Uranium-238	48/51	0.60 - 1.23	Normal	1.12
Radionuclides (mg/kg)				
Thorium, total	50/50	2.83 - 12.3	Normal	11.1
Uranium, total	48/51	1.81 - 3.69	Lognormal	3.69

TABLE D-3 (Continued)

Constituents	Frequency of Detection	Range of Detection	Distribution	95th Percentile
Inorganics (mg/kg)				
Aluminum	51/51	3250 - 16,100	Lognormal	16,100
Antimony	0/37	ND	Undefined	ND
Arsenic	44/51	1.60 - 14.5	Lognormal	9.57
Barium	51/51	13.7 - 134	Lognormal	119
Beryllium	15/50	0.48 - 0.68	Undefined	0.62
Cadmium	6/51	0.47 - 1.30	Undefined	0.91
Calcium	51/51	3310 - 335,000	Undefined	150,000
Chromium	51/51	4.50 - 22.4	Lognormal	20.7
Cobalt	51/51	3.60 - 17.9	Lognormal	15.7
Copper	50/51	6.80 - 24.3	Lognormal	20.0
Cyanide	1/51	0.17	Undefined	0.17
Iron	51/51	8970 - 30,700	Lognormal	30,700[a]
Lead	47/51	3.00 - 18.4	Lognormal	15.6
Magnesium	51/51	2930 - 54,100	Normal	42,600
Manganese	51/51	251 - 1750	Undefined	1300
Mercury	1/51	0.29	Undefined	0.29
Molybdenum	1/51	2.70	Undefined	2.70
Nickel	51/51	8.50 - 41.9	Lognormal	34.3
Potassium	51/51	340 - 2180	Lognormal	1980
Selenium	0/51	ND	Undefined	ND
Silicon	51/51	449 - 1850	Lognormal	1590
Silver	0/51	ND	Undefined	ND
Sodium	51/51	53.8 - 345	Undefined	285
Thallium	3/51	0.49 - 0.55	Undefined	0.49
Vanadium	51/51	8.40 - 44.5	Undefined	37.8
Zinc	51/51	27.3 - 101	Lognormal	82.0

[a]Maximum detect since 95 percent UCL on median exceeds the maximum positive detect.

ND - Not Detected
NA - Not Analyzed/Not Applicable

TABLE D.1-1

FEMP SOIL DATA, 1988-1993 (SURFACE SOIL)
DEPTH: 0 - 1.5 FEET

Parameter	Units	Summary of Positive/Nonpositive Detections							95% Background Value
		Frequency of Detection	Total Validated Samples	Freq. of Detection Above Bkgd.	Range of Positive Detections	Average of Positive Detections	Minimum Nondetect	Maximum Nondetect	
RADIONUCLIDES									
Uranium-238	pCi/g	1404/1581	685	1273/1581	0.300-19100	91.4	0.600	120	1.24
Uranium, total	mg/kg	2216/2557	802	1937/2557	1.00-90300	241	2.00	46.0	3.73
Uranium-234	pCi/g	1086/1100	679	944/1100	0.200-18100	98.9	0.600	19.0	1.24
Thorium-230	pCi/g	926/970	705	499/970	0.200-7900	26.7	0.100	64.0	1.97
Radium-226	pCi/g	1099/1251	606	346/1251	0.300-2950	10.8	0.250	5.70	1.42
Lead-210	pCi/g	8/8	3	7/8	1.25-168	45.5			1.30
Polonium-210	pCi/g	10/10	10	10/10	1.45-84.5	29.5			NA
Uranium-235/236	pCi/g	769/1116	699	648/1116	0.0180-1020	7.99	0.100	0.100	0.156
Thorium-232	pCi/g	1218/1425	683	403/1425	0.180-283	3.29	0.100	11.4	1.36
Thorium, total	mg/kg	1417/1959	266	511/1959	1.01-2580	27.3	0.912	45.0	12.4
Radium-228	pCi/g	563/744	613	183/744	0.520-558	6.49	0.500	28.5	1.25
Thorium-228	pCi/g	882/935	671	305/935	0.200-315	3.54	0.100	0.910	1.43
Neptunium-237	pCi/g	12/568	512	12/568	0.214-2.63	0.840	0.200	6.00	NA
Plutonium-239/240	pCi/g	34/645	590	34/645	0.215-12.9	2.31	0.200	2.99	NA
Plutonium-238	pCi/g	39/647	590	39/647	0.207-151	14.5	0.200	5.71	NA
Strontium-90	pCi/g	234/639	564	234/639	0.510-26.3	1.72	0.500	5.00	0.424
Technetium-99	pCi/g	125/652	534	125/652	1.10-602	19.1	1.00	22.0	ND
Ruthenium-106	pCi/g	6/1026	504	6/1026	1.88-10.6	6.28	1.00	71.0	ND
Cesium-137	pCi/g	402/1086	545	108/1086	0.209-4.26	0.650	0.200	7.80	0.711
Gross alpha	pCi/g	330/358	22	330/358	4.34-1900	142	4.20	28.0	NA
Gross beta	pCi/g	325/354	22	325/354	4.53-2000	145	16.0	40.0	NA
Actinium-227	pCi/g	4/21	21	4/21	0.650-3.95	2.15	0.100	1.60	0.090

TABLE D.1-1 (Continued)

Parameter	Units	Summary of Positive/Nonpositive Detections							95% Background Value
		Frequency of Detection	Total Validated Samples	Freq. of Detection Above Bkgd.	Range of Positive Detections	Average of Positive Detections	Minimum Nondetect	Maximum Nondetect	
Gross gamma	pCi/g	0/2	0	0/2			170	170	
Protactinium-231	pCi/g	1/21	21	1/21	5.04-5.04	5.04	0.700	9.00	ND
Radium-224	pCi/g	21/21	21	20/21	0.313-5.36	1.98			0.900
Uranium-236	pCi/g	91/121	0	80/121	0.404-5.00	0.390	0.028	2.50	0.0880
Thorium-234	pCi/g	20/21	21	20/21	2.05-2290	236	33.4	33.4	NA
INORGANICS									
Aluminum	mg/kg	428/428	425	106/428	483-25700	9300			11900
Antimony	mg/kg	40/233	230	40/233	2.80-59.8	21.5	0.280	19.3	ND
Arsenic	mg/kg	386/400	373	64/400	0.770-81.9	6.57	0.420	61.0	8.20
Barium	mg/kg	452/452	425	148/452	11.4-587	93.6			95.7
Beryllium	mg/kg	249/424	421	197/424	0.280-5.70	0.970	0.220	3.80	0.600
Boron	mg/kg	1/1	1	1/1	14.3-14.3	14.3			13.7
Cadmium	mg/kg	159/442	415	154/442	0.490-12.4	3.71	0.460	5.00	0.870
Calcium	mg/kg	418/428	425	365/428	778-347000	62300	1080	3270	4340
Chromium	mg/kg	441/446	419	212/446	1.60-80.1	16.4	2.10	12.4	15.5
Cobalt	mg/kg	403/428	425	41/428	1.80-32.9	10.0	1.50	10.9	14.2
Copper	mg/kg	386/428	425	278/428	3.80-695	22.5	1.90	34.1	14.1
Cyanide	mg/kg	107/384	384	66/384	0.110-22.8	0.840	0.090	3.40	0.270
Iron	mg/kg	428/428	425	127/428	24.5-45100	18500			21700
Lead	mg/kg	410/415	377	114/415	2.80-2180	55.4	0.470	10.7	26.4
Magnesium	mg/kg	428/428	425	361/428	227-65300	15800			2780
Manganese	mg/kg	411/413	410	20/413	9.90-4400	629	0.420	739	1350
Mercury	mg/kg	55/447	421	21/447	0.060-6.30	0.530	0.010	0.528	0.300
Molybdenum	mg/kg	142/403	400	142/403	0.600-13.3	5.28	0.910	19.0	NA
Nickel	mg/kg	369/454	419	171/422	3.80-72.2	21.3	3.80	44.3	20.9
Potassium	mg/kg	422/428	425	137/428	222-4230	1080	21.2	2490	1230

TABLE D.1-1 (Continued)

Parameter	Units	Summary of Positive/Nonpositive Detections							95% Background Value
		Frequency of Detection	Total Validated Samples	Freq. of Detection Above Bkgd.	Range of Positive Detections	Average of Positive Detections	Minimum Nondetect	Maximum Nondetect	
Selenium	mg/kg	58/365	338	19/365	0.230-7.70	0.900	0.200	61.0	0.720
Silicon	mg/kg	262/278	277	36/278	31.8-6660	999	51.4	356	1800
Silver	mg/kg	167/434	407	167/434	0.470-36.4	5.73	0.200	9.90	ND
Sodium	mg/kg	341/428	425	303/428	25.2-2360	225	30.0	183	51.1
Thallium	mg/kg	59/425	422	4/425	0.110-0.750	0.340	0.110	1.60	0.580
Vanadium	mg/kg	425/428	425	69/428	4.30-49.0	23.9	8.00	28.4	30.4
Zinc	mg/kg	402/420	417	162/420	6.20-2150	84.8	10.0	67.3	59.6
VOLATILES									
1,1,1-Trichloroethane	µg/kg	38/385	350	38/385	1.00-9400	537	5.00	13000	NA
1,1,2,2-Tetrachloroethane	µg/kg	2/350	350	2/350	2.00-190	96.0	5.00	13000	NA
1,1,2-Trichloroethane	µg/kg	1/385	350	1/385	14.0-14.0	14.0	5.00	13000	NA
1,1,2-Trichlorotrifluoroethane	µg/kg	0/16	0	0/16			420	4200	NA
1,1-Dichloroethane	µg/kg	7/351	351	7/351	1.00-22.0	10.4	5.00	13000	NA
1,1-Dichloroethene	µg/kg	5/370	351	5/370	2.00-39.0	10.6	5.00	13000	NA
1,2-Dichloroethane	µg/kg	1/370	351	1/370	2.00-2.00	2.00	5.00	13000	NA
1,2-Dichloroethene (total)	µg/kg	9/351	351	9/351	1.00-340	55.8	5.00	13000	NA
1,2-Dichloropropane	µg/kg	0/350	350	0/350			5.00	13000	NA
2-Butanone	µg/kg	16/268	233	16/268	1.00-110	18.0	6.00	13000	NA
2-Hexanone	µg/kg	3/248	248	3/248	2.00-47.0	17.0	5.00	13000	NA
4-Methyl-2-pentanone	µg/kg	15/285	250	15/285	1.00-160	23.7	3.00	13000	NA
Acetone	µg/kg	40/383	348	40/383	3.00-450	44.7	6.00	13000	NA
Benzene	µg/kg	4/386	350	4/386	2.00-5.00	3.00	5.00	13000	NA
Bromodichloromethane	µg/kg	0/350	350	0/350			5.00	13000	NA
Bromoform	µg/kg	0/350	350	0/350			5.00	13000	NA
Bromomethane	µg/kg	1/351	351	1/351	720-720	720	10.0	13000	NA
Carbon disulfide	µg/kg	17/379	344	17/379	2.00-790	52.1	5.00	13000	NA

TABLE D.1-1 (Continued)

Parameter	Units	Summary of Positive/Nonpositive Detections							95% Background Value
		Frequency of Detection	Total Validated Samples	Freq. of Detection Above Bkgd.	Range of Positive Detections	Average of Positive Detections	Minimum Nondetect	Maximum Nondetect	
Carbon tetrachloride	µg/kg	2/385	350	2/385	1100-1200	1150	5.00	13000	NA
Chlorobenzene	µg/kg	5/385	350	5/385	1.00-10.0	3.80	5.00	13000	NA
Chloroethane	µg/kg	0/370	351	0/370			10.0	13000	NA
Chloroform	µg/kg	8/351	351	8/351	1.00-280	39.9	5.00	13000	NA
Chloromethane	µg/kg	0/367	348	0/367			8.00	13000	NA
cis-1,3-Dichloropropene	µg/kg	0/350	350	0/350			5.00	13000	NA
Dibromochloromethane	µg/kg	0/350	350	0/350			5.00	13000	NA
Ethylbenzene	µg/kg	8/386	350	8/386	0.800-660	137	5.00	13000	NA
Methylene chloride	µg/kg	59/386	351	59/386	1.00-5500	200	5.00	15000	NA
Styrene	µg/kg	2/349	349	2/349	1.00-28.0	14.5	5.00	13000	NA
Tetrachloroethene	µg/kg	37/381	346	37/381	1.00-48000	1920	5.00	13000	NA
Toluene	µg/kg	73/386	350	73/386	0.700-200	17.5	5.00	13000	NA
trans-1,3-Dichloropropene	µg/kg	0/344	344	0/344			5.00	13000	NA
Trichloroethene	µg/kg	46/385	350	46/385	1.00-89000	3300	5.00	13000	NA
Trichlorofluoromethane	µg/kg	0/35	0	0/35			11.0	830	NA
Vinyl acetate	µg/kg	0/282	282	0/282			10.0	13000	NA
Vinyl chloride	µg/kg	0/370	351	0/370			10.0	13000	NA
Xylenes, total	µg/kg	11/370	350	11/370	2.00-2000	286	5.00	13000	NA
SEMIVOLATILES									
1,2,4-Trichlorobenzene	µg/kg	0/342	342	0/342			10.0	5600	NA
1,2-Dichlorobenzene	µg/kg	0/342	342	0/342			10.0	5600	NA
1,3-Dichlorobenzene	µg/kg	0/342	342	0/342			10.0	5600	NA
1,4-Dichlorobenzene	µg/kg	0/350	342	0/350			10.0	5600	NA
2,4,5-Trichlorophenol	µg/kg	0/358	334	0/358			25.0	27000	NA
2,4,6-Trichlorophenol	µg/kg	0/358	334	0/358			10.0	5600	NA
2,4-Dichlorophenol	µg/kg	1/334	334	1/334	100-100	100	10.0	5600	NA

TABLE D.1-1 (Continued)

Parameter	Units	Summary of Positive/Nonpositive Detections							95% Background Value
		Frequency of Detection	Total Validated Samples	Freq. of Detection Above Bkgd.	Range of Positive Detections	Average of Positive Detections	Minimum Nondetect	Maximum Nondetect	
2,4-Dimethylphenol	µg/kg	3/351	335	0/351	60.0-100	76.7	10.0	5600	NA
2,4-Dinitrophenol	µg/kg	0/318	318	0/318			25.0	27000	NA
2,4-Dinitrotoluene	µg/kg	1/366	342	1/366	53.0-53.0	53.0	10.0	5600	NA
2,6-Dinitrotoluene	µg/kg	1/342	342	1/342	11.0-11.0	11.0	340	5600	NA
2-Benzyl-4-chlorophenol	µg/kg	0/2	2	0/2			390	400	NA
2-Chloronaphthalene	µg/kg	0/342	342	0/342			10.0	5600	NA
2-Chlorophenol	µg/kg	1/334	334	1/334	48.0-48.0	48.0	10.0	5600	NA
2-Methylnaphthalene	µg/kg	28/342	342	28/342	25.0-1700	391	10.0	5600	NA
2-Methylphenol	µg/kg	1/342	334	1/342	45.0-45.0	45.0	10.0	5600	NA
2-Nitroaniline	µg/kg	0/342	341	0/342			25.0	27000	NA
2-Nitrophenol	µg/kg	0/334	334	0/334			10.0	5600	NA
3,3'-Dichlorobenzidine	µg/kg	1/341	341	1/341	190-190	190	10.0	11000	NA
3-Nitroaniline	None	0/321	321	0/321			25.0	27000	NA
4,6-Dinitro-2-methylphenol	µg/kg	0/329	329	0/329			25.0	27000	NA
4-Bromophenyl phenyl ether	µg/kg	0/342	342	0/342			10.0	5600	NA
4-Chloro-3-methylphenol	µg/kg	1/334	334	1/334	46.0-46.0	46.0	10.0	5600	NA
4-Chlorophenyl phenyl ether	µg/kg	0/342	342	0/342			10.0	5600	NA
4-Methylphenol	µg/kg	4/343	335	4/343	50.0-190	105	10.0	5600	NA
4-Nitroaniline	µg/kg	1/321	321	1/321	330-330	330	25.0	27000	NA
4-Nitrophenol	µg/kg	0/330	330	0/330			25.0	27000	NA
Acenaphthene	µg/kg	21/342	342	21/342	52.0-4800	726	10.0	5600	NA
Acenaphthylene	µg/kg	13/342	342	13/342	41.0-3100	629	10.0	5600	NA
Anthracene	µg/kg	38/346	346	38/346	1.00-11000	1180	340	4200	NA
Benzo(a)anthracene	µg/kg	82/346	346	82/346	1.00-61000	1700	340	4200	NA
Benzo(a)pyrene	µg/kg	66/345	345	66/345	1.00-69000	2390	270	4200	NA
Benzo(b)fluoranthene	µg/kg	78/346	346	78/346	34.0-39000	1540	10.0	4200	NA
Benzo(g,h,i)perylene	µg/kg	48/346	346	48/346	38.0-48000	2170	10.0	5600	NA

TABLE D.1-1 (Continued)

Parameter	Units	Summary of Positive/Nonpositive Detections							95% Background Value
		Frequency of Detection	Total Validated Samples	Freq. of Detection Above Bkgd.	Range of Positive Detections	Average of Positive Detections	Minimum Nondetect	Maximum Nondetect	
Benzo(k)fluoranthene	µg/kg	74/346	346	74/346	19.0-69000	1750	10.0	5600	NA
Benzoic acid	µg/kg	9/287	287	9/287	55.0-250	105	25.0	27000	NA
Benzyl alcohol	µg/kg	2/295	295	2/295	69.0-290	179	10.0	5600	NA
Bis(2-chloroethoxy)methane	µg/kg	0/342	342	0/342			10.0	5600	NA
Bis(2-chloroethyl)ether	µg/kg	0/342	342	0/342			10.0	5600	NA
Bis(2-chloroisopropyl)ether	µg/kg	2/328	328	2/328	44.0-48.0	46.0	10.0	5600	NA
Bis(2-ethylhexyl)phthalate	µg/kg	99/341	341	99/341	36.0-11000	752	10.0	4200	NA
Butyl benzyl phthalate	µg/kg	5/344	344	5/344	42.0-750	200	10.0	5600	NA
Carbazole	µg/kg	11/161	161	11/161	7.00-570	130	10.0	560	NA
Chrysene	µg/kg	82/345	345	82/345	1.00-18000	1150	340	4200	NA
Di-n-butyl phthalate	µg/kg	41/346	346	41/346	1.00-6100	378	340	5600	NA
Di-n-octyl phthalate	µg/kg	5/344	344	5/344	7.00-630	271	10.0	5600	NA
Dibenzo(a,h)anthracene	µg/kg	27/346	346	27/346	39.0-23000	1740	10.0	5600	NA
Dibenzofuran	µg/kg	24/342	342	24/342	50.0-3400	530	10.0	5600	NA
Diethyl phthalate	µg/kg	3/342	342	3/342	1.00-52.0	22.3	340	5600	NA
Dimethyl phthalate	µg/kg	0/342	342	0/342			10.0	5600	NA
Fluoranthene	µg/kg	114/345	345	114/345	1.00-33000	1370	57.0	4200	NA
Fluorene	µg/kg	23/342	342	23/342	7.00-5700	692	10.0	5600	NA
Hexachlorobenzene	µg/kg	0/366	342	0/366			10.0	5600	NA
Hexachlorobutadiene	µg/kg	1/362	338	1/362	430-430	430	10.0	5600	NA
Hexachlorocyclopentadiene	µg/kg	0/340	340	0/340			10.0	5600	NA
Hexachloroethane	µg/kg	0/366	342	0/366	35.0		10.0	5600	NA
Indeno(1,2,3-cd)pyrene	µg/kg	50/346	346	50/346	35-49000	2150	10.0	5600	NA
Isophorone	µg/kg	1/342	342	1/342	830-830	830	10.0	5600	NA
N-Nitroso-di-n-propylamine	µg/kg	1/338	338	1/338	39.0-39.0	39.0	10.0	5600	NA
N-Nitrosodiphenylamine	µg/kg	4/342	342	4/342	43.0-1300	536	10.0	5600	NA
Naphthalene	µg/kg	28/342	342	28/342	1.00-1800	343	340	5600	NA

TABLE D.1-1 (Continued)

Parameter	Units	Summary of Positive/Nonpositive Detections							95% Background Value
		Frequency of Detection	Total Validated Samples	Freq. of Detection Above Bkgd.	Range of Positive Detections	Average of Positive Detections	Minimum Nondetect	Maximum Nondetect	
Nitrobenzene	µg/kg	0/362	338	0/362			10.0	5600	NA
o,o,o-Triethylphosphorothioate	µg/kg	0/6	6	0/6			0.0300	0.040	NA
p-Chloroaniline	µg/kg	0/324	324	0/324			10.0	5600	NA
Pentachlorophenol	µg/kg	0/358	334	0/358			25.0	27000	NA
Phenanthrene	µg/kg	92/345	345	92/345	1.00-22000	1130	340	4200	NA
Phenol	µg/kg	9/335	335	9/335	1.00-730	174	340	5600	NA
Pyrene	µg/kg	115/345	345	115/345	1.00-22000	1150	74.0	4200	NA
Pyridine	µg/kg	0/24	0	0/24			200	10000	NA
Tributyl phosphate	µg/kg	8/39	39	8/39	46.0-1200	248	350	1500	NA
PESTICIDES									
4,4'-DDD	µg/kg	0/333	329	0/333			3.30	99000	NA
4,4'-DDE	µg/kg	3/333	329	3/333	11.0-38.0	23.0	3.30	99000	NA
4,4'-DDT	µg/kg	6/334	330	6/334	3.00-19.0	11.9	3.40	99000	NA
Aldrin	µg/kg	1/333	329	1/333	1.60-1.60	1.60	1.70	49000	NA
Alpha-BHC	µg/kg	0/333	329	0/333			1.70	49000	NA
Alpha-Chlordane	µg/kg	4/333	329	4/333	2.10-9.70	4.93	1.70	490000	NA
Aroclor-1016	µg/kg	0/336	332	0/336			33.0	490000	NA
Aroclor-1221	µg/kg	0/336	332	0/336			37.0	490000	NA
Aroclor-1232	µg/kg	0/336	332	0/336			33.0	490000	NA
Aroclor-1242	µg/kg	0/336	332	0/336			33.0	490000	NA
Aroclor-1248	µg/kg	0/336	332	0/336			33.0	490000	NA
Aroclor-1254	µg/kg	81/337	333	81/337	11.0-14000	1210	33.0	2600	NA
Aroclor-1260	µg/kg	17/338	334	17/338	120-2800	608	33.0	990000	NA
Beta-BHC	µg/kg	3/333	329	3/333	46.0-220	115	1.70	49000	NA
Delta-BHC	µg/kg	0/333	329	0/333			1.70	49000	NA
Dieldrin	µg/kg	5/333	329	5/333	0.550-20.0	6.89	3.30	99000	NA

TABLE D.1-1 (Continued)

Parameter	Units	Summary of Positive/Nonpositive Detections							95% Background Value
		Frequency of Detection	Total Validated Samples	Freq. of Detection Above Bkgd.	Range of Positive Detections	Average of Positive Detections	Minimum Nondetect	Maximum Nondetect	
Endosulfan II	µg/kg	1/333	329	1/333	2.00-2.00	2.00	3.30	99000	NA
Endosulfan Sulfate	µg/kg	1/333	329	1/333	0.730-0.730	0.730	3.30	99000	NA
Endosulfan I	µg/kg	0/333	329	0/333			1.70	49000	NA
Endrin	µg/kg	5/351	329	5/351	0.940-19.0	6.61	2.10	99000	NA
Endrin Aldehyde	µg/kg	2/179	177	2/179	8.70-15.0	11.9	3.30	200	NA
Endrin Ketone	µg/kg	0/333	329	0/333			3.30	99000	NA
Gamma-BHC (Lindane)	µg/kg	0/351	329	0/351			1.40	49000	NA
Gamma-Chlordane	µg/kg	1/351	329	1/351	5.30-5.30	5.30	1.70	490000	NA
Heptachlor	µg/kg	0/351	329	0/351			1.00	49000	NA
Heptachlor Epoxide	µg/kg	2/351	329	2/351	1.00-2.80	1.90	1.70	49000	NA
Methoxychlor	µg/kg	3/351	329	3/351	0.850-3.50	1.88	10.0	490000	NA
Sulfotep	µg/kg	0/6	6	0/6			0.0300	0.0400	NA
Toxaphene	µg/kg	0/350	328	0/350			84.0	990000	NA
HERBICIDES									
2,4,5-TP (Silvex)	µg/kg	0/18	0	0/18			3.60	5.00	NA
2,4-D	µg/kg	0/18	0	0/18			5.00	30.0	NA
DIOXINS/FURANS									
1,2,3,4,6,7,8-Heptachloro-dibenzo-p-dioxin	ng/g	0/16	16	0/16			120	1000	NA
1,2,3,4,6,7,8-Heptachloro-dibenzofuran	ng/g	0/16	16	0/16			98.0	1000	NA
1,2,3,4,7,8,9-Heptachloro-dibenzofuran	ng/g	0/16	16	0/16			140	1000	NA
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	ng/g	0/16	16	0/16			100	1000	NA
1,2,3,4,7,8-Hexachloro-dibenzofuran	ng/g	0/17	17	0/17			66.0	1000	NA

TABLE D.1-1 (Continued)

Parameter	Units	Summary of Positive/Nonpositive Detections							95% Background Value
		Frequency of Detection	Total Validated Samples	Freq. of Detection Above Bkgd.	Range of Positive Detections	Average of Positive Detections	Minimum Nondetect	Maximum Nondetect	
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	ng/g	0/16	16	0/16			94.0	1000	NA
1,2,3,6,7,8-Hexachlorodibenzo-furan	ng/g	0/17	17	0/17			61.0	1000	NA
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	ng/g	0/16	16	0/16			93.0	1000	NA
1,2,3,7,8,9-Hexachlorodibenzo-furan	ng/g	0/17	17	0/17			76.0	1000	NA
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	ng/g	0/16	16	0/16			120	1000	NA
1,2,3,7,8-Pentachlorodibenzo-furan	ng/g	0/16	16	0/16			60.0	1000	NA
2,3,4,6,7,8-Hexachlorodibenzo-furan	ng/g	0/17	17	0/17			70.0	1000	NA
2,3,4,7,8-Pentachlorodibenzo-furan	ng/g	0/16	16	0/16			60.0	1000	NA
2,3,7,8-Tetrachlorodibenzo-p-dioxin	ng/g	0/46	46	0/46			24.0	1000	NA
2,3,7,8-Tetrachlorodibenzofuran	ng/g	0/20	20	0/20			23.0	1000	NA
Heptachlorodibenzo-p-dioxins	ng/g	0/20	20	0/20			120	1000	NA
Heptachlorodibenzofurans	ng/g	1/20	20	1/20	320-320	320.00	180	1200	NA
Hexachlorodibenzo-p-dioxins	ng/g	0/26	26	0/26			83.0	1000	NA
Hexachlorodibenzofurans	ng/g	0/27	27	0/27			67.0	1000	NA
Octachlorodibenzo-p-dioxin	ng/g	6/20	20	6/20	240-1100	572	200	1300	NA
Octachlorodibenzofuran	ng/g	2/20	20	2/20	240-1300	770	90.0	1000	NA
Pentachlorodibenzo-p-dioxins	ng/g	0/26	26	0/26			100	1000	NA
Pentachlorodibenzofurans	ng/g	0/26	26	0/26			30.0	1000	NA
Tetrachlorodibenzo-p-dioxins	ng/g	0/26	26	0/26			36.0	1000	NA
Tetrachlorodibenzofurans	ng/g	0/26	26	0/26			31.0	1000	NA

TABLE D.1-1 (Continued)

Parameter	Units	Summary of Positive/Nonpositive Detections							95% Background Value
		Frequency of Detection	Total Validated Samples	Freq. of Detection Above Bkgd.	Range of Positive Detections	Average of Positive Detections	Minimum Nondetect	Maximum Nondetect	
ORGANOPHOSPHORUS PESTICIDES									
Azinphosmethyl	µg/kg	0/7	7	0/7			82.0	107	NA
Demeton	µg/kg	0/7	7	0/7			66.0	85.0	NA
Diazinon	µg/kg	0/7	7	0/7			33.0	43.0	NA
Dimethoate	µg/kg	0/6	6	0/6			0.0300	0.0400	NA
Disulfoton	µg/kg	0/13	13	0/13			0.0300	43.0	NA
Ethion	µg/kg	0/7	7	0/7			33.0	43.0	NA
Famphur	µg/kg	0/6	6	0/6			0.0900	0.120	NA
Malathion	µg/kg	0/7	7	0/7			33.0	43.0	NA
Methyl Parathion	µg/kg	0/13	13	0/13			0.0600	43.0	NA
Parathion	µg/kg	0/13	13	0/13			0.0600	43.0	NA
Phorate	µg/kg	0/6	6	0/6			0.0600	0.0800	NA
Thionazin	µg/kg	0/6	6	0/6			0.0300	0.0400	NA
GENERAL CHEMISTRY									
Nitrate, as nitrogen	mg/kg	1/1	0	1/1	435-435	435			NA
Total organic carbon	mg/kg	1/1	1	1/1	38682-38682	38682			NA
Total petroleum hydrocarbons (TPH)	pCi/g	0/1	0	0/1			10.0	10.0	NA

TABLE D.1-2

FEMP SOIL DATA 1988-1993 (SUBSURFACE SOIL)
DEPTH: >1.5 FEET

Parameter	Units	Summary of Positive/Nonpositive Detections							95% Background Value
		Frequency of Detection	Total Validated Samples	Freq. of Detection Above Bkgd.	Range of Positive Detections	Average of Positive Detections	Minimum Nondetect	Maximum Nondetect	
RADIONUCLIDES									
Uranium-238	pCi/g	436/508	483	226/508	0.200-317	9.27	0.600	9.30	1.12
Uranium, total	mg/kg	1164/1829	864	878/1829	0.500-69300	194	0.100	12.0	3.69
Uranium-234	pCi/g	418/492	472	223/492	0.200-319	9.40	0.600	1.20	1.04
Thorium-230	pCi/g	497/566	549	64/566	0.300-153	2.00	0.100	1.30	1.91
Radium-226	pCi/g	432/501	473	36/501	0.300-137	1.23	0.250	3.00	1.47
Lead-210	pCi/g	36/48	48	33/48	0.560-34.0	4.78	0.500	1.20	.850
Polonium-210	pCi/g	75/75	75	75/75	0.627-34.4	3.39			NA
Uranium-235/236	pCi/g	91/496	476	89/496	0.0480-36.2	3.43	0.100	1.20	0.150
Thorium-232	pCi/g	362/573	552	34/573	0.200-8.07	0.930	0.100	1.10	1.26
Thorium, total	mg/kg	777/1618	588	144/1618	0.912-290	9.75	0.800	45.0	11.1
Radium-228	pCi/g	214/506	485	27/506	0.510-23	1.17	0.500	4.00	1.31
Thorium-228	pCi/g	415/560	543	57/560	0.200-19.5	1.11	0.100	1.00	1.38
Neptunium-237	pCi/g	2/315	311	2/315	0.288-0.305	0.300	0.200	0.600	NA
Plutonium-239/240	pCi/g	17/362	359	17/362	0.300-5.50	1.30	0.200	0.700	NA
Plutonium-238	pCi/g	8/363	359	8/363	0.344-158	20.7	0.200	2.10	NA
Strontium-90	pCi/g	84/372	364	84/372	0.511-47.6	3.07	0.500	5.00	.436
Technetium-99	pCi/g	43/439	430	43/439	1.02-205	10.3	1.00	2.90	ND
Ruthenium-106	pCi/g	0/328	317	0/328			1.00	24.3	ND
Cesium-137	pCi/g	17/409	397	17/409	0.242-2.94	0.820	0.200	1.40	ND
Gross alpha	pCi/g	116/129	11	116/129	5.10-1054	37.1	3.60	11.0	NA
Gross beta	pCi/g	128/129	10	128/129	7.10-159	33.6	5.40	5.40	NA
Actinium-227	pCi/g	0/2	2	0/2			0.300	0.600	.105
Protactinium-231	pCi/g	0/4	4	0/4			1.10	7.20	ND
Radium-224	pCi/g	4/4	4	1/4	0.670-1.33	0.920			101

TABLE D.1-2 (Continued)

Parameter	Units	Summary of Positive/Nonpositive Detections							95% Background Value
		Frequency of Detection	Total Validated Samples	Freq. of Detection Above Bkgd.	Range of Positive Detections	Average of Positive Detections	Minimum Nondetect	Maximum Nondetect	
INORGANICS									
Aluminum	mg/kg	338/338	334	25/338	1100-142000	10100			16100
Antimony	mg/kg	11/145	141	11/145	1.20-22.1	16.8	0.880	15.5	ND
Arsenic	mg/kg	308/312	304	36/312	0.0300-74.2	6.19	0.510	14.7	9.57
Barium	mg/kg	342/342	334	50/342	9.90-3610	91.4			119
Beryllium	mg/kg	231/333	329	185/333	0.290-5.20	1.03	0.350	4.00	0.620
Cadmium	mg/kg	172/328	320	172/328	0.920-8.00	3.76	0.670	9.60	0.910
Calcium	mg/kg	338/338	334	20/338	2180-314000	78000			150000
Chromium	mg/kg	327/329	321	51/329	4.70-115	16.4	5.80	6.90	20.7
Cobalt	mg/kg	309/338	334	34/338	2.60-105	10.8	3.30	11.7	15.7
Copper	mg/kg	304/336	332	103/336	5.00-171	19.7	1.90	37.3	20.0
Cyanide	mg/kg	35/313	309	26/313	0.110-9.80	0.950	0.000	5.10	.170
Iron	mg/kg	338/338	334	36/338	4000-193000	21000			30700
Lead	mg/kg	339/339	326	85/339	0.470-139	12.9			15.6
Magnesium	mg/kg	338/338	334	11/338	1390-93200	20600			42600
Manganese	mg/kg	338/338	334	23/338	107-12200	643			1300
Mercury	mg/kg	14/342	334	1/342	0.0400-2.30	0.260	0.0100	1.00	0.290
Molybdenum	mg/kg	113/317	313	103/317	1.60-11.1	4.58	1.30	23.1	2.70
Nickel	mg/kg	292/325	321	44/325	6.70-186	25.7	3.80	39.0	34.3
Potassium	mg/kg	337/338	334	28/338	204-10900	1220	21.2	21.2	1980
Selenium	mg/kg	27/300	292	27/300	0.320-3.30	0.970	0.220	3.90	ND
Silicon	mg/kg	139/152	152	4/152	17.6-5950	522	54.7	192	1590
Silver	mg/kg	164/320	312	164/320	0.410-31.1	5.75	0.210	9.60	ND
Sodium	mg/kg	287/338	334	25/338	42.2-1700	188	34.1	280	285
Thallium	mg/kg	30/337	333	4/337	0.210-0.720	0.350	0.0450	3.90	0.490
Vanadium	mg/kg	334/338	334	23/338	4.70-190	24.1	16.7	28.7	37.8
Zinc	mg/kg	332/336	332	44/336	16.7-780	63.5	37.7	82.9	82.0

