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Office of Environmental Audit

Environmental Survey Preliminary Report

Kansas City Plant
Kansas City, Missouri

January 1988

PREFACE
TO
THE DEPARTMENT OF ENERGY
KANSAS CITY PLANT
ENVIRONMENTAL SURVEY PRELIMINARY REPORT

This report contains the preliminary findings based on the first phase of the Environmental Survey at the Department of Energy (DOE) Kansas City Plant (KCP), located at Kansas City, Missouri. The Survey is being conducted by DOE's Office of Environment, Safety and Health.

The KCP Survey is a portion of the larger, comprehensive DOE Environmental Survey encompassing all major operating facilities of DOE. The DOE Environmental Survey is one of a series of initiatives announced on September 18, 1985, by Secretary of Energy, John S. Herrington, to strengthen the environmental, safety, and health programs and activities within DOE. The purpose of the Environmental Survey is to identify, via a "no-fault" baseline Survey of all the Department's major operating facilities, environmental problems and areas of environmental risk. The identified problem areas will be prioritized on a Department-wide basis in order of importance in 1989.

The findings in this report are subject to modification based on the results from the Sampling and Analysis Phase of the Survey. The findings are also subject to modification based on comments from the Albuquerque Operations Office concerning their technical accuracy. The modified preliminary findings and any other appropriate changes will be incorporated into an Interim Report. The Interim Report will serve as the site-specific source of environmental information generated by the Survey, and ultimately as the primary source of information for the DOE-wide prioritization of environmental problems in the Survey Summary Report.

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EXECUTIVE SUMMARY

Introduction

This report presents the preliminary findings from the first phase of the Environmental Survey of the United States Department of Energy (DOE), Kansas City Plant (KCP), conducted March 23 through April 3, 1987.

The Survey is being conducted by a multidisciplinary team of environmental specialists, led and managed by the Office of Environment, Safety and Health's Office of Environmental Audit. Individual team members are outside experts being supplied by a private contractor. The objective of the Survey is to identify environmental problems and areas of environmental risk associated with the KCP. The Survey covers all environmental media and all areas of environmental regulations. It is being performed in accordance with the DOE Environmental Survey Manual. This phase of the Survey involves the review of existing site environmental data, observations of the operations performed at the KCP, and interviews with site personnel.

The Survey team developed a Sampling and Analysis Plan to assist in further assessing certain environmental problems identified during its on-site activities. The Sampling and Analysis Plan is being executed by DOE's Argonne National Laboratory. When completed, the results will be incorporated into the KCP Environmental Survey Interim Report. The Interim Report will reflect the final determinations of the KCP Survey.

Site Description

The KCP occupies 136 acres of a 300-acre Federal complex within the city limits of Kansas City, Missouri. The complex, located 12 miles south of the City's downtown section, is shared by four other federal agencies: Federal Aviation Administration, U.S. Marine Corps, General Services Administration, and Internal Revenue Service. The Federal complex is zoned for heavy industry with the surrounding area characterized by residential dwellings, commercial establishments, industrial districts, and public use lands. The KCP is operated by the Allied Signal Corporation, Bendix Kansas City Division, under contract to DOE.

The primary mission of the KCP is to produce and procure non-nuclear components for the nuclear weapons program. Activities include development of new technologies and materials, support of weapons design phases, and production of stockpile hardware. Production efforts are concentrated in three primary areas: electrical and electronics work, mechanical products, and plastics products. The plant has a major engineering organization with supporting research and development capabilities to supplement manufacturing operations. No operations directly involving radioactive materials or explosives normally associated with nuclear weapons are assigned to the plant. The present functions of the KCP began in 1949 at the Federal complex.

<u>Summary of Findings</u>

The major preliminary findings of the Environmental Survey of the KCP are as follows:

- Groundwater on-site is known to be contaminated with chlorinated organic solvents (particularly trichloroethene (TCE) and its biodegradation products) from four major areas, one of which is off-site; levels of TCE exceed recommended drinking-water standards by several orders of magnitude. Because of the hydrogeology of the plant site, the contaminated groundwater will eventually discharge into Blue River or Indian Creek and may potentially degrade the surface water. Neither the groundwater nor the surface streams are known to be used for community drinking water supplies at present.

- The Department 27 air plenum and production area may be contaminated with dioxins and dibenzofurans as a result of a June 1985 fire that occurred in a supply ventilation duct known to be contaminated with PCB oil on the interior surface. Sampling is being conducted as part of the Environmental Survey in addition to sampling conducted by KCP to determine whether the potential exists for personnel entering these areas to come in contact with dioxins and dibenzofurans.

- In the event of a 70-year or more flood at the KCP, there is a potential for damage to waste management facilities and, subsequently, waste storage containers. Such damage may possibly result in the release of hazardous substances into the environment. The plant is situated within the 100-year floodplain, and hazardous wastes (including PCB wastes) are stored on-site until disposed at off-site commercial facilities. The Toxic Substance Control Act (TSCA) requires that PCB wastes being stored for disposal be outside the 100-year floodplain, and the Resource Conservation and Recovery Act (RCRA) requires that waste management facilities be outside the 100-year floodplain or be protected from the 100-year flood.

- Widespread contamination of the plant with polychlorinated biphenyls (PCBs) has resulted in the off-site release of PCB. Plant contamination may be attributed primarily to past operations and spill incidents; nevertheless, off-site discharges of residual PCB continue at the present time. Although KCP has implemented a number of controls, PCB continues to appear at very low levels in the discharges from the industrial wastewater system (i.e., south lagoon), sanitary sewer system, and the stormwater sewer system. On several occasions over the past year, PCB has been detected in concentrations above the allowable NPDES limit in KCP stormwater sewer system outfalls 001 and 002, and up to ten fold higher concentrations have been detected in the combined industrial wastewater and sanitary sewer systems discharge.

- There are approximately 26 sources of known or suspected soil and/or groundwater contamination. The sources include inactive waste disposal sites, underground storage tanks, leaking heat transfer systems, industrial wastewater lagoon and ponds, material storage/transfer/reclamation areas, and other spill areas. Contaminants include heavy metals, chlorinated organic solvents, PCB, and petroleum products. Characterization and remedial investigation is under way for many of these sources.

- KCP industrial wastewater discharges to the Kansas City sewer system have exceeded the EPA pretreatment guidelines for the metal-finishing category under the Clean Water Act. A pretreatment plant is being installed in FY 87-88 which is designed to treat the cyanides, chromates, and metals in the discharge. Pilot studies have indicated that this treatment will also help reduce the organics in the effluent, even though no specific organic removal process is included in the design.

Overall Conclusions

The Survey found no environmental problems at the KCP that represent an immediate threat to human life. The preliminary findings identified at KCP by the Survey do indicate that the site is affected by a number of substantial environmental problems, most of which are a legacy of past practices when environmental implications and consequences were not as well understood. Generally, the Survey findings reflect conditions that the KCP had prior knowledge of, have begun to characterize, and in many instances, begun to remediate. The most pressing problems facing the plant at present appear to be (1) contaminated groundwater on-site and eventual off-site migration of contamination to downgradient surface waters; (2) inadequate pretreatment of industrial wastewaters discharged to the Kansas City municipal sewer system; and (3) environmental contamination from inactive waste disposal, spill, and release sites.

The environmental problems described in this report vary in terms of their magnitude and risk. Although the Survey-related sampling and analysis being performed at the KCP will assist in further identifying environmental problems at the site, a complete understanding of the significance of some of the environmental problems identified requires a level of study and characterization that is beyond the scope of the Survey. Actions under way or planned at the site will contribute toward meeting this requirement. Such actions include the groundwater investigation and remediation activities and the construction of an industrial wastewater pretreatment facility, as well as the Phase II activities of the Comprehensive Environmental Analysis and Response Program (CEARP).

Transmittal of Results

The findings of the Environmental Survey of the Kansas City Plant were shared with the Albuquerque Operations Office, the Kansas City Area Office, and the site contractor at the Survey closeout briefing held April 3, 1987. Since that time, informal coordination with the site and with representatives of the Operations Office and Area Office has been ongoing in an effort to gather additional environmental information and data not available during the on-site Survey activities. Those problems that involve extended studies and multi-year budget commitments will be the subject of the Environmental Survey Summary Report and the DOE-wide prioritization.

Within the Office of Environment, Safety and Health, the Office of Environmental Guidance and Compliance has immediate responsibility for monitoring environmental compliance and the status of the KCP Survey findings. The Office of Environmental Audit will continue to assess the environmental problems through the program of systematic environmental audits that will be initiated toward the conclusion of the DOE Environmental Survey in 1989.

1.0 INTRODUCTION

The purpose of this report is to present the preliminary findings made during the Environmental Survey, March 23 through April 3, 1987, of the Department of Energy's (DOE) Kansas City Plant (KCP) in Kansas City, Missouri. The contents of the preliminary report are subject to revisions, in the Interim Report, based on the Albuquerque Operations Office (ALO) review and comments on the technical accuracy, the results of the sampling and analyses, and other information that may come to the Survey team's attention prior to issuance of the Interim Report. KCP is operated for DOE by the Bendix Kansas City Division (BKCD) of Allied Signal Corporation.

The KCP Survey is part of the larger DOE-wide Environmental Survey effort announced by Secretary John S. Herrington on September 18, 1985. The purpose of this effort is to identify, via "no fault" baseline Surveys, existing environmental problems and areas of environmental risk at DOE facilities and to rank them on a DOE-wide basis. This ranking will enable DOE to more effectively establish priorities for addressing environmental problems and to allocate the resources necessary to correct these problems. Because the Survey is "no fault" and is not an "audit," it is not designed to identify specific isolated incidents of noncompliance, or to analyze environmental management practices. Such incidents and/or management practices will, however, be used in the Survey as a means of identifying existing and potential environmental problems.

The KCP Environmental Survey was conducted by a multidisciplinary team of technical specialists headed and managed by a Team Leader and Assistant Team Leader from DOE's Office of Environmental Audit. A complete list of the KCP Survey participants and their affiliations is provided in Appendix A.

The Survey team focused on all environmental media, using Federal, state, and local environmental statutes and regulations, accepted industry practices, and professional judgment to make the preliminary findings included in this report. The team carried out its activities in accordance with the guidance and protocols in the Environmental Survey Manual (August 1987). Substantial use of existing information and of interviews with knowledgeable field office and site-contractor personnel accounted for a large part of the on-site effort. The Survey Plan is presented in Appendix B, and a summary of the site-specific Survey activities is presented in Appendix C. Appendix D is a list defining symbols, abbreviations, and acronyms used in this report.

