# INTEGRATED ASSESSMENT (IA) REPORT

# BAKER WOOD CREOSOTING SITE

**Marion, Marion County**

**U.S. EPA ID: OH 001 326 610**

**Prepared by:**

**OHIO ENVIRONMENTAL PROTECTION AGENCY**
**Division of Emergency & Remedial Response**

**March 5, 1998**

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**Marion, Ohio**

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# 1.0 EXECUTIVE SUMMARY

Ohio Environmental Protection Agency (Ohio EPA) personnel conducted an Integrated Assessment (IA) at the former Baker Wood Creosoting in Marion, Marion County, Ohio on October 29, 1996. This Integrated Assessment was performed under the United States Environmental Protection Agency (USEPA) site investigation protocol. The purpose of this IA was to determine if work or disposal practices released contaminants into the environment, specifically to the site's soil and nearby surface water bodies.

# 2.0 INTRODUCTION

The Ohio EPA's Division of Emergency and Remedial Response (DERR) formed a cooperative agreement with the U.S. EPA, Region 5, to conduct an Integrated Assessment at the Baker Wood Creosoting site (USEPA ID: OH 001 326 610). The site has been a concern to the Ohio EPA since about 1988, when some of the highest concentrations of polynuclear aromatic hydrocarbon compounds (PAH's) in the state were detected in the sediments of a surface water body near the site. Many of the PAH's detected are also common constituents in creosote.

# 3.0 SITE BACKGROUND

## 3.1 Site Description

The Baker Wood Creosoting site consists of approximately 100 acres and is located on the west edge of the City of Marion, Marion county (Figures 1 & 2). The site is located in the northwest corner of the intersection of State Route 309 and Holland Road. The general land use within 1 mile of the site is industrial to the south, residential and commercial to the east and north, and agricultural to the west. Approximately ½ mile west of the site, North Rockswale Ditch crosses beneath Holland Road, then parallels the road west until it meets the Little Scioto River, approximately 1 mile west of the site. The site is not within the 100- or 500-year floodplain. The geographic coordinates for the site are 40° 35' 37" north latitude and 083° 09' 20" west longitude.

A combined sanitary/storm sewer is located adjacent to the site, along the southern border. The sewer travels beneath Holland Road, flowing west, and discharges directly into North Rockswale Ditch. Drawings provided by the City of Marion indicate that old sewer tie-ins from the preserving facility may still be in existence. During heavy periods of rainfall, the sewer flood gate at North Rockswale Ditch opens and directly discharges into the ditch. During these high water periods, the discharge carries a visible oil sheen. The water in the sewer as well as the sediments of North Rockswale Ditch have been sampled and analyzed; the results demonstrated PAH compounds historically associated with coal tars and the creosoting process. This combined sanitary/storm sewer is thought to be a direct link to the surface water contaminant migration pathway.

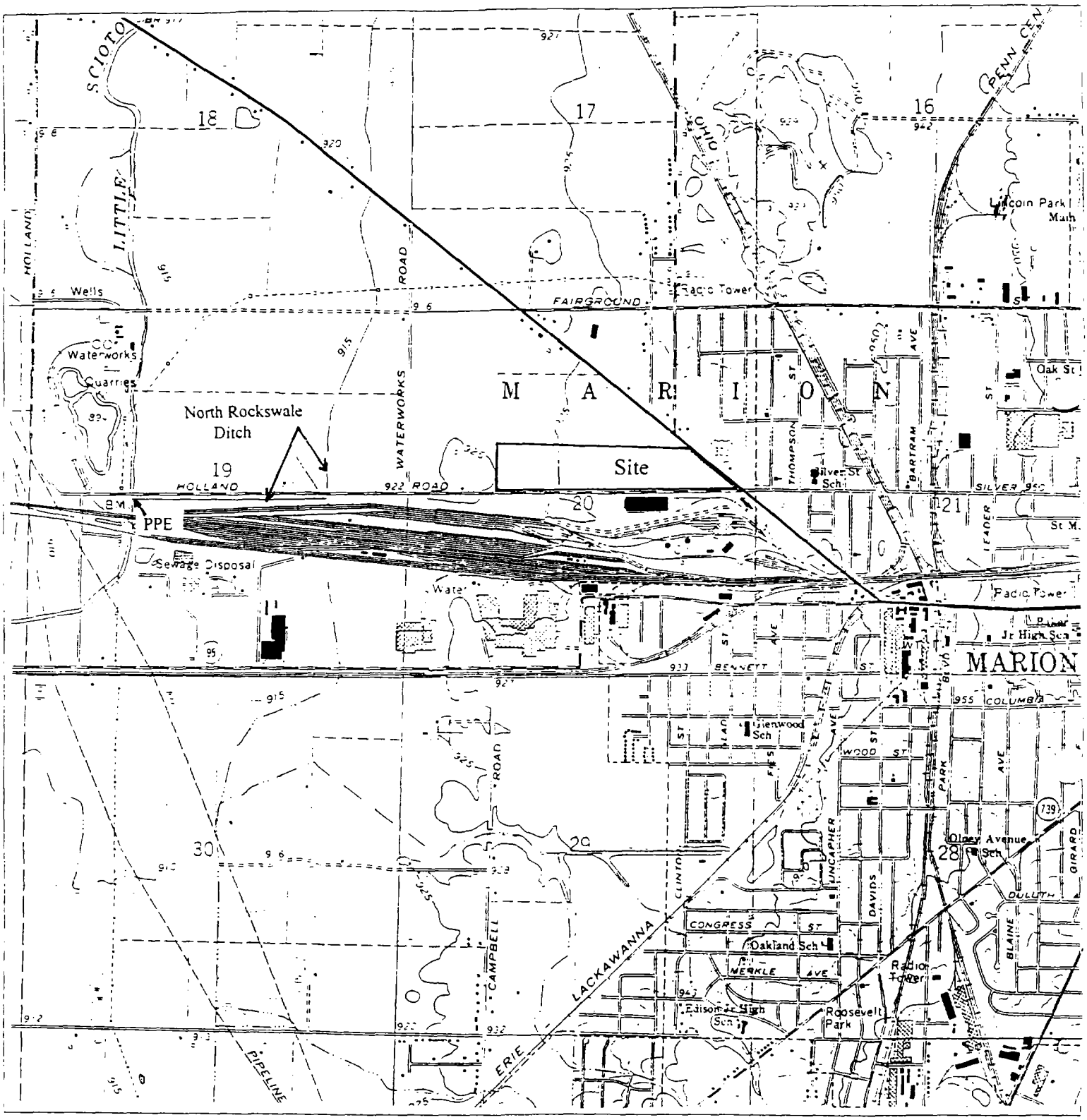


**Figure 1:** Baker Wood Creosoting - Site Location Map


QUADRANGLE LOCATION

MARION WEST, OHIO
SW/4 MARION 15' QUADRANGLE
N4030—W8307 5/7.5
PHOTOINSPECTED 1973
1961
PHOTOREVISED 1970
AMS 4365 II SW-SERIES V852