TABLE D.1-2 (Continued)

Parameter	Units	Summary of Positive/Nonpositive Detections							95% Background Value
		Frequency of Detection	Total Validated Samples	Freq. of Detection Above Bkgd.	Range of Positive Detections	Average of Positive Detections	Minimum Nondetect	Maximum Nondetect	
VOLATILES									
1,1,1-Trichloroethane	µg/kg	49/381	375	49/381	1.00-6600	234	5.00	5000	NA
1,1,2,2-Tetrachloroethane	µg/kg	9/378	376	9/378	2.00-190	38.6	5.00	1300000	NA
1,1,2-Trichloroethane	µg/kg	6/382	376	6/382	1.00-4.00	2.00	5.00	1300000	NA
1,1,2-Trichlorotrifluoroethane		0/4	0	0/4			420	4200	NA
1,1-Dichloroethane	µg/kg	39/378	376	39/378	1.00-460	45.9	5.00	1600	NA
1,1-Dichloroethene	µg/kg	25/378	376	25/378	1.00-460	31.8	5.00	1600	NA
1,2-Dichloroethane	µg/kg	6/377	375	6/377	2.00-10.0	4.00	5.00	1600	NA
1,2-Dichloroethene (total)	µg/kg	47/378	376	47/378	1.00-4300	165	5.00	1300	NA
1,2-Dichloropropane	µg/kg	0/378	376	0/378			5.00	1600	NA
2-Butanone	µg/kg	27/246	240	27/246	2.00-200	32.1	4.00	6300	NA
2-Hexanone	µg/kg	7/299	297	7/299	1.00-2600	373	1.00	3400	NA
4-Methyl-2-pentanone	µg/kg	53/304	298	53/304	1.00-2600	68.3	1.00	4200	NA
Acetone	µg/kg	67/380	374	67/380	4.00-230	47.1	4.00	10000	NA
Benzene	µg/kg	3/387	376	3/387	1.00-1300	456	5.00	2100	NA
Bromodichloromethane	µg/kg	2/378	376	2/378	7.00-13.0	10.0	5.00	1600	NA
Bromoform	µg/kg	0/378	376	0/378			5.00	1600	NA
Bromomethane	µg/kg	0/378	376	0/378			10.0	3400	NA
Carbon disulfide	µg/kg	95/382	376	94/382	1.00-390	16.8	5.00	2900	NA
Carbon tetrachloride	µg/kg	2/382	376	2/382	5.00-12.0	8.50	5.00	3800	NA
Chlorobenzene	µg/kg	2/382	376	2/382	1.00-2.00	1.50	5.00	4600	NA
Chloroethane	µg/kg	3/378	376	3/378	2.00-210	72.0	10.0	3400	NA
Chloroform	µg/kg	14/378	376	14/378	2.00-160	30.3	5.00	1600	NA
Chloromethane	µg/kg	1/373	371	1/373	12.0-12.0	12.0	10.0	13000	NA
cis-1,3-Dichloropropene	µg/kg	0/378	376	0/378			5.00	1600	NA
Dibromochloromethane	µg/kg	1/378	376	1/378	1300-1300	1300	5.00	1600	NA
Ethylbenzene	µg/kg	7/387	376	7/387	1.00-747	110	5.00	2100	NA
Methylene chloride	µg/kg	46/382	376	46/382	1.00-100	20.9	2.00	6700	NA
Styrene	µg/kg	2/378	376	2/378	1.00-2.00	1.50	5.00	1600	NA
Tetrachloroethene	µg/kg	46/381	375	46/381	1.00-21000	1350	5.00	305000	NA
Toluene	µg/kg	47/387	376	47/387	1.00-794	24.8	1.00	2800	NA

TABLE D.1-2 (Continued)

Parameter	Units	Summary of Positive/Nonpositive Detections							95% Background Value
		Frequency of Detection	Total Validated Samples	Freq. of Detection Above Bkgd.	Range of Positive Detections	Average of Positive Detections	Minimum Nondetect	Maximum Nondetect	
trans-1,3-Dichloropropene	µg/kg	1/366	364	1/366	1300-1300	1300	5.00	1600	NA
Trichloroethene	µg/kg	51/381	375	51/381	1.00-150000	5790	5.00	5400	NA
Trichlorofluoromethane	µg/kg	0/4	0	0/4			420	4200	NA
Vinyl acetate	µg/kg	0/359	357	0/359			10.0	3400	NA
Vinyl chloride	µg/kg	6/378	376	6/378	2.00-110	22.2	10.0	3400	NA
Xylenes, total	µg/kg	14/383	376	14/383	3.00-31000	2750	3.00	1300	NA
SEMIVOLATILES									
1,2,4-Trichlorobenzene	µg/kg	1/309	308	1/309	220-220	220.00	330	3500	NA
1,2-Dichlorobenzene	µg/kg	0/309	308	0/309			330	3500	NA
1,3-Dichlorobenzene	µg/kg	0/309	308	0/309			330	3500	NA
1,4-Dichlorobenzene	µg/kg	1/309	308	1/309	210-210	210.00	330	3500	NA
2,4,5-Trichlorophenol	µg/kg	0/313	308	0/313			820	17000	NA
2,4,6-Trichlorophenol	µg/kg	0/313	308	0/313			330	3500	NA
2,4-Dichlorophenol	µg/kg	0/309	308	0/309			330	3500	NA
2,4-Dimethylphenol	µg/kg	1/313	308	1/313	100-100	100	330	3500	NA
2,4-Dinitrophenol	µg/kg	0/308	307	0/308			820	17000	NA
2,4-Dinitrotoluene	µg/kg	1/312	307	1/312	110-110	110	330	3500	NA
2,6-Dinitrotoluene	µg/kg	0/309	308	0/309			330	3500	NA
2-Benzyl-4-chlorophenol	µg/kg	0/2	2	0/2			400	420	NA
2-Chloronaphthalene	µg/kg	0/309	308	0/309			330	3500	NA
2-Chlorophenol	µg/kg	3/309	308	3/309	42.0-390	159	330	3500	NA
2-Methylnaphthalene	µg/kg	5/309	308	5/309	45.0-200	86.2	330	3500	NA
2-Methylphenol	µg/kg	0/309	308	0/309			330	3500	NA
2-Nitroaniline	µg/kg	1/309	308	1/309	2400-2400	2400.00	380	17000	NA
2-Nitrophenol	µg/kg	0/309	308	0/309			330	3500	NA
3,3'-Dichlorobenzidine	µg/kg	0/311	310	0/311			340	210000	NA
3-Nitroaniline	None	0/304	303	0/304			820	17000	NA
4,6-Dinitro-2-methylphenol	µg/kg	0/308	307	0/308			820	17000	NA
4-Bromophenyl phenyl ether	µg/kg	0/308	307	0/308			330	3500	NA
4-Chloro-3-methylphenol	µg/kg	4/309	308	4/309	43.0-88.0	57.0	330	3500	NA

TABLE D.1-2 (Continued)

Parameter	Units	Summary of Positive/Nonpositive Detections							95% Background Value
		Frequency of Detection	Total Validated Samples	Freq. of Detection Above Bkgd.	Range of Positive Detections	Average of Positive Detections	Minimum Nondetect	Maximum Nondetect	
4-Chlorophenylphenyl ether	µg/kg	0/308	307	0/308			330	3500	NA
4-Methylphenol	µg/kg	1/309	308	1/309	110-110	110	330	3500	NA
4-Nitroaniline	µg/kg	0/300	300	0/300			820	17000	NA
4-Nitrophenol	µg/kg	4/307	306	4/307	58.0-330	148	820	17000	NA
Acenaphthene	µg/kg	2/308	307	2/308	77.0-250	163	330	3500	NA
Acenaphthylene	µg/kg	3/309	308	3/309	780-2100	1390	330	2100	NA
Anthracene	µg/kg	7/312	311	7/312	51.0-1400	531	330	100000	NA
Benzo(a)anthracene	µg/kg	20/312	311	20/312	38.0-17000	2450	330	2100	NA
Benzo(a)pyrene	µg/kg	13/311	310	13/311	63.0-8600	2010	330	100000	NA
Benzo(b)fluoranthene	µg/kg	17/312	311	17/312	39.0-23000	4610	45.0	2100	NA
Benzo(g,h,i)perylene	µg/kg	9/312	311	9/312	53.0-5900	1620	330	100000	NA
Benzo(k)fluoranthene	µg/kg	5/312	311	5/312	98.0-280	188	38.0	100000	NA
Benzoic acid	µg/kg	8/289	288	8/289	46.0-200	89.5	380	17000	NA
Benzyl alcohol	µg/kg	0/290	289	0/290			330	3500	NA
Bis(2-chloroethoxy)methane	µg/kg	0/309	308	0/309			330	3500	NA
Bis(2-chloroethyl)ether	µg/kg	0/309	308	0/309			330	3500	NA
Bis(2-chloroisopropyl)ether	µg/kg	0/275	274	0/275			330	3500	NA
Bis(2-ethylhexyl)phthalate	µg/kg	100/309	308	100/309	3.00-9100	871	330	100000	NA
Butyl benzyl phthalate	µg/kg	5/311	310	5/311	46.0-430	237	330	100000	NA
Carbazole	µg/kg	0/105	105	0/105			340	470	NA
Chrysene	µg/kg	19/312	311	19/312	47.0-17000	2440	330	2100	NA
Di-n-butyl phthalate	µg/kg	17/312	311	17/312	37.0-1400	229	51.0	100000	NA
Di-n-octyl phthalate	µg/kg	3/312	311	3/312	50.0-280	129	330	100000	NA
Dibenzo(a,h)anthracene	µg/kg	6/311	310	6/311	42.0-1100	537	330	100000	NA
Dibenzofuran	µg/kg	3/308	307	3/308	36.0-120	74.3	330	3500	NA
Diethyl phthalate	µg/kg	7/308	307	7/308	43.0-250	121	330	3500	NA
Dimethyl phthalate	µg/kg	0/309	308	0/309			330	3500	NA
Fluoranthene	µg/kg	32/312	311	32/312	40.0-34000	3010	330	2100	NA
Fluorene	µg/kg	2/307	306	2/307	77.0-370	223	330	3500	NA
Hexachlorobenzene	µg/kg	0/312	307	0/312			330	3500	NA
Hexachlorobutadiene	µg/kg	1/313	308	1/313	350-350	350	330	3500	NA

TABLE D.1-2 (Continued)

Parameter	Units	Summary of Positive/Nonpositive Detections							95% Background Value
		Frequency of Detection	Total Validated Samples	Freq. of Detection Above Bkgd.	Range of Positive Detections	Average of Positive Detections	Minimum Nondetect	Maximum Nondetect	
Hexachlorocyclopentadiene	µg/kg	0/306	305	0/306			330	3500	NA
Hexachloroethane	µg/kg	0/313	308	0/313			330	3500	NA
Indeno(1,2,3-cd)pyrene	µg/kg	11/312	311	11/312	78.0-4900	1148	330	100000	NA
Isophorone	µg/kg	0/309	308	0/309			330	3500	NA
N-Nitroso-di-n-propylamine	µg/kg	1/301	300	1/301	190-190	190.00	330	3500	NA
N-Nitrosodimethylamine	µg/kg	1/2	2	1/2	5.00-5.00	5.00	420	420	NA
N-Nitrosodiphenylamine	µg/kg	1/308	307	1/308	72.0-72.0	72.0	330	3500	NA
Naphthalene	µg/kg	3/309	308	3/309	52.0-120	75.3	330	3500	NA
Nitrobenzene	µg/kg	0/303	298	0/303			330	3500	NA
P-Chloroaniline	µg/kg	0/304	303	0/304			330	3500	NA
Pentachlorophenol	µg/kg	4/312	307	4/312	49.0-260	122	820	17000	NA
Phenanthrene	µg/kg	29/312	311	29/312	39.0-18000	1550	88.0	2100	NA
Phenol	µg/kg	8/309	308	8/309	38.0-710	194	330	3500	NA
Pyrene	µg/kg	36/312	311	36/312	43.0-30000	2560	330	2100	NA
Pyridine	µg/kg	0/5	1	0/5			370	2000	NA
Total methylphenol	µg/kg	0/1	1	0/1			370	370	NA
Tributyl phosphate	µg/kg	0/19	19	0/19			350	480	NA
PESTICIDES									
4,4'-DDD	µg/kg	0/252	246	0/252			3.40	700	NA
4,4'-DDE	µg/kg	0/252	246	0/252			3.40	700	NA
4,4'-DDT	µg/kg	0/253	246	0/253			3.40	700	NA
Aldrin	µg/kg	0/252	246	0/252			1.70	350	NA
Alpha-BHC	µg/kg	1/253	246	1/253	17.0-17.0	17.0	1.70	350	NA
Alpha-Chlordane	µg/kg	0/253	246	0/253			1.70	3500	NA
Aroclor-1016	µg/kg	0/254	248	0/254			34.0	3500	NA
Aroclor-1221	µg/kg	0/253	247	0/253			68.0	3500	NA
Aroclor-1232	µg/kg	0/253	248	0/253			34.0	3500	NA
Aroclor-1242	µg/kg	0/253	248	0/253			34.0	3500	NA
Aroclor-1248	µg/kg	1/253	248	1/253	110-110	110	34.0	3500	NA
Aroclor-1254	µg/kg	23/254	247	23/254	9.90-1700	324	18.0	4300	NA

TABLE D.1-2 (Continued)

Parameter	Units	Summary of Positive/Nonpositive Detections							95% Background Value
		Frequency of Detection	Total Validated Samples	Freq. of Detection Above Bkgd.	Range of Positive Detections	Average of Positive Detections	Minimum Nondetect	Maximum Nondetect	
Aroclor-1260	µg/kg	5/254	247	5/254	10.0-2700	972	34.0	7000	NA
Beta-BHC	µg/kg	0/253	246	0/253			1.70	350	NA
Delta-BHC	µg/kg	0/252	246	0/252			1.70	350	NA
Dieldrin	µg/kg	0/252	246	0/252			3.40	700	NA
Endosulfan II	µg/kg	0/253	246	0/253			3.40	700	NA
Endosulfan Sulfate	µg/kg	0/253	245	0/253			3.40	700	NA
Endosulfan I	µg/kg	1/252	246	1/252	1.90-1.90	1.90	1.70	350	NA
Endrin	µg/kg	0/252	246	0/252			3.40	700	NA
Endrin Aldehyde	µg/kg	1/104	100	1/104	5.00-5.00	5.00	3.40	97.0	NA
Endrin Ketone	µg/kg	0/252	246	0/252			3.40	700	NA
Gamma-BHC (Lindane)	µg/kg	0/252	246	0/252			1.70	350	NA
Gamma-Chlordane	µg/kg	0/253	246	0/253			1.70	3500	NA
Heptachlor	µg/kg	0/252	246	0/252			1.70	350	NA
Heptachlor Epoxide	µg/kg	0/253	246	0/253			1.70	350	NA
Methoxychlor	µg/kg	1/252	246	1/252	22.0-22.0	22.0	17.0	3500	NA
Sulfotep	µg/kg	0/1	1	0/1			50.0	50.0	NA
Toxaphene	µg/kg	0/252	247	0/252			160	7000	NA
DIOXINS/FURANS									
1,2,3,4,6,7,8-Heptachloro-dibenzo-p-dioxin	ng/g	0/6	6	0/6			960	1000	NA
1,2,3,4,6,7,8-Heptachloro-dibenzofuran	ng/g	0/6	6	0/6			960	1000	NA
1,2,3,4,7,8,9-Heptachloro-dibenzofuran	ng/g	0/6	6	0/6			960	1000	NA
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	ng/g	0/6	6	0/6			960	1000	NA
1,2,3,4,7,8-Hexachloro-dibenzofuran	ng/g	0/6	6	0/6			960	1000	NA
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	ng/g	0/6	6	0/6			960	1000	NA

TABLE D.1-2 (Continued)

Parameter	Units	Summary of Positive/Nonpositive Detections							95% Background Value
		Frequency of Detection	Total Validated Samples	Freq. of Detection Above Bkgd.	Range of Positive Detections	Average of Positive Detections	Minimum Nondetect	Maximum Nondetect	
1,2,3,6,7,8-Hexachlorodibenzo-furan	ng/g	0/6	6	0/6			960	1000	NA
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	ng/g	0/6	6	0/6			960	1000	NA
1,2,3,7,8,9-Hexachlorodibenzo-furan	ng/g	0/6	6	0/6			960	1000	NA
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	ng/g	0/6	6	0/6			960	1000	NA
1,2,3,7,8-Pentachlorodibenzo-furan	ng/g	0/6	6	0/6			960	1000	NA
2,3,4,6,7,8-Hexachlorodibenzo-furan	ng/g	0/6	6	0/6			960	1000	NA
2,3,4,7,8-Pentachlorodibenzo-furan	ng/g	0/6	6	0/6			960	1000	NA
2,3,7,8-Tetrachlorodibenzo-p-dioxin	ng/g	0/10	10	0/10			71.0	1000	NA
2,3,7,8-Tetrachlorodibenzo-furan	ng/g	0/6	6	0/6			960	1000	NA
Heptachlorodibenzo-p-dioxins	ng/g	0/6	6	0/6			960	1000	NA
Heptachlorodibenzofurans	ng/g	0/6	6	0/6			960	1000	NA
Hexachlorodibenzo-p-dioxins	ng/g	0/6	6	0/6			960	1000	NA
Hexachlorodibenzofurans	ng/g	0/6	6	0/6			960	1000	NA
Octachlorodibenzo-p-dioxin	ng/g	0/6	6	0/6			960	1000	NA
Octachlorodibenzofuran	ng/g	1/6	6	1/6	1500-1500	1500	960	1000	NA
Pentachlorodibenzo-p-dioxins	ng/g	0/6	6	0/6			960	1000	NA
Pentachlorodibenzofurans	ng/g	0/6	6	0/6			960	1000	NA
Tetrachlorodibenzo-p-dioxins	ng/g	0/6	6	0/6			960	1000	NA
Tetrachlorodibenzofurans	ng/g	0/6	6	0/6			960	1000	NA
ORGANOPHOSPHORUS PESTICIDES									
Azinphosmethyl	µg/kg	0/6	6	0/6			81.0	82.0	NA
Demeton	µg/kg	0/6	6	0/6			65.0	66.0	NA
Diazinon	µg/kg	0/6	6	0/6			32.0	33.0	NA

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TABLE D.1-2 (Continued)

Parameter	Units	Summary of Positive/Nonpositive Detections							95% Background Value
		Frequency of Detection	Total Validated Samples	Freq. of Detection Above Bkgd.	Range of Positive Detections	Average of Positive Detections	Minimum Nondetect	Maximum Nondetect	
Dimethoate	µg/kg	0/1	1	0/1			50.0	50.0	NA
Disulfoton	µg/kg	0/7	7	0/7			32.0	50.0	NA
Ethion	µg/kg	0/6	6	0/6			32.0	33.0	NA
Famphur	µg/kg	0/1	1	0/1			100	100	NA
Malathion	µg/kg	0/6	6	0/6			32.0	33.0	NA
Methyl Parathion	µg/kg	0/7	7	0/7			32.0	50.0	NA
Parathion	µg/kg	0/7	7	0/7			32.0	50.0	NA
Phorate	µg/kg	0/1	1	0/1			50.0	50.0	NA
Thionazin	µg/kg	0/1	1	0/1			50.0	50.0	NA
GENERAL CHEMISTRY									
Total organic carbon	mg/kg	29/29	29	29/29	464-33200	8620			NA
Total petroleum hydrocarbons (TPH)	pCi/g	3/5	0	3/5	1270-23600	9010	10.0	10.0	NA

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TABLE D.1-3
URANIUM-238

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	▣	■	■	□	■	□	□	■	■	■	■	■	●
0.5 - 1	■	■	□	■	□	■	■	■	■	■	□	■	□	■	■	■	□	■	□	▣	■	□	■	□	□	■	■	■	□	□	●
1 - 1.5	■	■	■	■	■	■	■	■	■	■	□	●	□	■	■	■	□	■	□	■	■	□	▣	○	□	■	■	■	□	▣	□
Subsurface Soil:																															
1.5 - 3	■	■	□	■	■	■	■	■	■	■	□	○	□	▣	■	■	□	□	□	■	●	□	□	■	□	■	●	●	□	●	□
3 - 5	□	□	■	■	■	□	▣	■	○	□	□	□	□	□	□	●	□	□	□	▣	■	□	□	○	□	○	●	●	□	■	□
5 - 10	■	■	■	■	■	○	■	■	●	■	□	○	□	□	□	▣	□	□	○	■	■	▣	□	○	□	○	●	■	○	○	□
10 - 15	●	■	□	■	■	○	■	■	■	□	□	○	□	□	□	□	□	□	-	▣	-	○	□	○	□	○	●	●	○	▣	□
15 - 20	●	■	□	■	■	▣	■	□	○	□	□	○	□	□	□	□	□	□	□	●	■	□	□	□	□	●	●	●	●	▣	□

- □ "Blank" - Not analyzed.
- - Analyzed and not detected.
- ○ Detection less than 95th percentile background concentration.
- ● Detection above but < 2 X 95th percentile background value.
- ▣ Detection 2 to 5 X 95th percentile background value.
- ■ Detection greater than 5 X 95th percentile background value.
- X Detection where background level not recorded.

TABLE D.1-4
URANIUM-238 DETECTIONS BY AREA
MININUM - MAXIMUM (pCI/g)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0- ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 - 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	0.90 - 4108.00	0.83 - 1651.00	4.80 - 276.00	0.76 - 16.10	-	0.70 - 9.60	1.40 - 1.40	1.40 - 1.40
PLANT 2/3 AREA	0.40 - 1736.00	1.60 - 75.40	0.90 - 246.00	0.40 - 317.00	-	0.40 - 48.10	0.60 - 164.00	5.65 - 5.65
PLANT 4/5/7 AREA	40.30 - 56.60	-	0.30 - 140.00	-	82.50 - 82.50	1.20 - 1.50	-	-
PLANT 6 AREA	91.90 - 19067.00	78.00 - 194.00	0.30 - 781.00	0.90 - 103.00	8.30 - 8.30	1.01 - 144.00	1.20 - 51.90	0.60 - 71.60
PLANT 8 AREA	0.80 - 227.00	-	0.50 - 12.00	0.30 - 37.60	2.07 - 73.70	1.17 - 125.00	0.64 - 31.90	1.60 - 43.10
PLANT 9 AREA	0.30 - 87.90	4.60 - 74.40	1.00 - 94.20	0.70 - 115.00	-	0.70 - 0.80	0.70 - 0.95	0.60 - 2.60
SEWAGE TREATMENT PLANT	4.10 - 1477.00	3.29 - 790.00	1.17 - 500.00	0.92 - 32.70	5.59 - 5.59	2.13 - 24.40	1.01 - 17.60	1.07 - 11.80
PILOT PLANT AREA	0.70 - 78.10	13.50 - 57.70	0.70 - 16.50	1.16 - 253.00	3.80 - 19.30	0.50 - 69.80	1.30 - 267.00	-
LABORATORY AREA	0.40 - 14321.00	40.20 - 748.00	0.60 - 981.00	0.70 - 20.60	0.40 - 0.40	1.20 - 2.20	0.80 - 7.93	1.00 - 1.00
ADMINISTRATION AREA	4.40 - 125.00	7.40 - 26.00	0.40 - 15.60	0.60 - 8.90	-	0.70 - 7.20	-	-
ELECTRICAL SUBSTATION AREA	3.60 - 6.89	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	1.40 - 118.00	20.90 - 25.80	0.90 - 1.30	0.60 - 0.60	-	0.50 - 0.60	0.60 - 0.60	0.80 - 0.80
TANK FARM AND BOILER HOUSE AREA	7.80 - 7.80	-	-	-	-	-	-	-
D&D BUILDING AND DRUM BALING AREA	3.00 - 1300.00	9.00 - 500.00	7.70 - 222.70	2.80 - 2.80	-	-	-	-
SCRAP METAL PILE	8.30 - 7178.00	10.20 - 826.00	6.90 - 468.00	16.90 - 20.80	-	-	-	-
GRAPHITE FURNACE AREA	3.50 - 179.00	7.60 - 52.90	1.20 - 147.00	0.50 - 17.50	0.70 - 1.20	0.90 - 2.70	-	-
KC-2 WAREHOUSE	24.90 - 60.00	-	-	-	-	-	-	-
FIRE TRAINING AREA	2.10 - 348.00	12.80 - 12.80	21.30 - 21.30	-	-	-	-	-
TRAP RANGE	0.50 - 3.70	-	-	-	-	0.89 - 0.89	ND	-
AREA WEST OF K-65 SILOS	2.27 - 20.80	1.50 - 6.00	2.10 - 12.50	0.90 - 15.10	0.40 - 3.60	0.40 - 7.80	0.91 - 2.70	1.30 - 1.30
K-65/CLEARWELL LINE WEST	3.30 - 210.00	4.40 - 65.60	56.30 - 78.20	1.23 - 1.23	14.30 - 14.30	0.88 - 13.40	ND	28.00 - 28.00
CLEARWELL LINE EAST	-	-	-	-	-	0.83 - 2.57	1.01 - 1.11	-
OUTFALL PIPELINE	1.00 - 9.60	0.70 - 7.60	0.60 - 6.00	-	-	-	-	-
GREAT MIAMI RIVERBANK CHARACTERIZATION	-	-	0.60 - 0.60	6.90 - 6.90	0.50 - 0.50	0.30 - 0.70	0.20 - 0.90	-
NORTHEAST AREA OF FEMP	0.50 - 1849.00	9.70 - 339.00	1.20 - 259.00	1.40 - 7.60	0.90 - 0.90	1.00 - 1.10	1.00 - 1.00	0.88 - 1.70
SOUTHERN AREA OF FEMP	0.30 - 22.12	7.60 - 148.47	6.30 - 10.50	0.84 - 1.40	1.86 - 2.10	0.60 - 1.38	0.70 - 1.93	0.63 - 1.26
WESTERN AREA OF FEMP	0.90 - 710.00	3.20 - 154.00	0.40 - 343.00	1.40 - 1.40	0.90 - 1.70	0.88 - 7.78	0.60 - 1.82	0.77 - 1.15
NORTHWESTERN AREA OF FEMP	0.70 - 19.91	-	-	-	-	0.90 - 0.90	0.70 - 0.76	0.88 - 1.54
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	0.35 - 16.503	-	1.07 - 6.09	0.63 - 1.96	0.70 - 7.00	0.60 - 1.00	0.70 - 2.30	0.80 - 3.20
AREA 2-5 MILES OUTSIDE OF FEMP BOUNDARY	0.50 - 1.83	-	1.51 - 1.51	-	-	-	-	-

ND NOT DETECTED

TABLE D.1-5
TOTAL URANIUM

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	□	▒	■	■	■	■	■	●
0.5 - 1	■	■	-	■	□	■	■	■	■	■	□	■	□	■	■	■	-	■	□	■	■	□	■	□	●	■	■	■	●	□	●
1 - 1.5	■	■	■	■	■	■	■	■	■	■	□	●	▒	■	■	■	□	■	□	■	■	□	■	■	●	■	■	■	●	▒	□
Subsurface Soil:																															
1.5 - 3	■	■	■	■	■	■	■	■	■	■	□	■	▒	■	■	■	□	■	□	■	■	▒	□	■	●	■	▒	■	●	●	□
3 - 5	■	■	□	■	■	■	■	■	●	●	□	●	□	■	■	■	-	▒	□	■	■	□	●	■	□	●	▒	■	●	■	□
5 - 10	■	■	■	■	■	■	■	■	■	■	□	●	▒	■	▒	■	-	▒	O	■	■	▒	●	■	▒	●	▒	■	●	●	□
10 - 15	■	■	■	■	■	■	■	■	■	●	□	●	▒	■	■	■	-	●	-	●	●	▒	■	●	●	●	▒	●	●	●	□
15 - 20	■	■	□	■	■	■	■	■	■	●	□	●	▒	●	▒	■	□	▒	□	●	■	●	□	□	●	▒	▒	▒	●	▒	□

□ "Blank" - Not analyzed.

- Analyzed and not detected.

O Detection less than 95th percentile background value.

● Detection above but < 2 X 95th percentile background value.

▒ Detection 2 to 5 X 95th percentile background value.

■ Detection greater than 5 X 95th percentile background value.

X Detection where background level not recorded.

TABLE D.1-6
TOTAL URANIUM DETECTIONS BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	1.74- 12336.91	2.20- 6140.00	7.14- 1050.00	1.11- 121.00	2.10- 91.00	2.30- 73.00	2.34- 22.00	2.90- 68.00
PLANT 2/3 AREA	6.90- 5685.00	6.14- 225.00	2.80- 1916.00	2.50- 558.00	7.20- 285.00	4.15- 711.00	2.50- 467.00	2.65- 735.00
PLANT 4/5/7 AREA	10.10- 652.00	ND	3.60- 407.00	7.26- 83.70	14.00- 191.00	3.00- 64.00	3.73- 29.00	67.00- 68.00
PLANT 6 AREA	3.70-90350.00	3.25- 1416.00	2.30- 8059.00	1.99- 54000.00	2.80-69300.00	1.74- 4763.00	4.22- 266.00	2.18- 479.00
PLANT 8 AREA	2.40- 541.00	-	2.00- 255.00	1.70- 349.00	3.17- 158.00	3.50- 386.00	1.98- 328.00	3.20- 136.00
PLANT 9 AREA	1.40- 217.00	17.63- 209.00	2.10- 3504.00	2.40- 354.00	1.55- 260.00	2.26- 292.00	2.00- 79.00	2.00- 115.40
SEWAGE TREATMENT PLANT	7.26- 7572.00	9.80- 2240.00	3.60- 976.00	2.70- 310.00	7.00- 58.00	9.00- 69.60	4.68- 214.00	3.28- 37.89
PILOT PLANT AREA	6.00- 242.00	34.30- 74.50	3.00- 47.00	2.80- 637.00	3.10- 170.00	2.05- 703.00	5.72- 629.00	2.49- 102.90
LABORATORY AREA	2.00- 43118.55	125.00- 1260.00	3.20- 3250.00	3.31- 72.00	2.00- 11.00	4.30- 21.10	3.00- 11.30	2.10- 30.00
ADMINISTRATION AREA	5.80- 297.00	21.00- 80.00	1.50- 43.00	1.40- 78.00	16.00- 16.00	0.70- 23.00	3.09- 15.00	11.00- 17.00
ELECTRICAL SUBSTATION AREA	14.00- 28.30	-	-	ND	-	ND	ND	ND
MAINTENANCE BUILDING AREA	4.30- 330.00	53.00- 70.10	3.10- 4.38	2.03- 136.60	10.30- 11.80	2.10- 7.31	2.40- 6.24	2.30- 5.36
TANK FARM AND BOILER HOUSE AREA	7.49- 53.30	-	13.10- 13.10	11.00- 11.00	-	4.00- 11.00	-	4.10- 4.10
D&D BUILDING AND DRUM BALING AREA	8.00- 3890.00	31.00- 1780.00	5.20- 668.31	1.60- 22.00	1.70- 190.00	27.00- 265.00	19.00- 174.00	6.00- 6.00
SCRAP METAL PILE	12.00- 21423.94	30.00- 2270.00	5.73- 962.00	13.00- 62.00	3.80- 51.00	4.22- 7.71	4.07- 36.00	4.40- 12.00
GRAPHITE FURNACE AREA	12.00- 467.00	24.00- 98.00	2.90- 428.00	2.10- 57.70	2.40- 52.00	2.30- 37.00	3.65- 39.00	1.64- 19.00
KC-2 WAREHOUSE	80.50- 175.00	11.00- 11.00	-	-	ND	ND	ND	-
FIRE TRAINING AREA	9.90- 1170.00	32.00- 32.00	59.00- 59.00	7.07- 59.20	14.30- 14.30	6.53- 13.60	3.40- 6.41	8.25- 13.80
TRAP RANGE	8.00- 23.70	-	-	-	-	2.30- 2.30	ND	-
AREA WEST OF K-65 SILOS	28.80- 64.00	12.30- 20.60	7.40- 99.60	4.30- 58.30	2.60- 26.60	0.50- 20.70	8.60- 11.40	4.15- 4.15
K-65/CLEARWELL LINE WEST	9.83- 628.82	7.45- 204.43	7.45- 233.04	5.01- 116.00	11.00- 40.60	4.09- 45.70	11.00- 11.00	11.00- 83.81
CLEARWELL LINE EAST	11.00- 30.00	-	-	12.00- 13.00	-	2.69- 14.00	5.46- 13.51	4.22- 4.22
OUTFALL PIPELINE	3.30- 28.89	3.60- 54.00	3.00- 28.00	-	9.70- 12.25	6.92- 15.60	5.92- 31.21	-
GREAT MIAMI RIVERBANK CHARACTERIZATION	-	-	2.20- 53.00	2.70- 53.80	2.10- 24.10	1.30- 11.00	1.10- 11.00	-
SOUTHWEST FIELD AREA	1.00- 9.00	7.00- 7.00	7.00- 7.00	1.00- 6.00	-	1.00- 8.00	1.00- 6.00	1.00- 5.00
NORTHEAST AREA OF FEMP	1.40- 5533.31	9.00- 893.00	3.70- 1100.00	3.70- 16.00	2.50- 14.00	2.40- 6.00	2.00- 6.00	2.66- 11.00
SOUTHERN AREA OF FEMP	1.50- 66.29	6.00- 443.58	1.53- 31.57	2.10- 11.00	1.80- 11.00	1.00- 11.00	1.44- 11.00	1.54- 16.00
WESTERN AREA OF FEMP	1.00- 2115.80	9.54- 806.00	2.60- 1790.00	2.00- 27.71	1.99- 22.00	2.00- 24.60	1.00- 17.00	2.00- 11.00
NORTHWESTERN AREA OF FEMP	3.00- 52.82	5.00- 7.00	5.00- 6.00	6.00- 7.00	4.00- 6.00	2.96- 4.00	2.24- 5.00	2.66- 6.00
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	1.21- 46.712	-	2.98- 12.00	2.55- 7.35	3.00- 11.50	1.27- 4.85	2.00- 3.94	1.00- 6.00
AREA 2-5 MILES OUTSIDE OF FEMP BOUNDARY	1.55- 5.13	-	4.72- 4.72	-	-	-	-	-

ND - NOT DETECTED

000823

5698

TABLE D.1-7
URANIUM-234

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Bailing Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	■	■		■		■	■	■	■	■		■	■	■	■	■	■	■	●	■	■		■			■	■	■	■	■	●
0.5 - 1	■	■		■		■	■	■	■	■		■		■	■	■		●		●	●		■			■	■				●
1 - 1.5	■	■		■	■	■	■	■	■	■		○		■	■	■		●		■			●	○		■	■	■		■	
Subsurface Soil:																															
1.5 - 3	■	■		■	■	■	■	■	■	●		○		●	■	■				■	○			■		■	●	●		●	
3 - 5			■	■	■		●	■	○							○				●	■			○		○	●	○		■	
5 - 10	■	■	●	■	■	○	■	■	●	●		○				●			●	■	■	●		○		●	●	■	○	●	
10 - 15	●	■		■	■	○	■	■	■			○							○	●	-	●		○		○	●	●	○	●	
15 - 20	●	●		■	■	●	■		○			○								●	■					●	○	○		●	

"Blank" - Not analyzed.	● Detection above but < 2 X 95th percentile background value.
- Analyzed and not detected.	● Detection 2 to 5 X 95th percentile background value.
○ Detection less than 95th percentile background value.	■ Detection greater than 5 X 95th percentile background value.
	X Detection where background level not recorded.