The preliminary Survey findings, in the form of existing and potential environmental problems, are presented in Sections 3.0 and 4.0. Section 3.0 includes those findings that pertain to a specific environmental medium (e.g., air or soil), whereas Section 4.0 includes those that are non-media specific (e.g., waste management, radiation, and quality assurance). Because the findings are highly varied in terms of magnitude, risk, and characterization, and consequently require different levels of management attention and response, they are further subdivided into four categories within Sections 3.0 and 4.0.

The criteria for placing a finding into one of the four categories are as follows:

- Category I includes only those findings which, based upon the information available to the Team Leader, involve immediate threat to human life. Findings of this type shall be immediately conveyed to the responsible environmental safety and health personnel at the scene or in control of the facility or location in question for action. Category I findings are those environmental problems where the potential risk is highest, the confidence in the finding, based on the information available, is the strongest, and the appropriate response to the finding is the most restrictive in terms of alternatives.

- Category II findings encompass one or more of the following situations:

  - Multiple or continuing exceedances, past or present, of a health-based environmental standard where there is immediate potential for human population exposure, or a one-time exceedance where residual impacts pose an immediate potential for human population exposure.

  - Evidence that a health-based environmental standard may be exceeded, as discussed in the preceding situation, within the time-frame of the DOE-wide Survey.

  - Evidence that the likelihood is high for an unplanned release due to, for example, the condition or design of pollution abatement or monitoring equipment or other environmental management practices.

  - Noncompliance with significant regulatory procedures, (i.e., those substantive technical regulatory procedures designed to directly or indirectly minimize or prevent risks, such as inadequate monitoring or failure to obtain required permits).

  Category II findings include those environmental problems where the risk is high but where the definition of risk is broader than in Category I. The information available to the Team Leader is adequate to identify the problem but may be insufficient to fully characterize it. Finally, in this category, most discretion is available to the Operations

Offices and Program Offices as to the appropriate response; however, the need for that response is such that management should not wait for the completion of the entire DOE-wide Survey to respond. Unlike Category I findings, a sufficient, near-term response by the Operations Office may include further characterization prior to any action taken to rectify the situation.

- Category III findings encompass one or both of the following criteria:

  - The existence of pollutants or hazardous materials in the air, water, groundwater, or soil resulting from DOE operations that pose or may pose a hazard to human health or the environment.

  - The existence of conditions at a DOE facility that pose or may pose a hazard to human health or the environment.

Category III findings are those environmental problems for which the broadest definition of risk is used. As in Category II, the information available to the Team Leader may not be sufficient to fully characterize the problem. Under this strategy, the range of alternatives available for response, and the corresponding timeframes for response, are the greatest. Environmental problems included within this category will typically require lengthy investigation and remediation phases, and multiyear budget commitments. These problems will be included in the DOE-wide prioritization effort to ensure that DOE's resources are used most effectively.

In general, the levels of pollutants or materials that constitute a hazard or potential for hazard are those that exceed some Federal, state, or local regulations for release of, contamination by, or exposure to such pollutants or materials. However, in some cases, the Survey may determine that the presence of some nonregulated material is in a concentration that presents a concern for local populations or the environment that is sufficient to be included as an environmental problem. Likewise, the presence of regulated materials in concentrations that, even below those established by regulatory authorities, nevertheless present a potential for hazard or concern, may be classified as an environmental problem. In general, however, conditions that meet regulatory or other requirements, where such exist, should not present a potential hazard and will not be identified as environmental problems.

Conditions that pose or may pose a hazard are generally those which are violations of regulations or requirements (e.g., improper storage of hazardous chemicals in unsafe tanks). Such conditions present a potential hazardous threat to human health and the environment and should be identified as an environmental problem. Additionally, potentially hazardous conditions are those where the likelihood of the occurrence of release is high. The definition of the term environmental problem is broad and flexible to allow for the wide difference among the DOE sites and operations. Therefore, a good deal of professional judgment must be applied to the identification of environmental problems.

- Category IV findings include instances of administrative noncompliance and management practices that are indirectly related to environmental risk, but are not appropriate for inclusion in Categories I-III. Such findings can be based upon any level of information available to the Team Leader, including direct observations by the team members. Findings in this category are generally expected to lend themselves to relatively simple, straightforward resolution without further evaluation or analysis. These findings, although not part of the DOE-wide prioritization effort, will be passed along to the Operations Office and appropriate Program Office for their action.

Based on the professional judgment of the Team Leader, the findings within categories are arranged in order of relative significance. Comparing the relative significance of one finding to another, either between categories within a section or within categories between sections, is neither appropriate nor valid. The categorization and listing of findings in order of significance within this report is only the first step in a multi-step iterative process to prioritize DOE's problems.

The subsequent phase of the KCP Survey involved sampling and analysis (S&A). Argonne National Laboratory (ANL), the S&A team for KCP, began taking samples in September 1987. Prior to sampling, an S&A plan was prepared by DOE and ANL in accordance with the protocols in the draft Survey Manual. The S&A plan was designed to fill existing data gaps or weaknesses. The results generated by the S&A effort will be used to assist the Survey team in further defining the existence and extent of potential environmental problems identified during the Survey.

An Interim Report will be prepared 6 to 8 weeks after the completion of the S&A effort. The Interim Report will incorporate the results of the S&A effort as well as any changes or comments resulting from the review of the Preliminary Report. Based on the S&A results, the preliminary findings and observations made during the on-site Survey may be modified, deleted, or moved within or between categories. The Interim Report will serve both as the site-specific repository for information generated by the Survey, and ultimately as the site-specific source of information for the DOE-wide prioritization of environmental problems.

It is clear that certain of the findings and observations contained in this report, especially those in Category II, can and should be addressed in the near-term (i.e., prior to the DOE-wide prioritization effort). It is also clear that the findings and observations in this report vary greatly in terms of magnitude, risk, and characterization. Consequently, the priority, magnitude, and timeliness of near-term responses will require careful planning to ensure appropriate and effective application. The information in this Preliminary Report, albeit provisional, will assist the ALO in the planning of these near-term responses.

2.0 GENERAL SITE INFORMATION

2.1 Site Setting

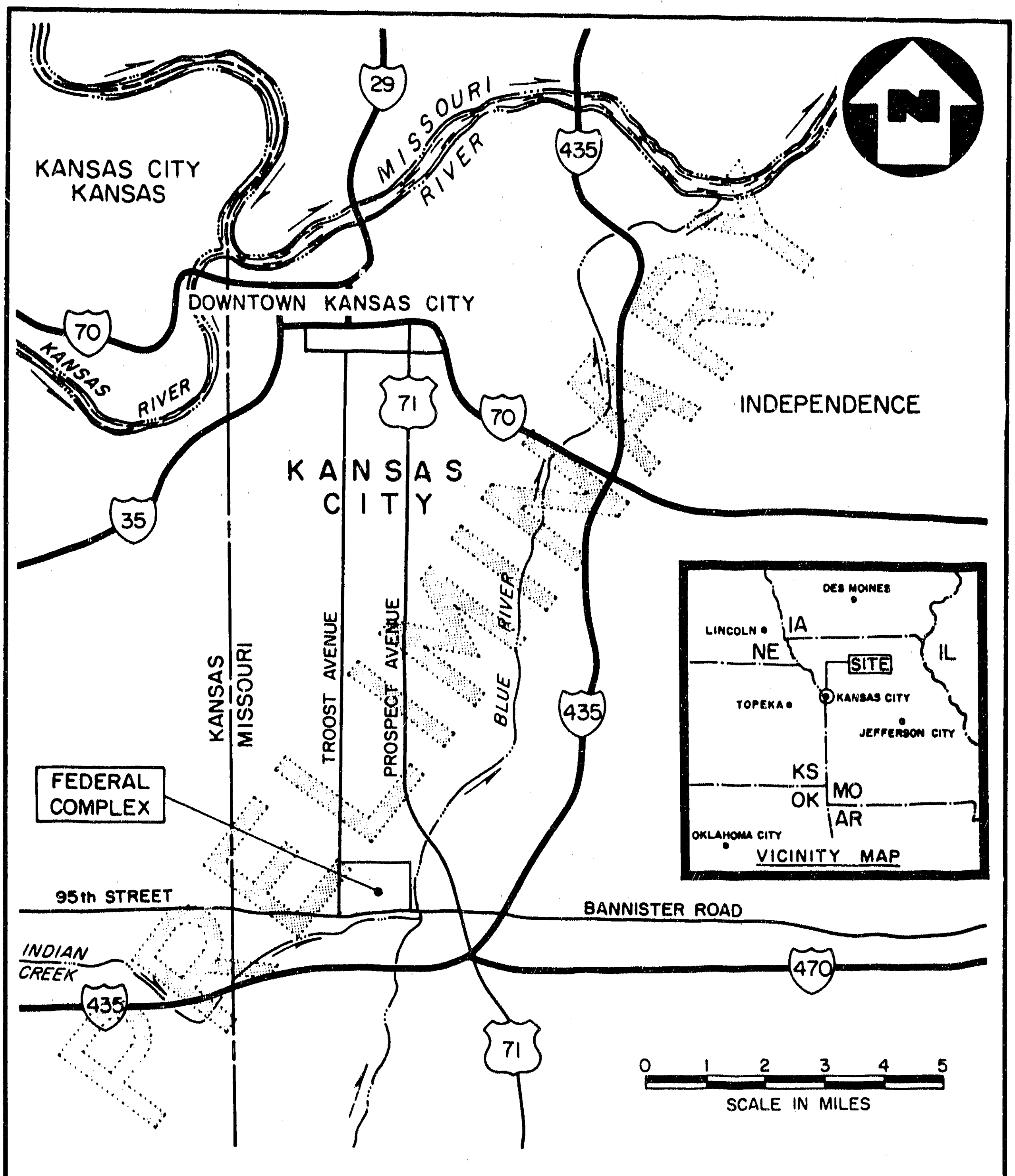
The Kansas City Plant is located on a 136-acre parcel of a 300-acre Federal complex in Jackson County, Missouri, within the city limits of Kansas City, Missouri (Figure 2-1), about 12 miles south of the downtown area. The complex is shared by four other federal agencies: Federal Aviation Administration, U.S. Marine Corps, General Services Administration, and Internal Revenue Service (Figure 2-2). Of the area occupied by the Kansas City Plant, 122 acres are owned by DOE and 14 acres are leased from the General Services Administration.

The Federal complex is zoned for heavy industry with the surrounding area characterized by single and multiple family dwellings, commercial establishments, industrial districts, and public-use lands. The property adjoining the Federal complex is zoned for residential use with isolated commercial tracts, except for areas along the east and north sides that have been designated for public recreational and agricultural uses. Some crop lands remain near the site, but they are diminishing because of rapid urbanization of the area. Low hills nearly encircle the plant, which is situated in a small river valley about 800 feet above sea level. The complex is bordered on the west side by Troost Avenue, a major north-south traffic artery for metropolitan Kansas City. A heavily wooded bluff and the Legacy Park wildlife refuge border the north side of the complex (Figure 2-2). The Blue River flows northward along the east border, and the south side is bordered by Bannister Road and Indian Creek.