SCALE 1 24 000

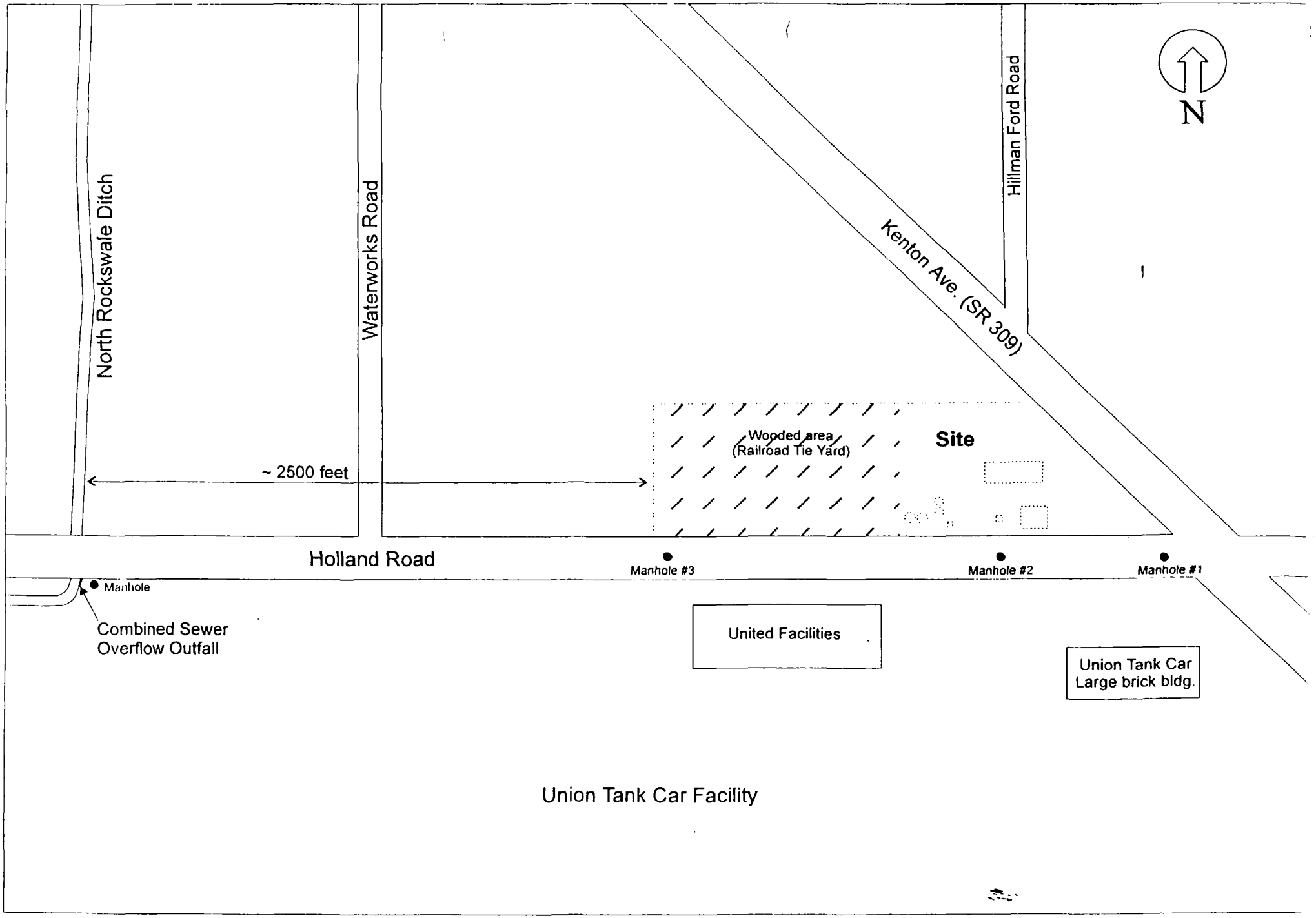


Figure 2: Baker Wood Creosoting Site - Site Features Map

The present owner of the site is the Baker Wood Limited Partnership. This partnership was created by the previous owner, Sims Bros., Inc. of Marion, Ohio and has, in the past, utilized the site to operate a scrap metal salvage yard. The site is currently vacant with no on-site workers. Evidence of the old creosoting operation still exists. The foundations of many of the old buildings are still evident, as are the foundations of the creosote storage tanks. The area once referred to as the railroad tie yard (approx. 2200 feet by 300 feet) has become overgrown with a dense woodland; however, stressed vegetation has been observed in several area of the wood lot. No terrestrial sensitive environments were identified within a 4-mile radius of the site and no surface water intakes are present within 15 miles downstream of the site. One sensitive environment was identified within the stream segment 15-mile target distance limit.

## 3.2 Site History

The wood treating industry has been in existence in the United States since for over a hundred years. The former Baker Wood Preserving Company operated as a preserver of lumber products in Marion from the 1890's until the 1960's. An early Sanborn insurance map (circa 1892) indicates that railroad ties were preserved with creosote and stacked to dry on the western portion of the property. The most likely process used at this facility was to treat wood in pressurized cylinders with creosote, in combination with petroleum or other solvents. It is not known if any other wood preserving techniques, such as using pentachlorophenol (PCP) or aqueous solutions of copper, chromium and arsenic, were practiced during operation.

The Ohio Department of Health (ODH), predecessor to the Ohio Environmental Protection Agency, first cited the Baker Wood Preserving company as a contributor of contamination to surface water on September 4, 1946. A letter to the City of Marion documents oil wastes being discharged from the Baker Wood Preserving company to the sewer and states that the receiving stream, Rockswale Ditch, of the storm sewer discharge is grossly polluted at and below the sewer outfall. In a letter dated December 4, 1946, to the Baker Wood Preserving Company, the ODH informed the company that it should install a waste treatment system. Ohio Department of Health documents contained in Ohio EPA files document that treatment system was not in place until May 1953. However, a letter dated April 29, 1958 from ODH, documents that creosote materials were still being discharged to surface water from the Baker Wood Creosoting Company.

A metal salvage yard had once occupied the eastern portion of the site until the early 1990's. Sims Brothers, Inc. began salvaging metal railroad tank cars in the 1970's when they purchased the property from the D.B. Frampton Company of Columbus, Ohio. The D.B. Frampton company merged with the Baker Wood Creosoting Company in the 1950's. It is not known what types of practices occurred during salvage operation.

## 3.3 Previous Site Work

Sediment samples were collected from the Little Scioto River and Scioto River by the Ohio EPA during 1988 and from the Little Scioto River and North Rockswale Ditch in 1991. From August 1992 to February, 1993, Ohio EPA's Division of Surface Water staff conducted biological community, fish tissue, biomarker, sediment and surface water sampling of the Little Scioto River. During this study, sediment sampling was also conducted in North Rockswale Ditch, Rockswale Ditch, Columbia Ditch and the Scioto River. Conclusions made from these investigations determined severe biological and water quality degradation in the Little Scioto River (at river mile 6.5), the entirety of Rockswale Ditch and the lower one mile of Columbia Ditch. Concentrations of PAH compounds in these sediments were among the highest observed in the published literature. Five of the PAH compounds identified in the Little Scioto River sediment in 1988 have been recognized as possible human carcinogens: benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, chrysene, and dibenzo(a,h)anthracene.

In October, 1991, the Ohio EPA's Site Investigation Field Unit conducted a field investigation of the site. The purpose of this investigation was to collect field data necessary to establish the existence of hazardous constituents, and to find evidence of waste migration to sensitive receptors. Results of this study concluded that PAH compounds are persisting in the soil at the Baker Wood Creosoting site. However, it was inconclusive as to determining whether contamination from the Baker Wood site was continuing to migrate off-site to the Little Scioto River.

On March 20, 1992, the Ohio Department of Health issued an advisory against swimming, wading and eating fish caught in a 4-mile length of the Little Scioto River, west of the city of Marion from Holland Road south to State Route 739.

## 3.4 Site Geology & Hydrology

Bedrock in this area is composed of limestone/dolomite. According to Ohio Department of Natural Resources (ODNR) well logs and county ground water resources maps, depth to bedrock is 30 to 64 feet near the site (Little, 1991). The limestone/dolomite bedrock appears to contain a shallow and deep aquifer (Wilson, 1985). Depth to water ranges from 40 feet (shallow aquifer) to 250 feet (deep aquifer). The shallow aquifer is used for private residential wells while the deep aquifer is pumped for the municipal water supply (E & E, 1990). The aquifer of concern is located at an approximate depth of 40 feet.

At the Marion City Landfill, southwest of the site, the bedrock is directly overlain by 2 to 42 feet of glacial outwash sand and gravel. Over the sand and gravel is 14 to 59 feet of glacial till consisting of clay and silt with occasional fine sand seams. The Baker Wood site is underlain by low permeability soils, glacial till and lacustrine deposits. Sand seams and lenses within the till can potentially transport contaminants and ground water laterally (Little, 1991).