TABLE D.1-8
URANIUM-234 DETECTIONS BY AREA
MINIMUM - MAXIMUM (pCi/g)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	0.77- 3857.00	0.81- 758.00	4.70- 211.00	0.76- 10.30	-	0.60- 9.00	1.40- 1.40	1.60- 1.60
PLANT 2/3 AREA	0.50- 1519.00	1.50- 78.30	1.10- 253.00	0.50- 319.00	-	0.30- 49.00	0.60- 177.00	3.68- 3.68
PLANT 4/5/7 AREA	38.00- 54.90	-	0.40- 128.00	-	78.00- 78.00	1.10- 1.50	-	-
PLANT 6 AREA	36.20- 18093.00	71.90- 184.00	0.30- 738.00	0.90- 111.00	8.80- 8.80	0.95- 144.00	1.00- 50.60	0.61- 66.90
PLANT 8 AREA	0.78- 228.00	-	0.60- 13.80	0.50- 38.50	2.07- 74.80	1.00- 133.00	0.82- 35.70	1.30- 48.40
PLANT 9 AREA	0.40- 100.00	4.60- 83.80	1.10- 106.00	0.70- 118.00	-	0.50- 0.60	0.50- 0.91	0.60- 2.90
SEWAGE TREATMENT PLANT	3.70- 1627.00	3.34- 808.00	1.21- 516.00	0.97- 32.70	5.39- 5.39	2.31- 23.20	0.93- 17.00	11.80- 11.80
PILOT PLANT AREA	0.70- 92.20	12.30- 54.90	0.50- 25.60	1.00- 258.00	3.56- 21.60	0.50- 86.90	1.10- 255.00	-
LABORATORY AREA	0.40- 13262.00	42.30- 749.00	0.50- 873.00	0.60- 23.60	0.40- 0.40	1.20- 2.30	0.80- 7.64	1.00- 1.00
ADMINISTRATION AREA	4.00- 50.80	7.00- 20.00	0.40- 12.40	0.40- 4.30	-	0.60- 2.90	-	-
ELECTRICAL SUBSTATION AREA	3.57- 6.90	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	1.30- 117.00	21.20- 26.20	0.90- 1.00	0.50- 0.50	-	0.40- 0.60	0.60- 0.60	0.70- 0.70
TANK FARM AND BOILER HOUSE AREA	8.10- 8.10	-	-	-	-	-	-	-
D&D BUILDING AND DRUM BALING AREA	2.80- 1300.00	8.40- 468.40	7.10- 215.00	2.50- 2.50	-	-	-	-
SCRAP METAL PILE	9.30- 7075.00	9.70- 684.00	6.70- 442.00	17.90- 21.70	-	-	-	-
GRAPHITE FURNACE AREA	2.60- 191.00	7.10- 56.80	1.30- 171.00	0.50- 18.20	0.50- 0.90	0.80- 2.30	-	-
KC-2 WAREHOUSE	19.50- 52.10	-	-	-	-	-	-	-
FIRE TRAINING AREA	1.50- 361.00	3.90- 3.90	5.90- 5.90	-	-	-	-	-
TRAP RANGE	0.60- 4.63	-	-	-	-	1.46- 1.46	0.66- 0.66	-
AREA WEST OF K-65 SILOS	2.20- 6.90	1.30- 5.50	1.30- 11.50	0.50- 7.50	0.40- 2.80	0.40- 5.50	0.93- 2.30	2.10- 2.10
K-65/CLEARWELL LINE WEST	5.58- 89.90	3.83- 4.40	-	0.99- 0.99	5.51- 5.51	0.86- 5.85	ND	6.90- 6.90
CLEARWELL LINE EAST	-	-	-	-	-	0.92- 2.75	0.89- 1.07	-
OUTFALL PIPELINE	1.00- 8.40	0.90- 8.30	0.80- 5.60	-	-	-	-	-
GREAT MIAMI RIVERBANK CHARACTERIZATION	-	-	0.70- 1.20	6.90- 6.90	0.40- 0.40	0.30- 0.60	0.20- 0.90	-
NORTHEAST AREA OF FEMP	0.60- 2899.00	3.90- 51.50	1.10- 46.70	0.90- 7.50	0.80- 0.80	0.80- 1.20	0.80- 0.80	1.80- 1.80
SOUTHERN AREA OF FEMP	0.20- 20.79	34.90- 34.90	5.00- 8.50	0.98- 1.40	1.68- 1.85	0.62- 2.00	0.70- 2.52	0.71- 0.71
WESTERN AREA OF FEMP	0.50- 298.00	17.40- 29.10	0.40- 52.10	1.20- 1.20	0.70- 1.00	0.70- 5.65	0.70- 1.51	0.81- 0.91
NORTHWESTERN AREA OF FEMP	0.72- 14.88	-	-	-	-	0.90- 0.90	0.70- 0.89	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	0.42- 3.52	-	1.00- 6.48	0.80- 1.75	0.70- 6.50	0.60- 1.30	0.70- 2.60	0.70- 2.90
AREA 2-5 MILES OUTSIDE OF FEMP BOUNDARY	0.54- 1.68	-	1.60- 1.60	-	-	-	-	-

ND - NOT DETECTED

000825

5698

TABLE D.1-9
THORIUM-230

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Bailing Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	■	■	■	⊡	⊡	■	■	■	■	■	●	●		■	■	■	⊡	■	○	⊡	■		●			■	■	■	●	●	
0.5 - 1	■	■		●		●	■	■	■	●		●		●	●	●		○		●	●		●			●	■	●			
1 - 1.5	■	■	○	●	○	●	●	○	■	●		○	○	■	●	●		○		●			●	○		●	●	●		●	
Subsurface Soil:																															
1.5 - 3	●	■	○	■	⊡	●	■	●	○	○		○		○	○	○				●	●			○		○	●	○		●	
3 - 5	○		-	○	○	○	○	●	○						○	○				●	○			○		○	●	●		●	
5 - 10	○	●	●	⊡	●	○	●	⊡	○	○		○		⊡		○			●	●	■	○		○		○	●	●		○	
10 - 15	○	■		●	○	○	●	○	○			○							○	○	○	○		○		○	●	○	○	○	
15 - 20	○	●		⊡	■	○	●	○	○			○								○	⊡					○	○	○		●	

- [ ] "Blank" - Not analyzed.
- [-] Analyzed and not detected.
- [○] Detection less than 95th percentile background concentration.
- [●] Detection above but < 2 X 95th percentile background value.
- [⊡] Detection 2 to 5 X 95th percentile background value.
- [■] Detection greater than 5 X 95th percentile background value.
- [X] Detection where background level not recorded.

TABLE D.1-10
THORIUM-230 DETECTIONS BY AREA
MINIMUM - MAXIMUM (pCi/g)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	1.10- 2729.00	1.40- 2749.00	0.80- 272.00	0.80- 2.59	0.80- 0.80	0.40- 1.00	0.90- 0.90	0.60- 0.60
PLANT 2/3 AREA	0.70- 102.00	1.30- 37.10	0.90- 81.30	0.90- 72.20	-	0.90- 2.20	0.70- 20.00	1.64- 3.21
PLANT 4/5/7 AREA	0.50- 20.90	-	0.30- 0.90	0.70- 0.70	ND	0.70- 2.00	-	-
PLANT 6 AREA	1.30- 5.08	0.96- 7.22	0.80- 3.80	0.80- 9.73	1.00- 1.70	0.89- 6.21	0.94- 2.80	0.77- 4.25
PLANT 8 AREA	0.60- 7.08	-	0.70- 1.45	3.86- 3.86	1.40- 1.84	0.60- 2.44	0.81- 1.26	1.90- 34.20
PLANT 9 AREA	0.40- 82.10	1.81- 2.00	0.70- 5.48	0.85- 2.46	1.25- 1.75	0.50- 1.54	0.80- 1.53	0.70- 1.88
SEWAGE TREATMENT PLANT	1.20- 806.00	1.05- 359.00	1.12- 4.40	0.92- 13.90	1.64- 1.64	1.53- 3.43	0.90- 3.19	2.41- 2.41
PILOT PLANT AREA	0.90- 23.20	1.30- 55.60	0.84- 1.30	0.40- 3.03	1.13- 4.61	0.61- 6.18	0.50- 1.71	0.84- 0.84
LABORATORY AREA	1.10- 288.00	1.80- 150.00	0.90- 16.40	0.80- 1.32	0.80- 0.80	0.70- 1.10	0.64- 1.20	0.80- 0.80
ADMINISTRATION AREA	1.00- 9.92	1.50- 3.00	0.70- 3.50	0.30- 1.30	-	0.80- 1.30	-	-
ELECTRICAL SUBSTATION AREA	1.57- 1.99	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	0.50- 8.21	4.84- 4.84	0.60- 0.90	0.80- 0.80	-	0.60- 1.36	0.50- 0.75	0.70- 1.40
TANK FARM AND BOILER HOUSE AREA	-	-	1.10- 1.10	-	-	-	-	-
D&D BUILDING AND DRUM BALING AREA	0.92- 120.00	1.00- 6.60	1.00- 22.90	1.50- 1.50	-	7.70- 7.70	-	-
SCRAP METAL PILE	0.93- 1137.00	4.70- 6.60	1.40- 3.90	1.10- 1.10	0.60- 0.60	-	-	-
GRAPHITE FURNACE AREA	0.30- 17.00	2.10- 4.10	0.40- 2.60	0.50- 1.20	1.60- 1.60	0.70- 1.20	-	-
KC-2 WAREHOUSE	5.02- 9.27	-	-	-	-	-	-	-
FIRE TRAINING AREA	1.00- 13.50	1.30- 1.30	1.10- 1.10	-	-	-	-	-
TRAP RANGE	0.80- 1.77	-	-	-	-	2.37- 2.37	0.97- 0.97	-
AREA WEST OF K-65 SILOS	3.90- 8.50	1.30- 4.90	0.80- 9.20	0.80- 2.40	0.80- 2.90	0.40- 2.10	1.00- 1.60	1.60- 1.60
K-65/CLEARWELL LINE WEST	2.64- 229.00	1.80- 2.00	-	3.74- 3.74	0.96- 0.96	1.46- 20.30	1.20- 1.20	4.70- 4.70
CLEARWELL LINE EAST	-	-	-	-	-	0.92- 1.36	1.43- 1.43	-
OUTFALL PIPELINE	1.30- 2.90	1.30- 2.60	1.40- 2.30	-	-	-	-	-
GREAT MIAMI RIVERBANK CHARACTERIZATION	-	-	0.30- 1.20	0.80- 0.80	0.40- 0.40	0.60- 1.00	0.50- 1.30	-
NORTHEAST AREA OF FEMP	0.40- 7901.00	1.60- 7.60	0.80- 5.60	1.10- 1.20	0.80- 0.80	1.00- 1.20	0.90- 1.08	1.00- 1.00
SOUTHERN AREA OF FEMP	0.63- 52.23	14.84- 14.84	0.69- 2.70	0.81- 2.00	0.61- 2.84	0.61- 2.16	0.86- 3.01	0.88- 1.13
WESTERN AREA OF FEMP	0.20- 219.00	1.20- 6.80	0.30- 9.20	0.70- 1.60	0.90- 2.30	0.53- 2.75	0.90- 1.80	0.85- 0.97
NORTHWESTERN AREA OF FEMP	0.89- 3.14	-	-	-	-	-	1.20- 1.69	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	0.40- 3.50	-	1.15- 3.52	0.68- 2.40	1.00- 2.40	0.67- 1.70	0.60- 1.80	1.10- 2.00

ND - NOT DETECTED

000827

TABLE D.1-11
RADIUM-226

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	■	■	○	●	●	○	■	■	●	●	○	○	○	■	■	●		○	○	■	■		○			●	■	■	○	●	
0.5 - 1	■	▒		○		○	■	■	●	●		○		●	●	●		○		■	■					○		■			
1 - 1.5	■	■	○	○	○	○	▒	○	●	○		○	-	■	○	○		○		■	■			○		○	○	●		○	
Subsurface Soil:																															
1.5 - 3	○	▒	○	○	-	○	●	○	●	●		○			●	○				▒	▒			-		○	○	▒		○	
3 - 5			○	○	-	○	○	●	-						○	○				■	○			○		○	○	○		○	
5 - 10	○	○	○	○	○	○	-	●	○	●		●			○	○			-	■	●	○	○	-		○	○	○		○	
10 - 15	○	●		○	○	○	○	○	○	○		○			○				○	-	○	○	○	○		○	○	○	○	▒	
15 - 20	○	▒		○		○	○					○								○	○					○	○	○	○	○	

- □ "Blank" - Not analyzed.
- - Analyzed and not detected.
- ○ Detection less than 95th percentile background value.
- ● Detection above but < 2 X 95th percentile background value.
- ▒ Detection 2 to 5 X 95th percentile background value.
- ■ Detection greater than 5 X 95th percentile background value.
- X Detection where background level not recorded.

000828

TABLE D.1-12
RADIUM-226 DETECTIONS BY AREA
MINIMUM - MAXIMUM (pCi/g)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	0.42- 2720.00	0 69- 2630.00	0.60- 383.00	0.30- 1.45	-	0.70- 1.10	1.00- 1.00	0.60- 0.60
PLANT 2/3 AREA	0.30- 16.60	0.70- 4.90	0.30- 18.80	0.40- 3.91	-	0.30- 1.30	0.60- 2.44	3.17- 3.17
PLANT 4/5/7 AREA	0.68- 1.30	-	0.50- 1.40	1.10- 1.10	1.47- 1.47	0.80- 1.10	-	-
PLANT 6 AREA	0.40- 1.80	0.91- 0.91	0.50- 1.20	0.30- 1.35	0.50- 1.00	0.37- 1.37	0.72- 0.96	0.59- 0.99
PLANT 8 AREA	0.45- 1.94	-	0.80- 0.80	ND	ND	0.40- 0.90	0.63- 0.63	-
PLANT 9 AREA	0.30- 1.20	0.46- 0.94	0.68- 0.84	0.50- 0.95	0.48- 0.85	0.50- 0.73	0.52- 0.80	0.40- 0.93
SEWAGE TREATMENT PLANT	0.73- 188.00	0.99- 12.40	0.89- 3.10	0.92- 1.65	1.21- 1.21	ND	0.98- 1.31	0.81- 1.11
PILOT PLANT AREA	0.30- 8.00	0.91- 7.32	0.30- 0.90	0.30- 1.07	3.05- 3.14	0.30- 5.91	0.30- 0.52	-
LABORATORY AREA	0.70- 2.60	0.90- 2.00	0.40- 1.60	0.30- 1.60	ND	0.50- 1.00	0.79- 0.92	-
ADMINISTRATION AREA	0.30- 2.60	0.80- 1.70	0.50- 1.20	2.00- 2.00	-	0.30- 1.60	0.93- 1.04	-
ELECTRICAL SUBSTATION AREA	0.83- 1.24	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	0.80- 1.20	0.62- 0.80	0.70- 1.30	1.20- 1.20	-	0.70- 1.50	1.10- 1.10	1.00- 1.00
TANK FARM AND BOILER HOUSE AREA	0.40- 0.40	-	ND	-	-	-	-	-
D&D BUILDING AND DRUM BALING AREA	0.90- 9.58	0.60- 2.60	0.70- 9.80	-	-	-	-	-
SCRAP METAL PILE	0.90- 2950.00	1.10- 1.70	0.40- 1.30	0.90- 1.70	0.52- 0.52	0.70- 0.70	0.66- 0.66	-
GRAPHITE FURNACE AREA	0.50- 1.80	0.80- 1.50	0.40- 1.30	0.40- 0.90	0.30- 0.50	0.30- 0.30	-	-
KC-2 WAREHOUSE	1.56- 3.39	-	-	-	-	-	-	-
FIRE TRAINING AREA	0.40- 1.30	0.40- 0.40	0.50- 0.50	-	-	-	-	-
TRAP RANGE	0.50- 1.40	-	-	-	-	ND	0.51- 0.51	-
AREA WEST OF K-65 SILOS	2.30- 34.70	0.40- 75.10	0.50- 12.60	0.40- 4.60	0.30- 137.00	0.30- 11.00	ND	1.00- 1.00
K-65/CLEARWELL LINE WEST	0.40- 220.00	0.70- 75.90	0.60- 11.90	2.04- 3.70	0.59- 0.59	0.88- 5.93	0.60- 0.60	1.10- 1.10
CLEARWELL LINE EAST	-	-	-	-	-	0.76- 1.10	0.77- 0.96	-
OUTFALL PIPELINE	0.90- 0.90	-	-	-	-	0.66- 0.66	0.30- 0.78	-
GREAT MIAMI RIVERBANK CHARACTERIZATION	-	-	0.60- 0.90	ND	0.30- 0.30	0.30- 0.30	0.30- 0.30	-
NORTHEAST AREA OF FEMP	0.30- 2.30	0.80- 1.10	0.30- 1.20	0.30- 1.07	0.80- 0.80	0.50- 0.50	0.60- 0.60	0.72- 0.81
SOUTHERN AREA OF FEMP	0.30- 10.80	-	0.67- 1.40	1.00- 1.00	1.22- 1.22	0.39- 1.20	0.41- 0.88	0.43- 0.87
WESTERN AREA OF FEMP	0.30- 51.20	0.50- 14.90	0.30- 1.60	0.30- 3.30	0.30- 1.10	0.70- 1.18	0.70- 0.90	0.69- 0.75
NORTHWESTERN AREA OF FEMP	0.60- 1.20	-	-	-	-	-	0.80- 0.81	0.70- 0.89
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	0.30- 1.90	-	0.70- 1.25	0.76- 1.22	0.78- 1.38	0.44- 1.40	0.39- 6.59	0.30- 0.80

ND - NOT DETECTED

TABLE D.1-13
URANIUM-235/236

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Bailing Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	■	■	■	■	■	■	■	■	■	■	⊡	■	⊡	■	■	■	■	■	■	⊡	■		⊡			■	■	■	■	■	○
0.5 - 1	■	■	□	■	□	■	■	■	■	■		■		■	■	■		-		●	●		⊡			■	■				○
1 - 1.5	■	■	■	■	■	■	■	-	■	⊡		-		■	■	■		-		■			●	-		■	-	■		-	
Subsurface Soil:																															
1.5 - 3	⊡	■	□	■	■	■	■	■	■	●		-		-	■	■				●	-			⊡		-	-	-		○	
3 - 5			■	⊡	■		-	■	-							-				●	-			-		-	-	-		⊡	
5 - 10	⊡	■	●	■	■	-	■	■	-	-		-				-			-	⊡	●	●		-		-	-	■	-	-	
10 - 15	-	■		■	■	-	■	■	-			-							-	●	-	-		-		-	-	-	-	-	
15 - 20	-	-		■	■	⊡	■		-			-								-	■					-	-	-	-	-	

□ "Blank" - Not analyzed.

- Analyzed and not detected.

○ Detection less than 95th percentile background value.

● Detection above but < 2 X 95th percentile background value.

⊡ Detection 2 to 5 X 95th percentile background value.

■ Detection greater than 5 X 95th percentile background value.

X Detection where background level not recorded.

TABLE D.1-14
URANIUM-235/236 DETECTIONS BY AREA
MINIMUM - MAXIMUM (pCi/g)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	0.11- 204.00	0.13- 25.10	0.20- 22.10	0.12- 0.50	-	0.70- 0.70	ND	ND
PLANT 2/3 AREA	0.50- 310.00	0.60- 7.18	0.30- 72.00	33.00- 33.00	-	0.20- 5.94	14.30- 14.30	ND
PLANT 4/5/7 AREA	1.51- 5.90	-	0.20- 8.69	-	8.10- 8.10	0.30- 0.30	-	-
PLANT 6 AREA	2.81- 1021.00	5.01- 14.20	0.40- 63.40	0.70- 12.60	0.70- 0.70	0.20- 9.29	3.10- 3.63	4.68- 5.61
PLANT 8 AREA	0.61- 26.10	-	1.00- 1.00	4.59- 4.59	0.93- 9.50	12.10- 12.10	3.76- 3.76	3.73- 3.73
PLANT 9 AREA	2.50- 10.10	0.61- 10.70	0.20- 18.70	0.65- 36.20	-	ND	ND	0.60- 0.60
SEWAGE TREATMENT PLANT	0.18- 145.00	0.19- 41.50	0.11- 23.30	0.16- 1.86	ND	1.60- 4.36	1.22- 1.22	0.77- 0.77
PILOT PLANT AREA	0.20- 5.69	1.61- 2.30	ND	3.50- 14.80	1.69- 1.69	0.30- 7.80	0.30- 17.30	-
LABORATORY AREA	0.20- 950.00	2.00- 35.00	0.20- 70.00	1.00- 1.00	ND	ND	ND	ND
ADMINISTRATION AREA	0.30- 3.48	1.30- 1.30	0.20- 0.50	0.20- 0.20	-	-	-	-
ELECTRICAL SUBSTATION AREA	0.60- 0.60	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	0.20- 8.60	1.20- 2.47	ND	ND	-	ND	ND	ND
TANK FARM AND BOILER HOUSE AREA	0.40- 0.40	-	-	-	-	-	-	-
D&D BUILDING AND DRUM BALING AREA	0.17- 59.00	1.10- 19.30	0.70- 10.00	ND	-	-	-	-
SCRAP METAL PILE	0.18- 69.90	0.60- 29.30	0.30- 21.50	1.40- 1.70	-	-	-	-
GRAPHITE FURNACE AREA	0.30- 28.40	0.80- 2.80	0.60- 5.80	1.00- 1.00	ND	ND	-	-
KC-2 WAREHOUSE	0.91- 23.70	-	-	-	-	-	-	-
FIRE TRAINING AREA	0.70- 19.10	ND	ND	-	-	-	-	-
TRAP RANGE	0.20- 0.81	-	-	-	-	ND	ND	-
AREA WEST OF K-65 SILOS	0.20- 0.40	0.20- 0.30	1.00- 1.00	0.20- 0.50	0.20- 0.20	0.20- 0.40	0.20- 0.20	ND
K-65/CLEARWELL LINE	0.29- 6.50	0.20- 0.22	-	ND	ND	0.26- 0.28	ND	0.80- 0.80
CLEARWELL LINE EAST	-	-	-	-	-	0.20- 0.20	ND	-
OUTFALL PIPELINE	0.10- 0.37	0.17- 0.36	0.17- 0.26	-	-	-	-	-
GREAT MIAMI RIVERBANK CHARACTERIZATION	-	-	ND	0.40- 0.40	ND	ND	ND	-
NORTHEAST AREA OF FEMP	0.14- 49.30	3.80- 3.80	4.30- 4.30	ND	ND	ND	ND	ND
SOUTHERN AREA OF FEMP	0.37- 0.90	2.46- 2.46	ND	ND	ND	ND	ND	ND
WESTERN AREA OF FEMP	0.12- 33.00	1.60- 2.60	0.20- 5.10	ND	ND	0.82- 0.88	ND	ND
NORTHWESTERN AREA OF FEMP	0.63- 1.60	-	-	-	-	ND	ND	ND
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	0.02- 0.681	-	-	0.05- 0.05	0.70- 0.70	-	-	-
AREA 2-5 MILES OUTSIDE OF FEMP BOUNDARY	0.02- 0.10	-	0.08- 0.08	-	-	-	-	-

ND - NOT DETECTED

000831

5698

TABLE D.1-15
THORIUM-232

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	■	⊙	●	○	●	■	■	■	■	●	○	●		■	■	●	⊙	⊙	○	●	■		●			■	⊙	■	●	●	
0.5 - 1	■	⊙		●		○	⊙	●	■	○		●		●	○	●		-		○	■		●			○	⊙	⊙			
1 - 1.5	⊙	⊙	○	○	○	■	●	●	■	○		○	○	●	○	●		-		○	⊙		○	○		○	○	⊙		●	
Subsurface Soil:																															
1.5 - 3	⊙	●	○	●	○	●	⊙	○	○	○		○		○	○	○				○	○			○		○	○	●		○	
3 - 5	○		●	○	○	○	●	●	○						○	●				●	-			○		○	○	●		○	
5 - 10	○	●	●	●	●	○	●	■	○	○		○		⊙		○			-	●	●	○		○		○	○	●		○	
10 - 15	○	●		○	○	○		○	○			○							-	○	-	○		○		○	⊙	○	○	○	
15 - 20	○	●		○	●	○		-	○			○								○	○					○	○	-		⊙	

- [ ] "Blank" - Not analyzed.
- [-] Analyzed and not detected.
- [○] Detection less than 95th percentile background value.
- [●] Detection above but < 2 X 95th percentile background value.
- [⊙] Detection 2 to 5 X 95th percentile background value.
- [■] Detection greater than 5 X 95th percentile background value.
- [X] Detection where background level not recorded.

000832

TABLE D.1-16
THORIUM-232 DETECTIONS BY AREA
MINIMUM - MAXIMUM (pCi/g)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	0.60- 31.40	0.60- 18.80	0.40- 5.00	0.50- 5.56	0.60- 0.60	0.60- 0.90	0.60- 0.60	0.50- 0.50
PLANT 2/3 AREA	0.20- 3.07	0.30- 6.00	0.30- 4.30	0.50- 2.19	-	0.61- 1.51	0.75- 2.35	0.87- 2.02
PLANT 4/5/7 AREA	0.60- 2.67	-	0.30- 0.60	0.60- 0.60	1.36- 1.36	0.50- 1.10	-	-
PLANT 6 AREA	0.80- 1.20	1.80- 1.80	0.70- 1.20	0.60- 1.38	0.80- 1.00	0.69- 1.59	0.61- 1.07	0.63- 1.22
PLANT 8 AREA	0.20- 2.14	-	0.30- 0.80	0.90- 0.90	0.87- 1.05	0.50- 1.59	0.77- 0.77	1.18- 2.08
PLANT 9 AREA	0.40- 84.90	0.70- 1.30	0.60- 35.60	0.67- 1.46	0.62- 0.85	0.50- 1.02	0.62- 0.84	0.50- 1.03
SEWAGE TREATMENT PLANT	0.60- 61.90	0.55- 6.10	0.67- 1.40	0.60- 3.21	1.34- 1.34	0.83- 1.69	0.75- 1.25	0.91- 0.91
PILOT PLANT AREA	0.70- 20.40	1.10- 1.60	0.61- 2.00	0.70- 0.90	0.65- 2.41	0.30- 8.07	0.40- 0.90	ND
LABORATORY AREA	0.50- 283.00	1.00- 57.40	0.70- 61.60	0.70- 1.00	0.40- 0.40	0.50- 0.60	0.20- 0.80	0.60- 0.60
ADMINISTRATION AREA	0.40- 1.70	0.80- 1.00	0.40- 1.20	0.80- 0.90	-	0.70- 1.00	-	-
ELECTRICAL SUBSTATION AREA	0.52- 1.07	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	0.50- 2.60	1.75- 1.75	0.40- 0.70	0.60- 0.60	-	0.40- 0.60	0.50- 0.50	0.92- 0.92
TANK FARM AND BOILER HOUSE AREA	-	-	0.70- 0.70	-	-	-	-	-
D&D BUILDING AND DRUM BALING AREA	0.25- 38.00	0.60- 1.90	0.80- 3.10	0.90- 0.90	-	2.55- 2.55	-	-
SCRAP METAL PILE	0.30- 194.00	0.90- 1.20	0.70- 1.30	1.20- 1.20	0.50- 0.50	-	-	-
GRAPHITE FURNACE AREA	0.40- 1.80	1.10- 1.50	0.50- 1.40	0.80- 1.20	1.30- 1.30	0.80- 1.00	-	-
KC-2 WAREHOUSE	1.15- 2.97	-	-	-	-	-	-	-
FIRE TRAINING AREA	0.70- 5.20	ND	ND	-	-	-	-	-
TRAP RANGE	0.50- 1.04	-	-	-	-	ND	ND	-
AREA WEST OF K-65 SILOS	0.70- 1.40	0.30- 1.10	0.60- 1.10	0.30- 1.20	0.40- 1.30	0.30- 1.40	0.80- 0.80	0.70- 0.70
K-65/CLEARWELL LINE WEST	0.21- 40.00	0.60- 14.60	0.90- 5.10	1.20- 1.20	ND	0.71- 1.43	ND	0.80- 0.80
CLEARWELL LINE EAST	-	-	-	-	-	0.63- 0.99	0.48- 0.83	-
OUTFALL PIPELINE	0.60- 1.50	0.34- 1.40	0.80- 1.10	-	-	-	-	-
GREAT MIAMI RIVERBANK CHARACTERIZATION	-	-	0.30- 0.70	0.50- 0.50	0.40- 0.40	0.30- 0.50	0.20- 0.60	-
NORTHEAST AREA OF FEMP	0.20- 104.60	0.80- 0.90	0.70- 1.20	0.70- 0.90	0.60- 0.60	0.70- 0.80	0.62- 0.70	0.50- 0.50
SOUTHERN AREA OF FEMP	0.18- 6.00	0.50- 1.37	1.00- 1.10	0.80- 0.80	0.88- 0.92	0.62- 1.08	0.62- 5.59	0.63- 0.63
WESTERN AREA OF FEMP	0.19- 38.00	0.40- 6.80	0.20- 3.80	0.50- 1.30	0.20- 1.30	0.79- 1.39	0.72- 1.11	ND
NORTHWESTERN AREA OF FEMP	0.60- 1.40	-	-	-	-	-	0.73- 0.73	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	0.39- 1.40	-	0.62- 1.40	0.70- 1.01	0.90- 1.10	0.70- 1.00	0.60- 0.80	0.60- 3.00

ND - NOT DETECTED

TABLE D.1-17
TOTAL THORIUM

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-86 Silos	K-86/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	■	■	●	■	▒	■	■	■	■	●	○	●	●	■	■	▒	▒	■	○	●	■	●	▒			■	▒	■	●	●	
0.5 - 1	■	●	-	●		▒	▒	●	■	○		●		●	■	●	-	○		○	■		▒			○	▒	▒			
1 - 1.5	▒	■	○	○	○	■	●	▒	■	○		○	○	▒	○	●		○		○	▒		●	●		○	○	▒		●	
Subsurface Soil:																															
1.5 - 3	▒	●	○	▒	○	■	▒	▒	○	●		○	●	●	■	○		■		○	○	●	-	●		▒	●	●		○	
3 - 5	●	●	●	○	○	●	●	■	○	●		○	○	-	■	▒	-	●		●	●		○	●		○	●	●		○	
5 - 10	●	▒	▒	▒	▒	▒	●	■	○	▒		○	●	▒	●	○	▒	■	○	●	●	○	○	●		▒	●	●		○	
10 - 15	●	●		●	●	○	●	●	○	○		○	●	-	○	●	-	●	○	○	●	○	●	●		○	●	●	○	○	
15 - 20	▒	▒		●	○	●	○	●		○		○	○	-	○	○		○		○	●	○				○	○	●		▒	

□	"Blank" - Not analyzed.
-	Analyzed and not detected.
○	Detection less than 95th percentile background value.
●	Detection above but < 2 X 95th percentile background value.
▒	Detection 2 to 5 X 95th percentile background value.
■	Detection greater than 5 X 95th percentile background value.
X	Detection where background level not recorded.