The major water bodies in the area are the Missouri and Kansas Rivers, which flow west to east through Kansas City, Missouri and Kansas City, Kansas, respectively. Indian Creek flows into the Blue River, which flows north to the Missouri River.

Kansas City, Missouri, is the largest of approximately 100 incorporated cities in the Kansas City Metropolitan Statistical Area (MSA). The results of the 1980 census showed that the population of Kansas City, Missouri, was 448,159. The Kansas City MSA (Figure 2-3), which, according to the 1980 census, consists of five counties in Missouri (Cass, Clay, Jackson, Platte, and Ray) and two counties in Kansas (Johnson and Wyandotte), had a 1980 census population of 1,327,020 (BKCD, 1986).

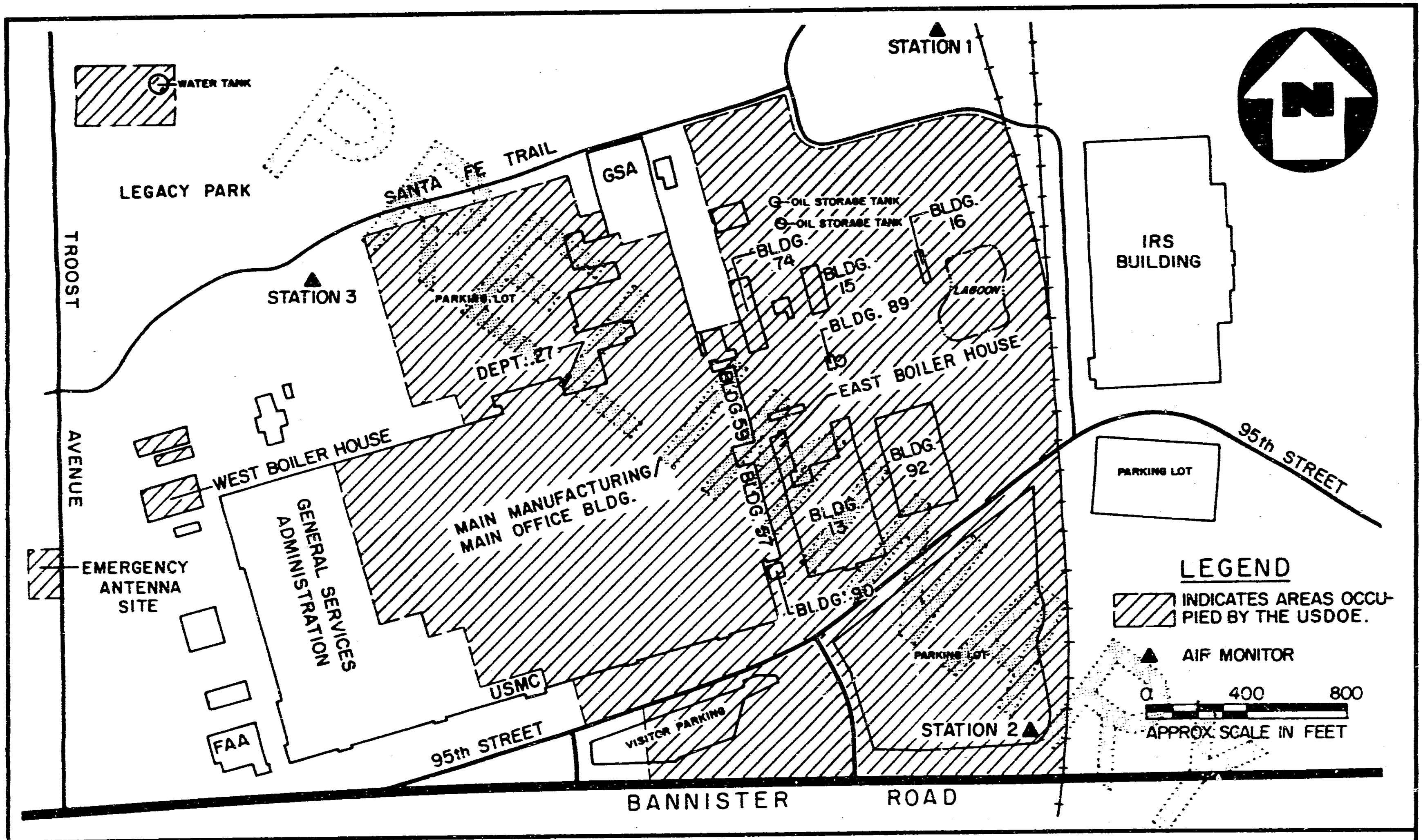
Kansas City is very near the geographical center of the United States (48 contiguous states) in an area of gently rolling terrain. Because of a lack of obstructions to air flow, the climate of the region is defined as modified continental. Summers are characterized by warm to hot days and mild nights,



SOURCE: Based on U.S Geological Survey maps.

FIGURE 2-1

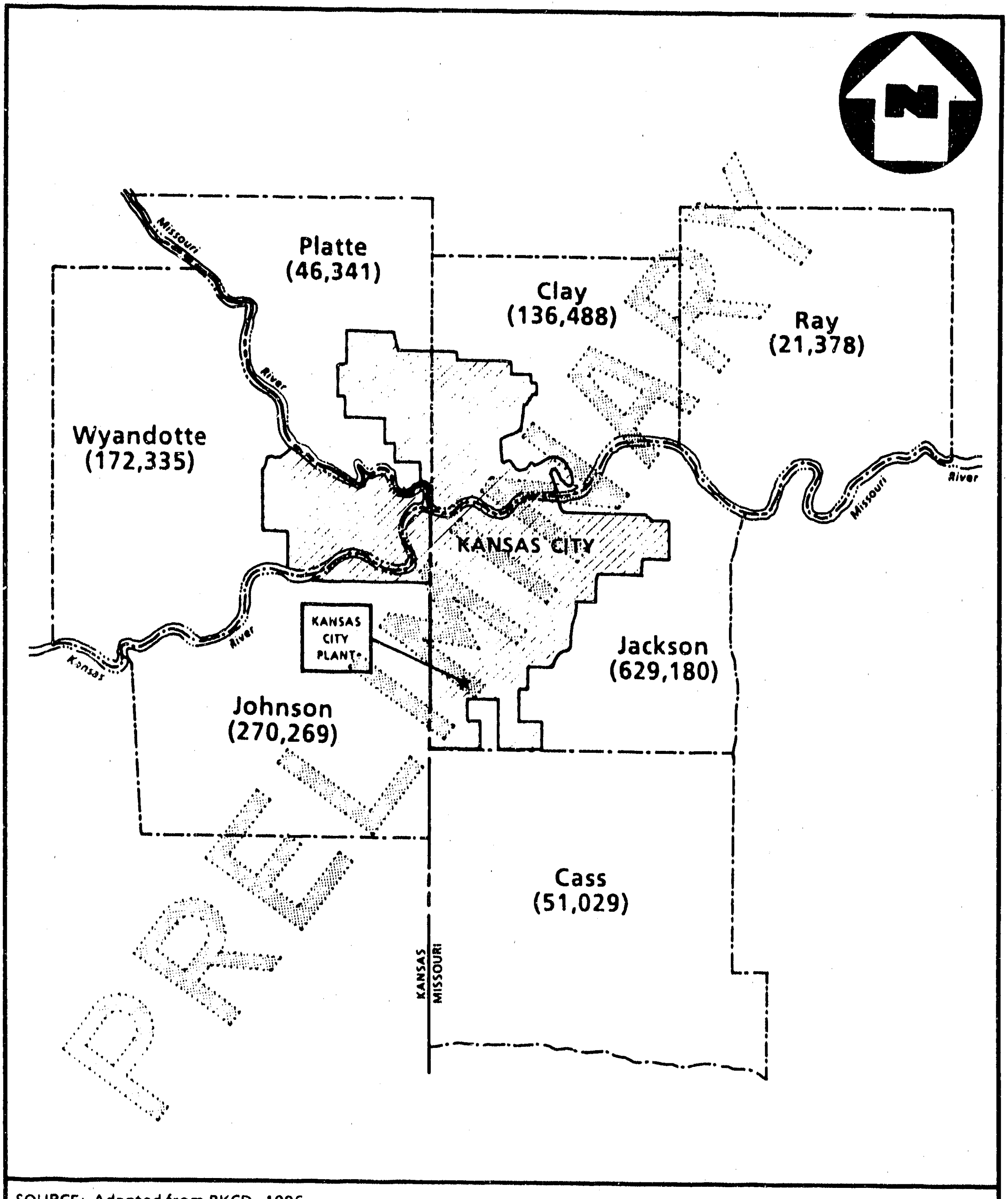
KANSAS CITY METROPOLITAN AREA
KANSAS CITY PLANT – KANSAS CITY, MISSOURI



SOURCE: DOE, 1986a.

FIGURE 2-2

AREA OCCUPIED BY THE U.S.DOE AT THE FEDERAL COMPLEX KANSAS CITY PLANT – KANSAS CITY, MISSOURI



SOURCE: Adapted from BKCD, 1986

FIGURE 2-3

LOCATION OF COUNTIES AND POPULATIONS IN THE KANSAS CITY METROPOLITAN STATISTICAL AREA KANSAS CITY PLANT – KANSAS CITY, MISSOURI with moderate humidity. Daytime temperatures occasionally exceed 100°F. Winters are not severely cold, with about 10 days per year of below 0°F. The record low is −13°F. The fall season is normally mild, with mild sunny days and cold nights. Spring is a period of frequent and rapid fluctuations in conditions. Temperatures range from an average daily minimum of 18.4°F in January to an average daily maximum of 88.0°F in July.

The average annual precipitation (water equivalent) is 37 inches, including about 20 inches per year of snow. Measurable precipitation (0.01 inch or more) occurs on an average of 101 days per year, and is distributed seasonally as follows: spring, 28 percent; summer, 37 percent; fall, 24 percent; and winter, 11 percent. Nearly 60 percent of the precipitation occurs during the 6-month period of April through September (NOAA, 1981a). Snow is generally light; rarely do snowfalls accumulate to 10 inches.

The surface wind flow at Kansas City (Downtown Airport) is predominantly from the south during the April through October period and from the south-southeast for the balance of the year, except for March, when the wind is from the east-northeast. Annual average wind speed is 10 miles per hour; however, wind speeds as high as 72 miles per hour have been recorded (NOAA, 1981b).

Severe weather in the Kansas City area usually means thunderstorm activity (about 52 days per year) with lightning, hail, heavy rain, and strong winds. This area is also considered a high tornado risk area. During a 17-year period, 68 tornadoes have struck within a 25-mile radius of Kansas City, but none have hit the Federal complex.