Regional ground water flow in the bedrock aquifer is most likely influenced by the quarry northeast of the site and by the municipal well field west of the site. When pumping does not occur at the northeast quarry, ground water flow will be primarily influenced by the pumping of the well field to the west (Little, 1991). Other factors that influence ground water flow in this region are surface water bodies and hydraulic gradient. Typically, however, ground water flows westward in the direction of the Little Scioto River.

Surface water run-off drains to the west into the Little Scioto River, which flows south and connects to the Scioto River at Green Camp about 3 miles to the south. Smaller north-south running ditches are also near the site and drain to the Little Scioto River. One of these, Rockswale Ditch, appears to have cut across the Union Tank Car site in the past, however, its northern branch appears to have been truncated just south of Holland Road and rerouted to flow west to the Little Scioto River.

The municipal water supply for the City of Marion serves a population of approximately 51,500 and is primarily from the Little Scioto and Scioto rivers. Twenty to thirty percent of the water is from 16 ground water wells and is blended with the surface water to balance high turbidity. The ground water supply wells are located at the well field west of the site, just west of the Little Scioto. The wells are open to the limestone bedrock from approximately 45 to 60 feet from the surface to 180 to 450 feet deep. Depth to water as noted in well logs is approximately 20 to 45 feet deep. The water depth is at a higher elevation than the top of the bedrock and overlying sand and gravel and indicates that the bedrock aquifer and sand and gravel is confined by the overlying clay.

# 4.0 SAMPLING LOCATIONS AND RESULTS DISCUSSION

Environmental samples were collected from soil and surface water matrices during the Integrated Assessment on October 29, 1996. All samples were analyzed by U.S. EPA Contract Laboratory Program (CLP) laboratories. Analyses included the following parameters: volatile organic compounds (VOC's), semi-volatile organic compounds (SVOC's), pesticides, PCB's, and target analyte list (TAL) metals. Since metals were not constituents of concern in the surface water pathway, surface water samples were not analyzed for inorganics.

Standard quality assurance and quality control (QA/QC) procedures for field activities were followed during the investigation and collection of all samples. These procedures, including sample collection, packaging, shipping, and equipment decontamination, are documented in the Quality Assurance Project Plan (QAPjP) for the Ohio Environmental Agency and Ohio EPA Field Standard Operating Procedures, 3rd Edition.

Complete analytical results from this investigation are contained in Appendix B. Significant findings based on these data are summarized in Tables 1 & 2. Data were reviewed by U.S. EPA Region 5 personnel for compliance with the Contract Laboratory Program, and validated by Region 5's Central Regional Laboratory staff. A photographic log of sampling locations can be found in Appendix A.

## 4.1 Soil Samples

Soil samples were collected to determine the potential for direct exposure of contaminants to the public and to possibly establish potential migration pathways from surface and sub-surface soils to the Little Scioto River via surface runoff or other modes of contaminant migration. A total of ten (10) soil samples, including one background sample, were collected from nine (9) locations to determine the presence of site attributable contaminants (Figure 3).

With the exception of the background sample, all soil samples were collected between Holland Road and the site's gravel access road, in the vicinity of the old creosote storage tanks and the pre-existing pump house. Direct push techniques, utilizing a Geoprobe™, were employed to collect three of the soil samples at depths ranging from 6.5 to 12 feet below ground surface. All sample locations were chosen based on evaluation of historical records, aerial photographs, physical appearance of the potential source areas, or field screening results from portable air monitoring instrumentation (i.e., field photoionization detector).

Significant findings for soil samples appear in Table 1; the comprehensive results may be found in Appendix B. Several hazardous substances were detected in the soil samples collected on site at concentrations significantly above background levels.

The majority of the site attributable contaminants were semi-volatile organic compounds; and many of these constituents are associated with what is commonly referred to as creosote. Unless otherwise noted, the following are concentrations of some of the more

pre-dominant semi-volatile compounds detected in the storage tank area soils within one foot from the surface: naphthalene, ranging from 2600 parts per billion (ppb) to 13,000,000 ppb; 2-methylnaphalene, ranging from 1000 ppb to 7,700,000 ppb; acenaphthylene, as high as 27,000 ppb; acenaphthene, ranging from 460 ppb to 6,800,000 ppb; dibenzofuran, ranging from 940 ppb to 6,600,000 ppb; fluorene, ranging from 420 ppb to 10,000,000 ppb; phenanthrene, ranging from 1700 ppb to 20,000,000 ppb; anthracene, ranging from 1200 ppb to 33,000,000 ppb; carbazole, ranging from 740 ppb to 13,000,000 ppb; fluoranthene, ranging from 6700 ppb to 6,400,000 ppb; pyrene, ranging from 8000 ppb to 4,800,000 ppb; benzo(a)anthracene, ranging from 4700 ppb to 1,200,000 ppb; chrysene, ranging from 5000 ppb to 1,110,000 ppb; benzo(b)fluoranthene, as high as 780,000 ppb; benzo(k)fluoranthene, as high as 720,000 ppb; benzo(a)pyrene, ranging from 2900 ppb to 130,000 ppb; indeno(1,2,3-cd)pyrene, as high as 51,000 ppb; and benzo(g,h,i)perylene as high as 60,000 ppb.

Significant concentrations of volatile organic compounds were also detected in soils at five of the sample locations. Ranges of those constituents detected include the following: 2-butanone, ranging from 14 ppb to 42 ppb; benzene, ranging from 5 ppb to 9500 ppb; toluene, ranging from 8 ppb to 51,000 ppb; ethyl benzene, ranging from 46 ppb to 37,000 ppb; styrene, ranging from 4 ppb to 22,000 ppb; and xylene (total), ranging from 110 ppb to 170,000 ppb.

Several metal analytes were also detected in the soil samples at significant concentrations above background levels. Some metals of concern include: arsenic, as high as 239 parts per million (ppm); copper, as high as 123 ppm; lead, as high as 325 ppm; mercury, as high as 29.1 ppm; thallium, as high as 141 ppm; and cyanide, as high as 46.3 ppm.

Additionally, several pesticides were detected at concentrations significantly above background concentrations. Of particular interest, methoxychlor was detected at concentrations ranging from 5200 ppb to 10,000 ppb in the samples collected just southeast of the creosote storage tank area. Other pesticides detected in the soils sampled on site include: alpha-BHC, as high as 84 ppb; gamma-BHC (Lindane), as high as 55 ppb; heptaclor, as high as 4.9 ppb; aldrin, as high as 87 ppb; heptachlor epoxide, as high as 220 ppb; endosulfan II, as high as 130 ppb; 4,4-DDD, as high as 120 ppb; endosulfan sulfate, as high as 380 ppb; 4,4-DDT, as high as 280 ppb; endrin ketone, as high as 760 ppb; endrin aldehyde, as high as 83 ppb; alpha-chlordane, as high as 69 ppb; and gamma-chlordane, as high as 82 ppb. No polychlorinated biphenyls (PCB) were detected in any soil sample collected during this investigation.