TABLE D.1-18
TOTAL THORIUM DETECTIONS BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	1.01- 286.50	5.47- 171.60	3.65- 45.60	4.56- 50.20	5.47- 23.00	4.23- 23.00	3.90- 21.70	4.51- 25.00
PLANT 2/3 AREA	1.82- 88.00	2.74- 54.72	2.16- 62.20	4.56- 19.80	2.19- 13.50	3.79- 26.00	3.65- 36.00	4.58- 34.00
PLANT 4/5/7 AREA	5.47- 24.10	ND	2.74- 5.47	5.47- 5.47	12.30- 12.30	4.56- 23.00	ND	ND
PLANT 6 AREA	7.30- 92.10	2.44- 16.30	4.37- 10.94	1.18- 45.00	7.30- 9.12	1.72- 25.00	2.41- 23.00	4.28- 31.00
PLANT 8 AREA	1.82- 19.52	-	2.74- 9.79	4.93- 8.40	3.12- 9.79	4.56- 23.00	3.64- 24.00	6.79- 18.80
PLANT 9 AREA	3.65- 766.00	2.66- 43.00	4.44- 321.00	5.31- 66.00	3.23- 15.00	3.59- 28.00	2.47- 7.61	4.11- 28.50
SEWAGE TREATMENT PLANT	5.47- 564.57	5.02- 55.65	6.11- 12.77	5.47- 29.00	12.10- 12.10	7.52- 15.20	6.75- 24.00	8.21- 8.21
PILOT PLANT AREA	5.37- 184.00	9.94- 14.00	5.49- 48.00	1.23- 19.00	5.34- 83.00	2.74- 290.00	3.64- 28.60	6.21- 12.70
LABORATORY AREA	4.56- 2581.01	9.12- 523.50	2.98- 561.80	2.27- 9.12	3.65- 4.10	2.68- 5.47	1.82- 7.30	5.47- 5.47
ADMINISTRATION AREA	3.65- 19.00	7.30- 9.12	3.65- 10.94	0.91- 18.00	18.00- 18.00	4.51- 23.00	3.31- 8.93	5.30- 6.69
ELECTRICAL SUBSTATION AREA	4.75- 9.71	-	-	ND	-	ND	ND	ND
MAINTENANCE BUILDING AREA	4.56- 23.71	15.80- 15.80	3.65- 6.38	3.70- 5.47	4.52- 5.57	3.65- 5.47	3.36- 6.96	4.52- 8.27
TANK FARM AND BOILER HOUSE AREA	3.64- 18.00	-	6.38- 6.38	18.00- 18.00	3.86- 5.56	18.00- 18.00	-	4.62- 4.62
D&D BUILDING AND DRUM BALING AREA	9.12- 152.00	5.47- 17.33	5.47- 28.27	8.21- 18.00	ND	23.00- 23.00	ND	ND
SCRAP METAL PILE	8.46- 1769.29	-	6.38- 132.00	6.66- 69.00	1.65- 72.00	5.74- 12.80	1.85- 10.20	5.24- 9.05
GRAPHITE FURNACE AREA	3.65- 23.00	10.00- 13.68	3.65- 12.77	7.30- 10.94	1.82- 23.00	1.82- 9.12	18.00- 18.00	1.03- 8.37
KC-2 WAREHOUSE	ND	ND	-	-	ND	23.00- 23.00	ND	-
FIRE TRAINING AREA	3.00- 82.00	5.47- 5.47	5.47- 5.47	5.36- 136.00	10.00- 14.00	5.00- 78.00	3.00- 17.00	10.00- 10.00
TRAP RANGE	4.56- 9.42	-	-	-	-	1.95- 1.95	3.33- 3.33	-
AREA WEST OF K-65 SILOS	6.38- 12.77	2.74- 10.03	5.47- 10.03	2.74- 10.94	1.42- 11.86	0.91- 12.77	5.38- 7.30	6.38- 6.38
K-65/CLEARWELL LINE WEST	1.92- 364.80	2.74- 133.15	4.56- 46.51	8.81- 10.94	3.74- 18.00	6.40- 18.00	18.00- 18.00	7.30- 18.00
CLEARWELL LINE EAST	19.00- 19.00	-	-	18.00- 18.00	-	5.66- 8.89	4.36- 7.50	3.43- 3.43
OUTFALL PIPELINE	5.80- 25.00	3.20- 27.00	2.10- 24.00	ND	4.00- 7.00	2.00- 11.00	3.00- 12.00	-
GREAT MIAMI RIVERBANK CHARACTERIZATION	-	-	2.74- 18.00	4.56- 18.00	3.65- 18.00	2.74- 18.00	1.82- 18.00	-
NORTHEAST AREA OF FEMP	1.82- 954.35	7.30- 8.21	6.38- 10.94	5.00- 25.00	5.47- 5.47	6.38- 23.00	5.62- 6.38	4.56- 4.56
SOUTHERN AREA OF FEMP	1.64- 54.72	2.74- 12.47	1.69- 10.03	2.11- 18.00	1.80- 18.00	2.78- 18.00	1.26- 50.50	2.61- 5.67
WESTERN AREA OF FEMP	1.73- 346.56	2.74- 62.02	1.82- 34.66	4.56- 19.00	1.82- 11.86	5.07- 18.00	6.53- 18.00	4.64- 18.00
NORTHWESTERN AREA OF FEMP	5.47- 12.77	-	-	-	-	-	4.00- 6.56	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	3.65- 21.00	-	4.34- 12.77	3.34- 9.12	8.21- 9.97	1.63- 9.12	5.47- 7.30	1.01- 27.38

ND - NOT DETECTED

TABLE D.1-19
RADIUM-228

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	■	●	○	○	▒	■	■	■	■	●	○	●	-	■	■	●		▒	○	●	●		○			■	●	■	●	●	
0.5 - 1	▒	■		-		○	■	■	■	○		○		●	●	●		-		○	●					○		■			
1 - 1.5	▒	▒	○	○	-	■	○	○	■	○		○	-	○	■	○		-		-				●		●	○	■		○	
Subsurface Soil:																															
1.5 - 3	■	●	-	●	-	○	●	○	○	-		-			■	○				○	○			-		○	○	●		○	
3 - 5	○		●	○	-	○	○	●	-						-	-				-	-			-		-	○	○		●	
5 - 10	-	○	-	●	-	○	●	■	○	○		○			○	○			○	●	●	○		○		-	○	○		○	
10 - 15	-	●		○	-	○	○	●	○	○		○			○				-	-	-	○	○	○		○	○	○	○	○	
15 - 20	○	●		○		○	○		-			-								○	○					○	○	○	●	●	

□ "Blank" - Not analyzed.

[-] Analyzed and not detected.

[○] Detection less than 95th percentile background value.

[●] Detection above but < 2 X 95th percentile background value.

[▒] Detection 2 to 5 X 95th percentile background value.

■ Detection greater than 5 X 95th percentile background value.

[X] Detection where background level not recorded.

TABLE D.1-20
RADIUM-228 DETECTIONS BY AREA
MINIMUM - MAXIMUM (pCi/g)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	0.53- 56.20	0.60- 6.30	0.60- 7.70	0.63- 8.62	0.70- 0.70	ND	ND	0.60- 0.60
PLANT 2/3 AREA	0.80- 1.81	0.91- 7.90	0.90- 5.00	0.73- 1.60	-	0.60- 0.90	2.35- 2.35	2.58- 2.58
PLANT 4/5/7 AREA	0.77- 0.98	-	0.60- 0.60	ND	2.14- 2.14	ND	-	-
PLANT 6 AREA	0.63- 1.00	ND	0.60- 0.94	0.58- 1.49	1.00- 1.00	0.56- 1.43	0.65- 0.90	0.71- 1.00
PLANT 8 AREA	0.61- 4.61	-	ND	ND	ND	ND	ND	-
PLANT 9 AREA	0.70- 27.90	0.57- 1.25	0.82- 50.37	0.66- 1.00	0.52- 0.70	0.61- 0.67	0.69- 0.92	0.65- 0.79
SEWAGE TREATMENT PLANT	0.60- 16.90	0.77- 7.20	0.60- 1.19	0.58- 1.46	1.08- 1.08	1.66- 1.66	1.18- 1.18	0.76- 0.97
PILOT PLANT AREA	0.60- 49.80	0.80- 23.90	0.60- 0.71	0.60- 1.01	1.00- 2.58	1.00- 17.60	0.60- 2.03	-
LABORATORY AREA	0.60- 546.00	1.00- 217.00	0.90- 45.80	0.70- 0.70	ND	0.80- 0.80	0.70- 1.10	ND
ADMINISTRATION AREA	0.70- 1.30	0.70- 1.10	1.20- 1.20	-	-	0.60- 0.60	0.78- 0.87	-
ELECTRICAL SUBSTATION AREA	0.52- 0.99	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	1.00- 1.80	0.60- 0.95	0.60- 0.60	ND	-	0.80- 0.80	0.60- 0.60	ND
TANK FARM AND BOILER HOUSE AREA	ND	-	ND	-	-	-	-	-
D&D BUILDING AND DRUM BALING AREA	0.70- 24.80	0.70- 1.90	0.80- 3.50	-	-	-	-	-
SCRAP METAL PILE	1.19- 8.30	1.20- 1.50	1.00- 105.00	0.80- 23.90	ND	0.70- 0.70	0.71- 0.71	-
GRAPHITE FURNACE AREA	0.55- 1.80	0.70- 1.40	0.90- 1.20	0.60- 0.60	ND	0.60- 0.60	-	-
KC-2 WAREHOUSE	1.32- 3.97	-	-	-	-	-	-	-
FIRE TRAINING AREA	0.80- 5.80	ND	ND	-	-	-	-	-
TRAP RANGE	0.94- 1.09	-	-	-	-	0.51- 0.51	ND	-
AREA WEST OF K-65 SILOS	1.40- 1.40	0.80- 0.80	ND	0.60- 0.80	ND	0.60- 1.40	ND	0.60- 0.60
K-65/CLEARWELL LINE WEST	1.35- 1.80	1.12- 1.33	-	1.09- 1.09	ND	0.74- 1.72	ND	1.00- 1.00
CLEARWELL LINE EAST	-	-	-	-	-	0.71- 1.07	0.59- 0.85	-
OUTFALL PIPELINE	0.80- 0.80	-	-	-	-	-	0.67- 0.99	-
GREAT MIAMI RIVERBANK CHARACTERIZATION	-	-	1.40- 1.40	ND	ND	0.60- 0.60	0.60- 0.60	-
NORTHEAST AREA OF FEMP	0.60- 558.00	1.10- 1.10	1.10- 1.30	1.20- 1.20	ND	ND	0.64- 0.64	0.59- 0.89
SOUTHERN AREA OF FEMP	0.59- 1.32	-	1.08- 1.10	0.90- 0.90	0.65- 1.07	0.70- 1.19	0.65- 0.90	0.58- 0.78
WESTERN AREA OF FEMP	0.57- 30.50	0.80- 12.30	0.80- 16.40	1.10- 1.60	0.97- 1.20	0.66- 1.23	0.65- 0.80	0.74- 0.74
NORTHWESTERN AREA OF FEMP	0.60- 1.35	-	-	-	-	-	0.60- 0.76	0.66- 1.55
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	0.70- 1.30	-	0.60- 1.10	0.61- 1.09	1.32- 1.32	0.70- 1.30	0.90- 0.90	0.70- 1.50

ND - NOT DETECTED

TABLE D.1-21
THORIUM-228

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Bailing Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	■	●	●	■	▒	▒	■	■	■	●	○	●		■	■	●	●	▒	●	○	■		●			■	●	■	●	●	
0.5 - 1	■	■		●		●	▒	●	■	●		●		●	○	●		-		○	○		●			○	▒	■			
1 - 1.5	▒	▒	○	○	●	■	▒	●	■	○		○	○	●	○	●		-		○			●	○		○	●	■		●	
Subsurface Soil:																															
1.5 - 3	●	●	○	●	○	●	▒	○	○	○		○		●	○	○				○	○			○		○	○	○		●	
3 - 5	○		○	○	○	○	●	▒	○						○	○				●	○			○		○	●	●		●	
5 - 10	○	○	○	●	●	○	●	■	○	○		○		▒		○			○	●	●	●		○		○	●	●		○	
10 - 15	○	▒		○	○	○	○	○	○			○							○	○	○	○		○		●	▒	○	●	○	
15 - 20	○	▒		○	●	○	●	-	○			○								○	○					○	●	○		●	

- □ "Blank" - Not analyzed.
- [-] Analyzed and not detected.
- [○] Detection less than 95th percentile background value.
- [●] Detection above but < 2 X 95th percentile background value.
- [▒] Detection 2 to 5 X 95th percentile background value.
- ■ Detection greater than 5 X 95th percentile background value.
- [X] Detection where background level not recorded.

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TABLE D.1-22
THORIUM-228 DETECTIONS BY AREA
MINIMUM - MAXIMUM (pCi/g)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	0.60- 31.20	0.60- 19.50	0.40- 6.00	0.60- 1.44	0.60- 0.60	0.30- 0.50	0.70- 0.70	0.60- 0.60
PLANT 2/3 AREA	0.20- 2.77	0.30- 7.60	0.20- 4.70	0.40- 2.46	-	0.80- 1.34	0.60- 2.80	0.66- 3.38
PLANT 4/5/7 AREA	0.50- 2.41	-	0.20- 0.90	0.70- 0.70	1.09- 1.09	0.60- 1.20	-	-
PLANT 6 AREA	0.80- 22.10	1.48- 2.41	0.40- 1.20	0.50- 1.79	0.90- 1.00	0.66- 1.86	0.60- 1.17	0.74- 1.15
PLANT 8 AREA	0.30- 3.24	-	0.30- 1.55	1.16- 1.16	1.22- 1.34	0.60- 1.71	0.99- 1.17	1.15- 1.46
PLANT 9 AREA	0.30- 5.22	0.66- 1.52	0.50- 37.70	0.79- 1.60	0.70- 0.90	0.50- 0.89	0.64- 0.80	0.50- 1.08
SEWAGE TREATMENT PLANT	0.70- 24.80	0.79- 5.70	0.63- 3.43	0.95- 3.89	1.83- 1.83	1.10- 1.83	0.85- 1.25	1.75- 1.75
PILOT PLANT AREA	0.70- 26.10	0.60- 1.90	1.00- 2.60	0.50- 1.23	0.86- 3.50	0.40- 14.60	0.30- 0.80	ND
LABORATORY AREA	0.60- 315.00	1.10- 67.00	0.60- 55.80	0.70- 0.80	0.40- 0.40	0.50- 0.80	0.50- 0.80	0.70- 0.70
ADMINISTRATION AREA	0.50- 1.50	0.80- 1.50	0.40- 1.30	0.80- 0.90	-	0.70- 1.10	-	-
ELECTRICAL SUBSTATION AREA	0.52- 1.02	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	0.50- 2.19	1.74- 1.74	0.50- 0.50	0.50- 0.50	-	0.60- 0.60	0.50- 0.50	0.50- 0.62
TANK FARM AND BOILER HOUSE AREA	-	-	0.80- 0.80	-	-	-	-	-
D&D BUILDING AND DRUM BALING AREA	0.39- 40.00	0.60- 2.00	0.60- 2.80	1.60- 1.60	-	2.76- 2.76	-	-
SCRAP METAL PILE	0.22- 14.00	1.10- 1.30	0.60- 1.20	1.20- 1.20	0.50- 0.50	-	-	-
GRAPHITE FURNACE AREA	0.30- 2.05	1.20- 1.60	0.50- 1.50	0.30- 1.10	0.20- 1.10	0.40- 1.00	-	-
KC-2 WAREHOUSE	1.17- 2.74	-	-	-	-	-	-	-
FIRE TRAINING AREA	0.60- 6.20	ND	ND	-	-	-	-	-
TRAP RANGE	0.30- 1.63	-	-	-	-	1.35- 1.35	1.05- 1.05	-
AREA WEST OF K-65 SILOS	0.70- 1.20	0.70- 0.80	0.40- 1.10	0.30- 1.00	0.40- 1.50	0.20- 1.60	0.69- 0.70	0.80- 0.80
K-65/CLEARWELL LINE WEST	0.69- 62.70	0.96- 1.07	-	1.27- 1.27	0.62- 0.62	0.97- 1.75	0.60- 0.60	1.00- 1.00
CLEARWELL LINE EAST	-	-	-	-	-	0.90- 1.40	0.53- 1.18	-
OUTFALL PIPELINE	0.55- 1.90	0.20- 1.70	0.90- 1.60	-	-	-	-	-
GREAT MIAMI RIVERBANK CHARACTERIZATION	-	-	0.30- 0.70	0.50- 0.50	0.30- 0.30	0.30- 0.50	0.20- 0.70	-
NORTHEAST AREA OF FEMP	0.70- 39.20	0.90- 1.00	0.80- 1.20	1.00- 1.00	0.70- 0.70	0.70- 0.80	0.70- 2.14	0.50- 0.50
SOUTHERN AREA OF FEMP	0.26- 2.49	3.29- 3.29	0.90- 1.70	0.80- 0.80	1.06- 1.47	0.64- 1.53	0.60- 5.92	0.62- 1.93
WESTERN AREA OF FEMP	0.30- 38.90	0.70- 14.20	0.30- 24.00	0.50- 1.30	0.60- 1.40	0.60- 1.50	0.70- 1.21	0.68- 0.72
NORTHWESTERN AREA OF FEMP	0.57- 2.91	-	-	-	-	-	2.00- 2.02	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	0.30- 1.70	-	0.67- 1.60	0.47- 2.15	0.70- 1.72	0.70- 1.36	0.70- 0.90	0.80- 1.60

ND - NOT DETECTED

TABLE D.1-23
NEPTUNIUM-237

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	-	X	-	-	-	-	-	-	-	-	-	-		-	-	-		-	-	-	X		-			-	-	X	X	-	
0.5 - 1	-	-		-		X	-	-	-	-		-		-	-	-		-			-					-		-			
1 - 1.5	-	-	-	-		-	-	-	-	-				-	-	-		-								-	-	-		-	
Subsurface Soil:																															
1.5 - 3	-	-		-		-	-	-	-					-	-						-					-	-	-		-	
3 - 5			-	-	-		-	-												-							-	-		-	
5 - 10		-		-	-		-	-						-						-	X	X					-	-		-	
10 - 15		-		-	-	-	-	-	-	-										-	-	-					-	-	-	-	
15 - 20				-	-		-													-	-						-	-		-	

- "Blank" - Not analyzed.
- - Analyzed and not detected.
- o Detection less than 95th percentile background value.
- • Detection above but < 2 X 95th percentile background value.
- Detection 2 to 5 X 95th percentile background value.
- Detection greater than 5 X 95th percentile background value.
- X Detection where background level not recorded.

TABLE D.1-24
NEPTUNIUM-237 DETECTIONS BY AREA
MINIMUM - MAXIMUM pCi/g)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	ND	ND	ND	ND	-	-	-	-
PLANT 2/3 AREA	2.63- 2.63	ND	ND	ND	-	ND	ND	-
PLANT 4/5/7 AREA	ND	-	ND	-	ND	-	-	-
PLANT 6 AREA	ND	ND	ND	ND	ND	ND	ND	ND
PLANT 8 AREA	ND	-	-	-	ND	ND	ND	ND
PLANT 9 AREA	ND	0.71- 0.71	ND	ND	-	-	ND	-
SEWAGE TREATMENT PLANT	ND	ND	ND	ND	ND	ND	ND	ND
PILOT PLANT AREA	ND	ND	ND	ND	ND	ND	ND	-
LABORATORY AREA	ND	ND	ND	ND	-	-	ND	-
ADMINISTRATION AREA	-	-	-	-	-	-	-	-
ELECTRICAL SUBSTATION AREA	ND	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	ND	ND	-	-	-	-	-	-
D&D BUILDING AND DRUM BALING AREA	ND	ND	ND	-	-	ND	-	-
SCRAP METAL PILE	ND	ND	ND	ND	-	-	-	-
GRAPHITE FURNACE AREA	ND	ND	ND	-	-	-	-	-
KC-2 WAREHOUSE	ND	-	-	-	-	-	-	-
FIRE TRAINING AREA	ND	ND	ND	-	-	-	-	-
TRAP RANGE	ND	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	ND	-	-	-	ND	ND	ND	ND
K-65/CLEARWELL LINE WEST	0.21- 0.21	ND	-	ND	-	0.31- 0.31	ND	ND
CLEARWELL LINE EAST	-	-	-	-	-	0.29- 0.29	ND	-
OUTFALL PIPELINE	ND	-	-	-	-	-	-	-
NORTHEAST AREA OF FEMP	ND	ND	ND	ND	-	-	-	-
SOUTHERN AREA OF FEMP	ND	-	ND	ND	ND	ND	ND	ND
WESTERN AREA OF FEMP	0.33- 1.10	ND	ND	ND	ND	ND	ND	ND
NORTHWESTERN AREA OF FEMP	0.81- 0.81	-	-	-	-	-	ND	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	-	-	-	-	-	-	-	-

ND - NOT DETECTED

TABLE D.1-25
PLUTONIUM-239/240

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	-	X	-	-	-	-	X	X	X	-	-	-		-	-	-		X	X	-	X		-			-	X	X	-	X	
0.5 - 1	-	-		-		-	-	-	X	-		X		-	-	-		-		X	-					-	-	-			
1 - 1.5	-	X	-	-		-	-		X	-				-	-	X		-		-				-		-	-	-		-	
Subsurface Soil:																															
1.5 - 3	-	X		-		-	-	-	-					-	-	-				X	-					-	-	-		-	
3 - 5			-	-	-		-	-								-				X	-			-			-	-		-	
5 - 10		-		X	-		-	-						-					-	X	-	-		-			-	-		-	
10 - 15		-		-	-	-	-	-	-	-									-	X	-	-		-		-	-	X	-	-	
15 - 20		-		-	-		-													-	-						-	X		-	

- [ ] "Blank" - Not analyzed.
- [-] Analyzed and not detected.
- [o] Detection less than 95th percentile background value.
- [•] Detection above but < 2 X 95th percentile background value.
- [▒] Detection 2 to 5 X 95th percentile background value.
- [■] Detection greater than 5 X 95th percentile background value.
- [X] Detection where background level not recorded.

TABLE D.1-26
PLUTONIUM-239/240 DETECTIONS BY AREA
MINIMUM - MAXIMUM (pCi/g)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	ND	ND	ND	ND	-	-	-	-
PLANT 2/3 AREA	0.63- 0.93	ND	0.71- 0.71	0.89- 0.89	-	ND	ND	ND
PLANT 4/5/7 AREA	ND	-	ND	-	ND	-	-	-
PLANT 6 AREA	ND	ND	ND	ND	ND	1.41- 1.41	ND	ND
PLANT 8 AREA	ND	-	-	-	ND	ND	ND	ND
PLANT 9 AREA	ND	ND	ND	ND	-	-	ND	-
SEWAGE TREATMENT PLANT	1.50- 1.50	ND	ND	ND	ND	ND	ND	ND
PILOT PLANT AREA	1.65- 1.65	ND	-	ND	ND	ND	ND	-
LABORATORY AREA	1.80- 12.90	1.20- 4.30	0.70- 0.70	ND	-	-	ND	-
ADMINISTRATION AREA	-	-	-	-	-	-	-	-
ELECTRICAL SUBSTATION AREA	ND	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	ND	1.51- 1.51	-	-	-	-	-	-
D&D BUILDING AND DRUM BALING AREA	ND	ND	ND	ND	-	ND	-	-
SCRAP METAL PILE	ND	ND	ND	ND	-	-	-	-
GRAPHITE FURNACE AREA	ND	ND	6.50- 6.50	ND	ND	-	-	-
FIRE TRAINING AREA	1.90- 2.90	ND	ND	-	-	-	-	-
TRAP RANGE	0.40- 1.70	-	-	-	-	ND	ND	-
AREA WEST OF K-65 SILOS	ND	1.10- 1.10	ND	0.30- 0.30	0.30- 0.70	0.40- 5.50	2.10- 2.10	ND
K-65/CLEARWELL LINE WEST	0.30- 0.30	ND	-	ND	ND	ND	ND	ND
CLEARWELL LINE EAST	-	-	-	-	-	ND	ND	-
OUTFALL PIPELINE	ND	-	-	-	-	-	-	-
GREAT MIAMI RIVERBANK CHARACTERIZATION	-	-	ND	-	ND	ND	ND	-
NORTHEAST AREA OF FEMP	ND	ND	ND	ND	-	-	ND	-
SOUTHERN AREA OF FEMP	0.50- 0.60	ND	ND	ND	ND	ND	ND	ND
WESTERN AREA OF FEMP	0.22- 0.80	ND	ND	ND	ND	ND	0.62- 0.62	2.44- 2.44
NORTHWESTERN AREA OF FEMP	ND	-	-	-	-	-	ND	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	0.60- 0.60	-	-	-	-	-	-	-

ND - NOT DETECTED

TABLE D.1-27
PLUTONIUM-238

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Bailing Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	-	X	X	X	-	-	X	X	X	X	-	-		-	-	-		X	-	-	X		-			-	-	X	-	-	
0.5 - 1	-	X		-		-	-	-	X	-		-		-	-	-		-		-	-					-	-	-			
1 - 1.5	-	-	-	-		-	-		X	-				-	-	-		-		-				-		-	-	-		-	
Subsurface Soil:																															
1.5 - 3	-	-		-		-	-	-	X						-	-				X	-					-	-	-		-	
3 - 5			-	-	-		-	-								-				-	-			-			-	-		-	
5 - 10		-		X	-		-	-						-					-	-	X	-		-			-	-		-	
10 - 15		-		-	-	-	-	-	-	-									-	-	-	-		-		-	X	X	-	-	
15 - 20		-		-	-		-													-	-						-	-		-	

"Blank" - Not analyzed.

- Analyzed and not detected.

O Detection less than 95th percentile background value.

• Detection above but < 2 X 95th percentile background value.

Detection 2 to 5 X 95th percentile background value.

Detection greater than 5 X 95th percentile background value.

X Detection where background level not recorded.

TABLE D.1-28
PLUTONIUM-238 DETECTIONS BY AREA
MINIMUM - MAXIMUM (pCi/g)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	ND	ND	ND	ND	-	-	-	-
PLANT 2/3 AREA	0.72- 0.76	0.90- 0.90	ND	ND	-	ND	ND	ND
PLANT 4/5/7 AREA	1.05- 1.05	-	ND	-	ND	-	-	-
PLANT 6 AREA	0.85- 0.85	ND	ND	ND	ND	1.27- 158.00	ND	ND
PLANT 8 AREA	ND	-	-	-	ND	ND	ND	ND
PLANT 9 AREA	ND	ND	ND	ND	-	-	ND	-
SEWAGE TREATMENT PLANT	1.50- 1.50	ND	ND	ND	ND	ND	ND	ND
PILOT PLANT AREA	6.10- 19.80	ND	-	ND	ND	ND	ND	-
LABORATORY AREA	0.70- 151.00	4.70- 67.40	0.80- 8.20	2.77- 2.77	-	-	ND	-
ADMINISTRATION AREA	0.21- 0.65	-	-	-	-	-	-	-
ELECTRICAL SUBSTATION AREA	ND	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	ND	ND	-	-	-	-	-	-
D&D BUILDING AND DRUM BALING AREA	ND	ND	ND	ND	-	ND	-	-
SCRAP METAL PILE	ND	ND	ND	ND	-	-	-	-
GRAPHITE FURNACE AREA	ND	ND	ND	ND	ND	-	-	-
FIRE TRAINING AREA	1.30- 1.30	ND	ND	-	-	-	-	-
TRAP RANGE	ND	-	-	-	-	ND	ND	-
AREA WEST OF K-65 SILOS	ND	ND	ND	0.40- 0.40	ND	ND	ND	ND
K-65/CLEARWELL LINE WEST	0.60- 0.60	ND	-	ND	ND	0.34- 0.34	ND	ND
CLEARWELL LINE EAST	-	-	-	-	-	ND	ND	-
OUTFALL PIPELINE	ND	-	-	-	-	-	-	-
GREAT MIAMI RIVERBANK CHARACTERIZATION	-	-	ND	-	ND	ND	ND	-
NORTHEAST AREA OF FEMP	ND	ND	ND	ND	-	-	ND	-
SOUTHERN AREA OF FEMP	ND	ND	ND	ND	ND	ND	0.60- 0.60	ND
WESTERN AREA OF FEMP	0.24- 4.10	ND	ND	ND	ND	ND	0.94- 0.94	ND
NORTHWESTERN AREA OF FEMP	ND	-	-	-	-	-	ND	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	-	-	-	-	-	-	-	-

ND - NOT DETECTED

TABLE D.1-29
STRONTIUM-90

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	■	■	●	●	●	●	■	●	■	-	-	●		■	■	●		■	●	●	●		-			■	■	●	■	●	
0.5 - 1	●	●		●		●	-	●	■	-		-		●	●	■		-		●	●					-	-	●			
1 - 1.5	●	-	●	●		■	-	-	●	●				■	■	●		-		-				-		●	●	■		●	
Subsurface Soil:																															
1.5 - 3	■	●		■		■	■	-	-						■	-				-	●			-		■	-	-		■	
3 - 5			-	■	■		■	●								-				-	-			-			-	■		●	
5 - 10		■		■	●		■	●						●					-	■	-	-		-			-	●		■	
10 - 15		-		●	-		■	-	-	-									-	-	-	-		-		●	●	■	■	-	
15 - 20		-		●	●		●													-	-						●	-		-	

- [ ] "Blank" - Not analyzed.
- [-] Analyzed and not detected.
- [○] Detection less than 95th percentile background value.
- [●] Detection above but < 2 X 95th percentile background value.
- [▒] Detection 2 to 5 X 95th percentile background value.
- [■] Detection greater than 5 X 95th percentile background value.
- [X] Detection where background level not recorded.

TABLE D.1-30
STRONTIUM-90 DETECTIONS BY AREA
MINIMUM - MAXIMUM (pCi/g)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	0.59- 3.10	0.86- 2.22	0.60- 1.40	0.80- 3.34	-	-	-	-
PLANT 2/3 AREA	2.45- 6.90	0.69- 1.44	ND	0.94- 0.94	-	3.98- 3.98	ND	ND
PLANT 4/5/7 AREA	1.91- 1.91	-	ND	-	ND	-	-	-
PLANT 6 AREA	1.06- 1.48	0.51- 1.91	1.00- 1.00	0.52- 47.60	1.37- 2.80	0.72- 10.70	0.60- 1.95	1.95- 2.44
PLANT 8 AREA	0.84- 2.04	-	-	-	2.40- 2.40	1.12- 1.12	ND	0.69- 0.69
PLANT 9 AREA	1.00- 1.00	0.90- 1.08	0.65- 6.22	1.30- 2.54	-	-	-	-
SEWAGE TREATMENT PLANT	0.60- 7.70	ND	ND	0.57- 7.46	9.30- 9.30	1.68- 7.10	1.74- 10.10	1.30- 1.30
PILOT PLANT AREA	0.88- 0.88	0.70- 1.03	ND	ND	0.57- 0.57	1.07- 1.07	ND	-
LABORATORY AREA	0.64- 26.30	1.90- 4.00	0.70- 0.70	ND	-	-	ND	-
ADMINISTRATION AREA	-	-	1.10- 1.10	-	-	-	-	-
ELECTRICAL SUBSTATION AREA	ND	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	1.11- 1.11	ND	-	-	-	-	-	-
D&D BUILDING AND DRUM BALING AREA	0.60- 6.16	0.80- 2.00	0.90- 3.40	-	-	1.42- 1.42	-	-
SCRAP METAL PILE	0.60- 2.50	1.20- 1.30	0.60- 2.20	1.50- 2.50	-	-	-	-
GRAPHITE FURNACE AREA	1.10- 1.50	3.20- 3.40	1.70- 1.70	ND	ND	-	-	-
KC-2 WAREHOUSE	2.55- 2.55	-	-	-	-	-	-	-
FIRE TRAINING AREA	0.60- 5.00	ND	ND	-	-	-	-	-
TRAP RANGE	0.80- 2.10	-	-	-	-	ND	ND	-
AREA WEST OF K-65 SILOS	0.70- 1.00	1.00- 1.00	ND	ND	ND	0.60- 2.80	ND	ND
K-65/CLEARWELL LINE WEST	1.44- 1.44	0.84- 0.84	-	0.51- 0.51	ND	ND	ND	ND
CLEARWELL LINE EAST	-	-	-	-	-	ND	ND	-
OUTFALL PIPELINE	ND	-	-	-	-	-	-	-
GREAT MIAMI RIVERBANK CHARACTERIZATION	-	-	ND	ND	ND	ND	ND	-
NORTHEAST AREA OF FEMP	0.60- 6.50	ND	0.60- 0.60	9.40- 9.40	-	-	2.16- 2.16	-
SOUTHERN AREA OF FEMP	0.70- 4.10	ND	0.70- 0.70	ND	ND	ND	0.60- 1.01	0.80- 0.80
WESTERN AREA OF FEMP	0.51- 1.80	0.90- 2.10	0.60- 3.62	ND	6.00- 6.00	0.56- 2.04	2.53- 6.65	ND
NORTHWESTERN AREA OF FEMP	0.60- 2.50	-	-	-	-	-	2.67- 2.67	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	0.60- 0.80	-	0.51- 0.51	1.50- 6.71	0.70- 0.70	0.70- 2.90	-	-

ND - NOT DETECTED

TABLE D.1-31
TECHNETIUM-99

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	X	X	-	X	X	X	X	X	X	-	-	X		X	X	X		X	-	X	X		X			X	X	X	X	X	
0.5 - 1	X	-		X		-	X	-	X	X		-		X	X	X		-		-	-		X			-	-	-			
1 - 1.5	X	X	-	X		X	X	X	X	X				X	X	-		-		-			X	-		-	-	X		-	
Subsurface Soil:																															
1.5-3	X	-		X		X	X	X	-						-	X				X	-		-	-		-	-			-	
3 - 5			-	-	X		-	X								-				X	-		-	-			-	-		-	
5 - 10		X		X	X		X	X											-	X	-	-	-	-			-	-		X	
10 - 15		X		X	-		-	X	-										-	-	-	-	-	-		-	-	X	X	-	
15 - 20		-		X	X		-													-	X						-	-		-	

- [ ] "Blank" - Not analyzed.
- [-] Analyzed and not detected.
- [o] Detection less than 95th percentile background value.
- [•] Detection above but < 2 X 95th percentile background value.
- [•] Detection 2 to 5 X 95th percentile background value.
- [■] Detection greater than 5 X 95th percentile background value.
- [X] Detection where background level not recorded.

TABLE D.1-32
TECHNETIUM-99 DETECTIONS BY AREA
MINIMUM - MAXIMUM (pCi/g)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	1.10- 118.20	2.32- 6.40	6.60- 6.60	1.40- 1.40	-	-	-	-
PLANT 2/3 AREA	1.27- 2.50	ND	1.40- 1.40	ND	-	2.90- 2.90	1.31- 1.31	ND
PLANT 4/5/7 AREA	ND	-	ND	-	ND	-	-	-
PLANT 6 AREA	210.00- 210.00	2.18- 4.47	3.41- 3.41	1.02- 37.90	ND	1.24- 4.30	2.82- 2.82	2.70- 2.70
PLANT 8 AREA	1.17- 37.40	-	-	-	1.44- 1.44	205.00- 205.00	ND	1.65- 1.65
PLANT 9 AREA	1.60- 1.60	ND	2.40- 2.40	1.30- 1.30	-	-	-	-
SEWAGE TREATMENT PLANT	1.50- 228.00	4.30- 56.90	44.20- 44.20	2.82- 3.59	ND	3.15- 3.63	ND	ND
PILOT PLANT AREA	2.05- 2.05	ND	27.80- 27.80	15.30- 15.30	1.24- 1.24	1.30- 1.30	1.64- 1.64	-
LABORATORY AREA	1.10- 320.00	6.10- 10.20	3.80- 4.80	ND	-	-	ND	-
ADMINISTRATION AREA	-	4.40- 4.40	5.50- 5.50	-	-	-	-	-
ELECTRICAL SUBSTATION AREA	ND	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	1.60- 2.20	ND	-	-	-	-	-	-
D&D BUILDING AND DRUM BALING AREA	1.20- 2.86	4.30- 5.40	4.70- 8.10	-	-	-	-	-
SCRAP METAL PILE	2.20- 5.09	1.10- 1.10	1.10- 1.10	ND	-	-	-	-
GRAPHITE FURNACE AREA	1.30- 18.50	1.20- 5.00	ND	1.80- 1.80	ND	-	-	-
KC-2 WAREHOUSE	ND	-	-	-	-	-	-	-
FIRE TRAINING AREA	8.70- 27.30	ND	ND	-	-	-	-	-
TRAP RANGE	ND	-	-	-	-	ND	ND	-
AREA WEST OF K-65 SILOS	1.20- 1.20	ND	ND	3.00- 4.20	1.70- 7.70	1.30- 18.60	ND	ND
K-65/CLEARWELL LINE WEST	1.79- 602.00	ND	-	ND	ND	ND	ND	1.90- 1.90
CLEARWELL LINE EAST	-	-	-	-	-	ND	ND	-
OUTFALL PIPELINE	1.50- 1.50	1.60- 1.60	1.10- 1.10	ND	ND	ND	ND	-
GREAT MIAMI RIVERBANK CHARACTERIZATION	-	-	ND	ND	ND	ND	ND	-
NORTHEAST AREA OF FEMP	1.10- 24.00	ND	ND	ND	-	-	ND	-
SOUTHERN AREA OF FEMP	1.30- 1.30	ND	ND	ND	ND	ND	ND	ND
WESTERN AREA OF FEMP	1.57- 93.00	ND	1.10- 1.10	ND	ND	ND	1.40- 3.60	ND
NORTHWESTERN AREA OF FEMP	1.60- 1.60	-	-	-	-	-	1.04- 1.04	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	1.80- 1.80	-	-	-	-	43.60- 43.60	-	-

ND - NOT DETECTED

TABLE D.1-33
RUTHENIUM-106

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	-	X	-	-	-	-	-	-	-	-	-	-		-	-	-		-	-	-	X		-			-	X	X	-	-	
0.5 - 1	-	-		-		-	-	-	-	-		-		-	-	-		-			-		-			-		-			
1 - 1.5	-	-		-		-	-	-	-	-				-	-	-		-			-					-	-	-		-	
Subsurface Soil:																															
1.5 - 3	-	-		-		-	-	-	-						-						-					-	-	-		-	
3 - 5			-	-	-	-	-	-							-						-		-				-	-		-	
5 - 10				-	-	-	-	-							-				-	-	-	-	-				-	-		-	
10 - 15		-		-	-	-	-	-	-	-					-				-		-	-	-			-	-	-	-	-	
15 - 20		-		-		-	-													-	-					-	-	-	-	-	

"Blank" - Not analyzed.