2.2 Overview of Major Site Operations

The Kansas City Plant, operated for the Department of Energy by the Allied Signal Corporation, Bendix Kansas City Division, is a major production facility engaged in the production of weapons components. The principal mission of the plant is the production and procurement of non-nuclear electrical, electronic, electromechanical, mechanical, plastic, and nonfissionable metal components for the DOE Nuclear Weapons Program. The plant does not machine or process any radioactive materials, and does not handle any of the radioactive materials (e.g., plutonium, uranium, or tritium) or high explosives normally associated with nuclear weapons. The plant does handle small quantities of radioactive materials, primarily sealed calibration sources, activated components, and x-ray tubes; these materials are not processed in any way that would lead to radioactive materials in an effluent stream. Explosives are used in limited quantities for explosive forming of some components.

The Kansas City Plant currently occupies approximately 3.2 million square feet of floor space, nearly 82 percent of which is in one building (Figure 2-2). This building, constructed in the 1940s, is shared with the General Services Administratio (GSA) and the U.S. Marine Corps. The building consists of two main building sections under one roof: the Main Manufacturing Building and the Main Office Building. The Kansas City Plant occupies 240,600 square feet of the 490,000-square-foot Main Office Building and 2,389,000 square feet of the 3,526,000-square-foot Main Manufacturing Building. The GSA and the U.S. Marine Corps occupy the remainder of the building. The Manufacturing Support Building (Building 13 on Figure 2-2) provides 132,000 square feet of general purpose manufacturing and office space. The Electrical Products Manufacturing Building (Building 92 on Figure 2-2) provides 247,300 square feet of floorspace for the manufacture and assembly of electrical products and for office space. These three buildings are linked by enclosed corridors. Approximately 20 smaller buildings lie adjacent to the three major structures. These ancillary structures include two boiler houses, chemical storage and waste management facilities, unused aircraft engine test cells left from the original use of the plant, polymer production facilities, and metal finishing facilities.

At the time of the Environmental Survey, the Kansas City Plant employed approximately 7,200 people. The plant operates three shifts daily with approximately 5,900 people on the first, 1,000 on the second, and 300 on the third.

2.2.1 Past Operations

Prior to May of 1942, the Federal complex, in which the Kansas City Plant is located, had been primarily used as farmland. This was largely because of its proximity to the Blue River and Indian Creek and its frequency of flooding. An automotive racetrack was constructed at the location, but it was abandoned after about 1 year of use. The land was subsequently used once again for farming. Several gas wells had been drilled in the area, but the gas was of poor quality. Consequently the wells were capped and abandoned. The exact location of the wells is unknown.

In May of 1942, it was announced that Kansas City had been selected as the site for a new aircraft engine plant. The facility was constructed by the U.S. Navy for Pratt-Whitney. Engine production began in May 1943. After World War II, the plant ceased production, and the facility was taken over as excess property by the War Assets Administration in 1945.

The facility was used from 1945 until 1948 to house various private and government operations. In 1948, the U.S. Navy acquired the entire Federal complex and leased part of it to the Westinghouse Electric Company to build jet aircraft engines.

In 1948, the Atomic Energy Commission (AEC) selected the Kansas City Plant for the production of electrical and mechanical components for U.S. nuclear weapons, and announced that the Bendix Corporation had been chosen as the prime contractor to operate the plant. Bendix subleased a portion of the main building from Westinghouse and began operations in April 1949. In 1961, the Navy canceled its contract with Westinghouse and transferred that portion of the building to GSA. In 1962, the GSA assumed control of the entire complex (with the exception of a 24-acre tract), with the understanding that AEC would continue to use portions of it.

In subsequent years, the KCP operations increased in scope, and the plant expanded into more of the main building and into adjacent and new buildings.

In 1975, the KCP came under the control of the Energy Research and Development Administration (ERDA) following a reorganization of the Atomic Energy Commission. In 1976, the ERDA-occupied portion of the Federal complex was transferred to ERDA control. When the Department of Energy (DOE) was formed in 1977, the KCP facilities were included in the DOE organization.

2.2.2 Present Operations

The current mission of the KCP includes development of new technologies and materials, support of weapons design phases, and production of stockpile hardware. Most of the products manufactured at the plant are delivered to the final assembly plant at Amarillo, Texas. Technical coordination of designs is maintained with the DOE laboratories operated by AT&T Technologies, Inc. (Albuquerque, New Mexico and Livermore, California) and by the University of California (Los Alamos, New Mexico and Livermore, California).

The Kansas City Plant manufactures or fabricates a wide variety of products that include machining of metals, plastics forming and fabrication, plating operations, and assembly of electrical and mechanical components. The KCP typically produces approximately 15,000 different products annually. Many of the product lines are one-of-a-kind or small-quantity items, although some may involve large-volume production.

The current production effort consists of approximately 42 percent electrical and electronic components, 44 percent mechanical components, and 14 percent plastic products.

Electrical and electronics products include components such as radar units, timers, high-voltage power supplies, hybrid microelectronic circuits, transformers, coils, cables, printed circuit boards, telemetry and flight instrumentation units, and device electronic triggers. The circuit-board production may include drilling and cutting of circuit-board stock material, transfer of circuit designs onto the photosensitive board surface, photofinishing-type operations on the board, etching of excess metal from board surfaces, and plating of other metal onto the circuit paths. Associated processes include soldering, welding, modeling, and assembly. Since most of the electronics require a high degree of cleanliness, special air cleaning and handling techniques are required. Solvent cleaning of components may also be necessary.

Mechanical products include a variety of components and assemblies that involve a number of different processes. Products that require machining include cases, rings, component housings, plates, covers, precision gears and rachets, pawls, rollers, and parts of valves and switches. Processes associated with machining include standard metal removing operations (e.g., lathe turning and milling) for stainless steel, aluminum, and titanium. Precision assembly work is required for coded mechanical locking devices, high-pressure valves, environmental sensing devices, and a variety of metal-formed components and assemblies. Assembly-related processes may include pressing, hydroforming, welding, bending, joining and some secondary machining. In addition to machining and welding, a number of components require vapor degreasing, chemical and electromechanical cleaning, electroplating, etching, polishing, sandblasting, painting, and plastic coating.

Plastic products fabricated at the KCP include housing for electronic and mechanical components, electrical connectors, precision miniature parts, desiccants, structural supports, fillers, and filled plastics. Boron-impregnated materials are fabricated for neutron shielding of components. Materials used include polystyrenes, polyurethanes, silicones, syntactics, and other plastics. Processes related to plastic products include mixing, blending, injection and compressions molding, impregnating, filament winding, and machining.

Special technologies employed at KCP include organic coatings, metal deposition, laser machining, fabrication of miniature electronic devices, etching of precision patterns into metal films, formulating polymers and adhesives, and designing and fabricating instrumentation for product testing. The plant has a major engineering design organization with supporting research and development capabilities to supplement manufacturing operations.

2.3 State/Federal Concerns

As a part of the KCP pre-Survey site visit, a meeting was held at the Kansas City Area Office with representatives of EPA Region VII, the Missouri Department of Natural Resources (MDNR), and Kansas City, Missouri (KCMO) on February 11, 1987. This meeting was held to advise these agencies of the scope and objectives of the Environmental Survey. The agency personnel were asked to express any concerns they might have related to environmental conditions at KCP so that these could be addressed, as appropriate, during the DOE Survey. Their concerns are summarized below:

- The EPA expressed concern over the groundwater contamination plume from the tank farm, the North Lagoon, and the South Lagoon. Regulatory issues include the development of closure plans, groundwater monitoring, and the implementation of corrective actions. The EPA recommends separating physical closure from corrective action.

- KCP has been in violation of the metal-finishing pretreatment standards for 2 years. KCMO considers it essential to complete the wastewater treatment plant by the target date of October 1988.

- The Survey team was requested to to be aware of pretreatment standards (in addition to metal-finishing standards) that might be applicable to KCP.

- The method for disposal of treated water from groundwater clean-up must be resolved.

- The Missouri Department of Natural Resources (MDNR) expressed concern over historical storm sewer outfall polychlorinated biphenyl (PCB) exceedances and periodic upsets, and the discharge of these waters to a protected stream.

The KCP received, on December 3, 1984, an Abatement Order from the MDNR, requiring that the KCP cease violations of the Missouri Clean Water Law. The violations related to discharges of PCBs to waters of the state. The KCP National Pollutant Discharge Elimination System (NPDES) permit prohibits discharges of any measurable quantities of PCBs to waters of the state. The Abatement Order required that the KCP submit a plan, by December 28, 1984, to reduce the discharge of PCBs and, by July 3, 1985, complete all actions identified in the plan to reduce the PCB discharge to 1 microgram per liter on a monthly average. On July 10, 1985, MDNR issued a Stipulation for Modification of Abatement Order, in which it was stated that DOE had agreed to conduct an investigation into possible sources of PCBs appearing in the discharge from outfall 002. DOE was required to advise MDNR, by July 31, 1986, of the remedial actions proposed to reduce the PCBs in the outfall 002 discharges to 1 microgram per liter on a monthly average. DOE was further required to achieve the stated discharge limits by December 31, 1986, or if unable to meet the limit, to notify MDNR and appeal that condition at the time of the reissue of the NPDES permit, at midnight, April 15, 1987. The issue of PCBs in the KCP discharges is discussed in Section 3.3.

3.0 MEDIA-SPECIFIC SURVEY FINDINGS

The discussions in this section pertain to existing or potential environmental problems in the air, soil, surface-water, and groundwater media. The discussions include a summary of the available background environmental information related to each medium, a description of the sources of pollution and their control techniques, a review of the environmental monitoring program specific to each medium, and a categorization and explanation of the environmental problems found by the Survey team related to each medium.

3.1 Air

3.1.1 Background Environmental Information

The Kansas City Plant (KCP) is located in the Metropolitan Kansas City Interstate Air Quality Control Region (AQCR), which consists of Buchanan, Cass, Clay, Jackson, Platte, and Ray counties in Missouri and of Johnson, Leavenworth, and Wyandotte counties in Kansas. The National Ambient Air Quality Standards (NAAQS), which are designed to protect public health and welfare and which are pertinent to the Missouri portion of the Kansas City AQCR, are shown in Table 3-1. The State of Missouri has imposed its own standards, which duplicate the NAAQS, except that the Missouri standard for suspended particulates is equivalent to the more stringent secondary NAAQS. Also, the Missouri standards include air-quality standards for hydrogen sulfide and sulfuric acid. The Air Quality Section of the Kansas City, Missouri, Health Department has adopted and enforces the state-prescribed air-quality standards.