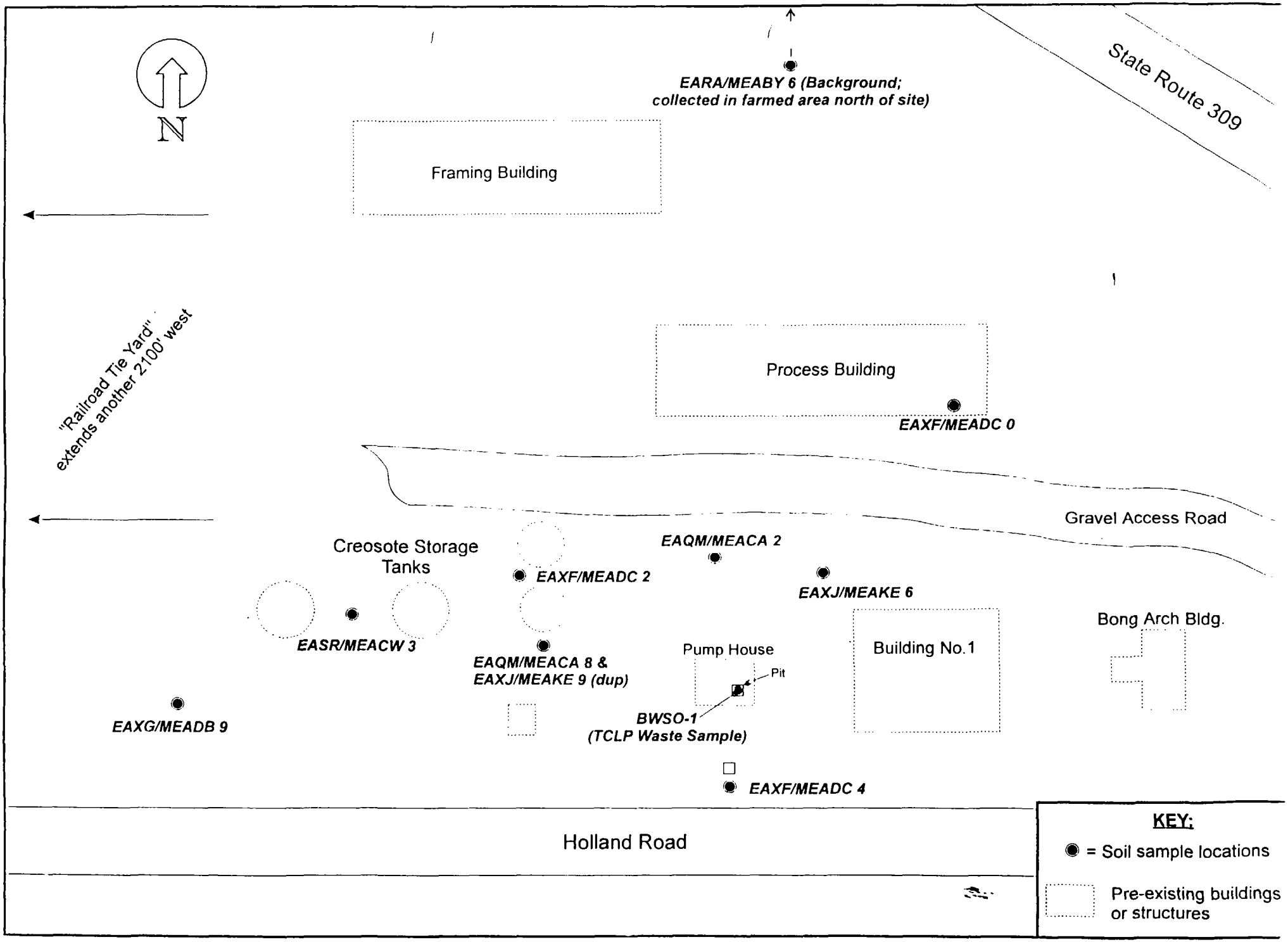


Figure 3: Baker Wood Creosoting Site - Soil Sample Location Map

Table 1: Soil Data - Significant Sample Results

| CLP SAMPLE NUMBERS | EAQM/ MEACA 2 | EAQM/ MEACA 8 | EARA/ MEABY 6 | EASR/ MEACW 3 | EAXF/ MEADC 0 | EAXF/ MEADC 2 | EAXF/ MEADC 4 | EAXG/ MEADB 9 | EAXJ/ MEAKE 9 | EAXJ/ MEAKE 6 |
|---|---|---|---|---|---|---|---|---|---|---|
| DATE SAMPLE COLLECTED | 10/29/96 | 10/29/96 | 10/29/96 | 10/29/96 | 10/29/96 | 10/29/96 | 10/29/96 | 10/29/96 | 10/29/96 | 10/29/96 |
| TIME SAMPLE COLLECTED | 1033 | 1350 | 1510 | 1145 | 1420 | 1015 | 1630 | 925 | 1400 | 920 |
| SAMPLE DEPTH | 10-12 in. | 10-12 in. | 0-4 in. | 6.5-8.5 ft. | 6-8 in. | 7.5-8.5 ft. | 10-12 ft. | 0-8 in. | 10-12 in. | 4-6 in. |
| QA/QC DESCRIPTION (if applicable) | | | Background | | MS/MSD | | | | Dup of EAQM/ MEACA 8 | |

| COMPOUND DETECTED (ug/kg or parts per billion) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *VOLATILE ORGANIC COMPOUNDS* | *CRQL* | | | | | | | | | | |
| 2-butanone | 10 ug/kg | 14 | | 12 U | | | | | | | 42 D |
| benzene | 10 ug/kg | 82 | 6800 DJ | 12 U | 5 J | | 11 J | | | 9500 | 7 DJ |
| toluene | 10 ug/kg | 180 | 45000 D | 12 U | 8 J | | 70 | | | 51000 | 56 D |
| ethyl benzene | 10 ug/kg | 110 | 35000 D | 12 U | 58 | | 61 | | | 37000 | 46 D |
| styrene | 10 ug/kg | 61 | 22000 D | 12 U | 4 J | | | | | 22000 | 36 D |
| xylene (total) | 10 ug/kg | 280 | 170000 D | 12 U | 110 | | 170 | | | 170000 | 260 D |

| COMPOUND DETECTED (ug/kg or parts per billion) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *SEMI-VOLATILE ORGANIC COMPOUNDS* | *CRQL* | | | | | | | | | | |
| naphthalene | 330 ug/kg | 830000 DB | 8800000 D | 100 J | 81000 | 2600 DJ | 36000 B | | | 13000000 D | 1300000 D |
| 2-methylnaphthalene | 330 ug/kg | 390000 D | 5400000 DJ | 77 J | 19000 J | 1000 DJ | 16000 | | | 7700000 D | 840000 D |
| acenaphthylene | 330 ug/kg | 27000 DJ | | 390 U | | 1900 DJ | | | 1100 J | | |
| acenaphthene | 330 ug/kg | 470000 D | 5400000 DJ | 95 J | 18000 J | 1100 DJ | 21000 | 460 | | 6800000 D | 960000 D |
| dibenzofuran | 330 ug/kg | 330000 D | 5400000 DJ | 92 J | 14000 J | 940 DJ | 16000 | | | 6600000 D | 950000 D |
| fluorene | 330 ug/kg | 460000 D | 8400000 D | 130 J | 17000 J | 1600 DJ | 21000 | 420 | | 10000000 D | 1300000 D |
| phenanthrene | 330 ug/kg | 1300000 D | 17000000 D | 340 J | 49000 | 12000 D | 55000 | | 1700 J | 20000000 D | 3000000 D |
| anthracene | 330 ug/kg | 260000 D | 30000000 D | 340 J | 8300 J | 3600 DJ | 7900 J | | 1200 J | 33000000 D | 780000 D |
| carbazole | 330 ug/kg | 65000 DJ | 13000000 D | 160 J | 3600 J | 740 DJ | 3400 J | | | 13000000 D | 410000 DJ |
| fluoranthene | 330 ug/kg | 820000 D | 5700000 DJ | 190 J | 26000 | 23000 D | 30000 | | 6700 J | 6400000 D | 1400000 D |
| pyrene | 330 ug/kg | 750000 D | 3800000 DJ | 150 J | 18000 J | 18000 D | 20000 | | 8000 | 4800000 DJ | 940000 D |
| benzo(a)anthracene | 330 ug/kg | 210000 DJ | 960000 DJ | 56 J | 5900 J | 14000 D | 5700 J | | 4700 J | 1200000 DJ | 270000 DJ |
| chrysene | 330 ug/kg | 200000 DJ | 860000 DJ | 77 J | 5000 J | 14000 D | 5300 J | | 8800 | 1100000 DJ | 260000 DJ |
| bis(2-ethylhexyl)phthalate | 330 ug/kg | | | 39 J | 86000 | | | | | | |
| benzo(b)fluoranthene | 330 ug/kg | 220000 DJ | | 96 XJ | 5400 J | 23000 D | 5400 J | | 24000 | 780000 DJ | 220000 DJ |
| benzo(k)fluoranthene | 330 ug/kg | 200000 DJ | | 95 XJ | 5000 J | 26000 D | 4800 J | | 27000 | 720000 DJ | 200000 DJ |
| benzo(a)pyrene | 330 ug/kg | 130000 DJ | | 390 U | 3000 J | 12000 D | 2900 J | | 8600 | | 110000 DJ |
| indeno(1,2,3-cd)pyrene | 330 ug/kg | 51000 DJ | | 390 U | | 5100 DJ | | | 5300 J | | |
| dibenzo(a,h)anthracene | 330 ug/kg | | | 390 U | | 1500 DJ | | | 2300 J | | |
| benzo(g,h,i)perylene | 330 ug/kg | 60000 DJ | | 390 U | | 2800 DJ | 1200 J | | 1300 J | | |