- Analyzed and not detected.

O Detection less than 95th percentile background value.

• Detection above but < 2 X 95th percentile background value.

Detection 2 to 5 X 95th percentile background value.

Detection greater than 5 X 95th percentile background value.

X Detection where background level not recorded.

TABLE D.1-34
RUTHENIUM-106 DETECTIONS BY AREA
MINIMUM - MAXIMUM (pCi/g)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	ND	ND	ND	ND	-	-	-	-
PLANT 2/3 AREA	ND	ND	ND	ND	-	-	ND	ND
PLANT 4/5/7 AREA	ND	-	-	-	ND	-	-	-
PLANT 6 AREA	ND	ND	ND	ND	ND	ND	ND	ND
PLANT 8 AREA	ND	-	-	-	ND	ND	ND	-
PLANT 9 AREA	ND	ND	ND	ND	ND	ND	ND	ND
SEWAGE TREATMENT PLANT	ND	ND	ND	ND	ND	ND	ND	ND
PILOT PLANT AREA	ND	ND	ND	ND	ND	ND	ND	-
LABORATORY AREA	ND	ND	ND	ND	-	-	ND	-
ADMINISTRATION AREA	-	-	-	-	-	-	-	-
ELECTRICAL SUBSTATION AREA	ND	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	ND	ND	-	-	-	-	-	-
D&D BUILDING AND DRUM BALING AREA	ND	ND	ND	-	-	-	-	-
SCRAP METAL PILE	ND	ND	ND	ND	ND	ND	ND	-
GRAPHITE FURNACE AREA	ND	ND	ND	-	-	-	-	-
KC-2 WAREHOUSE	ND	-	-	-	-	-	-	-
FIRE TRAINING AREA	ND	ND	ND	-	-	-	-	-
TRAP RANGE	ND	-	-	-	-	ND	ND	-
AREA WEST OF K-65 SILOS	ND	-	-	-	-	ND	-	ND
K-65/CLEARWELL LINE WEST	2.25- 10.55	ND	ND	ND	ND	ND	ND	ND
CLEARWELL LINE EAST	-	-	-	-	-	ND	ND	-
OUTFALL PIPELINE	ND	ND	-	-	ND	ND	ND	-
NORTHEAST AREA OF FEMP	ND	ND	ND	ND	-	-	ND	ND
SOUTHERN AREA OF FEMP	ND	-	ND	ND	ND	ND	ND	ND
WESTERN AREA OF FEMP	3.07- 3.07	ND	ND	ND	ND	ND	ND	ND
NORTHWESTERN AREA OF FEMP	ND	-	-	-	-	-	ND	ND
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	-	-	-	-	-	-	-	-

ND - NOT DETECTED

TABLE D.1-35
CESIUM-137

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	■	○	○	-	○	○	●	●	▒	○	○	○		●	●	○		●	○	-	▒		○			●	●	▒	▒	●	
0.5 - 1	-	●		-		-	-	-	○	-		-		-	○	○		-		-	-		-			-		○			
1 - 1.5	-	○		-		○	-	-	-	-				-	-	-		-		-	○			○		-	●	○		○	
Subsurface Soil:																															
1.5 - 3	-	X		-		-	-	-	-						-	-				X	-			-		-	-	-		X	
3 - 5			X	-	X	-	-	-							-	-				-	-		-	-			-	-		-	
5 - 10				-	X	-	X	-							-				-	X	-	-	X	-			-	X		-	
10 - 15		-		-	-	-	-	-	-	-					-				-	-	-	-	X	X		-	-	-	-	-	
15 - 20		-		-		X	-													-	-					-	-	-	-	-	

[ ]	"Blank" - Not analyzed.
[-]	Analyzed and not detected.
[○]	Detection less than 95th percentile background value.
[●]	Detection above but < 2 X 95th percentile background value.
[▒]	Detection 2 to 5 X 95th percentile background value.
[■]	Detection greater than 5 X 95th percentile background value.
[X]	Detection where background level not recorded.

TABLE D.1-36
CESIUM-137 DETECTIONS BY AREA
MINIMUM - MAXIMUM (pCi/g)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	0.30- 4.26	ND	ND	ND	-	-	-	-
PLANT 2/3 AREA	0.30- 0.48	1.10- 1.10	0.25- 0.25	0.26- 0.26	-	-	ND	ND
PLANT 4/5/7 AREA	0.23- 0.23	-	-	-	0.30- 0.30	-	-	-
PLANT 6 AREA	ND	ND	ND	ND	ND	ND	ND	ND
PLANT 8 AREA	0.28- 0.48	-	-	-	1.31- 1.31	2.94- 2.94	ND	-
PLANT 9 AREA	0.50- 0.50	ND	0.47- 0.47	ND	ND	ND	ND	0.24- 0.24
SEWAGE TREATMENT PLANT	0.29- 1.10	ND	ND	ND	ND	0.49- 0.49	ND	ND
PILOT PLANT AREA	1.20- 1.20	ND	ND	ND	ND	ND	ND	-
LABORATORY AREA	0.60- 2.90	ND	ND	ND	-	-	ND	-
ADMINISTRATION AREA	0.23- 0.70	-	-	-	-	-	-	-
ELECTRICAL SUBSTATION AREA	0.30- 0.30	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	0.49- 0.60	ND	-	-	-	-	-	-
D&D BUILDING AND DRUM BALING AREA	0.30- 0.77	ND	ND	-	-	-	-	-
SCRAP METAL PILE	0.37- 1.02	0.50- 0.60	ND	ND	ND	ND	ND	-
GRAPHITE FURNACE AREA	0.21- 0.60	0.30- 0.30	ND	ND	ND	-	-	-
KC-2 WAREHOUSE	0.46- 1.42	-	-	-	-	-	-	-
FIRE TRAINING AREA	0.60- 1.40	ND	ND	-	-	-	-	-
TRAP RANGE	0.23- 0.70	-	-	-	-	ND	ND	-
AREA WEST OF K-65 SILOS	ND	ND	ND	0.30- 0.30	ND	0.40- 1.50	ND	ND
K-65/CLEARWELL LINE WEST	0.21- 2.01	ND	0.40- 0.40	ND	ND	ND	ND	ND
CLEARWELL LINE EAST	-	-	-	-	-	ND	ND	-
OUTFALL PIPELINE	0.30- 0.30	ND	-	-	ND	2.57- 2.57	1.00- 1.00	-
GREAT MIAMI RIVERBANK CHARACTERIZATION	-	-	0.30- 0.30	ND	ND	ND	0.80- 0.80	-
NORTHEAST AREA OF FEMP	0.22- 1.40	ND	ND	ND	-	-	ND	ND
SOUTHERN AREA OF FEMP	0.23- 1.30	-	0.80- 0.80	ND	ND	ND	ND	ND
WESTERN AREA OF FEMP	0.30- 2.10	0.60- 0.60	0.28- 0.28	ND	ND	0.37- 0.37	ND	ND
NORTHWESTERN AREA OF FEMP	0.30- 1.60	-	-	-	-	-	ND	ND
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	0.40- 0.90	-	0.24- 0.30	0.35- 0.35	-	-	-	-

ND - NOT DETECTED

TABLE D.1-37
ALUMINUM

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	●	●	●	●	○	○	●	●	●	●	●	○	●	○	○	●	○	○	○	●	●					●	●	●	●	○	
0.5 - 1	●	●		●		○	●	●	○			○	○			●				●	●										
1 - 1.5	●	●	●	●	○	○	▒	●	●	●		○	●		●	●				●						●		●			
Subsurface Soil:																															
1.5 - 3	●	○	●	○	○	○	●	○	○	○		○	○	○	○	○		●		○						●		○			
3 - 5	○			○		○		○	○			○	○		○	■				●						○		○			
5 - 10	○	●	○	○	○	○		●	○	○		○				○				■	●					○					
10 - 15	○	○				○		○	○			○				○				○	○					○					
15 - 20	○					○		○	○			○														○		○			

- "Blank" - Not analyzed.
- "-" Analyzed and not detected.
- ○ Detection less than 95 percentile background concentration.
- ● Detection above but < 2X of 95 percentile background concentration.
- ▒ Detection 2X to 5X 95 percentile background concentration.
- ■ Detection greater than 5X 95 percentile background concentration.
- X Detection where background level not recorded.

TABLE D.1-38
ALUMINUM DETECTIONS BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	2,740-20,700	2,380-14,300	5,520-18,300	2,020-17,400	8,080-8,080	9,040-11,400	9,620-9,620	3,690-3,690
PLANT 2/3 AREA	1,640-14,900	4,580-13,600	2,330-13,200	8,460-14,700	-	10,400-17,300	4,050-13,200	-
PLANT 4/5/7 AREA	6,480-16,700	-	5,500-17,300	17,500-17,500	-	8,550-12,600	-	-
PLANT 6 AREA	2,600-13,300	1,070-13,300	8,940-13,900	7,880-14,600	1,520-14,600	8,860-10,600	-	-
PLANT 8 AREA	1,550-10,300	-	1,430-8,370	1,360-1,360	-	10,300-10,800	-	-
PLANT 9 AREA	8,090-8,090	8,510-8,510	2,590-8,010	7,230-7,500	11,100-11,100	8,140-10,500	7,160-7,160	7,510-7,510
SEWAGE TREATMENT PLANT	6,280-18,800	13,200-14,900	14,700-25,700	14,300-27,000	-	-	-	-
PILOT PLANT AREA	2,390-18,000	4,900-12,400	9,800-19,400	6,460-14,000	7,030-11,200	6,680-24,700	2,450-10,500	7,140-7,140
LABORATORY AREA	7,570-13,800	8,330-8,330	6,170-16,100	6,040-14,700	5,510-5,510	5,640-11,100	5,670-5,670	6,050-6,050
ADMINISTRATION AREA	8,520-19,800	-	6,890-12,700	2,380-13,100	-	6,970-15,300	-	-
ELECTRICAL SUBSTATION AREA	4,220-13,700	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	2,230-7,660	1,830-11,700	5,470-7,300	1,100-12,200	1,910-11,700	2,060-9,040	5,600-9,260	6,630-6,630
TANK FARM AND BOILER HOUSE AREA	16,700-16,700	4,220-4,220	17,700-17,700	6,190-6,190	2,560-2,560	-	-	-
D&D BUILDING AND DRUM BALING AREA	8,670-11,800	-	-	13,700-13,700	-	-	-	-
SCRAP METAL PILE	3,710-11,400	-	14,600-14,600	13,600-13,600	9,030-9,030	-	-	-
GRAPHITE FURNACE AREA	483-18,600	2,850-14,800	4,550-20,800	2,100-14,700	4,710-142,000	6,360-13,700	6,540-6,540	-
KC-2 WAREHOUSE	3,910-4,600	-	-	-	-	-	-	-
FIRE TRAINING AREA	2,390-10,600	-	-	8,470-16,800	-	-	-	-
TRAP RANGE	4,130-10,300	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	9,860-13,000	9,260-13,500	8,220-16,200	6,100-14,700	8,770-20,400	3,900-87,000	2,620-7,770	-
K-65/CLEARWELL LINE WEST	5,320-12,900	12,700-18,000	-	-	-	11,200-18,600	10,100-10,100	-
NORTHEAST AREA OF FEMP	1,110-16,000	-	10,200-12,300	7,550-18,100	8,320-8,320	10,100-10,400	5,590-5,590	5,840-5,840
SOUTHERN AREA OF FEMP	1,580-12,300	-	-	-	-	-	-	-
WESTERN AREA OF FEMP	4,080-13,700	-	7,080-14,000	7,510-8,750	7,150-7,790	-	-	7,640-7,640
NORTHWESTERN AREA OF FEMP	4,730-13,400	-	-	-	-	-	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	6,790-9,590	-	-	-	-	-	-	-

TABLE D.1-39
ANTIMONY

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Bailing Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	X	-	-	-	X		X	-	-	-		-	-		-	-		X	X	X	X					X	X	X	X	-	
0.5 - 1		-					-	-	-			-				-				-	-										
1 - 1.5	-	-	-	-	-		-	-	-	-		-	-		-	-				-						-		-			
Subsurface Soil:																															
1.5 - 3	-	-	-	-	-		-	-	-	-		-		-	-	-		-		-						-		-			
3 - 5	-			X					-						-	-				-						-		-			
5 - 10		-	-		-			-	-	-						-				-	X										
10 - 15	-	X						-	-											-	-										
15 - 20	-								-																			-			

"Blank" - Not analyzed.

- Analyzed and not detected.

○ Detection less than 95th percentile background value.

• Detection above but < 2 X 95th percentile background value.

Detection 2 to 5 X 95th percentile background value.

Detection greater than 5 X 95th percentile background value.

X Detection where background level not recorded.

TABLE D.1-40
ANTIMONY DETECTIONS BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	18.10- 59.80	-	ND	ND	ND	-	ND	ND
PLANT 2/3 AREA	ND	ND	ND	ND	-	ND	1.20- 1.20	-
PLANT 4/5/7 AREA	ND	-	ND	ND	-	ND	-	-
PLANT 6 AREA	ND	-	ND	ND	14.90- 22.00	-	-	-
PLANT 8 AREA	21.20- 21.20	-	ND	ND	-	ND	-	-
PLANT 9 AREA	-	-	-	7.30- 7.30	-	-	-	-
SEWAGE TREATMENT PLANT	15.80- 21.50	ND	ND	ND	-	-	-	-
PILOT PLANT AREA	ND	ND	ND	ND	-	ND	ND	-
LABORATORY AREA	ND	ND	ND	ND	-	ND	ND	ND
ADMINISTRATION AREA	-	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	ND	ND	ND	ND	-	-	-	-
TANK FARM AND BOILER HOUSE AREA	ND	-	ND	-	-	-	-	-
D&D BUILDING AND DRUM BALING AREA	-	-	-	ND	-	-	-	-
SCRAP METAL PILE	ND	-	ND	ND	ND	-	-	-
GRAPHITE FURNACE AREA	ND	ND	ND	ND	ND	ND	-	-
FIRE TRAINING AREA	3.10- 3.10	-	-	ND	-	-	-	-
TRAP RANGE	2.80- 4.10	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	29.80- 29.80	ND	ND	ND	ND	ND	ND	-
K-65/CLEARWELL LINE WEST	26.30- 26.30	ND	-	-	-	21.80- 21.80	ND	-
NORTHEAST AREA OF FEMP	2.80- 3.70	-	ND	ND	ND	-	-	-
SOUTHERN AREA OF FEMP	10.60- 10.60	-	-	-	-	-	-	-
WESTERN AREA OF FEMP	12.80- 32.30	-	ND	ND	ND	-	-	ND
NORTHWESTERN AREA OF FEMP	3.20- 3.20	-	-	-	-	-	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	-	-	-	-	-	-	-	-

ND - NOT DETECTED

TABLE D.1-41
ARSENIC

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/6/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	●	●	○	○	○	○	○	▒	○	●		●	●	●	○	▒	▒	●	▒	●	●					●	●	▒	○	○	
0.5 - 1	●	●		▒		○	○	○	○			●	▒			■				●	●										
1 - 1.5	●	○	●	●	○	○	○	●	○	○		○	●		○	●				○						○		●			
Subsurface Soil:																															
1.5 - 3	●	○	●	●	○	○	○	○	●	●		○	○	●	○	●		●		○						○		●			
3 - 5	○			○		○		●	○			○	○		○	●				▒						○		○			
5 - 10	●	●	○	○	○	○		●	●	○		○				○				■	○					○					
10 - 15	○	○				○		○	○			○				○				○	○					○					
15 - 20	○					○		○	○			○														○		○			

- [ ] "Blank" - Not analyzed.
- [-] Analyzed and not detected.
- [○] Detection less than 95th percentile background value.
- [●] Detection above but < 2 X 95th percentile background value.
- [▒] Detection 2 to 5 X 95th percentile background value.
- [■] Detection greater than 5 X 95th percentile background value.
- [X] Detection where background level not recorded.

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TABLE D.1-42
ARSENIC DETECTIONS BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	2.30- 9.20	2.50- 13.70	3.60- 13.50	3.40- 14.40	4.00- 4.00	4.40- 18.70	3.10- 3.10	4.30- 4.30
PLANT 2/3 AREA	2.20- 12.00	5.90- 8.30	2.30- 7.50	3.10- 8.20	-	4.90- 17.30	2.30- 3.40	-
PLANT 4/5/7 AREA	5.70- 6.40	-	1.50- 9.60	11.30- 11.30	-	3.30- 5.50	-	-
PLANT 6 AREA	2.40- 7.40	1.80- 29.10	2.20- 12.20	3.90- 9.80	2.00- 4.60	2.60- 4.30	-	-
PLANT 8 AREA	0.77- 7.20	-	6.40- 6.40	1.40- 1.40	-	1.20- 3.80	-	-
PLANT 9 AREA	4.40- 4.40	6.20- 6.20	3.60- 5.40	4.20- 4.80	4.70- 4.70	3.60- 5.00	3.20- 3.20	2.90- 2.90
SEWAGE TREATMENT PLANT	4.20- 7.00	5.10- 5.10	6.40- 6.40	9.10- 9.10	-	-	-	-
PILOT PLANT AREA	1.50- 17.30	3.90- 6.70	2.60- 15.60	1.90- 7.10	4.00- 10.20	1.20- 14.90	2.40- 7.60	4.60- 4.60
LABORATORY AREA	5.60- 7.60	5.10- 5.10	4.70- 6.00	2.80- 17.20	4.10- 4.10	6.50- 9.80	5.70- 5.70	5.10- 5.10
ADMINISTRATION AREA	3.40- 11.60	-	4.80- 7.80	3.70- 16.30	-	4.40- 7.20	-	-
MAINTENANCE BUILDING AREA	2.30- 12.60	3.20- 9.10	3.60- 4.20	2.00- 8.20	2.50- 7.20	1.80- 6.60	2.50- 8.70	2.30- 2.30
TANK FARM AND BOILER HOUSE AREA	8.90- 8.90	22.30- 22.30	9.20- 9.20	7.20- 7.20	4.60- 4.60	-	-	-
D&D BUILDING AND DRUM BALING AREA	4.70- 9.50	-	-	13.50- 13.50	-	-	-	-
SCRAP METAL PILE	6.20- 8.00	-	3.30- 3.30	6.60- 6.60	4.10- 4.10	-	-	-
GRAPHITE FURNACE AREA	3.30- 23.10	3.70- 81.90	3.00- 14.00	0.03- 11.50	2.60- 15.00	2.80- 5.60	4.30- 4.30	-
KC-2 WAREHOUSE	3.10- 16.60	-	-	-	-	-	-	-
FIRE TRAINING AREA	2.10- 8.30	-	-	4.80- 10.00	-	-	-	-
TRAP RANGE	2.00- 25.30	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	5.70- 9.00	6.60- 8.70	2.00- 6.80	3.70- 9.10	2.80- 34.30	3.10- 74.20	1.90- 3.90	-
K-65/CLEARWELL LINE WEST	6.00- 8.80	7.90- 8.80	-	-	-	8.50- 9.00	2.70- 2.70	-
NORTHEAST AREA OF FEMP	1.90- 13.50	-	4.60- 4.80	4.90- 8.60	4.30- 4.30	2.00- 3.60	2.80- 2.80	2.80- 2.80
SOUTHERN AREA OF FEMP	1.50- 8.70	-	-	-	-	-	-	-
WESTERN AREA OF FEMP	1.60- 32.50	-	3.30- 14.00	5.30- 10.60	5.40- 5.40	-	-	5.60- 5.60
NORTHWESTERN AREA OF FEMP	2.40- 6.00	-	-	-	-	-	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	1.90- 5.30	-	-	-	-	-	-	-

TABLE D.1-43
BARIUM

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	●	●	●	●	●	○	●	▒	■	●	●	●	●	●	●	■	○	●	●	○	●					▒	●	●	●	▒	
0.5 - 1	●	●		●		○	●	▒	■			●	●			■				○	●										
1 - 1.5	●	●	●	●	●	○	●	●	○	●		○	○		●	●				○						●		●			
Subsurface Soil:																															
1.5 - 3	●	●	●	●	○	○	●	○	●	▒		●	○	●	●	●		●		○						○		○			
3 - 5	○			●		○		○	○			○	○		○	●				●						○		○			
5 - 10	▒	●	○	○	○	○		▒	○	●		○				○				■	●					○					
10 - 15	○	○				○		■	○			■				○				○	○					○					
15 - 20	○					○		○	○			○														○		○			

- [ ] "Blank" - Not analyzed.
- [-] Analyzed and not detected.
- [○] Detection less than 95th percentile background value.
- [●] Detection above but < 2 X 95th percentile background value.
- [▒] Detection 2 to 5X 95th percentile background value.
- [■] Detection greater than 5 X 95th percentile background value.
- [X] Detection where background level not recorded.

TABLE D.1-44
BARIUM DETECTIONS BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	50.60- 174.00	12.60- 145.00	49.20- 183.00	9.90- 165.00	49.90- 49.90	46.50- 348.00	51.30- 51.30	16.40- 16.40
PLANT 2/3 AREA	20.40- 135.00	49.20- 106.00	20.20- 140.00	67.60- 164.00	-	74.70- 223.00	15.70- 57.40	-
PLANT 4/5/7 AREA	69.60- 117.00	-	72.00- 141.00	157.00- 157.00	-	61.90- 115.00	-	-
PLANT 6 AREA	16.30- 151.00	13.70- 298.00	91.90- 142.00	66.30- 189.00	12.30- 130.00	90.30- 117.00	-	-
PLANT 8 AREA	11.40- 115.00	-	18.70- 97.40	12.20- 12.20	-	95.50- 104.00	-	-
PLANT 9 AREA	50.90- 50.90	88.70- 88.70	21.60- 51.50	50.50- 69.80	74.00- 74.00	44.20- 45.00	93.50- 93.50	53.70- 53.70
SEWAGE TREATMENT PLANT	75.80- 176.00	87.20- 106.00	97.10- 172.00	83.10- 167.00	-	-	-	-
PILOT PLANT AREA	21.70- 401.00	88.80- 406.00	62.70- 156.00	40.30- 95.40	47.60- 64.10	30.30- 364.00	23.40- 3610.00	25.20- 25.20
LABORATORY AREA	68.00- 561.00	587.00- 587.00	59.10- 78.40	52.10- 174.00	65.30- 65.30	46.10- 89.30	47.80- 47.80	43.10- 43.10
ADMINISTRATION AREA	74.00- 183.00	-	71.20- 102.00	15.20- 307.00	-	37.80- 159.00	-	-
ELECTRICAL SUBSTATION AREA	39.20- 145.00	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	24.30- 434.00	27.30- 456.00	23.20- 52.00	16.00- 132.00	24.40- 86.60	24.20- 54.30	65.70- 1200.00	62.10- 62.10
TANK FARM AND BOILER HOUSE AREA	97.70- 97.70	121.00- 121.00	81.30- 81.30	72.20- 72.20	14.20- 14.20	-	-	-
D&D BUILDING AND DRUM BALING AREA	81.30- 126.00	-	-	141.00- 141.00	-	-	-	-
SCRAP METAL PILE	80.50- 117.00	-	134.00- 134.00	185.00- 185.00	51.90- 51.90	-	-	-
GRAPHITE FURNACE AREA	36.40- 512.00	50.20- 523.00	24.50- 324.00	33.40- 208.00	40.40- 141.00	32.70- 93.50	48.50- 48.50	-
KC-2 WAREHOUSE	47.40- 79.70	-	-	-	-	-	-	-
FIRE TRAINING AREA	31.40- 117.00	-	-	69.20- 156.00	-	-	-	-
TRAP RANGE	36.10- 127.00	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	63.20- 76.40	65.70- 82.90	56.40- 88.10	41.90- 84.80	48.70- 175.00	14.90- 872.00	15.40- 33.50	-
K-65/CLEARWELL LINE WEST	62.00- 99.60	104.00- 123.00	-	-	-	96.60- 121.00	68.30- 68.30	-
NORTHEAST AREA OF FEMP	16.10- 241.00	-	97.00- 121.00	103.00- 110.00	61.00- 61.00	60.20- 63.70	56.20- 56.20	53.00- 53.00
SOUTHERN AREA OF FEMP	17.10- 109.00	-	-	-	-	-	-	-
WESTERN AREA OF FEMP	36.50- 116.00	-	48.90- 145.00	64.80- 102.00	64.00- 65.40	-	-	56.70- 56.70
NORTHWESTERN AREA OF FEMP	37.40- 185.00	-	-	-	-	-	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	54.60- 237.00	-	-	-	-	-	-	-

TABLE D.1-45
BERYLLIUM

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	●	●	-	●	●	○	●	●	●	●	●	●	-	●	●	●	●	●	●	●	●					■	●	●	●	●	
0.5 - 1	●	●		●		●	●	●	-			●	●			●				●	●										
1 - 1.5	●	■	●	●	■	●	●	●	●	●		●	-			-				●						●		●			
Subsurface Soil:																															
1.5 - 3	●	●	-	●	●	●	●	●	●	●		●	●	○		●		○		●						●		-			
3 - 5	●			●		●		●	-			●	-			●				●						-		-			
5 - 10	●	●	■	-	●	○		●	-	●		●				●				■	●					●					
10 - 15	●	●				○		●	●			○				●				-	●					○					
15 - 20	■					○		●	●			○														○		●			

- [ ] "Blank" - Not analyzed.
- [-] Analyzed and not detected.
- [○] Detection less than 95th percentile background value.
- [●] Detection above but < 2 X 95th percentile background value.
- [●] Detection 2 to 5 X 95th percentile background value.
- [■] Detection greater than 5 X 95th percentile background value.
- [X] Detection where background level not recorded.

TABLE D.1-46
BERYLLIUM DETECTIONS BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	0.28- 2.20	0.42- 0.92	1.00- 2.00	0.41- 2.70	3.20- 3.20	1.60- 1.60	1.80- 1.80	3.50- 3.50
PLANT 2/3 AREA	0.68- 2.40	0.66- 1.70	2.50- 3.20	1.40- 1.40	-	1.00- 1.80	1.40- 2.20	-
PLANT 4/5/7 AREA	ND	-	0.78- 0.78	ND	-	3.90- 3.90	-	-
PLANT 6 AREA	0.73- 1.10	0.76- 0.82	0.95- 1.40	1.90- 1.90	0.29- 1.10	ND	-	-
PLANT 8 AREA	0.61- 2.70	-	3.50- 3.50	2.20- 2.20	-	2.20- 2.70	-	-
PLANT 9 AREA	0.46- 0.46	0.77- 0.77	0.49- 1.10	0.51- 0.79	0.80- 0.80	0.62- 0.62	0.45- 0.45	0.49- 0.49
SEWAGE TREATMENT PLANT	0.52- 1.10	0.63- 0.68	0.60- 1.30	1.00- 1.10	-	-	-	-
PILOT PLANT AREA	0.48- 1.70	0.82- 0.94	0.60- 1.30	0.70- 1.30	0.76- 0.76	0.36- 0.98	0.53- 0.99	0.66- 0.66
LABORATORY AREA	0.51- 1.30	ND	0.45- 1.50	0.48- 1.60	ND	ND	1.30- 1.30	2.80- 2.80
ADMINISTRATION AREA	1.10- 1.10	-	1.80- 1.80	1.20- 1.50	-	1.70- 1.70	-	-
ELECTRICAL SUBSTATION AREA	0.38- 0.80	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	0.59- 1.70	0.57- 1.70	1.10- 1.10	0.62- 1.20	0.50- 1.20	0.47- 1.20	0.40- 0.52	0.33- 0.33
TANK FARM AND BOILER HOUSE AREA	ND	1.30- 1.30	ND	0.75- 0.75	ND	-	-	-
D&D BUILDING AND DRUM BALING AREA	0.59- 1.30	-	-	0.60- 0.60	-	-	-	-
SCRAP METAL PILE	0.63- 0.66	-	-	-	-	-	-	-
GRAPHITE FURNACE AREA	0.98- 1.80	0.70- 1.90	ND	0.63- 1.40	0.59- 2.20	0.77- 2.90	0.86- 0.86	-
KC-2 WAREHOUSE	0.57- 0.63	-	-	-	-	-	-	-
FIRE TRAINING AREA	0.53- 0.63	-	-	0.53- 0.53	-	-	-	-
TRAP RANGE	0.35- 0.73	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	0.49- 0.96	0.52- 0.89	0.90- 0.90	0.47- 2.80	0.36- 2.90	0.49- 5.20	ND	-
K-65/CLEARWELL LINE WEST	0.89- 1.40	1.40- 1.80	-	-	-	0.61- 1.00	1.20- 1.20	-
NORTHEAST AREA OF FEMP	0.48- 5.70	-	0.64- 0.64	1.00- 1.00	ND	0.64- 0.68	0.44- 0.44	0.42- 0.42
SOUTHERN AREA OF FEMP	0.54- 1.70	-	-	-	-	-	-	-
WESTERN AREA OF FEMP	0.51- 1.80	-	0.92- 2.10	ND	ND	-	-	1.00- 1.00
NORTHWESTERN AREA OF FEMP	0.41- 1.70	-	-	-	-	-	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	1.30- 1.30	-	-	-	-	-	-	-

ND - NOT DETECTED

TABLE D.1-47
CADMIUM

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/6/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	■	■	-	■	▒	-	-	■	▒	-	-	■	●	●	●	■	-	■	○	■	▒					▒	▒	■	●	-	
0.5 - 1		■		●		●	-	■	■			■	■			■				●	●										
1 - 1.5	▒	▒	●	▒	-	■	-	-	●	●		■	▒		-	●				-						-		●			
Subsurface Soil:																															
1.5 - 3	■	-	-	-	-	▒	-	▒	●	●		■	■	●	-	■		●		●						-		-			
3 - 5	●			■		▒		■	-			■	■		-	■				●						-		●			
5 - 10	●	▒	▒		▒	-		▒	●	-		■				■				●	-					-					
10 - 15	●	-				-		■	-			-				■				●	▒					-					
15 - 20	-					-		■	-			-														-		■			

"Blank" - Not analyzed.	● Detection above but < 2 X 95th percentile background value.
- Analyzed and not detected.	▒ Detection 2 to 5 X 95th percentile background value.
○ Detection less than 95th percentile background value.	■ Detection greater than 5 X 95th percentile background value.
	X Detection where background level not recorded.

TABLE D.1-48
CADMIUM DETECTIONS BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	2.00- 6.70	ND	2.50- 4.50	1.90- 6.40	1.10- 1.10	1.40- 1.80	1.60- 1.60	ND
PLANT 2/3 AREA	1.30- 6.90	1.10- 6.20	1.10- 1.80	ND	-	1.20- 4.10	ND	-
PLANT 4/5/7 AREA	ND	-	1.60- 1.60	ND	-	2.00- 2.00	-	-
PLANT 6 AREA	0.87- 4.60	0.51- 4.30	2.30- 2.30	ND	0.92- 7.00	-	-	-
PLANT 8 AREA	1.40- 3.80	-	ND	ND	-	1.60- 1.90	-	-
PLANT 9 AREA	ND	2.90- 2.90	4.00- 6.30	3.70- 3.70	3.00- 3.00	ND	ND	ND
SEWAGE TREATMENT PLANT	ND	ND	ND	ND	-	-	-	-
PILOT PLANT AREA	3.40- 5.40	3.00- 4.50	ND	2.90- 2.90	2.60- 5.00	2.10- 4.50	4.20- 7.90	5.10- 5.10
LABORATORY AREA	2.20- 3.50	4.90- 4.90	1.20- 1.20	1.30- 1.30	ND	1.70- 1.80	ND	ND
ADMINISTRATION AREA	-	-	1.10- 1.10	2.30- 2.30	-	-	-	-
ELECTRICAL SUBSTATION AREA	ND	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	5.10- 8.00	2.30- 7.10	5.10- 5.10	2.40- 7.00	2.00- 8.00	3.30- 6.90	ND	ND
TANK FARM AND BOILER HOUSE AREA	2.10- 2.10	5.40- 5.40	2.20- 2.20	5.60- 5.60	7.60- 7.60	-	-	-
D&D BUILDING AND DRUM BALING AREA	1.80- 1.80	-	-	1.00- 1.00	-	-	-	-
SCRAP METAL PILE	4.20- 4.20	-	ND	ND	ND	-	-	-
GRAPHITE FURNACE AREA	2.10- 6.20	1.90- 12.40	1.50- 2.70	1.40- 7.70	1.80- 6.00	1.50- 5.90	6.50- 6.50	-
KC-2 WAREHOUSE	ND	-	-	-	-	-	-	-
FIRE TRAINING AREA	4.10- 7.60	-	-	2.60- 4.20	-	-	-	-
TRAP RANGE	0.49- 0.49	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	4.90- 4.90	1.90- 1.90	ND	1.20- 1.70	1.50- 2.20	1.20- 2.40	4.20- 4.20	-
K-65/CLEARWELL LINE WEST	1.10- 3.10	1.30- 1.50	-	-	-	ND	4.30- 4.30	-
NORTHEAST AREA OF FEMP	0.53- 1.90	-	ND	ND	ND	ND	ND	ND
SOUTHERN AREA OF FEMP	1.30- 2.80	-	-	-	-	-	-	-
WESTERN AREA OF FEMP	1.30- 6.70	-	1.60- 1.70	ND	1.10- 1.20	-	-	4.80- 4.80
NORTHWESTERN AREA OF FEMP	0.51- 1.90	-	-	-	-	-	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	-	-	-	-	-	-	-	-

ND - NOT DETECTED

TABLE D.1-49
CALCIUM

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					■	■	■	■	▒	
0.5 - 1	■	■	□	■	□	■	■	■	■	□	□	■	■	□	□	■	□	□	□	■	■										
1 - 1.5	■	■	■	■	■	■	■	■	■	■	□	■	●	□	■	■	□	□	□	■	□					●		■			
Subsurface Soil:																															
1.5 - 3	●	○	○	○	○	○	○	○	○	○		●	○	○	○	●		○		○						○		○			
3 - 5	●			○		○		○	○			○	○		●	○				○						○		○			
5 - 10	●	○	○	○	○	○		○	○	○		●				○				▒	○					○					
10 - 15	○	○				○		●	●			●				○				○	○					●					
15 - 20	●					○		○	○			○														○		○			

□ "Blank" - Not analyzed.