The City of Kansas City operates an extensive network of air-quality monitoring stations in Kansas City and at select locations in adjacent counties. Only one of those stations is within 10 miles of the Kansas City Plant. That station is located at the northeast corner of the Federal complex (Station 1, Figure 3-1) and is known as the 2500 Bannister Street monitor. The only pollutants monitored by the city at that site are total suspended particulates, carbon monoxide, and lead. The data for 1985 are summarized in Table 3-1, where a comparison with the air-quality standards shows that these three parameters met the standards.

During calendar year (CY)1986, the maximum 1-hour reading for carbon monoxide was recorded in February (Ramirez, 1987a). The reading was 8.0 milligrams (8,000 micrograms) per cubic meter, which is 20.0 percent of the regulatory limit of 40.0 milligrams (40,000 micrograms) per cubic meter (see Table 3-1). No data were presented for comparison with the 8-hour standard of 10.0 milligrams (10,000 micrograms) per cubic meter.

TABLE 3-1

AMBIENT AIR QUALITY NEAR THE KANSAS CITY PLANT AND AIR-QUALITY STANDARDS KANSAS CITY PLANT, KANSAS CITY, MISSOURI

SUSPENDED PARTICULATES

	Bannister Street Monitor	Air-Quality Attainment Status	Air-Quality Standards		
			State of Missouri	National	
				Primary	Secondary
Annual Geo. Mean, µg/m³	49	Primary Attainment	60	75	60
24-Hour Average, µg/m³	134	Secondary Nonattainment	150 [a]	260 [a]	150 [a]

SULFUR DIOXIDE

Annual Average, µg/m³	ND	Attainment	80	80	----
24-Hour Average, µg/m³	ND	Attainment	365 [a]	365 [a]	----
3-Hour Average, µg/m³	ND	Attainment	1,300 [a]	----	1,300 [a]

CARBON MONOXIDE

8-Hour Average, µg/m³	ND	Attainment or cannot be classified	10,000 [a]	10,000 [a]	10,000 [a]
1-Hour Average, µg/m³	8,000		40,000 [a]	40,000 [a]	40,000 [a]

PHOTOCHEMICAL OXIDANTS (OZONE)

1-Hour Average, µg/m³	ND	Nonattainment	235 [a]	235 [a]	235 [a]

NITROGEN DIOXIDE

Annual Average, µg/m³	ND	Attainment or cannot be classified	100	100	100

LEAD

Calendar Quarter Average, µg/m³	0.03	Not designated	1.5	1.5	1.5

TABLE 3-1
AMBIENT AIR QUALITY NEAR THE KANSAS CITY PLANT AND AIR-QUALITY STANDARDS
KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE TWO

HYDROGEN SULFIDE

	Bannister Street Monitor	Air-Quality Attainment Status	Air-Quality Standards		
			State of Missouri	National	
				Primary	Secondary
1/2-Hour Average, $\mu g/m^3$	ND	Not designated	70 (b)	----	----
1/2-Hour Average, $\mu g/m^3$	ND		42 (c)	----	----

SULFURIC ACID

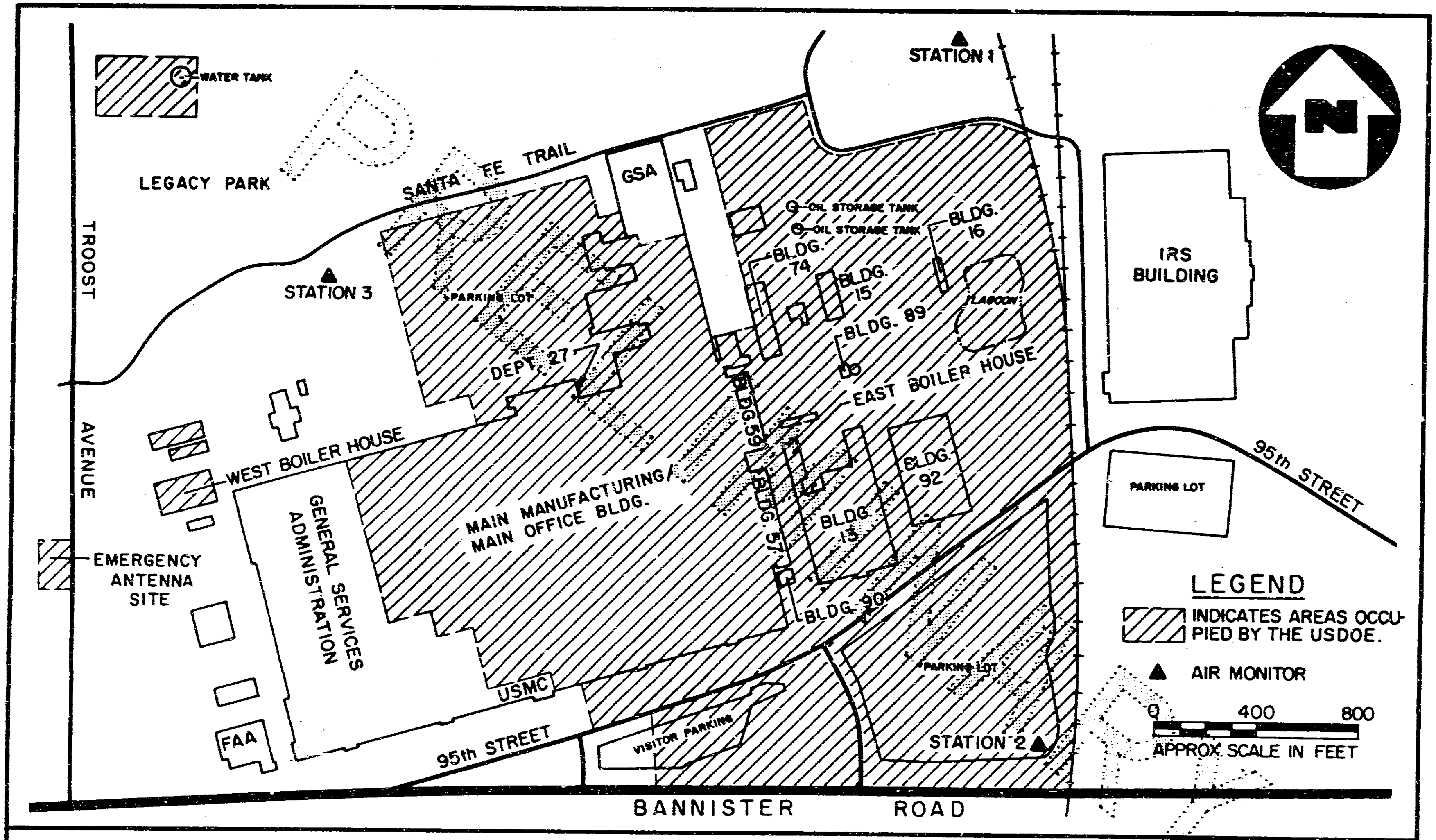
24-Hour Average, $\mu g/m^3$	ND	Not designated	10 (d)	----	----
1-Hour Average, $\mu g/m^3$	ND		30 (e)	----	----

Sources:

Missouri, 1983a; CFR, 1986.

(a) Not to be exceeded more than once per year.
(b) Not to be exceeded more than two times per year.
(c) Not to be exceeded more than two times in any 5 consecutive days.
(d) Not to be exceeded more than once in any 90 consecutive days.
(e) Not to be exceeded more than once in any 2 consecutive days.

ND Not determined



SOURCE: Environmental Survey observations.

FIGURE 3-1

PERIMETER AIR-MONITORING STATIONS
KANSAS CITY PLANT – KANSAS CITY, MISSOURI

Total suspended particulate samples (24-hour samples) were taken once every sixth day during CY1986. The highest particulate value was 134 micrograms per cubic meter, which is 89.3 percent of the Missouri 24-hour standard of 150 micrograms per cubic meter. The annual geometric mean particulate concentration was 49 micrograms per cubic meter, which is 82 percent of the Missouri annual standard of 60 micrograms per cubic meter.

Lead analyses were conducted on the particulate samples. Calendar-quarter averages were 0.03 microgram per cubic meter for the first, second, and fourth quarters, and 0.01 microgram per cubic meter for the third quarter. The 0.03 microgram per cubic meter value is 2 percent of the quarterly standard of 1.5 micrograms per cubic meter.

The National Emissions Standards for Hazardous Air Pollutants (NESHAP) in 40 CFR 61 lists 8 substances that have been designated as hazardous air pollutants, and an additional 20 substances that are under consideration for designation as hazardous air pollutants because of potential serious health effects. Those substances are listed in Table 3-2. The regulations of the State of Missouri (Missouri, 1983a and 1983b) and the City of Kansas City, Missouri (Kansas City, 1984), incorporate the NESHAP either directly or by reference, and are pertinent to the Missouri portion of the Kansas City AQCR.

The Kansas City Regulation 18.84(E) states that the director may require submission of an annual inventory of air contaminant sources and emissions to the Air Quality Section of the City Health Department. The KCP has submitted an annual inventory that includes specific source and fuel consumption data, but not emissions data, for boilers; data on solvents used in protective coatings (paints); solvent usage; and generic control and stack information for various operations. However, KCP does not have a comprehensive list of air pollutant sources nor, except for the West Boiler House, have its air emissions been quantified. As an indication of the number of potential air-emission points, the Kansas City Area Office has estimated that there are about 1,600 roof exhaust vents at KCP (Bean, 1987). A computer printout of a 1984 inventory of exhaust hoods, which was prepared for industrial hygiene purposes, showed a total of 549 exhaust systems (KCP, 1984a).