Table 1: Soil Data - Significant Sample Results

| CLP SAMPLE NUMBERS | EAQM/ MEACA 2 | EAQM/ MEACA 8 | EARA/ MEABY 6 | EASR/ MEACW 3 | EAXF/ MEADC 0 | EAXF/ MEADC 2 | EAXF/ MEADC 4 | EAXG/ MEADB 9 | EAXJ/ MEAKE 9 | EAXJ/ MEAKE 6 |
|---|---|---|---|---|---|---|---|---|---|---|
| DATE SAMPLE COLLECTED | 10/29/96 | 10/29/96 | 10/29/96 | 10/29/96 | 10/29/96 | 10/29/96 | 10/29/96 | 10/29/96 | 10/29/96 | 10/29/96 |
| TIME SAMPLE COLLECTED | 1033 | 1350 | 1510 | 1145 | 1420 | 1015 | 1630 | 925 | 1400 | 920 |
| SAMPLE DEPTH | 10-12 in. | 10-12 in. | 0-4 in. | 6.5-8.5 ft. | 6-8 in. | 7.5-8.5 ft. | 10-12 ft. | 0-8 in. | 10-12 in. | 4-6 in. |
| QA/QC DESCRIPTION (if applicable) | | | Background | | MS/MSD | | | | Dup of EAQM/ MEACA 8 | |
| COMPOUND DETECTED (ug/kg or parts per billion) | | | | | | | | | | |
| ***PESTICIDES/PCBs*** | ***CRQL*** | | | | | | | | | |
| alpha-BHC | 1.7 ug/kg | | 84 JD | 10 U | | | 2.1 JP | | | 43 P | 84 JDP |
| gamma-BHC (Lindane) | 1.7 ug/kg | | 55 JDP | 10 U | | | | | | 48 P | |
| heptachlor | 1.7 ug/kg | 4.9 JP | | 10 U | 1.1 JP | | 0.60 JP | | | | |
| aldrin | 1.7 ug/kg | 8.5 JP | 87 JDP | 1.7 JDP | | | | | | | |
| heptachlor epoxide | 1.7 ug/kg | 7.1 JP | 130 JDP | 10 U | | 0.56 JP | | | 0.84 JP | 220 | 97 JDP |
| 4,4-DDE | 3.3 ug/kg | | | 19 U | 0.73 JP | | | | | | |
| Endrin | 3.3 ug/kg | | | 19 U | | 1.1 JP | | | | | |
| Endosulfan II | 3.3 ug/kg | | | 19 U | 8.3 JP | 1.8 JP | | | 3.3 JP | 130 P | |
| 4,4-DDD | 3.3 ug/kg | 100 | 77 JDP | 19 U | | | 17 JP | | | | 120 JD |
| Endosulfan sulfate | 3.3 ug/kg | 86 P | 200 JDP | 19 U | | | 31 | | | 250 P | 380 JDP |
| 4,4-DDT | 3.3 ug/kg | | 280 JDP | 3.6 JDP | | | | | | 29 JP | 200 JDP |
| methoxychlor | 17.0 ug/kg | 5.1 JP | 5200 D | 100 U | | | | | 30 JP | | 10000 DP |
| endrin ketone | 3.3 ug/kg | | 440 JDP | 19 U | | 4.4 JP | | | 14 JP | | 760 DP |
| endrin aldehyde | 3.3 ug/kg | | 79 JDP | 19 U | | | | | | 83 P | |
| alpha-chlordane | 1.7 ug/kg | | 48 JDP | 2.1 JDP | | | | | | 31 P | 69 JDP |
| gamma-chlordane | 1.7 ug/kg | 7.0 JP | 52 JDP | | 1.0 JP | | | | | 80 P | 82 JDP |

| TCL COMPOUND QUALIFIERS | DEFINITION |
|---|---|
| J | Indicates an estimated value |
| U | Compound was analyzed for but not detected. |
| B | Compound is found in the associated blank as well as in the sample. |
| D | This flag indicates all compounds identified in an analysis at a secondary dilution factor. |
| E | This flag identifies compounds whose concentrations exceed the calibration range of the GC/MS instrument. |
| P | Indicates there is a greater than 25% difference for detected concentrations between two GC columns. The lower of the two values is reported. |

Table 1: Soil Data - Significant Sample Results

| CLP SAMPLE NUMBERS | EAQM/ MEACA 2 | EAQM/ MEACA 8 | EARA/ MEABY 6 | EASR/ MEACW 3 | EAXF/ MEADC 0 | EAXF/ MEADC 2 | EAXF/ MEADC 4 | EAXG/ MEADB 9 | EAXJ/ MEAKE 9 | EAXJ/ MEAKE 6 |
|---|---|---|---|---|---|---|---|---|---|---|
| DATE SAMPLE COLLECTED | 10/29/96 | 10/29/96 | 10/29/96 | 10/29/96 | 10/29/96 | 10/29/96 | 10/29/96 | 10/29/96 | 10/29/96 | 10/29/96 |
| TIME SAMPLE COLLECTED | 1033 | 1350 | 1510 | 1145 | 1420 | 1015 | 1630 | 925 | 1400 | 920 |
| SAMPLE DEPTH | 10-12 in. | 10-12 in. | 0-4 in. | 6.5-8.5 ft. | 6-8 in. | 7.5-8.5 ft. | 10-12 ft. | 0-8 in. | 10-12 in. | 4-6 in. |
| QA/QC DESCRIPTION (if applicable) | | | Background | | MS/MSD | | | | Dup of EAQM/ MEACA 8 | |
| ANALYTE DETECTED (mg/kg or parts per million) | | | | | | | | | | |
| *TAL METALS/CYANIDE* | *CRDL* | | | | | | | | | |
| antimony | 12 mg/kg | | 1.4 B | 0.51 U | | 1.4 B | | | | 0.72 B | |
| arsenic | 2 mg/kg | | 229 | 6.9 | | | | | | 239 | |
| barium | 40 mg/kg | | | 56.6 | | | | | | | 842 |
| cadmium | 1 mg/kg | | 6.3 | 0.24 U | 0.36 B | | | | | 5.5 | |
| calcium | 1000 mg/kg | 18500 E | | 1770 E | 69800 E | | 74300 E | 122000 E | | | |
| chromium | 2 mg/kg | | | 8.8 | | | | | | | 82.9 |
| copper | 5 mg/kg | | 123 | 10.7 | | | | | 88.3 | 102 | |
| lead | 0.6 mg/kg | | 325 | 23.5 | | | | | | 288 | |
| magnesium | 1000 mg/kg | 4510 E | | 1380 E | 18700 E | | 23000 E | 42200 E | | | |
| mercury | 0.1 mg/kg | | 21.7 | 0.06 U | 0.2 | 0.78 | 0.27 | | | 29.1 | |
| nickel | 8 mg/kg | | | 9.2 | 28.9 | | 29 | | | | |
| selenium | 1 mg/kg | 0.99 B | 16.2 | 0.68 U | | | 0.90 B | 1.1 B | | 12.2 | 1.1 B |
| silver | 2 mg/kg | | | 0.31 B | | | | | | 1.2 B | |
| sodium | 1000 mg/kg | | 1270 B | 182 B | | | | | | 1280 B | |
| thallium | 2 mg/kg | | 141 | 0.55 U | | | | | | 112 | |
| zinc | 4 mg/kg | | 178 | 50.4 | | | | | | 176 | |
| cyanide | 2 mg/kg | | 46.3 | 0.18 B | | | | | | 36.1 | |

| TAL ANALYTE QUALIFIERS | DEFINITION |
|---|---|
| B | Value is real, but is above instrument detection limit and below contract-required detection limit. |
| U | Analyte was analyzed for but not detected. |
| E | Indicates the reported value is estimated because of the presence of interferences. |