- Analyzed and not detected.

○ Detection less than 95th percentile background value.

● Detection above but < 2 X 95th percentile background value.

▒ Detection 2 to 5 X 95th percentile background value.

■ Detection greater than 5 X 95th percentile background value.

X Detection where background level not recorded.

000836

TABLE D.1-50
CALCIUM DETECTIONS BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	5,620-347,000	4,160-222,000	6,620-130,000	4,200-139,000	154,000-154,000	38,500-159,000	122,000-122,000	186,000-186,000
PLANT 2/3 AREA	49,700-185,000	54,600-128,000	6,910-115,000	4,090-119,000	-	5,040-92,800	79,100-124,000	-
PLANT 4/5/7 AREA	6,090-84,100	-	3,010-80,000	6,530-6,530	-	5,710-134,000	-	-
PLANT 6 AREA	4,340-142,000	4,210-49,900	6,240-48,700	6,840-70,200	4,630-142,000	21,100-64,300	-	-
PLANT 8 AREA	36,500-128,000	-	126,000-137,000	77,800-77,800	-	99,600-101,000	-	-
PLANT 9 AREA	97,900-97,900	45,700-45,700	112,000-153,000	107,000-128,000	61,700-61,700	105,000-115,000	112,000-112,000	114,000-114,000
SEWAGE TREATMENT PLANT	2,290-42,800	3,220-74,500	3,540-73,900	3,480-136,000	-	-	-	-
PILOT PLANT AREA	6,810-296,000	8,440-115,000	3,750-89,600	3,530-146,000	4,090-88,600	4,110-85,000	74,800-200,000	99,700-99,700
LABORATORY AREA	8,840-135,000	70,800-70,800	3,430-170,000	4,050-38,600	103,000-103,000	103,000-121,000	154,000-154,000	123,000-123,000
ADMINISTRATION AREA	18,300-87,200	-	56,800-88,600	9,990-143,000	-	8,610-116,000	-	-
ELECTRICAL SUBSTATION AREA	26,100-118,000	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	91,900-178,000	19,900-260,000	126,000-159,000	15,200-207,000	16,300-136,000	100,000-187,000	80,800-221,000	108,000-108,000
TANK FARM AND BOILER HOUSE AREA	19,400-19,400	112,000-112,000	5,150-5,150	125,000-125,000	148,000-148,000	-	-	-
D&D BUILDING AND DRUM BALING AREA	71,400-99,100	-	-	5,490-5,490	-	-	-	-
SCRAP METAL PILE	11,600-98,500	-	102,000-102,000	8,360-8,360	168,000-168,000	-	-	-
GRAPHITE FURNACE AREA	11,100-205,000	5,040-163,000	1,540-99,400	4,360-211,000	5,500-135,000	5,470-118,000	120,000-120,000	-
KC-2 WAREHOUSE	117,000-140,000	-	-	-	-	-	-	-
FIRE TRAINING AREA	2,240-130,000	-	-	4,850-97,700	-	-	-	-
TRAP RANGE	778-87,200	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	27,500-68,600	9,740-80,800	55,200-57,300	6,710-119,000	4,200-126,000	2,180-314,000	113,000-147,000	-
K-65/CLEARWELL LINE WEST	13,500-81,500	28,200-36,700	-	-	-	70,700-89,800	103,000-103,000	-
NORTHEAST AREA OF FEMP	1,120-208,000	-	3,450-8,540	3,490-7,670	133,000-133,000	115,000-128,000	240,000-240,000	119,000-119,000
SOUTHERN AREA OF FEMP	1,010-191,000	-	-	-	-	-	-	-
WESTERN AREA OF FEMP	1,480-220,000	-	2,260-117,000	32,200-134,000	122,000-144,000	-	-	102,000-102,000
NORTHWESTERN AREA OF FEMP	1,130-104,000	-	-	-	-	-	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	4,370-10,200	-	-	-	-	-	-	-

TABLE D.1-51
CHROMIUM

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	■	⊡	●	⊡	●	○	●	●	●	●	●	⊡	●	●	⊡	⊡	⊡	●	⊡	●	●					●	●	●	●	○	
0.5 - 1	●	⊡		⊡		●	●	●	⊡			⊡				●				●	●										
1 - 1.5	●	●	●	●	○	●	●	●	●	●		●	●		●	●				●						○		●			
Subsurface Soil:																															
1.5 - 3	●	●	○	○	○	○	●	○	○	○		●		○	○	⊡		●		○						●		○			
3 - 5	○			○		●		○	○			○			○	●				●						○		○			
5 - 10	○	●	○	○	○	○		●	○	○		●				○				■	○					○					
10 - 15	○	●				○		●	○			○				○				○	●					○					
15 - 20	○					○		○	○			○														○		●			

- [ ] "Blank" - Not analyzed.
- [-] Analyzed and not detected.
- [○] Detection less than 95th percentile background value.
- [●] Detection above but < 2 X 95th percentile background value.
- [⊡] Detection 2 to 5 X 95th percentile background value.
- [■] Detection greater than 5 X 95th percentile background value.
- [X] Detection where background level not recorded.

C00938

TABLE D.1-52
CHROMIUM DETECTIONS BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	7.00- 80.10	7.00- 16.50	12.10- 25.60	8.50- 22.60	12.30- 12.30	12.30- 16.60	15.30- 15.30	7.00- 7.00
PLANT 2/3 AREA	4.30- 75.50	12.30- 37.30	5.70- 19.30	12.50- 21.50	-	16.60- 30.50	11.30- 21.80	-
PLANT 4/5/7 AREA	10.20- 20.00	-	7.40- 22.60	18.90- 18.90	-	14.50- 18.00	-	-
PLANT 6 AREA	5.76- 51.60	5.56- 75.40	11.70- 20.40	12.70- 29.40	4.70- 20.00	14.30- 14.40	-	-
PLANT 8 AREA	3.60- 30.00	-	3.60- 11.20	5.00- 5.00	-	17.10- 18.20	-	-
PLANT 9 AREA	11.40- 11.40	23.10- 23.10	10.80- 18.80	10.70- 17.60	23.20- 23.20	11.90- 14.50	10.30- 10.30	11.10- 11.10
SEWAGE TREATMENT PLANT	11.40- 24.00	16.00- 17.70	19.30- 29.60	16.80- 31.10	-	-	-	-
PILOT PLANT AREA	5.70- 24.40	16.60- 23.40	15.50- 20.30	8.50- 17.50	15.80- 18.00	10.90- 28.40	11.20- 32.90	12.80- 12.80
LABORATORY AREA	9.80- 18.70	31.90- 31.90	9.40- 16.60	5.60- 18.60	8.20- 8.20	8.70- 14.70	10.80- 10.80	10.00- 10.00
ADMINISTRATION AREA	12.50- 24.30	-	10.80- 17.10	5.20- 17.10	-	10.80- 20.40	-	-
ELECTRICAL SUBSTATION AREA	6.90- 20.70	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	6.10- 67.50	5.50- 53.00	9.70- 21.20	7.80- 23.50	11.50- 20.30	9.50- 30.20	8.00- 12.10	9.70- 9.70
TANK FARM AND BOILER HOUSE AREA	23.20- 23.20	-	21.20- 21.20	-	-	-	-	-
D&D BUILDING AND DRUM BALING AREA	14.60- 21.10	-	-	17.00- 17.00	-	-	-	-
SCRAP METAL PILE	18.00- 64.00	-	18.30- 18.30	20.10- 20.10	13.50- 13.50	-	-	-
GRAPHITE FURNACE AREA	1.60- 37.50	11.20- 28.30	6.90- 25.80	10.20- 87.70	10.20- 28.30	12.00- 19.40	14.00- 14.00	-
KC-2 WAREHOUSE	16.80- 34.30	-	-	-	-	-	-	-
FIRE TRAINING AREA	9.60- 23.50	-	-	13.00- 24.30	-	-	-	-
TRAP RANGE	6.40- 42.80	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	12.40- 19.40	12.10- 19.50	9.30- 20.30	8.30- 16.30	11.00- 28.70	6.20- 115.00	7.80- 16.90	-
K-65/CLEARWELL LINE WEST	16.30- 22.90	18.00- 20.90	-	-	-	11.00- 17.80	26.60- 26.60	-
NORTHEAST AREA OF FEMP	3.20- 24.20	-	11.50- 13.50	9.70- 20.90	13.30- 13.30	12.50- 14.40	8.50- 8.50	8.70- 8.70
SOUTHERN AREA OF FEMP	3.70- 17.70	-	-	-	-	-	-	-
WESTERN AREA OF FEMP	6.00- 21.60	-	11.00- 16.10	12.00- 13.00	11.30- 11.30	-	-	23.50- 23.50
NORTHWESTERN AREA OF FEMP	5.90- 19.40	-	-	-	-	-	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	8.90- 12.10	-	-	-	-	-	-	-

TABLE D.1-53
COBALT

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	●	●	○	○	●	○	●	●	●	○	○	●	○	○	○	●	○	●	●	○	○					●	○	○	●	▒	
0.5 - 1	▒	●		○		○	●	●	○			○	○			●				●	○										
1 - 1.5	●	○	●	○	-	○	○	●	○	○		○	○		○	●				○						○		●			
Subsurface Soil:																															
1.5 - 3	●	○	○	●	-	○	○	○	●	●		○	○	○	●	●		●		○						○		○			
3 - 5	○			○		○		○	○			○	-		-	●				●						○		○			
5 - 10	●	●	●	○	●	○		●	○	○		○				○				■	○					○					
10 - 15	○	●				○		○	○			○				○				○	○					○					
15 - 20	○					○		○	○			○														○		○			

"Blank" - Not analyzed.

- Analyzed and not detected.

○ Detection less than 95th percentile background value.

● Detection above but < 2 X 95th percentile background value.

▒ Detection 2 to 5 X 95th percentile background value.

■ Detection greater than 5 X 95th percentile background value.

X Detection where background level not recorded.

TABLE D.1-54
COBALT DETECTIONS BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	6 30- 16.50	3.70- 32.90	5.80- 16.70	4.60- 30.20	7.30- 7.30	20.90- 20.90	8.70- 8.70	5.00- 5.00
PLANT 2/3 AREA	3 40- 25.80	8.50- 30.00	8.40- 11.80	8.10- 11.50	-	10.50- 23.60	18.10- 18.10	-
PLANT 4/5/7 AREA	9.30- 11.10	-	6.00- 17.60	15.30- 15.30	-	8.20- 16.50	-	-
PLANT 6 AREA	6.30- 12.70	6.80- 10.30	10.50- 10.80	10.20- 20.90	5.90- 13.30	11.50- 11.50	-	-
PLANT 8 AREA	9.00- 15.80	-	ND	ND	-	8.00- 16.60	-	-
PLANT 9 AREA	5.30- 5.30	11.20- 11.20	6.50- 11.00	4.20- 10.50	10.70- 10.70	5.80- 7.10	5.20- 5.20	5.00- 5.00
SEWAGE TREATMENT PLANT	6.50- 14.30	9.30- 15.80	9.60- 12.50	9.00- 13.90	-	-	-	-
PILOT PLANT AREA	7.00- 15.50	7.00- 16.50	7.20- 15.00	8.00- 14.50	10.40- 12.10	8.10- 21.10	8.30- 12.30	9.60- 9.60
LABORATORY AREA	7.60- 17.00	12.30- 12.30	5.90- 9.80	6.60- 15.80	7.90- 7.90	10.30- 14.80	5.80- 5.80	5.80- 5.80
ADMINISTRATION AREA	7.50- 12.50	-	6.60- 11.70	2.60- 15.90	-	6.40- 12.60	-	-
ELECTRICAL SUBSTATION AREA	3.40- 7.90	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	2.50- 16.80	5.80- 14.00	5.30- 13.80	3.70- 15.00	4.90- 14.90	4.90- 11.40	4.80- 7.90	4.90- 4.90
TANK FARM AND BOILER HOUSE AREA	7.70- 7.70	7.20- 7.20	9.50- 9.50	9.90- 9.90	ND	-	-	-
D&D BUILDING AND DRUM BALING AREA	7.00- 9.40	-	-	6.00- 6.00	-	-	-	-
SCRAP METAL PILE	4.20- 12.10	-	13.90- 13.90	21.80- 21.80	ND	-	-	-
GRAPHITE FURNACE AREA	7.70- 15.70	9.00- 16.10	8.00- 19.50	6.20- 23.60	6.20- 28.10	8.70- 11.80	10.20- 10.20	-
KC-2 WAREHOUSE	3.80- 5.30	-	-	-	-	-	-	-
FIRE TRAINING AREA	4.80- 15.70	-	-	6.10- 26.00	-	-	-	-
TRAP RANGE	3 30- 14.80	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	8.20- 11.60	7.90- 14.30	7.90- 11.80	7.20- 11.00	4.80- 22.80	2.90- 105.00	3.20- 7.70	-
K-65/CLEARWELL LINE WEST	5.10- 11.90	9.90- 14.20	-	-	-	10.10- 12.30	14.60- 14.60	-
NORTHEAST AREA OF FEMP	5.70- 22.20	-	3.80- 9.70	8.80- 11.20	8.80- 8.80	7.40- 8.10	3.80- 3.80	4.30- 4.30
SOUTHERN AREA OF FEMP	1.80- 11.80	-	-	-	-	-	-	-
WESTERN AREA OF FEMP	3.90- 13.20	-	4.50- 17.50	5.60- 6.60	6.50- 7.70	-	-	11.00- 11.00
NORTHWESTERN AREA OF FEMP	5.10- 17.90	-	-	-	-	-	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	6.90- 31.60	-	-	-	-	-	-	-

ND - NOT DETECTED

TABLE D.1-55
COPPER

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Bailing Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	◉	◉	●	●	◉	●	●	◉	●	●	■	●	-	■	■	◉	◉	◉	◉	●	◉					◉	●	●	●	●	
0.5 - 1	●	◉		◉		●	●	●	◉			●	●			◉				◉	●										
1 - 1.5	●	●	◉	●	○	●	●	●	●	●		●	-		●	◉				●						●		●			
Subsurface Soil:																															
1.5 - 3	●	●	○	○	-	○	●	○	●	●		●	●	●	●	◉		●		●						●		○			
3 - 5	-			●		○		●	○			●	●		-	●				●						●		○			
5 - 10	●	●	●	●	●	○		●	●	●		●				●				■	●					○					
10 - 15	-	●				○		●	-			○				○				○	○					○					
15 - 20	-					○		○	-			○														○		○			

- "Blank" - Not analyzed.
- - Analyzed and not detected.
- ○ Detection less than 95th percentile background value.
- ● Detection above but < 2 X 95th percentile background value.
- ◉ Detection 2 to 5 X 95th percentile background value.
- ■ Detection greater than 5 X 95th percentile background value.
- X Detection where background level not recorded.

000872

TABLE D.1-56
COPPER DETECTIONS BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	7.10- 56.20	5.50- 22.20	14.60- 18.40	9.50- 30.10	ND	14.10- 25.50	ND	ND
PLANT 2/3 AREA	7.70- 44.20	18.60- 39.50	9.80- 25.30	16.50- 27.10	-	12.40- 28.70	10.40- 25.20	-
PLANT 4/5/7 AREA	23.00- 23.00	-	17.90- 34.20	19.20- 19.20	-	21.00- 28.00	-	-
PLANT 6 AREA	14.50- 24.50	16.00- 28.20	17.00- 20.20	13.40- 17.80	7.60- 26.50	21.50- 22.00	-	-
PLANT 8 AREA	5.00- 34.80	-	13.40- 13.40	ND	-	15.50- 21.00	-	-
PLANT 9 AREA	15.10- 15.10	23.70- 23.70	14.30- 21.30	13.40- 19.40	19.90- 19.90	15.30- 17.30	19.00- 19.00	14.50- 14.50
SEWAGE TREATMENT PLANT	11.40- 23.80	10.70- 16.00	18.50- 23.80	15.20- 22.90	-	-	-	-
PILOT PLANT AREA	7.90- 28.90	8.50- 25.30	18.00- 24.00	9.40- 18.70	17.30- 20.60	9.90- 27.90	11.10- 24.00	18.70- 18.70
LABORATORY AREA	15.30- 25.90	69.40- 69.40	13.40- 21.30	7.50- 26.90	18.60- 18.60	14.90- 22.00	ND	ND
ADMINISTRATION AREA	14.00- 23.20	-	10.80- 17.30	5.00- 21.30	-	11.70- 20.20	-	-
ELECTRICAL SUBSTATION AREA	12.40- 184.00	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	8.30- 65.20	11.60- 46.20	10.20- 16.40	10.70- 31.30	11.70- 20.80	12.10- 26.20	9.40- 17.10	12.60- 12.60
TANK FARM AND BOILER HOUSE AREA	ND	22.80- 22.80	ND	26.40- 26.40	21.80- 21.80	-	-	-
D&D BUILDING AND DRUM BALING AREA	24.90- 695.00	-	-	27.00- 27.00	-	-	-	-
SCRAP METAL PILE	87.80- 207.00	-	26.20- 26.20	24.80- 24.80	ND	-	-	-
GRAPHITE FURNACE AREA	8.70- 28.30	7.50- 43.30	12.30- 51.40	14.50- 43.90	11.70- 30.60	14.60- 20.90	17.30- 17.30	-
KC-2 WAREHOUSE	23.30- 51.50	-	-	-	-	-	-	-
FIRE TRAINING AREA	13.20- 52.90	-	-	11.40- 21.50	-	-	-	-
TRAP RANGE	8.90- 30.40	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	16.70- 20.50	16.30- 49.20	12.80- 19.70	13.90- 32.00	13.60- 33.80	6.90- 171.00	10.50- 15.70	-
K-65/CLEARWELL LINE WEST	19.90- 31.80	20.40- 23.90	-	-	-	25.10- 25.10	19.00- 19.00	-
NORTHEAST AREA OF FEMP	3.80- 31.00	-	15.90- 15.90	24.20- 24.20	22.20- 22.20	16.80- 17.30	10.80- 10.80	12.40- 12.40
SOUTHERN AREA OF FEMP	5.00- 18.00	-	-	-	-	-	-	-
WESTERN AREA OF FEMP	8.80- 26.90	-	13.50- 22.00	14.90- 14.90	15.60- 15.60	-	-	14.70- 14.70
NORTHWESTERN AREA OF FEMP	6.80- 23.60	-	-	-	-	-	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	8.90- 16.80	-	-	-	-	-	-	-

ND - NOT DETECTED

TABLE D.1-57
CYANIDE

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	■	●	●	-	○	-	⊛	-	●	-	○	■	-	●	⊛	■	○	⊛	■	○	○					●	⊛	⊛	■	●	
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Subsurface Soil:																															
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10 - 15	-	-				○		-	-			-				■				■	-					-					
15 - 20	-					-		-	-			-														-		-			

☐	"Blank" - Not analyzed.
-	Analyzed and not detected.
○	Detection less than 95th percentile background value.
●	Detection above but < 2 X 95th percentile background value.
⊛	Detection 2 to 5 X 95th percentile background value.
■	Detection greater than 5 X 95th percentile background value.
X	Detection where background level not recorded.

TABLE D.1-58
CYANIDE DETECTIONS BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	0.13- 1.50	0.34- 0.34	ND	ND	ND	ND	ND	ND
PLANT 2/3 AREA	0.30- 0.30	ND	ND	ND	-	0.46- 0.46	ND	-
PLANT 4/5/7 AREA	0.35- 0.35	-	ND	ND	-	ND	-	-
PLANT 6 AREA	ND	-	ND	ND	0.15- 1.40	ND	-	-
PLANT 8 AREA	0.15- 0.15	-	ND	-	-	-	-	-
PLANT 9 AREA	ND	ND	1.23- 1.23	ND	0.18- 0.18	ND	0.14- 0.14	-
SEWAGE TREATMENT PLANT	0.56- 0.88	ND	0.58- 0.58	ND	-	-	-	-
PILOT PLANT AREA	ND	ND	ND	0.11- 0.11	ND	ND	ND	ND
LABORATORY AREA	0.30- 0.52	ND	ND	0.44- 0.44	ND	ND	ND	ND
ADMINISTRATION AREA	-	-	-	-	-	-	-	-
ELECTRICAL SUBSTATION AREA	0.13- 0.13	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	0.59- 22.80	0.14- 20.60	ND	0.27- 9.80	0.12- 0.48	0.14- 0.14	ND	ND
TANK FARM AND BOILER HOUSE AREA	ND	0.24- 0.24	ND	0.16- 0.16	0.19- 0.19	-	-	-
D&D BUILDING AND DRUM BALING AREA	0.32- 0.32	-	-	ND	-	-	-	-
SCRAP METAL PILE	0.14- 0.63	-	ND	ND	ND	-	-	-
GRAPHITE FURNACE AREA	2.30- 2.30	ND	ND	0.29- 0.52	0.13- 0.20	0.81- 0.81	1.30- 1.30	-
KC-2 WAREHOUSE	0.14- 0.14	-	-	-	-	-	-	-
FIRE TRAINING AREA	0.17- 1.20	-	-	0.50- 0.50	-	-	-	-
TRAP RANGE	0.19- 4.30	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	0.15- 0.24	ND	ND	ND	0.63- 0.63	ND	0.26- 1.50	-
K-65/CLEARWELL LINE WEST	0.15- 0.19	ND	-	-	-	ND	ND	-
NORTHEAST AREA OF FEMP	0.14- 0.47	-	0.11- 0.11	ND	ND	ND	ND	ND
SOUTHERN AREA OF FEMP	0.28- 0.91	-	-	-	-	-	-	-
WESTERN AREA OF FEMP	0.12- 0.69	-	0.16- 0.27	ND	ND	-	-	ND
NORTHWESTERN AREA OF FEMP	0.15- 1.70	-	-	-	-	-	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	0.36- 0.49	-	-	-	-	-	-	-

ND - NOT DETECTED

TABLE D.1-59
IRON

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Bailing Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	●	●	●	○	○	○	●	●	●	●	○	●	●	●	●	●	●	○	●	○	●					▒	●	●	●	●	
0.5 - 1	●	●		○		○	●	●	○			●	○			●				●	●										
1 - 1.5	●	●	●	●	○	○	●	●	●	●		○	●		●	●				●						○		●			
Subsurface Soil:																															
1.5 - 3	●	○	●	●	○	○	●	○	●	○		○	○	○	●	●		○		○						○		○			
3 - 5	○			○		○		○	○			○	○		○	▒				●						●		○			
5 - 10	●	●	○	○	○	○		●	○	○		○				○				■	○					○					
10 - 15	○	○				○		○	○			○				○				○	○					○					
15 - 20	○					○		○	○			○														○		○			

- [ ] "Blank" - Not analyzed.
- [-] Analyzed and not detected.
- [○] Detection less than 95th percentile background value.
- [●] Detection above but < 2 X 95th percentile background value.
- [▒] Detection 2 to 5 X 95th percentile background value.
- [■] Detection greater than 5 X 95th percentile background value.
- [X] Detection where background level not recorded.

000876

TABLE D.1-60
IRON DETECTIONS BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	8,240-35,000	3,420-26,400	13,800-31,800	5,950-38,900	16,700-16,700	19,100-31,800	22,200-22,200	11,500-11,500
PLANT 2/3 AREA	6,190-25,300	10,800-23,300	7,880-23,400	19,000-29,300	-	19,200-33,800	11,600-25,500	-
PLANT 4/5/7 AREA	15,500-27,500	-	11,700-36,600	33,100-33,100	-	22,000-30,200	-	-
PLANT 6 AREA	7,380-20,600	2,300-19,800	13,400-28,400	14,300-34,400	4,680-26,700	16,600-25,100	-	-
PLANT 8 AREA	5,360-21,200	-	4,750-17,700	4,120-4,120	-	19,500-24,900	-	-
PLANT 9 AREA	17,700-17,700	18,300-18,300	7,630-18,400	16,000-18,700	22,800-22,800	18,300-20,000	17,500-17,500	15,600-15,600
SEWAGE TREATMENT PLANT	12,700-25,900	18,600-22,200	19,300-34,700	19,800-34,300	-	-	-	-
PILOT PLANT AREA	4,410-38,900	8,180-22,400	19,700-33,200	19,900-24,700	17,400-30,100	9,720-42,600	8,750-26,300	18,100-18,100
LABORATORY AREA	11,700-29,700	15,200-15,200	13,600-25,400	8,600-33,000	18,500-18,500	18,300-25,200	13,800-13,800	11,200-11,200
ADMINISTRATION AREA	16,300-33,200	-	14,900-24,000	6,920-24,700	-	16,900-25,900	-	-
ELECTRICAL SUBSTATION AREA	10,200-21,000	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	7,690-26,900	6,430-40,000	14,500-18,200	4,000-26,800	6,220-20,700	6,850-18,300	10,900-18,200	13,500-13,500
TANK FARM AND BOILER HOUSE AREA	26,400-26,400	9,150-9,150	26,400-26,400	17,000-17,000	10,700-10,700	-	-	-
D&D BUILDING AND DRUM BALING AREA	20,100-24,100	-	-	19,300-19,300	-	-	-	-
SCRAP METAL PILE	10,500-23,400	-	26,000-26,000	34,900-34,900	19,500-19,500	-	-	-
GRAPHITE FURNACE AREA	7,170-32,700	8,620-41,800	11,300-35,000	6,940-40,000	13,700-66,600	14,900-28,800	15,300-15,300	-
KC-2 WAREHOUSE	12,300-24,900	-	-	-	-	-	-	-
FIRE TRAINING AREA	5,630-21,000	-	-	16,200-30,200	-	-	-	-
TRAP RANGE	10,800-40,600	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	25-20,800	18,200-27,900	14,700-24,900	14,200-22,900	14,800-37,100	8,060-193,000	10,100-18,800	-
K-65/CLEARWELL LINE WEST	22,400-26,200	24,300-25,300	-	-	-	22,900-30,100	20,400-20,400	-
NORTHEAST AREA OF FEMP	3,150-45,100	-	17,000-19,700	17,900-30,400	33,800-33,800	19,000-19,400	10,900-10,900	13,000-13,000
SOUTHERN AREA OF FEMP	4,260-22,300	-	-	-	-	-	-	-
WESTERN AREA OF FEMP	9,040-35,700	-	16,100-26,300	16,600-17,900	16,300-17,600	-	-	18,000-18,000
NORTHWESTERN AREA OF FEMP	9,940-24,000	-	-	-	-	-	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	12,400-21,800	-	-	-	-	-	-	-

TABLE D.1-61
LEAD

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Bailing Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	●		●		○	○		●	○	●			○			●		●		○						●	●	●	●	●	
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1 - 1.5	●	●	○	○	○	○	●	○	○	●		○	○		○	○				○						○		●			
Subsurface Soil:																															
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15 - 20	●					○		○	○			○														○		○			

"Blank" - Not analyzed.

- Analyzed and not detected.

○ Detection less than 95th percentile background value.

● Detection above but < 2 X 95th percentile background value.

● Detection 2 to 5 X 95th percentile background value.

■ Detection greater than 5 X 95th percentile background value.

X Detection where background level not recorded.

TABLE D.1-62
LEAD DETECTIONS BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	7.40- 60.50	2.90- 23.20	10.30- 37.70	4.40- 19.13	8.90- 8.90	9.30- 16.50	15.40- 15.40	28.20- 28.20
PLANT 2/3 AREA	4.50- 334.00	8.60- 440.00	3.40- 31.20	11.40- 18.40	-	8.30- 25.80	5.70- 12.10	-
PLANT 4/5/7 AREA	19.80- 29.40	-	10.50- 15.00	11.60- 11.60	-	8.30- 14.00	-	-
PLANT 6 AREA	5.30- 226.00	9.20- 88.00	11.30- 16.30	12.30- 30.00	2.90- 31.80	11.00- 17.60	-	-
PLANT 8 AREA	3.50- 17.00	-	3.70- 10.90	2.60- 2.60	-	15.00- 17.20	-	-
PLANT 9 AREA	9.10- 9.10	16.30- 16.30	6.10- 11.10	7.40- 8.10	12.80- 12.80	8.90- 10.20	7.70- 7.70	8.20- 8.20
SEWAGE TREATMENT PLANT	12.30- 570.00	17.40- 26.20	9.90- 31.40	11.60- 21.40	-	-	-	-
PILOT PLANT AREA	9.70- 117.00	15.50- 26.70	11.00- 21.30	12.50- 19.10	4.60- 15.90	7.70- 29.20	5.40- 16.90	8.40- 8.40
LABORATORY AREA	15.70- 22.30	42.30- 42.30	15.10- 18.50	11.00- 21.70	8.80- 8.80	7.90- 15.70	0.47- 0.47	4.30- 4.30
ADMINISTRATION AREA	11.40- 48.60	-	16.40- 54.80	2.40- 16.90	-	6.80- 19.10	-	-
ELECTRICAL SUBSTATION AREA	5.10- 543.00	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	9.40- 334.00	6.40- 165.00	7.70- 8.85	2.90- 19.70	4.40- 11.00	1.40- 10.20	5.98- 22.00	6.10- 13.30
TANK FARM AND BOILER HOUSE AREA	22.70- 22.70	27.30- 27.30	12.80- 12.80	7.90- 7.90	6.10- 6.10	-	-	-
D&D BUILDING AND DRUM BALING AREA	79.40- 162.00	-	-	7.80- 7.80	-	-	-	-
SCRAP METAL PILE	51.30- 569.00	-	16.60- 16.60	13.10- 13.10	14.70- 14.70	-	-	-
GRAPHITE FURNACE AREA	9.20- 57.20	7.80- 38.20	10.20- 21.20	7.70- 18.00	7.00- 17.00	8.20- 14.30	8.90- 8.90	-
KC-2 WAREHOUSE	110.00- 220.00	-	-	-	-	-	-	-
FIRE TRAINING AREA	22.40- 114.00	-	-	14.80- 71.00	-	-	-	-
TRAP RANGE	17.50- 2180.00	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	16.60- 26.10	16.70- 26.00	21.00- 21.00	9.30- 27.30	6.80- 40.00	8.90- 139.00	5.00- 10.20	-
K-65/CLEARWELL LINE WEST	14.80- 240.00	12.30- 18.00	-	-	-	10.40- 14.30	8.60- 8.60	-
NORTHEAST AREA OF FEMP	2.80- 32.30	-	14.10- 18.20	13.60- 17.90	9.20- 9.20	8.50- 8.80	7.70- 7.70	8.80- 8.80
SOUTHERN AREA OF FEMP	5.00- 61.50	-	-	-	-	-	-	-
WESTERN AREA OF FEMP	8.60- 111.00	-	10.30- 28.50	10.20- 13.30	7.50- 8.30	-	-	10.20- 10.20
NORTHWESTERN AREA OF FEMP	8.80- 33.30	-	-	-	-	-	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	16.90- 28.50	-	-	-	-	-	-	-

TABLE D.1-63
MAGNESIUM

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	■	■	■	■	■	■	▒	■	■	■	■	■	▒	■	■	■	■	■	■	■	■					■	■	■	■	●	
0.5 - 1	■	■	□	■	□	▒	■	■	■	□	□	■	■	□	□	■	□	□	□	■	▒										
1 - 1.5	■	■	▒	■	■	■	■	■	■	■	□	■	●	□	●	■	□	□	□	■	□					○		■			
Subsurface Soil:																															
1.5 - 3	●	○	○	○	●	○	○	●	○	●		●	○	○	○	○		○		○						○		○			
3 - 5	○			●		○		○	○			●	○		○	○				○						○		○			
5 - 10	○	○	○	○	○	○		○	○	○		●				○				▒	○					○					
10 - 15	○	○				○		○	●			○				○				○	○					○					
15 - 20	○					○		○	○			○														○		○			

□ "Blank" - Not analyzed.

- Analyzed and not detected.

○ Detection less than 95th percentile background value.

● Detection above but < 2 X 95th percentile background value.

▒ Detection 2 to 5 X 95th percentile background value.

■ Detection greater than 5 X 95th percentile background value.

X Detection where background level not recorded.

TABLE D.1-64
MAGNESIUM DETECTIONS BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	3,880-39,500	2,810-44,500	4,520-26,900	3,320-52,400	23,500-23,500	13,600-19,000	23,300-23,300	24,500-24,500
PLANT 2/3 AREA	11,300-49,200	13,400-34,300	4,060-36,400	3,040-23,500	-	4,650-27,900	26,200-40,600	-
PLANT 4/5/7 AREA	2,200-20,500	-	1,610-15,400	3,680-3,680	-	4,650-26,900	-	-
PLANT 6 AREA	3,060-25,900	2,170-16,600	3,670-21,100	3,890-19,500	3,670-45,100	5,700-8,330	-	-
PLANT 8 AREA	11,700-44,600	-	29,100-38,500	63,100-63,100	-	23,300-31,100	-	-
PLANT 9 AREA	27,700-27,700	13,400-13,400	21,200-52,600	26,600-30,600	15,000-15,000	25,200-28,900	29,000-29,000	28,900-28,900
SEWAGE TREATMENT PLANT	1,390-14,000	2,510-21,300	3,780-21,200	4,600-28,300	-	-	-	-
PILOT PLANT AREA	4,800-32,200	4,680-26,000	4,010-25,900	2,770-70,100	3,560-22,500	3,170-37,100	20,000-39,300	23,100-23,100
LABORATORY AREA	4,700-33,400	19,900-19,900	3,090-27,700	1,390-23,100	41,100-41,100	27,700-36,900	48,300-48,300	17,200-17,200
ADMINISTRATION AREA	10,600-22,800	-	12,100-21,400	5,280-51,100	-	5,600-41,000	-	-
ELECTRICAL SUBSTATION AREA	11,300-37,000	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	18,600-50,300	1,620-55,100	22,100-35,600	6,350-43,400	8,850-61,800	21,500-47,100	15,500-24,200	34,100-34,100
TANK FARM AND BOILER HOUSE AREA	7,180-7,180	30,300-30,300	3,780-3,780	28,900-28,900	40,100-40,100	-	-	-
D&D BUILDING AND DRUM BALING AREA	14,000-25,800	-	-	3,270-3,270	-	-	-	-
SCRAP METAL PILE	6,510-22,300	-	4,910-4,910	5,160-5,160	34,400-34,400	-	-	-
GRAPHITE FURNACE AREA	227-45,100	2,570-65,300	1,150-42,100	2,540-39,900	2,330-39,600	4,990-28,500	34,600-34,600	-
KC-2 WAREHOUSE	28,100-48,600	-	-	-	-	-	-	-
FIRE TRAINING AREA	1,730-35,900	-	-	2,830-24,600	-	-	-	-
TRAP RANGE	1,160-26,300	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	12,000-20,500	3,450-20,600	11,300-18,900	3,650-38,300	2,620-40,100	2,090-93,200	23,700-32,000	-
K-65/CLEARWELL LINE WEST	5,210-16,200	11,200-12,500	-	-	-	23,600-32,700	23,000-23,000	-
NORTHEAST AREA OF FEMP	1,200-65,300	-	2,520-2,730	2,010-4,840	17,900-17,900	23,900-33,100	20,400-20,400	37,200-37,200
SOUTHERN AREA OF FEMP	1,090-29,800	-	-	-	-	-	-	-
WESTERN AREA OF FEMP	1,740-65,300	-	2,420-34,700	17,100-29,000	32,400-35,400	-	-	28,700-28,700
NORTHWESTERN AREA OF FEMP	1,230-28,100	-	-	-	-	-	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	1,200-3,060	-	-	-	-	-	-	-

TABLE D.1-65
MANGANESE

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/6/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	○	○	○	○	○	○	●	○	○	●	●	○	○	●	○	○	○	●	●	○	○					◉	○	●	●	●	
0.5 - 1	●	○		○		○	○	○	○			○	○			○				○	○										
1 - 1.5	○	○	○	○	○	○	○	○	○	○		○	○		○	◉				○						○		○			
Subsurface Soil:																															
1.5 - 3	●	○	●	●	○	○	○	◉	●	●		○	○	○	●	◉		○		○						○		○			
3 - 5	○			○		○		○	○			○	○		○	●				○						○		○			
5 - 10	◉	●	○	○	○	○		●	○	○		○				○				■	○					○					
10 - 15	○	○				○		○	○			○				○				○	○					○					
15 - 20	○					○		○	○			○														○		○			

"Blank" - Not analyzed.