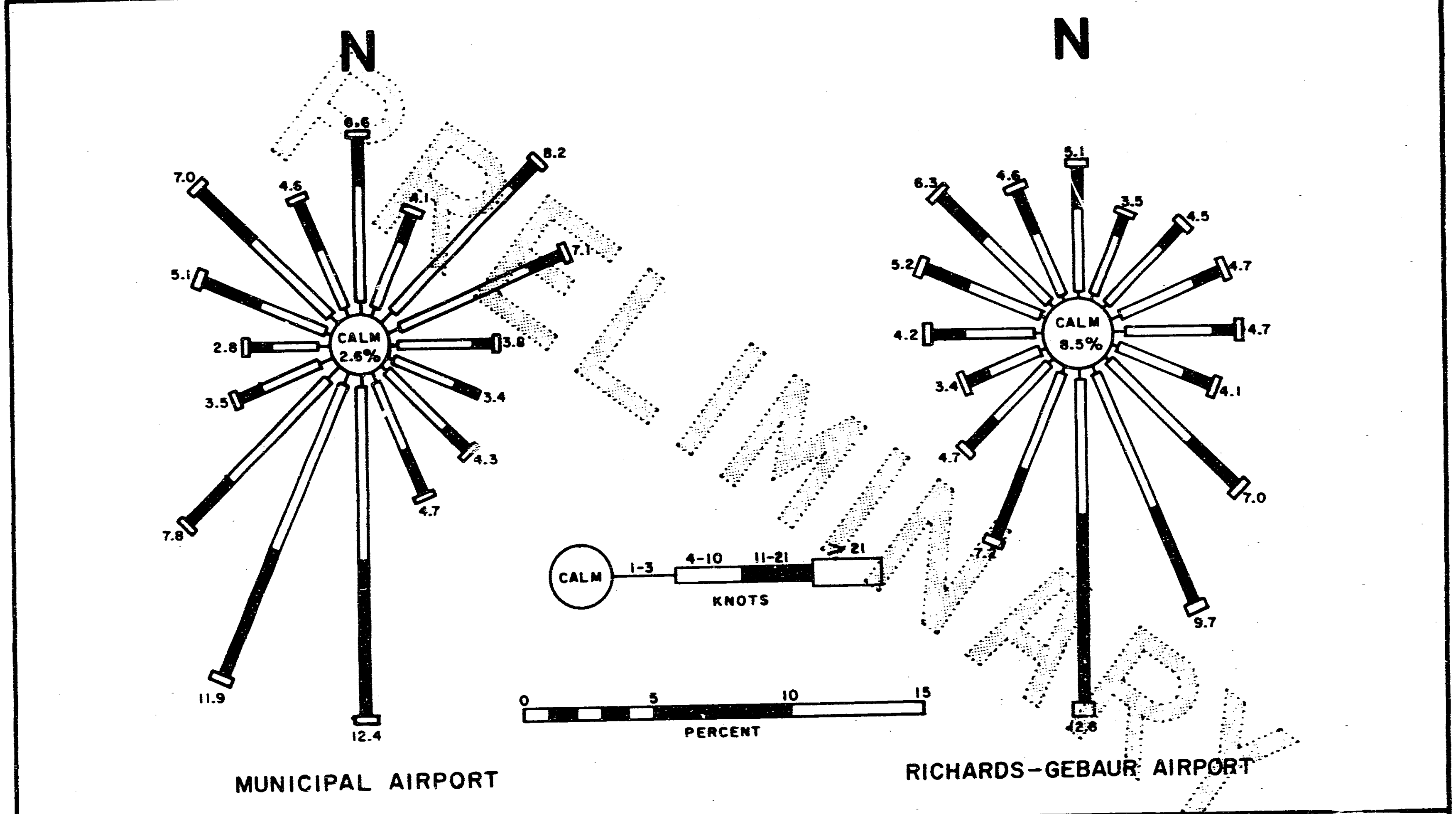
Annual wind roses for two meteorological stations in the vicinity of KCP are shown in Figure 3-2. The wind rose on the left presents data from Municipal Airport (about 15 miles north of KCP); data from the Richards-Gebaur Airport (about 10 miles south of KCP) are shown on the right. The bars emanating from the center circle represent the direction from which the wind was blowing. The length of each bar and the number at the end shows the frequency of winds from each direction. Wind frequency in four wind-speed categories is depicted by varied bar width and shading.

TABLE 3-2

SUBSTANCES DESIGNATED OR UNDER CONSIDERATION AS HAZARDOUS AIR POLLUTANTS KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Designated Hazardous Air Pollutants	Substances with Health Effects Under Consideration
Asbestos	Acrylonitrile
Benzene	1,3-Butadiene
Beryllium	Cadmium
Coke Oven Emissions	Carbon Tetrachloride
Inorganic Arsenic	Chlorinated Benzenes
Mercury	Chlorofluorocarbon-113
Radionuclides	Chloroform
Vinyl Chloride	Chloroprene
	Chromium
	Epichlorohydrin
	Ethylene Dichloride
	Ethylene Oxide
	Hexachlorocyclopentadiene
	Manganese
	Methyl Chloroform
	Methylene Chloride
	Perchloroethene
	Polycyclic Organic Matter
	Toluene
	Trichloroethene
	Vinylidene Chloride

Source: NESHAP, 40 CFR 61 as amended in 51 FR 23419, June 27, 1986.



SOURCE: BKCD, 1986.

FIGURE 3-2

ANNUAL WIND ROSES FOR THE KANSAS CITY AREA
KANSAS CITY PLANT – KANSAS CITY, MISSOURI

The frequency of observations of calm conditions is also shown at the center of each wind rose. At both locations, the prevailing winds are generally southerly, with 32.1 percent of the observations at Municipal Airport from the southwest through south sectors and 36.7 percent of the observations at Richards-Gebaur from the west-southwest through southeast sectors. These wind directions are also associated with higher wind speeds. Most winds fall within the 4 to 21 knot (2 to 11 m/sec) speed range.

3.1.1.1 Nonradioactive Air Contaminants

The U.S. Environmental Protection Agency has designated the Missouri portion of the Kansas City AQCR an attainment area for sulfur oxides, and attainment or "cannot be classified due to a lack of air quality data" for carbon monoxide and nitrogen dioxide. The AQCR has attained the national primary standards for total suspended particulate but is nonattainment with respect to the secondary standards. The counties of Clay, Platte, and Jackson (KCP is located in Jackson County) are designated nonattainment for ozone, while the remainder of the Missouri portion is attainment (40 CFR 81.326, November 27, 1985).

Ozone and other photochemical oxidants are not emitted into the atmosphere as primary pollutants. Rather, they are formed as secondary pollutants in the atmosphere through photochemical reactions involving primary organic and inorganic pollutants emitted from a multiplicity of sources. Thus, the emissions of photochemically active volatile organic compounds (VOCs) are considered precursors to ambient levels of ozone. Because of the ozone nonattainment status, the U.S. Environmental Protection Agency (USEPA), Region VII office has directed the State of Missouri to revise its ozone implementation plan to provide for attainment of the standard.

The attainment status of lead, hydrogen sulfide, and sulfuric acid has not been designated.

The nonattainment status of the Kansas City AQCR with respect to the secondary total suspended particulates and primary ozone NAAQS may result in added efforts by air pollution control agencies to minimize emissions of particulate matter and VOCs from sources within the AQCR, including the KCP.

3.1.1.2 Radioactive Air Contaminants

No radioactive materials are currently processed or machined at the Kansas City Plant. However, in the 1950s and 1960s, depleted uranium was machined. Those activities resulted in some low-level radioactive wastes that remain on-site (see Section 4.1) and in residual contamination in the main building (see Section 4.3.2).

3.1.2 General Description of Pollution Sources/Controls

The discussion of air emissions, controls, and problems at the Kansas City Plant is based only on nonradioactive materials because no radioactive materials are currently processed. The nonradioactive emissions include a variety of substances generated by the burning of fuels and by the operation of facilities for the manufacture of mechanical, electronic, and plastics products. A single annual operating permit issued by the City of Kansas City covers "all existing air pollution sources" located at the Kansas City Plant (Biery, 1986). The sources of nonradioactive air contaminants generated by the Kansas City Plant and the techniques used to control emissions are discussed in this section. These contaminants include, in part, the criteria pollutants with established ambient air-quality standards, and air contaminants regulated under the National Emission Standards for Hazardous Air Pollutants (NESHAP). However, the Survey also considered the emissions of toxic air pollutants and unregulated air contaminants that might pose future problems.

3.1.2.1 Fuel-Burning Sources and Emission Controls

Fuel is burned in indirect heating units at the Kansas City Plant for the purpose of producing steam, and for heating heat-transfer oil for plastics-molding operations. These units are described as indirect heaters because the products of combustion do not come in direct contact with the process materials being heated. Other fuel-burning equipment at KCP includes diesel-fueled internal combustion engines that power emergency generators and fire-protection pumps.

3.1.2.1.1 Boilers

Steam production for space-heating purposes at the Kansas City Plant in the recent past has been provided by seven boilers at two boiler houses (see Figure 2-2). The East Boiler House included three boilers, each with a design heat-input capacity of 56 x 10^6 Btu/hour. These boilers were capable of firing either natural gas or No. 6 fuel oil. Boiler No. 1 was taken out of service early in 1983. Boiler Nos. 2 and 3 have not been used since early 1983 and have been described as out of service (BKCD, 1986); however, the latter two have not been dropped from the annual emission inventory that is submitted to the City of Kansas City, Missouri. The West Boiler House has four boilers, each with a design heat-input capacity of 128 x 10^6 Btu/hour, that can be fired on natural gas or No. 6 fuel oil. Operating hours and fuel-usage data for all the boilers for the period 1981 through 1985 are shown in Table 3-3.

TABLE 3-3

BOILER OPERATING DATA
KANSAS CITY PLANT, KANSAS CITY, MISSOURI

BOILER NO. 1 EAST

	1985	1984	1983	1982	1981
Operating Hours	----	----	469 (a)	1,590	2,763
Fuel Usage					
Natural Gas, 10^6 ft^3	----	----	19.8	38.2	71.6
No. 6 Oil, gallon	----	----	0.0	0.0	0.0

BOILER NO. 2 EAST

	1985	1984	1983	1982	1981
Operating Hours	----	----	45 (b)	1,766	3,175
Fuel Usage					
Natural Gas, 10^6 ft^3	----	----	41.4	42.4	83.4
No. 6 Oil, gallon	----	----	0.0	0.0	14,082

BOILER NO. 3 EAST

	1985	1984	1983	1982	1981
Operating Hours	----	----	56 (b)	132	2,595
Fuel Usage					
Natural Gas, 10^6 ft^3	----	----	3.7	25.4	62.4
No. 6 Oil, gallon	----	----	0.0	0.0	0.0

BOILER NO. 1 WEST

	1985	1984	1983	1982	1981
Operating Hours	2,499	741	1,164	3,940	1,284
Fuel Usage					
Natural Gas, 10^6 ft^3	150.0	43.0	100.4	216.5	86.6
No. 6 Oil, gallon	0.0	0.0	0.0	0.0	0.0

BOILER NO. 2 WEST

	1985	1984	1983	1982	1981
Operating Hours	2,056	5,147	3,323	1,992	1,145
Fuel Usage					
Natural Gas, 10^6 ft^3	123.4	289.4	159.0	108.2	72.3
No. 6 Oil, gallon	0.0	0.0	0.0	0.0	0.0

TABLE 3-3
BOILER OPERATING DATA
KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE TWO

BOILER NO. 3 WEST

	1985	1984	1983	1982	1981
Operating Hours	3,016	4,522	4,383	2,906	3,210
Fuel Usage					
Natural Gas, 10^6 ft^3	181.0	286.1	236.9	166.0	196.6
No. 6 Oil, gallon	0.0	0.0	235,852	0.0	30,429

BOILER NO. 4 WEST

	1985	1984	1983	1982	1981
Operating Hours	5,520	2,467	2,573	4,184	5,160
Fuel Usage					
Natural Gas, 10^6 ft^3	331.2	144.2	127.2	230.9	308.0
No. 6 Oil, gallon	0.0	0.0	0.0	0.0	0.0

Source: Carrick, 1982; Williams, 1983; Williams 1984; Williams, 1985; Kircher, 1986a.