## 4.2 Surface Water Samples

A total of four (4) surface water samples, and one duplicate sample, were collected. All samples were analyzed for organic constituents only; including, volatile organic compounds, semi-volatile compounds, pesticides and PCB's. Significant findings for surface water samples appear in Table 2; the comprehensive results may be found in Appendix B.

Surface water samples were collected to determine the potential for surface and sub-surface soils to leach contaminants to the Little Scioto River via surface runoff or other modes of contaminant migration, namely, through potential connections to a sewer line directly south of the site. This combined sanitary/storm sewer is thought to be a direct link to the surface water contaminant migration pathway.

Using bucket immersion techniques, water samples were collected from the sewer through manholes opened along Holland Road (Figure 4). Three sewer locations were sampled; one upstream of the site (manhole #1), one adjacent to the site (manhole #2), and one south of the site's western border (manhole #3). Additionally, the surface water in North Rockswale Ditch was sampled downstream of the sewer outfall, just south of Holland Road.

Volatile organic, semi-volatile organic and pesticide compounds were detected in all samples collected from the sewer. The concentrations, from those contaminants detected, tend to diminish, from greater to lesser concentrations, the further downstream or down gradient the samples were collected from the suspected source area. Constituents common to all three manholes sampled include: acetone, ranging in concentration from 39 parts per billion (ppb) to 180 ppb; phenol, ranging from 6 ppb to 41 ppb; 4-methylphenol, ranging from 1 ppb to 59 ppb; diethylphthalate, ranging from 3 ppb to 6 ppb; and bis(2-ethylhexyl)phthalate, ranging from 3 ppb to 13 ppb. It should be noted that acetone is considered a common laboratory contaminant and may not be justified as a contaminant of concern at this site since the compound was detected at an estimated concentration in the trip blank sample (EAXP 1).

Five semi-volatile compounds, which were detected in on-site soils, were also detected in the water samples (EAQZ 5 & EAQZ 6) collected from manhole #3, located just west of the site on Holland Road, across from United Facilities.

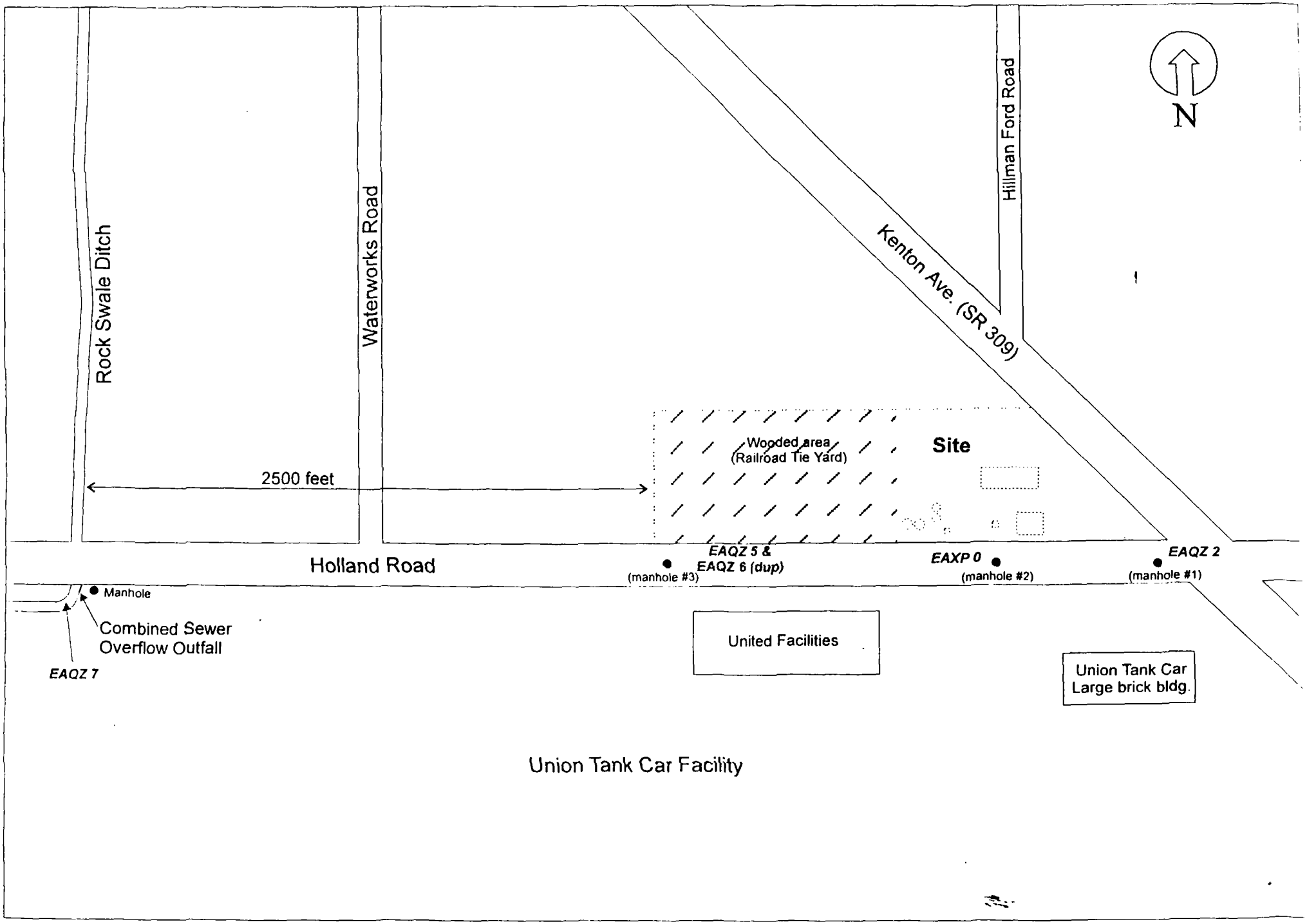


Figure 4: Baker Wood Creosoting Site - Sewer Map for Surface Water Samples (sampled for TCL organics only)