- Analyzed and not detected.

○ Detection less than 95th percentile background value.

● Detection above but < 2 X 95th percentile background value.

◉ Detection 2 to 5 X 95th percentile background value.

■ Detection greater than 5 X 95th percentile background value.

X Detection where background level not recorded.

TABLE D.1-66
MANGANESE DETECTIONS BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	412.00- 1000.00	303.00- 1360.00	376.00- 762.00	232.00- 1770.00	521.00- 521.00	713.00- 2620.00	463.00- 463.00	563.00- 563.00
PLANT 2/3 AREA	287 00- 917.00	323.00- 792.00	264.00- 1120.00	261.00- 699.00	-	337.00- 1890.00	380.00- 443.00	-
PLANT 4/5/7 AREA	481.00- 878.00	-	398.00- 1070.00	1340.00- 1340.00	-	555.00- 1020.00	-	-
PLANT 6 AREA	280.00- 790.00	167.00- 374.00	275.00- 685.00	238.00- 2540.00	188.00- 892.00	398.00- 772.00	-	-
PLANT 8 AREA	226.00- 792.00	-	387.00- 571.00	158.00- 158.00	-	526.00- 571.00	-	-
PLANT 9 AREA	333.00- 333.00	750.00- 750.00	262.00- 592.00	425.00- 544.00	462.00- 462.00	455.00- 703.00	434.00- 434.00	407.00- 407.00
SEWAGE TREATMENT PLANT	343.00- 2010.00	701.00- 1090.00	432.00- 871.00	570.00- 904.00	-	-	-	-
PILOT PLANT AREA	226.00- 835.00	296.00- 614.00	307.00- 637.00	395.00- 3890.00	412.00- 577.00	227.00- 1500.00	361.00- 526.00	440.00- 440.00
LABORATORY AREA	554.00- 1280.00	390.00- 390.00	316.00- 652.00	154.00- 1340.00	787.00- 787.00	471.00- 652.00	392.00- 392.00	390.00- 390.00
ADMINISTRATION AREA	564.00- 1720.00	-	497.00- 824.00	277.00- 2050.00	-	315.00- 1120.00	-	-
ELECTRICAL SUBSTATION AREA	293.00- 1470.00	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	250.00- 552.00	94.60- 591.00	363.00- 619.00	253.00- 903.00	107.00- 697.00	283.00- 522.00	288.00- 659.00	319.00- 319.00
TANK FARM AND BOILER HOUSE AREA	374.00- 374.00	254.00- 254.00	306.00- 306.00	446.00- 446.00	366.00- 366.00	-	-	-
D&D BUILDING AND DRUM BALING AREA	690.00- 1500.00	-	-	177.00- 177.00	-	-	-	-
SCRAP METAL PILE	307.00- 714.00	-	702.00- 702.00	1370.00- 1370.00	427.00- 427.00	-	-	-
GRAPHITE FURNACE AREA	9.90- 786.00	132.00- 818.00	274.00- 2700.00	188.00- 4200.00	117.00- 1610.00	319.00- 714.00	419.00- 419.00	-
KC-2 WAREHOUSE	482.00- 654.00	-	-	-	-	-	-	-
FIRE TRAINING AREA	304.00- 1480.00	-	-	285.00- 1080.00	-	-	-	-
TRAP RANGE	361.00- 1460.00	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	526.00- 693.00	553.00- 741.00	406.00- 622.00	434.00- 956.00	378.00- 1140.00	344.00- 12200.00	288.00- 505.00	-
K-65/CLEARWELL LINE WEST	460.00- 584.00	572.00- 974.00	-	-	-	570.00- 648.00	361.00- 361.00	-
NORTHEAST AREA OF FEMP	369.00- 4400.00	-	206.00- 767.00	463.00- 886.00	658.00- 658.00	437.00- 744.00	378.00- 378.00	367.00- 367.00
SOUTHERN AREA OF FEMP	253.00- 1350.00	-	-	-	-	-	-	-
WESTERN AREA OF FEMP	142.00- 1440.00	-	256.00- 1230.00	255.00- 374.00	464.00- 573.00	-	-	476.00- 476.00
NORTHWESTERN AREA OF FEMP	294.00- 1470.00	-	-	-	-	-	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	504.00- 3420.00	-	-	-	-	-	-	-

TABLE D.1-67
MERCURY

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	■	■	-	●	-	-	○	●	●	-	○	▒	▒	○	●	○	-	-	■	-	-					-	-	-	-	-	
0.5 - 1	-	▒		-		○	○	●				●	○			●				-	-										
1 - 1.5	▒	●	-	-	-	-	○	-	○	-		-	●		-	-				-						-		-			
Subsurface Soil:																															
1.5 - 3	-	■	-	-	-	-	○	-	○	-		-	-	○	-	-		○		-						-		-			
3 - 5	-			○		-		-	-			○	-		-	-				○						-		-			
5 - 10	-	-	-	-	-	-		○	-	-		-				-				○	-					-					
10 - 15	-	-				-		○	-			-				-				-	-					-					
15 - 20	-					-		-	-			-														-		-			

"Blank" - Not analyzed.

- Analyzed and not detected.

○ Detection less than 95th percentile background value.

● Detection above but < 2 X 95th percentile background value.

▒ Detection 2 to 5 X 95th percentile background value.

■ Detection greater than 5 X 95th percentile background value.

X Detection where background level not recorded.

TABLE D.1-68
MERCURY DETECTIONS BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	0.14- 4.60	ND	1.00- 1.00	ND	ND	ND	ND	ND
PLANT 2/3 AREA	0.08- 2.10	0.73- 0.73	0.48- 0.48	2.30- 2.30	-	ND	ND	-
PLANT 4/5/7 AREA	ND	-	ND	ND	-	ND	-	-
PLANT 6 AREA	0.39- 0.39	ND	ND	ND	0.05- 0.07	ND	-	-
PLANT 8 AREA	ND	-	ND	ND	-	ND	-	-
PLANT 9 AREA	ND	0.25- 0.25	ND	ND	ND	ND	ND	ND
SEWAGE TREATMENT PLANT	0.06- 0.12	0.08- 0.10	0.10- 0.10	0.06- 0.13	-	-	-	-
PILOT PLANT AREA	0.13- 0.34	1.10- 1.10	ND	ND	ND	0.24- 0.24	0.22- 0.22	ND
LABORATORY AREA	0.34- 0.34	-	0.06- 0.06	0.06- 0.06	ND	ND	ND	ND
ADMINISTRATION AREA	-	-	-	-	-	-	-	-
ELECTRICAL SUBSTATION AREA	0.17- 0.17	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	0.37- 0.65	0.18- 0.46	ND	ND	0.09- 0.09	ND	ND	ND
TANK FARM AND BOILER HOUSE AREA	1.30- 1.30	0.15- 0.15	0.48- 0.48	ND	ND	-	-	-
D&D BUILDING AND DRUM BALING AREA	0.12- 0.23	-	-	0.04- 0.04	-	-	-	-
SCRAP METAL PILE	0.12- 0.48	-	ND	ND	ND	-	-	-
GRAPHITE FURNACE AREA	0.16- 0.28	0.13- 0.32	ND	ND	ND	ND	ND	-
KC-2 WAREHOUSE	ND	-	-	-	-	-	-	-
FIRE TRAINING AREA	ND	-	-	0.18- 0.18	-	-	-	-
TRAP RANGE	0.06- 6.30	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	ND	ND	ND	ND	0.08- 0.08	0.05- 0.05	ND	-
K-65/CLEARWELL LINE WEST	ND	ND	-	-	-	ND	ND	-
NORTHEAST AREA OF FEMP	ND	-	ND	ND	ND	ND	ND	ND
SOUTHERN AREA OF FEMP	ND	-	-	-	-	-	-	-
WESTERN AREA OF FEMP	ND	-	ND	ND	ND	-	-	ND
NORTHWESTERN AREA OF FEMP	ND	-	-	-	-	-	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	-	-	-	-	-	-	-	-

ND - NOT DETECTED

TABLE D.1-69
MOLYBDENUM

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	X	X	-	X	X	-	X	-	X	-	X	X	-	X	X	X	X	X	X	X	X					X	X	X	X	-	
0.5 - 1	X	X		X		X	-	-	-			X	X			X				-	-										
1 - 1.5	-	-	X	-	-	X	-	-	X	-		X	-		-	-				-						X		X			
Subsurface Soil:																															
1.5 - 3	●	-	-	-	-	●	-	○	-	-		●	●		-	●		-		●						●		-			
3 - 5	-			●		○		●	●			●	-		-	●				●						-		-			
5 - 10	-	-	-	-	-	-		-	-	-		●				●				●	●					●					
10 - 15	-	-				-		●	-			-				●				-						-					
15 - 20	-					-		○	-			-														-		-			

"Blank" - Not analyzed.

- Analyzed and not detected.

○ Detection less than 95th percentile background value.

● Detection above but < 2 X 95th percentile background value.

Detection 2 to 5 X 95th percentile background value.

Detection greater than 5 X 95th percentile background value.

X Detection where background level not recorded.

TABLE D.1-70
MOLYBDENUM DETECTIONS BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	0.60- 5.20	4.20- 7.60	ND	4.40- 10.00	ND	ND	ND	ND
PLANT 2/3 AREA	2.80- 3.00	2.60- 3.80	ND	ND	-	ND	ND	-
PLANT 4/5/7 AREA	ND	-	6.40- 6.40	ND	-	ND	-	-
PLANT 6 AREA	2.40- 3.00	2.60- 3.10	ND	ND	2.90- 4.60	ND	-	-
PLANT 8 AREA	10.00- 13.10	-	ND	ND	-	ND	-	-
PLANT 9 AREA	ND	3.50- 3.50	3.80- 4.30	3.00- 3.00	2.40- 2.40	ND	ND	ND
SEWAGE TREATMENT PLANT	8.50- 8.50	ND	ND	ND	-	-	-	-
PILOT PLANT AREA	ND	ND	ND	2.40- 2.40	3.00- 3.60	ND	3.30- 3.30	2.60- 2.60
LABORATORY AREA	4.40- 4.40	ND	4.70- 4.70	ND	5.00- 5.00	ND	ND	ND
ADMINISTRATION AREA	-	-	-	-	-	-	-	-
ELECTRICAL SUBSTATION AREA	3.80- 6.90	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	4.70- 5.70	2.20- 6.20	3.80- 3.80	2.30- 5.50	2.70- 5.70	2.80- 6.50	ND	ND
TANK FARM AND BOILER HOUSE AREA	ND	2.30- 2.30	ND	4.30- 4.30	ND	-	-	-
D&D BUILDING AND DRUM BALING AREA	6.20- 6.80	-	-	-	-	-	-	-
SCRAP METAL PILE	4.60- 12.40	-	ND	ND	ND	-	-	-
GRAPHITE FURNACE AREA	2.30- 2.30	2.50- 3.10	ND	3.10- 6.90	3.40- 4.30	4.40- 4.40	4.80- 4.80	-
KC-2 WAREHOUSE	6.60- 11.10	-	-	-	-	-	-	-
FIRE TRAINING AREA	2.20- 4.60	-	-	ND	-	-	-	-
TRAP RANGE	7.50- 8.50	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	4.30- 4.70	ND	ND	5.50- 5.50	4.30- 9.60	3.50- 9.00	ND	-
K-65/CLEARWELL LINE WEST	5.20- 9.70	ND	-	-	-	1.60- 8.90	-	-
NORTHEAST AREA OF FEMP	5.30- 12.40	-	4.70- 4.70	7.10- 7.10	ND	5.20- 5.70	ND	ND
SOUTHERN AREA OF FEMP	6.50- 8.20	-	-	-	-	-	-	-
WESTERN AREA OF FEMP	2.70- 5.70	-	5.90- 7.90	ND	ND	-	-	ND
NORTHWESTERN AREA OF FEMP	6.90- 13.30	-	-	-	-	-	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	-	-	-	-	-	-	-	-

ND - NOT DETECTED

TABLE D.1-71
NICKEL

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	●	●	-	●	●	○	●	●	●	●	○	●	-	●	●	●	●	●	○	●	●					●	●	●	●	○	
0.5 - 1	○	●		●		●	●	●	●			●				●				●	●										
1 - 1.5	●	●	●	●	●	●	●	●	●	●		●	-		-	●				●						○		●			
Subsurface Soil:																															
1.5 - 3	●	○	-	●	-	○	○	○	●	●		●		○	-	●		●		○						○		○			
3 - 5	-			○		○		○	○			●			-	●				●						-		○			
5 - 10	●	●	-	○	○	○		○	●	○		●				○				■	○					○					
10 - 15	-	●				○		○	-			○				○				○	●					○					
15 - 20	-					○		○	-			○														○		○			

"Blank" - Not analyzed.

- Analyzed and not detected.

○ Detection less than 95th percentile background value.

● Detection above but < 2 X 95th percentile background value.

◉ Detection 2 to 5 X 95th percentile background value.

■ Detection greater than 5 X 95th percentile background value.

X Detection where background level not recorded.

TABLE D.1-72
NICKEL DETECTIONS BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	6.70- 49.10	9.10- 20.30	10.90- 39.70	11.30- 66.20	ND	19.60- 46.00	ND	ND
PLANT 2/3 AREA	5.70- 50.00	25.30- 46.60	4.90- 26.30	15.80- 25.90	-	22.00- 42.80	11.70- 38.20	-
PLANT 4/5/7 AREA	ND	-	25.80- 25.80	ND	-	ND	-	-
PLANT 6 AREA	9.10- 26.30	19.00- 28.20	14.70- 25.50	17.50- 52.40	17.00- 28.90	20.20- 26.90	-	-
PLANT 8 AREA	5.40- 24.60	-	21.00- 21.00	ND	-	16.90- 27.30	-	-
PLANT 9 AREA	13.20- 13.20	25.70- 25.70	16.40- 25.80	12.00- 25.80	25.00- 25.00	17.50- 19.00	13.90- 13.90	15.10- 15.10
SEWAGE TREATMENT PLANT	13.20- 23.70	12.50- 24.50	15.90- 28.50	21.60- 30.10	-	-	-	-
PILOT PLANT AREA	7.30- 40.50	29.20- 41.90	16.80- 21.40	11.60- 22.50	18.60- 25.60	9.50- 27.40	13.40- 25.90	23.60- 23.60
LABORATORY AREA	15.80- 35.10	48.10- 48.10	15.20- 31.80	7.60- 45.30	20.20- 20.20	18.30- 34.80	ND	ND
ADMINISTRATION AREA	18.30- 37.90	-	13.40- 29.30	34.80- 34.80	-	18.30- 31.60	-	-
ELECTRICAL SUBSTATION AREA	9.70- 20.60	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	6.10- 72.20	16.50- 70.50	12.40- 49.30	9.90- 37.60	20.90- 35.30	11.80- 39.40	8.80- 17.20	14.50- 14.50
TANK FARM AND BOILER HOUSE AREA	ND	-	ND	-	-	-	-	-
D&D BUILDING AND DRUM BALING AREA	25.00- 52.70	-	-	17.00- 17.00	-	-	-	-
SCRAP METAL PILE	19.30- 37.50	-	ND	ND	ND	-	-	-
GRAPHITE FURNACE AREA	5.30- 40.70	17.50- 44.80	8.00- 41.30	16.40- 52.40	15.80- 54.90	20.50- 26.10	27.20- 27.20	-
KC-2 WAREHOUSE	17.40- 27.80	-	-	-	-	-	-	-
FIRE TRAINING AREA	13.50- 25.70	-	-	15.30- 67.10	-	-	-	-
TRAP RANGE	10.30- 14.40	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	17.90- 26.60	17.20- 30.30	13.80- 23.30	15.50- 27.50	12.80- 63.00	7.30- 186.00	6.70- 21.80	-
K-65/CLEARWELL LINE WEST	16.30- 27.30	22.20- 28.30	-	-	-	21.10- 27.50	37.60- 37.60	-
NORTHEAST AREA OF FEMP	3.80- 43.60	-	11.30- 11.30	25.90- 25.90	ND	17.00- 19.70	9.50- 9.50	10.80- 10.80
SOUTHERN AREA OF FEMP	4.40- 21.00	-	-	-	-	-	-	-
WESTERN AREA OF FEMP	8.20- 41.30	-	11.70- 29.70	16.30- 18.70	17.00- 18.10	-	-	29.80- 29.80
NORTHWESTERN AREA OF FEMP	5.50- 25.80	-	-	-	-	-	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	6.10- 11.70	-	-	-	-	-	-	-

ND - NOT DETECTED

TABLE D.1-73
POTASSIUM

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	●	●	●	●	●	●	●	●	●	●	○	●	●	●	●	●	○	●	●	●	●					●	●	●	●	●	
0.5 - 1	●	●		○		○	●	●	●			●	○			●				●	●										
1 - 1.5	●	●	●	●	●	●	●	●	●	●		●	●		○	●				●						○		●			
Subsurface Soil:																															
1.5 - 3	●	○	○	○	○	○	●	○	○	○		○	○	○	○	○		○		○						○		○			
3 - 5	●			○		○		○	○			○	○		●	○				●						○		○			
5 - 10	●	●	○	○	○	●		●	○	○		●				●				■	●					●					
10 - 15	●	●				○		●	○			○				○				○	○					○					
15 - 20	○					○		○	○			○														○		○			

- "Blank" - Not analyzed.
- - Analyzed and not detected.
- ○ Detection less than 95th percentile background value.
- ● Detection above but < 2 X of 95th percentile background value.
- ◉ Detection 2 to 5 X 95th percentile background value.
- ■ Detection greater than 5 X 95th percentile background value.
- X Detection where background level not recorded.

TABLE D.1-74
POTASSIUM DETECTIONS BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	389-2,570	410-1,380	595-1,560	336-2,020	2,000-2,000	1,530-2,140	2,100-2,100	1,240-1,240
PLANT 2/3 AREA	260-1,550	335-1,310	361-1,470	523-1,190	-	1,000-2,520	786-2,890	-
PLANT 4/5/7 AREA	411-2,730	-	295-1,900	1,050-1,050	-	910-1,530	-	-
PLANT 6 AREA	525-1,450	529-1,000	775-1,890	678-1,180	204-2,320	855-1,040	-	-
PLANT 8 AREA	281-1,260	-	222-1,270	214-214	-	1,570-1,750	-	-
PLANT 9 AREA	1,290-1,290	952-952	490-1,420	1,240-1,270	1,420-1,420	1,650-2,190	1,440-1,440	1,690-1,690
SEWAGE TREATMENT PLANT	792-2,080	899-2,460	1,090-2,840	1,340-3,020	-	-	-	-
PILOT PLANT AREA	679-2,540	571-1,240	960-2,190	721-1,460	589-1,110	472-3,560	273-3,120	1,160-1,160
LABORATORY AREA	734-2,200	1,550-1,550	707-1,560	678-1,020	732-732	1,100-1,680	1,310-1,310	1,440-1,440
ADMINISTRATION AREA	1,180-1,960	-	663-1,340	379-1,810	-	1,040-1,600	-	-
ELECTRICAL SUBSTATION AREA	793-1,140	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	434-1,380	255-1,770	1,040-1,700	285-1,700	304-1,500	316-1,990	1,040-1,080	1,560-1,560
TANK FARM AND BOILER HOUSE AREA	1,520-1,520	444-444	1,330-1,330	572-572	476-476	-	-	-
D&D BUILDING AND DRUM BALING AREA	1,180-1,350	-	-	654-654	-	-	-	-
SCRAP METAL PILE	588-1,260	-	1,050-1,050	1,460-1,460	2,250-2,250	-	-	-
GRAPHITE FURNACE AREA	295-2,850	400-1,540	273-1,690	374-1,410	555-1,430	1,190-2,070	1,050-1,050	-
KC-2 WAREHOUSE	480-766	-	-	-	-	-	-	-
FIRE TRAINING AREA	300-1,490	-	-	590-1,020	-	-	-	-
TRAP RANGE	296-1,860	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	988-1,590	910-1,530	930-2,270	698-1,610	797-2,930	576-10,900	413-1,330	-
K-65/CLEARWELL LINE WEST	891-1,470	1,090-1,870	-	-	-	1,830-2,150	1,360-1,360	-
NORTHEAST AREA OF FEMP	237-1,940	-	648-945	440-1,580	1,360-1,360	2,130-2,320	1,480-1,480	1,490-1,490
SOUTHERN AREA OF FEMP	253-1,300	-	-	-	-	-	-	-
WESTERN AREA OF FEMP	477-2,070	-	648-4,230	1,220-1,230	1,440-1,750	-	-	1,040-1,040
NORTHWESTERN AREA OF FEMP	486-2,080	-	-	-	-	-	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	632-1,470	-	-	-	-	-	-	-

TABLE D.1-75
SELENIUM

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	●	●	-	○	○	-	-	-	▒	-	○	-	-	○	-	●	-	●	○	●	-					○	●	■	●	○	
0.5 - 1	○	-		▒		-	-					▒	○			■				○	-										
1 - 1.5	-	○	-	○	-	-	-	-	-	-		-	-		-	▒				-						-		▒			
Subsurface Soil:																															
1.5 - 3	-	X	-	-	-	-	-	X	X	-		-	X	-	-	X		-		X						-		X			
3 - 5	-			-		-		-	-			-	X		-	X				X						-		-			
5 - 10	X	X	-	X	X	-		X	-	-		-				X				X	-					-					
10 - 15	-	-				-		X	-			-				-				-	-					-					
15 - 20	-					-		-	-			-														-		-			

[ ]	"Blank" - Not analyzed.
[-]	Analyzed and not detected.
[○]	Detection less than 95th percentile background value.
[●]	Detection above but < 2 X 95th percentile background value.
[▒]	Detection 2 to 5 X 95th percentile background value.
[■]	Detection greater than 5 X 95th percentile background value.
[X]	Detection where background level not recorded.

TABLE D.1-76
SELENIUM DETECTIONS BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	ND	0.52- 0.52	ND	ND	ND	0.49- 0.49	ND	ND
PLANT 2/3 AREA	0.26- 1.00	ND	0.64- 0.64	0.81- 0.81	-	0.72- 0.75	ND	-
PLANT 4/5/7 AREA	ND	-	ND	ND	-	ND	-	-
PLANT 6 AREA	0.67- 0.67	ND	0.54- 0.54	ND	ND	0.76- 0.76	-	-
PLANT 8 AREA	0.37- 0.37	-	ND	ND	-	0.81- 0.81	-	-
PLANT 9 AREA	ND	ND	ND	ND	ND	ND	ND	ND
SEWAGE TREATMENT PLANT	ND	ND	ND	ND	-	-	-	-
PILOT PLANT AREA	ND	-	ND	0.82- 0.82	ND	1.20- 1.20	2.80- 2.80	ND
LABORATORY AREA	0.34- 2.30	-	ND	0.60- 0.60	ND	ND	ND	ND
ADMINISTRATION AREA	-	-	-	-	-	-	-	-
ELECTRICAL SUBSTATION AREA	0.41- 0.42	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	ND	2.60- 2.60	ND	ND	ND	ND	ND	ND
TANK FARM AND BOILER HOUSE AREA	ND	0.70- 0.70	ND	0.59- 0.59	ND	-	-	-
D&D BUILDING AND DRUM BALING AREA	0.55- 0.55	-	-	ND	-	-	-	-
SCRAP METAL PILE	ND	-	ND	ND	ND	-	-	-
GRAPHITE FURNACE AREA	1.00- 1.00	0.48- 7.70	0.89- 1.90	0.54- 0.80	0.59- 1.60	0.32- 0.62	ND	-
KC-2 WAREHOUSE	ND	-	-	-	-	-	-	-
FIRE TRAINING AREA	0.51- 0.81	-	-	ND	-	-	-	-
TRAP RANGE	0.23- 0.25	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	0.65- 0.84	0.46- 0.65	ND	3.30- 3.30	0.42- 0.87	0.47- 1.80	ND	-
K-65/CLEARWELL LINE WEST	ND	ND	-	-	-	ND	ND	-
NORTHEAST AREA OF FEMP	0.51- 0.57	-	ND	ND	ND	ND	ND	ND
SOUTHERN AREA OF FEMP	0.51- 0.80	-	-	-	-	-	-	-
WESTERN AREA OF FEMP	0.37- 3.70	-	0.73- 1.50	1.00- 1.00	ND	-	-	ND
NORTHWESTERN AREA OF FEMP	0.32- 0.77	-	-	-	-	-	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	0.28- 0.28	-	-	-	-	-	-	-

ND - NOT DETECTED

TABLE D.1-77
SILICON

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	●	O	O	-	O	O	●	O	O	O	O	O	-	O	O	O	O	O	O	O	O					O	O	●	O	O	
0.5 - 1	O	-					●													O	O										
1 - 1.5	O	O	O	O	O	O	●	O	O	O		O	-		O	O				O						O		O			
Subsurface Soil:																															
1.5 - 3	O	O	O		O	O	●	O	O	O		O			O	O		O		O						O		O			
3 - 5	-								O						O	O				O						O		O			
5 - 10		O	O		O	O		O	O	O		O				O				●	O										
10 - 15	O	O				O		O	-			O								O											
15 - 20	-					O			-			O																			

"Blank" - Not analyzed.

- Analyzed and not detected.

O Detection less than 95th percentile background value.

● Detection above but < 2 X 95th percentile background value.

Detection 2 to 5 X 95th percentile background value.

Detection greater than 5 X 95th percentile background value.

X Detection where background level not recorded.

TABLE D.1-78
SILICON DETECTIONS BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	155.00- 6660.00	322.00- 727.00	327.00- 327.00	123.00- 930.00	ND	-	106.00- 106.00	ND
PLANT 2/3 AREA	65.00- 172.00	ND	46.40- 101.00	73.60- 90.40	-	30.60- 50.70	121.00- 121.00	-
PLANT 4/5/7 AREA	179.00- 191.00	-	487.00- 627.00	435.00- 435.00	-	243.00- 580.00	-	-
PLANT 6 AREA	65.20- 65.20	-	119.00- 119.00	-	-	-	-	-
PLANT 8 AREA	119.00- 119.00	-	121.00- 121.00	158.00- 158.00	-	86.60- 213.00	-	-
PLANT 9 AREA	445.00- 445.00	-	802.00- 802.00	758.00- 758.00	-	512.00- 669.00	561.00- 561.00	450.00- 450.00
SEWAGE TREATMENT PLANT	128.00- 3960.00	2570.00- 3300.00	798.00- 2880.00	703.00- 2920.00	-	-	-	-
PILOT PLANT AREA	180.00- 1330.00	-	137.00- 1200.00	389.00- 1220.00	-	128.00- 1130.00	148.00- 1030.00	-
LABORATORY AREA	520.00- 522.00	-	471.00- 671.00	524.00- 726.00	503.00- 503.00	523.00- 688.00	ND	ND
ADMINISTRATION AREA	31.80- 78.50	-	44.40- 60.50	33.70- 56.80	-	17.60- 79.90	-	-
ELECTRICAL SUBSTATION AREA	429.00- 977.00	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	240.00- 580.00	-	566.00- 566.00	447.00- 447.00	-	394.00- 680.00	437.00- 565.00	715.00- 715.00
TANK FARM AND BOILER HOUSE AREA	57.00- 57.00	-	ND	-	-	-	-	-
D&D BUILDING AND DRUM BALING AREA	671.00- 739.00	-	-	-	-	-	-	-
SCRAP METAL PILE	158.00- 871.00	-	54.40- 54.40	125.00- 125.00	135.00- 135.00	-	-	-
GRAPHITE FURNACE AREA	54.80- 975.00	-	46.50- 735.00	58.70- 651.00	47.10- 577.00	97.40- 145.00	-	-
KC-2 WAREHOUSE	620.00- 1100.00	-	-	-	-	-	-	-
FIRE TRAINING AREA	247.00- 797.00	-	-	872.00- 872.00	-	-	-	-
TRAP RANGE	56.90- 718.00	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	218.00- 652.00	98.90- 593.00	597.00- 818.00	114.00- 647.00	60.50- 767.00	24.60- 5950.00	539.00- 728.00	-
K-65/CLEARWELL LINE WEST	485.00- 1170.00	811.00- 974.00	-	-	-	632.00- 1310.00	-	-
NORTHEAST AREA OF FEMP	141.00- 1580.00	-	373.00- 373.00	262.00- 262.00	372.00- 372.00	-	-	-
SOUTHERN AREA OF FEMP	235.00- 1300.00	-	-	-	-	-	-	-
WESTERN AREA OF FEMP	86.50- 1920.00	-	143.00- 953.00	422.00- 422.00	322.00- 322.00	-	-	-
NORTHWESTERN AREA OF FEMP	216.00- 1660.00	-	-	-	-	-	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	256.00- 1590.00	-	-	-	-	-	-	-

ND - NOT DETECTED

TABLE D.1-79
SILVER

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	X	X	-	X	X	X	X	X	X	-	X	X	-	X	X	X	X	X	-	X	X					X	X	X	X	-	
0.5 - 1	X	X		X		X	X	X	X			X	X			X				X	-										
1 - 1.5	X	X	X	-		X	-	-	X	-		X	-		-	-				-						X		X			
Subsurface Soil:																															
1.5 - 3	X	X	-	-	-	X	-	X	X	-		X	X	-	-	X		X		X						X					
3 - 5	-			X		X		X	X			X	X		X	X				X						-					
5 - 10	-	X	-	X	-	X		X	-	-		X				X				X	X					X					
10 - 15	-	-				X		X	-			X				X				X	X					-					
15 - 20	-					X		X	-			X														-		X			

"Blank" - Not analyzed.

- Analyzed and not detected.

O Detection less than 95th percentile background value.

• Detection above but < 2 X 95th percentile background value.

Detection 2 to 5 X 95th percentile background value.

Detection greater than 5 X 95th percentile background value.

X Detection where background level not recorded.

TABLE D.1-80
SILVER DETECTIONS BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	0.97- 10.20	3.00- 8 30	2.90- 2.90	3.50- 10.10	ND	ND	ND	ND
PLANT 2/3 AREA	7.70- 17.20	5.90- 8.30	1.50- 2.20	1.00- 1.00	-	3.90- 3.90	ND	-
PLANT 4/5/7 AREA	ND	-	7.80- 7.80	ND	-	ND	-	-
PLANT 6 AREA	1.10- 8.30	3.60- 8.00	ND	ND	2.90- 9.00	1.40- 1.40	-	-
PLANT 8 AREA	8.20- 15.20	-	ND	ND	-	ND	-	-
PLANT 9 AREA	4.00- 4.00	5.00- 5.00	4.10- 6.90	4.80- 4.80	5.30- 5.30	4.10- 4.50	3.70- 3.70	2.40- 2.40
SEWAGE TREATMENT PLANT	1.30- 1.40	1.80- 1.80	ND	ND	-	-	-	-
PILOT PLANT AREA	2.90- 2.90	2.60- 3.10	ND	6.60- 6.60	2.30- 9.10	2.20- 3.50	8.20- 31.10	8.90- 8.90
LABORATORY AREA	3.40- 3.40	3.20- 3.20	7.00- 7.00	5.20- 5.20	3.70- 3.70	ND	ND	ND
ADMINISTRATION AREA	-	-	-	-	-	-	-	-
ELECTRICAL SUBSTATION AREA	2.90- 7.90	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	2.90- 4.40	3.00- 5.90	2.70- 2.70	2.30- 25.30	2.50- 6.30	3.20- 25.00	1.80- 4.20	2.40- 2.40
TANK FARM AND BOILER HOUSE AREA	ND	4.90- 4.90	ND	5.90- 5.90	23.70- 23.70	-	-	-
D&D BUILDING AND DRUM BALING AREA	6.30- 7.40	-	-	ND	-	-	-	-
SCRAP METAL PILE	3.60- 6.70	-	ND	ND	0.41- 0.41	-	-	-
GRAPHITE FURNACE AREA	2.90- 4.00	2.40- 36.40	ND	2.40- 30.50	2.50- 7.50	0.93- 7.70	7.40- 7.40	-
KC-2 WAREHOUSE	5.70- 7.10	-	-	-	-	-	-	-
FIRE TRAINING AREA	4.30- 10.40	-	-	2.80- 5.60	-	-	-	-
TRAP RANGE	ND	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	4.80- 9.70	4.20- 4.20	ND	4.90- 4.90	0.48- 9.80	3.40- 10.50	3.90- 3.90	-
K-65/CLEARWELL LINE WEST	4.60- 7.10	ND	-	-	-	7.80- 7.80	2.70- 2.70	-
NORTHEAST AREA OF FEMP	0.48- 6.10	-	5.80- 5.80	8.20- 8.20	ND	3.90- 4.10	ND	ND
SOUTHERN AREA OF FEMP	0.47- 8.70	-	-	-	-	-	-	-
WESTERN AREA OF FEMP	0.47- 10.40	-	4.60- 7.70	-	-	-	-	2.40- 2.40
NORTHWESTERN AREA OF FEMP	3.90- 3.90	-	-	-	-	-	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	-	-	-	-	-	-	-	-

ND - NOT DETECTED

TABLE D.1-81
SODIUM

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	■	⊙	-	■	■	⊙	●	■	■	■	●	■	-	●	■	■	■	●	●	●	⊙					⊙	⊙	■	●	○	
0.5 - 1	■	●		⊙		■	●	■	■			■	●			■				●	⊙										
1 - 1.5	■	⊙	●	■	●	■	●	■	●	■		■	-		-	⊙				●						●		●			
Subsurface Soil:																															
1.5 - 3	⊙	○	-	●	○	●	○	●	○	○		●	○	○	-	○		●		○						○		○			
3 - 5	-			⊙		●		●	○			●	○		-	○				○						-		○			
5 - 10	○	○	-	●	○	○		■	○	●		●				○				⊙	○					○					
10 - 15	-	○				○		■	-			○				○				○	○					○					
15 - 20	-					○		○	-			○														○		○			

□ "Blank" - Not analyzed.