(a) Boiler No. 1 East was removed during 1983.
(b) Boiler Nos. 2 East and 3 East were taken out of service in 1983.

The Missouri sulfur dioxide emission standard and the particulate emission standard for fuel-burning sources have been adopted and are enforced by the Air Quality Section of the Kansas City, Missouri, Health Department (Kansas City, 1984), whose jurisdiction encompasses the KCP. The maximum allowable sulfur dioxide emission rate, established by Kansas City Regulation 18.87(A)(3), is 8.0 pounds per million Btu. While the sulfur dioxide emission limitation is stated simply, Kansas City Regulation 18.86(B)(2) provides a more complex technique to establish the maximum allowable particulate emission rate for existing indirect heating sources (such as boilers, heat-transfer-oil heaters, etc.), based on total heat input from all such sources at the facility. Thus, the maximum allowable particulate emission rate is determined as follows:

Total Heat Input (Q), Million Btu Per Hour	Maximum Allowable Particulate Emission Rate (E), Pounds Per Million Btu
Less than 10	0.60
10 ≥ Q ≥ 5,000	$E = 1.09 (Q)^{-0.259}$
Greater than 5,000	0.12

Because the total heat input of the four active boilers at the West Boiler House (128 million Btu per hour per boiler times 4 boilers = 512 million Btu per hour) falls in the midrange, it is necessary to calculate the maximum allowable particulate emission rate as follows:

$$E = 1.09\,(128 \times 4)^{-0.259} = 0.22\,\frac{pound}{10^6\,Btu}$$

A slightly lower allowable particulate emission limit would result if the heat input for hot-oil heaters (see Section 3.1.2.1.2) were included in the calculation as required by Kansas City Regulation 18.86(B)(2)(a). However, heat-input information was not available and could not be developed for the oil heaters.

Kansas City Regulation 18.86(D) restricts emissions of visible air contaminants to an opacity less than 20 percent.

3.1.2.1.2 Heat-Transfer Oil Heaters

Additional gas-fired units at KCP include heaters used in hot-oil systems. The hot oil is used by Departments 26 and 27 to heat molds and forming devices that produce molded and formed plastic products. As part of the on-site Survey, four heaters in and near Building 90 that serve Department 26 were observed (see Figure 2-2). Two of the heaters outside Building 90 serve an old, PCB-contaminated oil system that is being phased out. The two heaters inside Building 90 provide heat for a replacement hot-oil system. The new heaters each have rated heat outputs of 2.5 million Btu/hr. At Department 27, four heaters located at the north side of the main building were observed (see Figure 2-2). Two old Hydrotherm units, each with 3.5 million Btu/hr heat output, are being phased out of service and two new ENTEC heaters, each providing 3.5 million Btu/hour of heat output, that serve a new PCB-free hot-oil system are being phased in.

No information was available on rated heat input for any of the heaters to allow for calculation of a facility-wide maximum allowable particulate emission rate. The exhaust stacks are not equipped with emission-control devices. However, because the heaters burn natural gas, they are considered to be minor sources of particulates and sulfur dioxide, and emission-control devices are not required.

3.1.2.1.3 Diesel-Powered Stationary Sources

Other fuel-burning units at KCP include diesel-powered generators and diesel-powered fire-protection pumps for use during off-site power failures. A list of diesel-powered equipment is shown in Table 3-4. Each of these units is test-operated weekly to ensure operability during power outages. Emission-control devices are not required. Because the diesel-powered equipment is operated only on an emergency basis and for limited test periods, these units are considered very minor sources of air pollutants. However, according to Kansas City Air Regulation 18.86(F)(1), emissions of visible air contaminants in excess of 5 continuous seconds at any one time are not permitted. During the Survey, the diesel exhaust stacks were observed while each engine was started and operated for 1 minute. Those observations (Table 3-4) revealed that four of the engines appear to meet the visible emissions regulation and four did not. Three of the latter four showed an initial puff of black smoke and a continuing blue smoke emission. The engine at Building 75 had a continuous black emission.

3.1.2.2 Process Sources and Controls

The production of mechanical, electronic, and plastic components at KCP for the nuclear weapons program involves a variety of operations, including the formulation, molding, forming, and machining of plastic products; machining of metal products; manufacture of electrical and electronic devices; solvent-cleaning of manufactured parts; painting; metal-plating; and chemical processing. Many of these operations generate or have potential to generate air pollutants, such as volatile organic compounds and particulates.

TABLE 3-4

VISIBLE EMISSIONS FROM INTERNAL COMBUSTION ENGINES
KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Capital Equipment Number	Location	Equipment	Visible Emission	Remark
24255	S-28	Diesel Generator, 15 KVA	Black LT 5 sec*	Blue Smoke, continuous
-	Bldg. 5	Diesel Generator, 370 KW	Black 5 sec	
44521	Bldg. 75	Diesel Generator, 250 KW	Black GT 5 sec*	Black, continuous
-	Bldg. 48	Diesel Generator, 200 KW	Black LT 5 sec	
42425	MM43	Diesel Generator, 115 KW	Black LT 5 sec	
33630	Bldg. 42	Diesel Generator, 125 DCV 2.5 DC Amps	Black LT 5 sec	
52563	Bldg. 89	Diesel-powered Pump 160 HP @ 1,460 RPM	Black LT 5 sec*	Blue Smoke, continuous
52568	Bldg. 89	Diesel-powered Pump 160 HP @ 1,460 RPM	Black LT 5 sec*	Blue Smoke, continuous

Source: Observations by Environmental Survey team.

* Did not appear to meet visible emission requirement.
LT Less than
GT Greater than

3.1.2.2.1 Sources of Volatile Organic Compounds

The atmospheric emission of volatile organic compounds (VOC) from the KCP is of concern to the Survey because these materials react photochemically in the atmosphere to form ozone, a criteria pollutant. As stated in Section 3.1.1.1, the ozone standard has not been met in the Kansas City area. An air emissions inventory for CY1982 listed 76 degreasers at KCP that use solvents which are VOCs (Carrick, 1983). Of these 76, there were 10 cold cleaners, 15 spray cleaners, 23 ultrasonic cleaners, 22 vapor degreasers, and 6 not specified. During the Survey, 44 cleaners and degreasers were observed for operating characteristics and emission controls. The KCP was in the process of developing a complete inventory of degreasers and cleaners during the on-site survey; that inventory will be incorporated in the Interim Report.

Cold cleaners containing solvent at room temperature are used to clean articles by immersion and/or washing by means of a spray wand. Evaporation losses are minimized by a lid which is to be kept closed except while handling and cleaning articles. Any vapor from these cleaners is typically released to the room air and eventually to the outside via room ventilation.

A spray cleaner consists of a small hood in which articles are cleaned by means of an air-operated paint spray-type nozzle that siphons solvent from a 1-gallon container. A portion of the solvent drains into a waste receptacle and the remainder evaporates and is vented to the outside.

Although no purely ultrasonic cleaners were observed during the Survey, these devices are usually small-volume (1-gallon or less) containers in which solvent at room temperature is agitated ultrasonically to aid in removing surface contaminants from objects being cleaned. Evaporation losses are retarded by means of a lid.

The most prevalent type of solvent degreaser/cleaner in use at KCP is the vapor degreaser, which may range in size from about 5 gallons to about 300 gallons and may also incorporate an ultrasonic chamber. In the vapor degreaser, the solvent is heated to its boiling point either electrically or by steam coils. Solvent vapor rising above the liquid is contained within the degreaser by means of cooling coils (chilled water or refrigerated) that condense the vapor to a liquid, which returns to the solvent reservoir to be revaporized. The cooling coils surrounding the inside of the degreaser in effect form a "lid" to prevent escape of the hot solvent vapors from the unit. Parts to be cleaned are suspended in the vapor space where the solvent vapor condenses on the parts, washing away any oil, grease, dirt, or soldering flux from the surfaces. The cleaned parts are then raised into the air space above the solvent vapor to drain and dry. Most modern degreasers (and most of those at KCP) are also equipped with a safety thermostat that will shut off the heating source if the vapor level rises above the cooling coil as a result of inadequate cooling. The vapor degreasers are also equipped with lids that retard vapor losses during idle periods when heating and cooling coils are not in use. During the course of the Survey, observation of 44 degreasers and cleaners revealed the following operating practices and equipment shortcomings that could result in excessive solvent evaporation losses which, if determined to be greater than 100 tons per year, would be in violation of Kansas City Regulation 18.89(B).

- Observed removal of cleaned parts directly from vapor space to room air with no drip-dry time allowed in the freeboard area.
- Lids left open on degreasers while not in use; some lids not easily operated by one hand, leading to a tendency to leave the degreaser open.
- Many units did not have any operating instruction posted. None had operating procedures as provided in Kansas City Regulation 18.89(B)(3).
- No annual operator and supervisor training programs, as specified in Kansas City Regulation 18.89(B)(4).
- Spray wands fitted with nozzles that produce a finely divided spray which is more prone to evaporation than a solid fluid stream.
- Some units lack a vapor-level safety thermostat that could result in vapor overflow if cooling coils do not function properly.
- Some older units have water-chilled condensers rather than more effective, refrigerated, condenser coils.

In addition to the degreasers and cleaners, sources of emissions to the atmosphere of volatile organic compounds at KCP include six solvent-recovery stills. These stills are used to recover and recycle solvents from some of the degreasers and cleaners. Kansas City Regulations do not address the control of VOC emissions from solvent-recovery stills. Five of the stills are dedicated to specific degreasers, four of which use 1,1,1-trichloroethane (TCA); the fifth uses methylene chloride (dichloromethane). At each of these five stills, contaminated solvent is pumped from the degreaser reservoir to the still, where heat is applied to vaporize the solvent with the vapor condensing into a receiver and the liquid subsequently transferred back to the degreaser reservoir. The distillation residue, containing the contaminants, is periodically removed by the Waste Management Department for disposal (see Section 4.1.2.1). Solvent vapors can be lost to the room air as a result of incomplete condensation and during removal of the distillation residue.