Table 2: Surface Water Data - Significant Sample Results

| CLP SAMPLE NUMBERS: | EAXP 1 | EAQZ 2 | EAXP 0 | EAQZ 5 | EAQZ 6 | EAQZ 7 |
|---|---|---|---|---|---|---|
| DATE SAMPLE COLLECTED: | 10/28/96 | 10/29/96 | 10/29/96 | 10/29/96 | 10/29/96 | 10/29/96 |
| TIME SAMPLE COLLECTED: | 1130 | 1115 | 1015 | 1400 | 1400 | 1500 |
| SAMPLE DEPTH (Below Surface): | NA | NA | NA | NA | NA | NA |
| DESCRIPTION: | Trip Blank | Manhole #1 | Manhole #2 | Manhole #3 | Dup of EAQZ 5 | NRS Ditch |
| **COMPOUND DETECTED (ug/L or parts per billion)** | | | | | | |
| *VOLATILE ORGANIC COMPOUNDS* | *CRQL* | | | | | |
| Acetone | 10 ug/L | 10 J | 180 | 110 | | |
| 2-Butanone | 10 ug/L | 10 U | | 6 J | | |
| *SEMI-VOLATILE ORGANIC COMPOUN* | *CRQL* | | | | | |
| Phenol | 10 ug/L | NA | 41 | 37 | 8 J | 6 J |
| 4-Methylphenol | 10 ug/L | NA | 59 | 54 | 1 J | |
| 2-Methylnaphthalene | 10 ug/L | NA | | | 6 J | 6 J |
| Acenaphthene | 10 ug/L | NA | | | 4 J | 3 J |
| Dibenzofuran | 10 ug/L | NA | | | 2 J | 1 J |
| Diethylphthalate | 10 ug/L | NA | 6 J | 6 J | 3 J | 3 J |
| Fluorene | 10 ug/L | NA | | | 3 J | 2 J |
| Phenanthrene | 10 ug/L | NA | | | 3 J | 2 J |
| Di-n-Butylphthalate | 10 ug/L | NA | 2 J | | 2 J | 1 J |
| bis(2-Ethylhexyl)Phthalate | 10 ug/L | NA | 13 | 5 J | 4 J | 3 J | 1 J |
| **COMPOUND DETECTED (ug/L)** | | | | | | |
| *PESTICIDES/PCBs* | *CRQL* | | | | | |
| alpha-BHC | 0.05 ug/L | NA | 0.0029 JP | | | |
| Heptachlor epoxide | 0.05 ug/L | NA | | 0.0084 J | | 0.0048 JP |
| Dieldrin | 0.10 ug/L | NA | | 0.012 JP | | |
| 4,4'-DDE | 0.10 ug/L | NA | | | 0.019 JP | 0.0043 JP |
| 4,4'-DDD | 0.10 ug/L | NA | | 0.0034 JP | | |
| Endosulfan sulfate | 0.10 ug/L | NA | | | 0.0061 JP | |
| alpha-Chlordane | 0.05 ug/L | NA | 0.0078 JP | 0.0038 JP | 0.0060 JP | 0.0058 JP |
| gamma-Chlordane | 0.05 ug/L | NA | 0.011 JP | 0.0059 JP | 0.0069 JP | 0.0079 JP |

NA - Compound not analyzed for

| TCL COMPOUND QUALIFIERS | DEFINITION |
|---|---|
| J | Indicates an estimated value |
| U | Compound was analyzed for but not detected |
| P | Indicates there is a greater than 25% difference for detected concentrations between two GC columns. The lower of the two values is reported. |

# 5.0 MIGRATION PATHWAYS

Significant concentrations of site attributable contaminants were identified in the Integrated Assessment results section. Potential migration pathways and targets of site attributable contaminants are discussed in this section. During the course of this investigation, from records review to reconnaissance and sampling visits, information and data were compiled to substantiate the possibility that contamination to one or more of the migration pathways occurred. The four migration pathways are soil, surface water, groundwater, and air.

## 5.1 Soil Pathway

An observed release of contaminants to the soils at the Baker Wood site has been established by chemical analysis and direct observation. Hazardous substances have been identified at the surface and within the top two feet of on-site soils. Through chemical analysis, concentrations of several hazardous substances were found to be significantly elevated above background levels and are in part attributable to the site and its past operations. Additionally, since the substances in the release are affiliated with the past site operations, namely creosote and its associated constituents, attribution through direct observation has been established.

The Baker Wood Creosoting site is situated on what may be considered a dividing line between residential areas to the north and east and industrial areas to the south. Since the site is unfenced, access to the site is not restricted to the public in any way. During the sampling event, there was evidence that the site may be currently used for the deposition of fill material (i.e., dirt). The responsible party for this activity is currently unknown. Numerous trails were observed to meander throughout the wooded area of the site, and may be evidence that children use the area for recreational purposes (e.g., bicycles, motorcycles, etc.). The low frequency of traffic on Holland Road makes it attractive for running. People have been observed running by the site, essentially on a daily basis.

According to 1990 Census data, approximately 41,942 people live within a 4-mile radius of the site and 4,837 people live within one mile of the site. The nearest residence is approximately 1000 feet east northeast of the source area. Since the closing of a metal salvage business (Sims Brothers Inc.) in the early 1990's, no workers have been present on site. There are no schools, day care centers or residences on-site, or on or within 200 feet of the source area. No terrestrial sensitive environments or critical habitats exist within 200 feet of the documented areas of contamination.

Within the sampling limits of the investigation, the primary source of contamination at the Baker Wood Creosoting site are the soils saturated with creosote in the vicinity of the bulk storage tank area and pump house. This source area is approximately 250 feet by 375 feet, or approximately 93,750 square feet. It should be noted that during the sampling event, in what may have been the old pump house, a small pit or sump hole was observed to be filled with pure creosote product.

Since the soils are contaminated from the surface to a depth of at least two feet, the potential may exist for some contaminants to migrate from the site as windblown particulates. Factors such as unlimited access, lack of vegetative cover in several areas, and soils saturated with creosote products increase the risk posed by the contaminated soils on the site.

## 5.2 Surface Water Pathway

Approximately ½ mile west of the site's wooded area, North Rockswale Ditch crosses beneath Holland Road, then parallels the road west until it meets the Little Scioto River, approximately one mile west of the site. Due to the distance and local topography, overland flow of contaminants from the site is not likely. The one common link between the surface water bodies and the Baker Wood Creosoting site is the combined sanitary/storm sewer which travels beneath Holland Road, adjacent to the site's southern boundary.

Historical sampling data has indicated that both the Little Scioto River and North Rockswale Ditch have suffered severe biological and water quality degradation, particularly due to the elevated concentrations of polycyclic aromatic hydrocarbons (PAH's). The banks and bottom of the Little Scioto River between Holland Road and State Route 95 are heavily saturated with a black material that has a creosote odor. Human consumption of fish from the Little Scioto River has declined or halted due to the issuance of a health advisory from the Ohio Department of Health, banning wading, swimming, or fishing in the river from Holland Road south to State Route 739.

During the course of past investigations, it was alleged that old connections from the creosoting operation to the combined sewer still existed. One such lateral line was discovered to run from the pump house area south to the sewer main. Another possible scenario took into account the age of the brick-lined main and the fact that the mortar between the bricks was deteriorating, potentially allowing contaminants to migrate from the site's saturated soils into the sewer main. It appears as though some staining on the sewer walls has occurred. Confirmation that the sewer may be acting as a migration conduit came to rest upon the surfacing Ohio Department of Health documents asking the Baker Wood Preserving Company to stop the discharge of creosote into the sewer main.

An observed release to the surface water has been documented by both direct observation and analytical data. While sampling the sewer main, the water collected adjacent to and downstream from the site was observed to have an oily sheen. Chemical analysis confirmed the presence of five semi-volatile compounds which were also identified in on-site soils. The probable point of entry into North Rockswale Ditch is most likely the combined sanitary/storm sewer. Future work is planned in performing a sewer survey using a remote unit to identify any/all potential connections from the site and whether these connection are actively releasing to the sewer main.

One aquatic sensitive environment was identified along the 15-mile in-line target distance limit. The pondhorn (*Uniomerus tetralasmus)*, a fresh water mollusk, is known to occupy the Little Scioto River and has been designated as a State threatened species. No wetlands were identified within the target distance limit.

The Little Scioto River is designated in the Ohio Water Quality Standards as a modified warmwater habitat (Ohio Administrative Code, Chapter 3745-1-08). No drinking water intakes are within the target distance limit of 15 miles downstream of the site. However, the City of Marion does obtain its water from the Little Scioto River just upstream (approx. 2000 feet) from where North Rockswale Ditch enters the Little Scioto River. Surface water is blended with groundwater collected from 16 wells located at the well field just west of the Little Scioto River and serves a population of approximately 51,500. Although the drinking water intakes are upstream of the probable point of entry, it has been observed during periods of heavy precipitation downstream, or when strong southerly winds prevail, that the river's flow physically changes from a southern direction to a northern direction.