- Analyzed and not detected.

○ Detection less than 95th percentile background value.

● Detection above but < 2 X 95th percentile background value.

⊙ Detection 2 to 5 X 95th percentile background value.

■ Detection greater than 5 X 95th percentile background value.

X Detection where background level not recorded.

TABLE D.1-82
SODIUM DETECTIONS BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	80.60- 294.00	54.40- 2070.00	98.10- 316.00	67.10- 1560.00	ND	203.00- 261.00	ND	ND
PLANT 2/3 AREA	91.10- 170.00	109.00- 160.00	100.00- 182.00	59.30- 157.00	-	106.00- 246.00	127.00- 215.00	-
PLANT 4/5/7 AREA	ND	-	103.00- 103.00	ND	-	ND	-	-
PLANT 6 AREA	61.30- 442.00	30.80- 106.00	183.00- 556.00	163.00- 373.00	76.10- 697.00	194.00- 317.00	-	-
PLANT 8 AREA	125.00- 707.00	-	123.00- 212.00	138.00- 138.00	-	155.00- 223.00	-	-
PLANT 9 AREA	182.00- 182.00	265.00- 265.00	142.00- 323.00	167.00- 411.00	425.00- 425.00	176.00- 181.00	190.00- 190.00	190.00- 190.00
SEWAGE TREATMENT PLANT	27.70- 94.10	78.20- 151.00	79.60- 166.00	159.00- 208.00	-	-	-	-
PILOT PLANT AREA	68.10- 2030.00	220.00- 2220.00	150.00- 739.00	102.00- 606.00	52.20- 385.00	57.10- 1600.00	133.00- 1700.00	159.00- 159.00
LABORATORY AREA	85.70- 2180.00	2090.00- 2090.00	70.10- 154.00	118.00- 229.00	150.00- 150.00	164.00- 196.00	ND	ND
ADMINISTRATION AREA	99.70- 482.00	-	119.00- 322.00	280.00- 280.00	-	136.00- 302.00	-	-
ELECTRICAL SUBSTATION AREA	64.90- 155.00	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	182.00- 2070.00	95.10- 2360.00	197.00- 447.00	81.50- 414.00	95.90- 287.00	135.00- 304.00	111.00- 218.00	218.00- 218.00
TANK FARM AND BOILER HOUSE AREA	ND	141.00- 141.00	ND	135.00- 135.00	191.00- 191.00	-	-	-
D&D BUILDING AND DRUM BALING AREA	111.00- 240.00	-	-	284.00- 284.00	-	-	-	-
SCRAP METAL PILE	93.60- 2120.00	-	ND	ND	ND	-	-	-
GRAPHITE FURNACE AREA	60.90- 2000.00	48.40- 1700.00	81.80- 124.00	55.70- 193.00	45.00- 152.00	49.00- 197.00	139.00- 139.00	-
KC-2 WAREHOUSE	265.00- 403.00	-	-	-	-	-	-	-
FIRE TRAINING AREA	77.10- 171.00	-	-	85.30- 383.00	-	-	-	-
TRAP RANGE	35.00- 81.10	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	87.00- 127.00	82.90- 134.00	139.00- 139.00	87.10- 216.00	91.80- 167.00	42.20- 638.00	185.00- 239.00	-
K-65/CLEARWELL LINE WEST	42.70- 184.00	94.50- 129.00	-	-	-	152.00- 180.00	146.00- 146.00	-
NORTHEAST AREA OF FEMP	25.20- 141.00	-	70.30- 70.30	129.00- 129.00	ND	205.00- 252.00	227.00- 227.00	260.00- 260.00
SOUTHERN AREA OF FEMP	27.60- 157.00	-	-	-	-	-	-	-
WESTERN AREA OF FEMP	42.00- 262.00	-	38.90- 163.00	62.50- 62.50	176.00- 176.00	-	-	165.00- 165.00
NORTHWESTERN AREA OF FEMP	27.90- 143.00	-	-	-	-	-	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	36.40- 36.40	-	-	-	-	-	-	-

ND - NOT DETECTED

TABLE D.1-83
THALLIUM

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Bailing Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	O	O	-	O	-	-	O	-	O	O	-	O	-	-	-	O	-	-	-	O	-					●	-	O	●	O	
0.5 - 1	O	-		O		-	-	-	-			●	-			O				O	-										
1 - 1.5	O	O	-	O		-	-	-	O	O		O	-		-	O				-						-		O			
Subsurface Soil:																															
1.5 - 3	●	-	-	-	-	-	-	-	-	O		-	-	-	-	-		-		O						-		O			
3 - 5	O			●		-		-	-			●	-		-	O				O						-		O			
5 - 10	-	O	-	-	-	-		-	O	O		-				-				O	-					-					
10 - 15	-	O				-		-	O			-				-				O	-					-					
15 - 20	-					-		-	O			-														-		-			

"Blank" - Not analyzed.

- Analyzed and not detected.

O Detection less than 95th percentile background value.

● Detection above but < 2 X 95th percentile background value.

Detection 2 to 5 X 95th percentile background value.

Detection greater than 5 X 95th percentile background value.

X Detection where background level not recorded.

TABLE D.1-84
THALLIUM DETECTIONS BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	0.11- 0 41	0 35- 0.55	0.27- 0.27	0.25- 0.72	0.26- 0.26	ND	ND	ND
PLANT 2/3 AREA	0.29- 0.44	ND	0.28- 0.49	ND	-	0.26- 0.38	0.24- 0.28	-
PLANT 4/5/7 AREA	ND	-	ND	ND	-	ND	-	-
PLANT 6 AREA	0.23- 0.23	0.46- 0.46	0.23- 0.23	ND	0.57- 0.57	ND	-	-
PLANT 8 AREA	ND	-	ND	ND	-	ND	-	-
PLANT 9 AREA	ND	ND	ND	ND	ND	ND	ND	ND
SEWAGE TREATMENT PLANT	0.25- 0.47	ND	ND	ND	-	-	-	-
PILOT PLANT AREA	ND	ND	ND	ND	ND	ND	ND	ND
LABORATORY AREA	0.29- 0.40	ND	0.44- 0.44	ND	ND	0.29- 0.29	0.31- 0.31	0.27- 0.27
ADMINISTRATION AREA	0.27- 0.30	-	0.30- 0.37	0.26- 0.35	-	0.32- 0.35	-	-
ELECTRICAL SUBSTATION AREA	ND	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	0.38- 0.38	0.39- 0.60	0.34- 0.34	ND	0.50- 0.50	ND	ND	ND
TANK FARM AND BOILER HOUSE AREA	ND	ND	ND	ND	ND	-	-	-
D&D BUILDING AND DRUM BALING AREA	ND	-	-	ND	-	-	-	-
SCRAP METAL PILE	ND	-	ND	ND	ND	-	-	-
GRAPHITE FURNACE AREA	0.32- 0.42	0.24- 0.46	0.37- 0.37	ND	0.48- 0.48	ND	ND	-
KC-2 WAREHOUSE	ND	-	-	-	-	-	-	-
FIRE TRAINING AREA	ND	-	-	ND	-	-	-	-
TRAP RANGE	ND	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	0.51- 0.51	0.26- 0.26	ND	0.28- 0.28	0.26- 0.31	0.23- 0.44	0.28- 0.28	-
K-65/CLEARWELL LINE WEST	ND	ND	-	-	-	ND	ND	-
NORTHEAST AREA OF FEMP	0.75- 0.75	-	ND	ND	ND	ND	ND	ND
SOUTHERN AREA OF FEMP	ND	-	-	-	-	-	-	-
WESTERN AREA OF FEMP	0.44- 0.44	-	0.27- 0.27	0.27- 0.27	0.33- 0.33	-	-	ND
NORTHWESTERN AREA OF FEMP	0.67- 0.67	-	-	-	-	-	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	0.32- 0.32	-	-	-	-	-	-	-

ND - NOT DETECTED

TABLE D.1-85
VANADIUM

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/5/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	●	●	●	○	○	○	●	●	●	●	○	○	●	○	○	●	○	○	○	○	○					●	○	●	○	●	
0.5 - 1	●	○		○		○	●	○	○			●	○			●				○	●										
1 - 1.5	●	○	●	○	○	○	●	●	●	○		○	●		-	●				○						●		●			
Subsurface Soil:																															
1.5 - 3	●	○	○	●	○	○	●	○	○	○		○	○	○	○	○		○		○						●		○			
3 - 5	○			○		○		○	○			○	○		-	○				●						○		○			
5 - 10	○	○	○	○	○	○		●	○	○		○				○				■	●					○					
10 - 15	○	○				○		○	○			○				○				○	○					○					
15 - 20	○					○		○	○			○														○		○			

- [ ] "Blank" - Not analyzed.
- [-] Analyzed and not detected.
- [○] Detection less than 95th percentile background value.
- [●] Detection above but < 2 X 95th percentile background value.
- [●] Detection 2 to 5 X 95th percentile background value.
- [■] Detection greater than 5 X 95th percentile background value.
- [X] Detection where background level not recorded.

000902

TABLE D.1-86
VANADIUM DETECTIONS BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	8.20- 33.90	8.50- 37.60	16.80- 36.80	7.00- 41.80	26.70- 26.70	19.40- 28.50	25.00- 25.00	18.60- 18.60
PLANT 2/3 AREA	11.70- 35.60	18.10- 30.20	16.30- 28.80	21.70- 32.40	-	21.80- 36.80	17.40- 25.80	-
PLANT 4/5/7 AREA	25.30- 38.40	-	21.40- 42.60	36.40- 36.40	-	25.30- 25.30	-	-
PLANT 6 AREA	16.30- 27.70	4.30- 25.20	10.90- 29.50	15.00- 44.00	4.70- 32.30	12.60- 25.20	-	-
PLANT 8 AREA	8.50- 27.80	-	11.10- 19.40	6.70- 6.70	-	18.80- 21.80	-	-
PLANT 9 AREA	20.90- 20.90	22.60- 22.60	13.20- 21.80	19.40- 20.60	23.70- 23.70	21.30- 25.00	20.10- 20.10	19.20- 19.20
SEWAGE TREATMENT PLANT	21.30- 38.20	28.90- 32.60	34.50- 47.30	26.50- 51.30	-	-	-	-
PILOT PLANT AREA	5.60- 34.80	17.70- 26.90	16.90- 35.60	15.20- 28.70	18.90- 29.40	10.40- 49.70	15.40- 22.70	17.20- 17.20
LABORATORY AREA	19.00- 31.10	23.50- 23.50	19.50- 39.80	14.70- 35.30	23.20- 23.20	16.10- 26.40	19.00- 19.00	25.40- 25.40
ADMINISTRATION AREA	21.60- 35.40	-	21.50- 26.60	11.90- 31.30	-	15.90- 27.70	-	-
ELECTRICAL SUBSTATION AREA	11.20- 29.00	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	9.10- 29.50	8.40- 30.50	16.50- 21.50	10.20- 29.70	12.80- 22.50	12.40- 24.30	13.10- 27.50	17.90- 17.90
TANK FARM AND BOILER HOUSE AREA	34.30- 34.30	15.10- 15.10	32.00- 32.00	23.60- 23.60	21.30- 21.30	-	-	-
D&D BUILDING AND DRUM BALING AREA	20.10- 25.90	-	-	25.00- 25.00	-	-	-	-
SCRAP METAL PILE	12.50- 30.30	-	ND	31.40- 31.40	ND	-	-	-
GRAPHITE FURNACE AREA	8.50- 32.60	16.60- 41.30	13.80- 39.40	15.70- 33.10	14.70- 31.40	18.20- 35.00	17.90- 17.90	-
KC-2 WAREHOUSE	12.50- 20.30	-	-	-	-	-	-	-
FIRE TRAINING AREA	10.50- 29.70	-	-	20.40- 25.80	-	-	-	-
TRAP RANGE	14.00- 25.30	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	23.20- 27.70	20.70- 29.70	17.30- 29.50	17.90- 36.80	18.10- 47.00	10.40- 190.00	13.30- 21.80	-
K-65/CLEARWELL LINE WEST	25.10- 29.30	28.80- 37.50	-	-	-	23.50- 42.10	25.00- 25.00	-
NORTHEAST AREA OF FEMP	11.40- 42.90	-	18.60- 36.70	21.90- 42.50	29.30- 29.30	25.40- 25.60	13.30- 13.30	17.00- 17.00
SOUTHERN AREA OF FEMP	9.50- 27.50	-	-	-	-	-	-	-
WESTERN AREA OF FEMP	13.90- 49.00	-	25.50- 44.00	21.40- 24.80	22.10- 23.80	-	-	23.40- 23.40
NORTHWESTERN AREA OF FEMP	12.20- 28.80	-	-	-	-	-	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	15.60- 33.40	-	-	-	-	-	-	-

ND - NOT DETECTED

TABLE D.1-87
ZINC

Depth Interval, Feet	Plant 1 Area	Plant 2/3 Area	Plant 4/6/7 Area	Plant 6 Area	Plant 8 Area	Plant 9 Area	Sewage Treatment Plant Area	Pilot Plant Area	Laboratory Area	Administration Area	Electrical Substation Area	Maintenance Building	Tank Farm and Boiler House	D&D Building and Drum Baling Area	Scrap Metal Pile & Decontamination Building	Graphite Furnace, Oil Burner, and Coal Pile Area	KC-2 Warehouse Area	Fire Training Area	Trap Range	Area West of K-65 Silos	K-65/Clearwell Line (West of Production Area)	Clearwell Line (East of Production Area)	Outfall Pipeline	Great Miami Riverbank Characterization	Southwest Field Area	Northeastern Area of FEMP	Southern Area of FEMP	Western Area of FEMP	Northwestern Area of FEMP	Area Outside of FEMP Adjacent to Boundary	Area 2-5 Miles Outside of FEMP Boundary
Surface Soil:																															
0 - 0.5	■	◉	●	◉	○	○	■	●	●	●	◉	■	●	◉	■	◉	■	■	◉	●	●						●	◉	◉	●	
0.5 - 1	○	●		○		●	●	○				■	○			◉				◉	●										
1 - 1.5	■	●	●	●	○	○	●	●	●	○		◉	●		●	●				○								◉			
Subsurface Soil:																															
1.5 - 3	◉	●	○	●	○	○	●	○	●	●		○	○	○	○	●		○		●								○			
3 - 5	■			●		○		○	○			○	○		○	◉				●								○			
5 - 10	◉	●	○	○	○	○		○	●	●		○				○				■	○										
10 - 15	◉	●				○		○	○			○				○				○	○										
15 - 20	◉					○		○	◉			○																○			

□ "Blank" - Not analyzed.

- Analyzed and not detected.

○ Detection less than 95th percentile background value.

● Detection above but < 2 X 95th percentile background value.

◉ Detection 2 to 5 X 95th percentile background value.

■ Detection greater than 5 X 95th percentile background value.

X Detection where background level not recorded.

000904

TABLE D.1-88
ZINC DETECTIONS BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	28.90- 318.00	9.20- 58.20	52.60- 502.00	22.00- 189.00	780.00- 780.00	192.00- 202.00	391.00- 391.00	442.00- 442.00
PLANT 2/3 AREA	35.90- 247.00	32.90- 89.00	38.80- 90.60	51.10- 129.00	-	54.90- 101.00	33.10- 164.00	-
PLANT 4/5/7 AREA	48.40- 63.50	-	26.50- 77.00	63.40- 63.40	-	47.10- 75.90	-	-
PLANT 6 AREA	45.80- 153.00	6.20- 56.00	63.70- 99.10	49.80- 98.80	17.30- 82.10	76.60- 81.00	-	-
PLANT 8 AREA	25.80- 45.50	-	18.50- 18.50	17.40- 17.40	-	49.30- 64.20	-	-
PLANT 9 AREA	44.00- 44.00	86.50- 86.50	22.90- 41.10	37.50- 41.50	53.60- 53.60	45.20- 64.20	49.50- 49.50	38.70- 38.70
SEWAGE TREATMENT PLANT	54.70- 432.00	50.00- 110.00	57.00- 79.40	44.80- 89.90	-	-	-	-
PILOT PLANT AREA	33.50- 66.10	42.80- 42.80	38.10- 97.60	26.80- 49.50	36.80- 43.90	39.90- 67.10	22.20- 56.30	40.70- 40.70
LABORATORY AREA	53.50- 105.00	-	53.20- 65.20	35.50- 96.40	41.40- 41.40	48.30- 85.10	60.00- 60.00	363.00- 363.00
ADMINISTRATION AREA	53.90- 78.80	-	41.20- 56.20	22.70- 85.10	-	46.40- 84.90	-	-
ELECTRICAL SUBSTATION AREA	38.50- 218 00	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	22.50- 767.00	21.30- 324.00	32.20- 228.00	16.70- 57.90	19.50- 59.40	20.10- 44.30	26.70- 47.00	29.50- 29.50
TANK FARM AND BOILER HOUSE AREA	72.50- 72.50	45.50- 45.50	81.60- 81.60	38.90- 38.90	38.50- 38.50	-	-	-
D&D BUILDING AND DRUM BALING AREA	55.40- 239.00	-	-	63.00- 63.00	-	-	-	-
SCRAP METAL PILE	82.00- 764.00	-	61.60- 61.60	77.80- 77.80	37.10- 37.10	-	-	-
GRAPHITE FURNACE AREA	17.80- 248.00	42.70- 285.00	38.40- 91.80	23.70- 113.00	35.50- 216.00	36.90- 77.10	35.60- 35.60	-
KC-2 WAREHOUSE	112.00- 378.00	-	-	-	-	-	-	-
FIRE TRAINING AREA	43.20- 2150.00	-	-	47.30- 75.30	-	-	-	-
TRAP RANGE	24.50- 168.00	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	47.40- 64.70	46.10- 189.00	58.80- 58.80	40.70- 158.00	39.30- 102.00	21.60- 486.00	29.20- 43.30	-
K-65/CLEARWELL LINE WEST	55.90- 94.40	57.50- 60.40	-	-	-	55.70- 80.20	60.40- 60.40	-
NORTHEAST AREA OF FEMP	15.40- 90.90	-	41.50- 44.50	33.80- 66.80	45.60- 45.60	46.50- 49.00	26.70- 26.70	31.20- 31.20
SOUTHERN AREA OF FEMP	23.20- 96.80	-	-	-	-	-	-	-
WESTERN AREA OF FEMP	32.90- 137.00	-	43.00- 285.00	49.40- 72.20	53.30- 58.10	-	-	44.40- 44.40
NORTHWESTERN AREA OF FEMP	28.50- 137.00	-	-	-	-	-	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	39.10- 115.00	-	-	-	-	-	-	-

TABLE D.1-89
1,1,1-TRICHLOROETHANE BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	1.00- 1.00	5.00- 5.00	ND	2.00- 2.00	ND	ND	ND	ND
PLANT 2/3 AREA	ND	ND	ND	ND	-	6.00- 22.00	ND	-
PLANT 4/5/7 AREA	ND	-	ND	ND	-	ND	ND	-
PLANT 6 AREA	1.00- 9400.00	-	ND	ND	2.00- 190.00	ND	-	-
PLANT 8 AREA	ND	-	ND	ND	-	ND	-	-
PLANT 9 AREA	ND	ND	1.00- 1.00	2.00- 2.00	1.00- 68.00	2.00- 2.00	ND	ND
SEWAGE TREATMENT PLANT	ND	ND	ND	ND	-	-	-	-
PILOT PLANT AREA	1.00- 1.00	ND	ND	ND	1000.00-1000.00	2.00-1500.00	9.00- 15.00	ND
LABORATORY AREA	ND	-	ND	ND	ND	ND	ND	ND
ADMINISTRATION AREA	-	-	-	-	-	-	-	-
ELECTRICAL SUBSTATION AREA	1.00- 100.00	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	210.00- 210.00	1.00- 110.00	ND	3.00- 460.00	2.00- 160.00	4.00- 13.00	ND	4.00- 4.00
TANK FARM AND BOILER HOUSE AREA	ND	7.00- 7.00	ND	200.00- 200.00	36.00- 36.00	-	-	-
D&D BUILDING AND DRUM BALING AREA	ND	-	-	ND	-	-	-	-
SCRAP METAL PILE	ND	-	ND	2.00- 2.00	ND	-	-	-
GRAPHITE FURNACE AREA	7.00- 7.00	2.00- 350.00	ND	9.00- 9.00	8.00- 6600.00	ND	ND	-
KC-2 WAREHOUSE	ND	-	-	-	-	-	-	-
FIRE TRAINING AREA	ND	-	-	3.00- 3.00	-	-	-	-
TRAP RANGE	ND	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	-	-	-	ND	ND	-	ND	-
K-65/CLEARWELL LINE WEST	ND	ND	-	ND	ND	ND	ND	-
CLEARWELL LINE EAST	-	-	-	-	-	5.00- 5.00	ND	-
NORTHEAST AREA OF FEMP	ND	-	ND	ND	ND	ND	3.00- 3.00	ND
SOUTHERN AREA OF FEMP	ND	-	-	-	-	ND	-	-
WESTERN AREA OF FEMP	ND	-	ND	2.00- 2.00	ND	ND	-	ND
NORTHWESTERN AREA OF FEMP	ND	-	-	-	-	1.00- 1.00	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	-	-	-	-	-	-	-	-
AREA 2-5 MILES OUTSIDE OF FEMP BOUNDARY	-	-	-	-	-	-	-	-

ND - NOT DETECTED

TABLE D.1-90
TETRACHLOROETHENE BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	1.00- 48000.00	ND	ND	3.00- 3.00	ND	ND	ND	4.00- 4.00
PLANT 2/3 AREA	ND	ND	ND	ND	-	3.00- 3.00	ND	-
PLANT 4/5/7 AREA	ND	-	ND	ND	-	ND	-	-
PLANT 6 AREA	1600.00- 1600.00	-	ND	ND	2.00- 3.00	520.00- 520.00	-	-
PLANT 8 AREA	2.00- 2.00	-	ND	ND	-	ND	-	-
PLANT 9 AREA	ND	ND	12.00- 20.00	10.00- 10.00	220.00- 220.00	ND	ND	ND
SEWAGE TREATMENT PLANT	ND	ND	ND	ND	-	-	-	-
PILOT PLANT AREA	1.00- 52.00	ND	9.00- 9.00	19.00- 42.00	6300.00- 6300.00	2.00- 21000.00	1.00- 17000.00	ND
LABORATORY AREA	ND	-	ND	ND	ND	ND	ND	ND
ADMINISTRATION AREA	-	-	-	-	-	-	-	-
ELECTRICAL SUBSTATION AREA	1.00- 1.00	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	3300.00- 3300.00	480.00- 2000.00	ND	2.00- 1600.00	2.00- 1300.00	2..00- 2.00	ND	ND
TANK FARM AND BOILER HOUSE AREA	ND	ND	ND	ND	ND	-	-	-
D&D BUILDING AND DRUM BALING AREA	ND	-	-	ND	-	-	-	-
SCRAP METAL PILE	ND	-	1.00- 1.00	1.00- 1.00	ND	-	-	-
GRAPHITE FURNACE AREA	1.00- 15.00	4.00- 15000.00	ND	1.00- 420.00	1.00- 2800.00	ND	ND	-
KC-2 WAREHOUSE	ND	-	-	-	-	-	-	-
FIRE TRAINING AREA	2.00- 170.00	-	-	2.00- 2.00	-	-	-	-
TRAP RANGE	ND	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	-	-	-	ND	1.00- 1.00	-	ND	-
K-65/CLEARWELL LINE WEST	ND	ND	-	ND	ND	ND	ND	-
CLEARWELL LINE EAST	-	-	-	-	-	ND	ND	-
NORTHEAST AREA OF FEMP	ND	-	ND	ND	ND	ND	ND	ND
SOUTHERN AREA OF FEMP	2.00- 3.00	-	-	-	-	ND	-	-
WESTERN AREA OF FEMP	2.00- 2.00	-	ND	ND	ND	ND	-	ND
NORTHWESTERN AREA OF FEMP	ND	-	-	-	-	ND	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	1.00- 1.00	-	-	-	-	-	-	-
AREA 2-5 MILES OUTSIDE OF FEMP BOUNDARY	-	-	-	-	-	-	-	-

ND - NOT DETECTED

TABLE D.1-91
1,1-DICHLOROETHANE BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	ND	ND	ND	ND	ND	ND	ND	ND
PLANT 2/3 AREA	ND	ND	ND	ND	-	5.00- 46.00	2.00- 20.00	-
PLANT 4/5/7 AREA	ND	-	ND	ND	-	ND	-	-
PLANT 6 AREA	ND	-	ND	ND	75.00- 460.00	ND	-	-
PLANT 8 AREA	ND	-	ND	ND	-	ND	-	-
PLANT 9 AREA	ND	ND	ND	ND	1.00- 1.00	ND	ND	ND
SEWAGE TREATMENT PLANT	ND	ND	ND	ND	-	-	-	-
PILOT PLANT AREA	4.00- 4.00	ND	ND	3.00- 3.00	16.00- 16.00	1.00- 33.00	2.00- 11.00	ND
LABORATORY AREA	ND	-	ND	ND	ND	ND	ND	ND
ADMINISTRATION AREA	-	-	-	-	-	-	-	-
ELECTRICAL SUBSTATION AREA	9.00- 16.00	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	ND	12.00- 12.00	ND	2.00-37.00	1.00- 310.00	ND	ND	ND
TANK FARM AND BOILER HOUSE AREA	ND	ND	ND	14.00- 14.00	ND	-	-	-
D&D BUILDING AND DRUM BALING AREA	ND	-	-	ND	-	-	-	-
SCRAP METAL PILE	ND	-	ND	ND	ND	-	-	-
GRAPHITE FURNACE AREA	ND	1.00- 22.00	ND	25.00- 25.00	6.00- 290.00	15.00- 15.00	ND	-
KC-2 WAREHOUSE	ND	-	-	-	-	-	-	-
FIRE TRAINING AREA	ND	-	-	6.00- 6.00	-	-	-	-
TRAP RANGE	ND	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	-	-	-	ND	ND	-	ND	-
K-65/CLEARWELL LINE WEST	ND	ND	-	ND	ND	ND	ND	-
CLEARWELL LINE EAST	-	-	-	-	-	2.00- 2.00	ND	-
NORTHEAST AREA OF FEMP	ND	-	ND	ND	ND	ND	ND	ND
SOUTHERN AREA OF FEMP	ND	-	-	-	-	ND	-	-
WESTERN AREA OF FEMP	ND	-	ND	ND	ND	ND	-	ND
NORTHWESTERN AREA OF FEMP	ND	-	-	-	-	ND	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	-	-	-	-	-	-	-	-

ND - NOT DETECTED

TABLE D.1-92
TRICHLOROETHENE BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	ND	ND	3.00- 3.00	1.00- 40.00	ND	ND	ND	ND
PLANT 2/3 AREA	ND	ND	ND	ND	-	ND	ND	-
PLANT 4/5/7 AREA	ND	-	ND	ND	-	ND	-	-
PLANT 6 AREA	3.00- 500.00	-	ND	ND	120.00- 570.00	330.00- 330.00	-	-
PLANT 8 AREA	ND	-	ND	ND	-	ND	-	-
PLANT 9 AREA	ND	ND	53.00- 64.00	4.00- 1100.00	99.00- 4400.00	ND	ND	2.00- 2.00
SEWAGE TREATMENT PLANT	ND	ND	ND	ND	-	-	-	-
PILOT PLANT AREA	3.00- 34.00	4.00- 5.00	2.00- 2.00	4.00- 20.00	83.00- 83.00	2.00- 37.00	2.00- 2000.00	ND
LABORATORY AREA	ND	-	ND	ND	ND	ND	ND	ND
ADMINISTRATION AREA	-	-	-	-	-	-	-	-
ELECTRICAL SUBSTATION AREA	ND	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	18.00- 89000.00	3.00- 56000.00	ND	1.00- 120000.00	4.00- 150000.00	3.00- 210.00	ND	ND
TANK FARM AND BOILER HOUSE AREA	ND	5.00- 5.00	ND	7.00- 7.00	2.00- 2.00	-	-	-
D&D BUILDING AND DRUM BALING AREA	ND	-	-	ND	-	-	-	-
SCRAP METAL PILE	ND	-	ND	ND	ND	-	-	-
GRAPHITE FURNACE AREA	1.00- 12.00	2.00- 90.00	ND	19.00.- 19.00	4.00- 1300.00	ND	ND	-
KC-2 WAREHOUSE	ND	-	-	-	-	-	-	-
FIRE TRAINING AREA	ND	-	-	1.00-1.00	-	-	-	-
TRAP RANGE	ND	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	-	-	-	ND	ND	-	ND	-
K-65/CLEARWELL LINE WEST	ND	ND	-	ND	ND	ND	18.00- 18.00	-
CLEARWELL LINE EAST	-	-	-	-	-	ND	ND	-
NORTHEAST AREA OF FEMP	ND	-	ND	ND	ND	ND	ND	ND
SOUTHERN AREA OF FEMP	2.00- 2.00	-	-	-	-	ND	-	-
WESTERN AREA OF FEMP	4.00- 6.00	-	ND	ND	ND	ND	-	7.00- 7.00
NORTHWESTERN AREA OF FEMP	4.00- 4.00	-	-	-	-	ND	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	ND	-	-	-	-	-	-	-
AREA 2-5 MILES OUTSIDE OF FEMP BOUNDARY	-	-	-	-	-	-	-	-

ND - NOT DETECTED

TABLE D.1-93
1,2-DICHLOROETHENE (TOTAL) BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	ND	ND	ND	4.00- 4.00	ND	ND	ND	ND
PLANT 2/3 AREA	ND	ND	ND	ND	-	ND	ND	-
PLANT 4/5/7 AREA	ND	-	ND	ND	-	ND	-	-
PLANT 6 AREA	ND	-	ND	2.00- 2.00	3.00- 320.00	48.00- 48.00	-	-
PLANT 8 AREA	ND	-	ND	ND	-	ND	-	-
PLANT 9 AREA	ND	ND	20.00- 20.00	25.00- 25.00	2.00- 16.00	ND	ND	ND
SEWAGE TREATMENT PLANT	ND	ND	ND	ND	-	-	-	-
PILOT PLANT AREA	19.00- 19.00	2.00- 2.00	3.00- 3.00	4.00- 6.00	14.00- 14.00	3.00- 17.00	10.00- 1600.00	ND
LABORATORY AREA	ND	-	ND	ND	ND	ND	ND	ND
ADMINISTRATION AREA	-	-	-	-	-	-	-	-
ELECTRICAL SUBSTATION AREA	ND	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	ND	110.00- 340.00	ND	14.00- 440.00	5.00- 4300.00	2.00- 130.00	ND	ND
TANK FARM AND BOILER HOUSE AREA	ND	ND	ND	ND	ND	-	-	-
D&D BUILDING AND DRUM BALING AREA	ND	-	-	ND	-	-	-	-
SCRAP METAL PILE	ND	-	ND	ND	ND	-	-	-
GRAPHITE FURNACE AREA	1.00- 1.00	3.00- 4.00	ND	1.00- 29.00	2.00- 150.00	33.00- 33.00	ND	-
KC-2 WAREHOUSE	ND	-	-	-	-	-	-	-
FIRE TRAINING AREA	ND	-	-	2.00- 2.00	-	-	-	-
TRAP RANGE	ND	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	-	-	-	ND	ND	-	ND	-
K-65/CLEARWELL LINE WEST	ND	ND	-	ND	ND	ND	ND	-
CLEARWELL LINE EAST	-	-	-	-	-	ND	ND	-
NORTHEAST AREA OF FEMP	ND	-	ND	ND	ND	ND	ND	ND
SOUTHERN AREA OF FEMP	ND	-	-	-	-	ND	-	-
WESTERN AREA OF FEMP	ND	-	ND	ND	ND	ND	-	ND
NORTHWESTERN AREA OF FEMP	ND	-	-	-	-	ND	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	-	-	-	-	-	-	-	-

ND - NOT DETECTED

TABLE D.1-94
1,2-DICHLOROETHANE BY AREA
MINIMUM - MAXIMUM (mg/kg)

LOCATION	DEPTH INTERVAL							
	SURFACE SOIL			SUBSURFACE SOIL				
	0.0 - 0.5 ft.	0.5 - 1.0 ft.	1.0 - 1.5 ft.	1.5 - 3.0 ft.	3.0 - 5.0 ft.	5.0 - 10.0 ft.	10.0 15.0 ft.	15.0 - 20.0 ft.
PLANT 1 AREA	ND	ND	ND	ND	ND	ND	ND	ND
PLANT 2/3 AREA	ND	ND	ND	ND	-	ND	ND	-
PLANT 4/5/7 AREA	ND	-	ND	ND	-	ND	ND	-
PLANT 6 AREA	ND	-	ND	ND	6.00- 10.00	ND	-	-
PLANT 8 AREA	ND	-	ND	ND	-	ND	-	-
PLANT 9 AREA	ND	ND	ND	ND	ND	ND	ND	ND
SEWAGE TREATMENT PLANT	ND	ND	ND	ND	-	-	-	-
PILOT PLANT AREA	ND	ND	ND	ND	ND	2.00- 2.00	2.00- 2.00	ND
LABORATORY AREA	ND	-	ND	ND	ND	ND	ND	ND
ADMINISTRATION AREA	-	-	-	-	-	-	-	-
ELECTRICAL SUBSTATION AREA	ND	-	-	-	-	-	-	-
MAINTENANCE BUILDING AREA	ND	ND	ND	ND	2.00- 2.00	ND	ND	ND
TANK FARM AND BOILER HOUSE AREA	ND	ND	ND	ND	ND	-	-	-
D&D BUILDING AND DRUM BALING AREA	ND	-	-	ND	-	-	-	-
SCRAP METAL PILE	ND	-	ND	ND	ND	-	-	-
GRAPHITE FURNACE AREA	ND	2.00- 2.00	ND	ND	ND	ND	ND	-
KC-2 WAREHOUSE	ND	-	-	-	-	-	-	-
FIRE TRAINING AREA	ND	-	-	ND	-	-	-	-
TRAP RANGE	ND	-	-	-	-	-	-	-
AREA WEST OF K-65 SILOS	-	-	-	ND	ND	-	ND	-
K-65/CLEARWELL LINE WEST	ND	ND	-	ND	ND	ND	ND	-
CLEARWELL LINE EAST	-	-	-	-	-	ND	ND	-
NORTHEAST AREA OF FEMP	ND	-	ND	ND	ND	ND	ND	ND
SOUTHERN AREA OF FEMP	ND	-	-	-	-	ND	-	-
WESTERN AREA OF FEMP	ND	-	ND	ND	ND	ND	-	ND
NORTHWESTERN AREA OF FEMP	ND	-	-	-	-	ND	-	-
AREA OUTSIDE OF FEMP ADJACENT TO BOUNDARY	-	-	-	-	-	-	-	-

ND - NOT DETECTED