There is no documentation indicating that any containment at the source was designed, constructed, operated or maintained to prevent washout of hazardous substances by flooding. Additionally, the source area is not within the 100- or 500-year flood plains.

## 5.3 Ground Water Pathway

No groundwater or drinking water samples were collected during this investigation; therefore, an observed release to the groundwater was not established. Given the fact that the site and unlined source area is underlain by the somewhat poorly drained Blount silt loams and very poorly drained Pewamo soils, ponding of water on site is more likely than infiltration into the deeper soils zones. The predominant contaminants of concern at the site, polycyclic aromatic hydrocarbons (PAH's), have an affinity for soil and tend to bind readily with soils, thereby limiting potential contaminant migration. However, soils saturated with gross concentrations may tend to loose their binding ability over time and allow contaminants to migrate deeper into the soils. Significant concentrations of site attributable contaminants were detected in soils as deep as 8.5 feet below the ground surface.

Groundwater wells used by the City of Marion for public drinking water supplies are located approximately 1.75 miles west of the site. Private/community wells are present within the 4-mile target distance limit; however, these were not identified or sampled during this investigation. Additionally, the populations served by the private/community wells is currently unknown. Impact on the public or private wells by the site has not been determined. No Well Head Protection Program currently exists for the public water supply.

## 5.4 Air Pathway

The air pathway was not evaluated, and no samples were collected for analysis. Visual and physical evidence at the site, however, indicated a potential for contaminants to be released to the atmosphere. Because the surface soils are contaminated and the vegetative ground cover in the source area is sparse, the potential exists for contaminants to migrate from the site as windblown soil particulates.

The nearest residence is approximately 1000 feet east northeast of the source area and the total number of people living, working, and attending school within a 4-mile radius of the site is estimated to be approximately 41,942 people. Terrestrial sensitive environments identified within a 4-mile radius of the site include the following: Bearded Wheat Grass (*Elymus trachycaulus*), a state-threatened plant; Leiberg's Panic Grass (*Panicum leibergii*), a state endangered plant; Philadelphia Panic Grass (*Panicum philadelphicum*), a state-threatened plant; Prairie Wedgegrass (*Sphenopholis obtusata*), a state-threatened plant; and Flat-Stem Spikebrush (*Eleocharis compressa*), a state-threatened plant.

Although Ohio EPA did not initiate a formal air sampling program at the Baker Wood Creosoting site, portable air monitoring for airborne organic contaminants was conducted throughout the investigation for health and safety purposes.

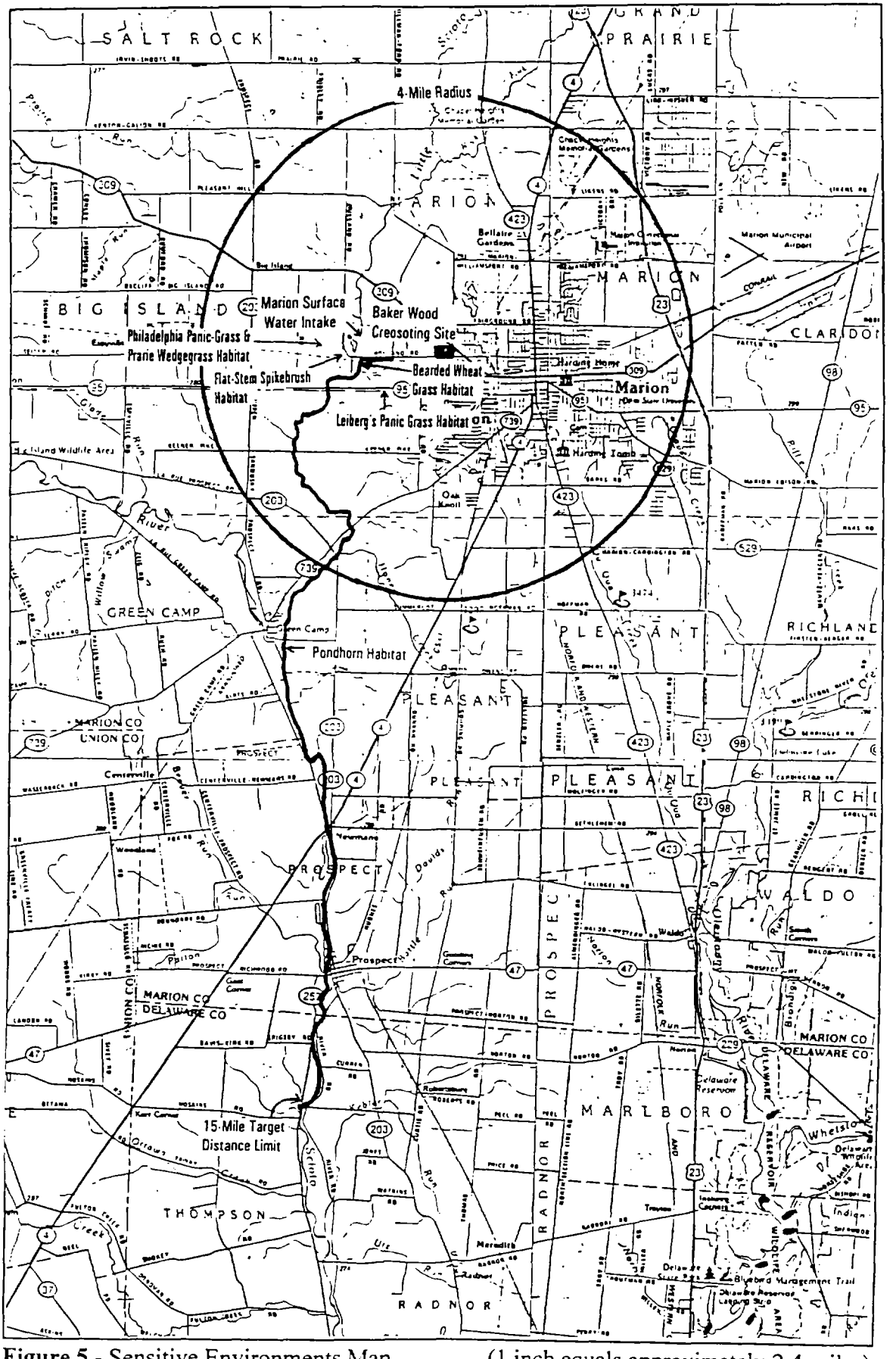


**Figure 5** - Sensitive Environments Map (1 inch equals approximately 2.4 miles)

## 6.0 REFERENCES

1. Hazard Ranking System; Final Rule, 40 CFR Part 300, United States Environmental Protection Agency, Dec. 14, 1990.

2. United States Geological Survey, 7.5 minute series topographic maps: Marion West quadrangle (1961, photo inspected 1973); Marion East quadrangle (1961, photo revised 1982); Morral quadrangle (1960, photo inspected 1984); and Monnet quadrangle (1961, photo revised 1970).

3. Ohio Environmental Protection Agency, Division of Ground Water (DGW), "Berwind Railway Services and Baker Woods Creosoting, Marion County: Preliminary Site Evaluation, I.D.# 351-0094", August 26, 1991.

4. Ohio Environmental Protection Agency, Division of Surface Water (DSW), "Bottom Sediment Evaluation of the Little Scioto River, Marion, Ohio," February 4, 1992.

5. Ohio Environmental Protection Agency, Division of Surface Water (DSW), "Biological, Sediment and Water Quality Study of the Little Scioto River, Marion, Ohio," April 8, 1994.

6. Ohio Department of Transportation, Bureau of Aerial Engineering, aerial photographs of Marion showing site: flight number 1847, strip #9, negative number 245, March 17, 1961; and flight number 4459, strip #1, negative number 12, Feb. 23, 1970.

7. TIGER files, 1990 Population Census Data

8. Sanborn Insurance Map, City of Marion, 1892, the Baker Wood Preserving Company.