A sixth solvent-recovery still is used in a batchwise operation to reduce the volume of waste for disposal and at the same time to recover solvents for reuse. This unit, located in Building 59, is used to process and recover trichloroethene (TCE), 1,1,1-trichloroethane (TCA), trichlorotrifluoroethane (refrigerant 113), and perchloroethene (PCE). The contaminated solvent is placed in the still pot, where it is heated to the boiling point by steam coils. The vaporized solvent passes out of the pot and into a water-cooled heat exchanger, where the vapor condenses to a liquid. The liquid flows by gravity to a receiving tank, which is vented to the outside. The cooling water line has a manual valve and a solenoid valve that opens when the still turns on and closes when the still is shut off. However, the system is not interlocked to prevent operation of the still if the manual valve is not opened or if the cooling water temperature is too high. Lack of cooling water flow could result in uncondensed vapors passing through the system and being vented to the outside. At a distillation rate of up to 5 gallons per minute, a 5-minute discharge could release on the order of 250 pounds of VOC to the atmosphere.

A multiplicity of other processes/activities use volatile organic compounds or products that incorporate VOCs. These include:

- Machining coolant and lubricant.
- Paints, thinners, and paint removers.
- Wire stripping.
- Bonding adhesive and cements.
- Photolithography.
- Leveling agent for spray coating.
- Laboratory reactants and standards.
- Polymer synthesis.
- Product inspection and testing.
- Floor stripping and refinishing.

The quantities of various solvent materials used at KCP are reported annually as part of the emission inventory questionnaire to the Air Quality Section of the Kansas City, Missouri Health Department. These data are summarized in Table 3-5, where the solvents are categorized as volatile organic compounds or as solvents exempt from the definition of volatile organic compounds [Kansas City Regulation 18.83(V)(6)]. During 1985, 126,518 gallons of solvents were used at KCP, with

TABLE 3-5

ORGANIC SOLVENTS USED DURING 1985
KANSAS CITY PLANT, KANSAS CITY, MISSOURI

VOLATILE ORGANIC COMPOUNDS

	Amount Used, Gallons[a]	Hauled Away, Gallons	Amount Evaporated, Gallons
Trichloroethene [b]	32,796	[c]	[c]
Methylene chloride [b]	17,784	[c]	[c]
Alcohol	14,153	[c]	[c]
Acetone	2,575	[c]	[c]
Toluene [b]	2,341	[c]	[c]
Xylene	364	[c]	[c]
Naphtha	138	[c]	[c]
Mineral spirits	455	[c]	[c]
Perchloroethene [b]	0	[c]	[c]
Miscellaneous	2,919	[c]	[c]
Total Volatile Organic Compounds	73,525	28,833 [d]	44,692 [e]

EXEMPT SOLVENTS[f]

1,1,1-trichloroethane	19,403	[c]	[c]
Trichlorotrifluoroethane [b]	33,590	[c]	[c]
Total Exempt Solvents	52,993	20,781 [d]	32,212 [d]
TOTAL	126,518	49,614 [a]	76,904 [d]

[a] Source: Kircher, 1986b.
[b] Substances being studied by EPA for possible regulation as hazardous air pollutants.
[c] Data on individual solvents were not available.
[d] Estimated by difference.
[e] Estimated by Survey team.

$$\text{Evap} = \frac{73{,}525 \times 76{,}904}{126{,}518} = 44{,}692 \text{ gallons}$$

[f] Compounds exempted from definition of volatile organic compounds by Kansas City Regulation 18.83(V)(6).

49,614 gallons of mixed waste solvents hauled away for disposal (see Section 4.1.2.1); the balance of 76,904 gallons is presumed to have evaporated into the atmosphere. An estimate made by the Survey team of the total volatile organic compounds evaporated to the atmosphere during 1985 is 44,692 gallons (about 239 tons based on an average solvent density of 10.7 pounds per gallon). Some of the substances being used at KCP have been included in a list of materials that the EPA is studying for possible regulation as hazardous air pollutants.

3.1.2.2.2 Sources of Particulate Matter

Production activities at KCP that involve machining, grinding, and sandblasting of metals and plastics are potential sources of particulate matter emissions to the atmosphere. These activities take place at a number of locations at the facility; however, a comprehensive list of sources and control devices was not available.

During the course of the Survey, particulate emission control devices were observed and are listed in Table 3-6. Most of the devices are essentially used for housekeeping purposes to prevent accumulations of dust in the working environment. Several of these units are used to capture particulates from operations in the carpenter and model shops and from plastics machining activities. The high efficiency particulate air (HEPA) filters are used to capture and recover boron particles for recycle. The baghouses at Building 73 remove finely divided paper particles from air exhausted at the two shredders that are used to destroy classified waste paper.

Inspection of these air cleaning devices indicated that they are effective in capturing particulates at the source and also appear to be effective in preventing the emission of particulates to the atmosphere. No visible emissions were observed. The only exception was at the baghouses serving the paper shredders. Finely divided paper dust was in evidence in the area surrounding the baghouses. When the air systems were turned on in a demonstration for the Survey, paper dust was seen escaping the baghouses as a result of defective seals on access doors.

Another potential source of particulate emissions involves the machining of a beryllium-copper alloy. This operation was of particular interest because beryllium is a listed NESHAP material. However, during the Survey, it was learned that the alloy includes less than two percent beryllium (Frerking, 1987). The NESHAP for beryllium applies only if the alloy contains more than 5 percent beryllium by weight (40 CFR 61.30). In addition, the parts being machined are constantly bathed by a cooling, lubricating oil flow that effectively prevents evolution of particulates.

TABLE 3-6

PARTICULATE EMISSION CONTROL EQUIPMENT
KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Type of Equipment	Department	Equipment Location	Service
Baghouse	D/187	Outside Main Building	Carpenter Shop
Baghouse	D/823	Outside Main Building	Model Shop
Pangborne Air Cleaner	D/26	Column J49	Plastics Deburring
Two Baghouses		Building 73	Paper Shredder
HEPA Filter*	D/29	Inside Main Building	Boron Dry Blender
Two Baghouses	D/48	Main Roof	Plastics Machining
"Twin Hotel" Cyclones	D/48	Main Roof	Plastics Machining
Baghouse	D/26	Main Roof	Plastics Machining
HEPA Filter	D/98	Main Roof	Boron Recovery
Three Pangborne Air Cleaners	D/98	Inside Main Building	Sandblasters

Source: Observations by Survey team, 1987.

*HEPA = High Efficiency Particulate Air

Windblown dust from paved surfaces at KCP represents another potential source of particulate matter. Sand is used at KCP during winter months to improve traction on icy roads and parking lots. The residual sand and other soil can be pulverized by vehicle movements, and the finely divided particles can become airborne as a result of traffic or wind. KCP uses a Tennant street sweeper that is equipped with rotating brushes and a vacuum system to minimize dust available for suspension. The sweeper is used almost daily on a where-needed basis.

3.1.3 Environmental Monitoring Program

The KCP has conducted only limited testing of stack and vent effluents to determine emission levels and is currently pursuing a project to initiate ambient air-quality monitoring at four perimeter stations. These activities are described in the following paragraphs.

3.1.3.1 Air Effluent Sampling/Monitoring

3.1.3.1.1 Boilers

The four stacks at the West Boiler House were tested in 1978 to determine compliance with regulatory emission limits (Burns & McDonnell, 1978). Each boiler was operated at 80 percent load (compliance load) while firing natural gas, and at three load levels (80 percent, 60 percent, and 40 percent) while firing No. 6 fuel oil. The stack test results, summarized in Table 3-7, show that all four boilers had particulate and sulfur dioxide emissions that were well below the maximum allowable limits while firing natural gas. After switching to No. 6 fuel oil, particulate emissions at Boiler Nos. 1, 3, and 4 exceeded the allowable limit at the 60 and 80 percent load levels and at the 40 percent load level on Boiler No. 4. Sulfur dioxide emissions were less than half the allowable limit of 8.0 pounds per million Btu.

Although periodic emission testing is not required by Permit or Regulation, additional stack tests were in progress at the West Boiler House during the on-site portion of the Survey. A testing program similar to the 1978 evaluation was being conducted. The results of those tests will be incorporated in the Interim Report when they become available.

In addition to stack tests to demonstrate performance, each boiler stack is equipped with a visible emission opacity monitoring device. This device is operated continuously when fuel oil is being fired to alert operators of opacities exceeding the 20 percent limit so that measures can be taken (e.g., adjustment of fuel/air ratio) to lower the opacity of emissions.

TABLE 3-7

RESULTS OF STACK TESTS AT WEST BOILER HOUSE BOILERS KANSAS CITY PLANT, KANSAS CITY, MISSOURI

	Natural Gas 80% Load	Fuel Oil 80% Load	Fuel Oil 60% Load	Fuel Oil 40% Load	Emission Limit
Particulate Emissions					
Boiler No. 1, lb/10^6Btu	0.020	0.263	0.246	0.194	0.22*
Boiler No. 2, lb/10^6Btu	0.089	0.179	0.168	0.145	0.22*
Boiler No. 3, lb/10^6Btu	0.020	0.243	0.253	0.169	0.22*
Boiler No. 4, lb/10^6Btu	0.013	0.221	0.232	0.243	0.22*
Sulfur Dioxide Emissions					
Boiler No. 1, lb/10^6Btu	0.37	2.87	2.97	1.95	8.0**
Boiler No. 2, lb/10^6Btu	0.00	2.90	2.79	2.82	8.0**
Boiler No. 3, lb/10^6Btu	0.00	2.73	3.22	2.95	8.0**
Boiler No. 4, lb/10^6Btu	0.01	2.92	2.93	3.08	8.0**

Source: Burns & McDonnell, 1978.

* As calculated by KCP, based on total design heat input for the four boilers.
** From Kansas City Regulation No. 18.87(A)(3).

The boiler flue gases are exhausted to the atmosphere from individual stacks. There are no emission controls on the stacks, nor are controls required due to low emissions of particulates and sulfur dioxide. Natural gas is the preferred fuel, with No. 6 fuel oil as backup fuel. However, since calendar year 1983, No. 6 fuel oil has been fired only for brief test periods, following notification to the Air Quality Section of the City of Kansas City, Missouri.

3.1.3.1.2 Heat-Transfer Oil Heaters

Combustion gases from each oil heater are exhausted through individual stacks that are equipped with continuous monitoring devices for visible emissions to ensure that those emissions do not exceed the 20 percent limit.

3.1.3.1.3 Volatile Organic Compounds

During the on-site Survey, KCP was attempting to measure VOC emissions at three exhaust vents serving three large degreasers to quantify the emission rates. However, wide variations in the measured volume of air exhausted during a test were being experienced, possibly due to opening and closing of doors inside the building. These variations in the air volume exhausted create problems in calculating the mass of VOC per unit volume of air exhausted. The results of those tests will be incorporated in the Interim Report.

3.1.3.2 Perimeter Air-Quality Monitoring

A contractor has been selected by KCP to equip and operate three plant perimeter monitoring stations for a period of 4 years. The stations are to be located as shown in Figure 3-1. Each station will be equipped to sample and analyze for particulates (both total and less than 10 micrometers in diameter [PM-10]), sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone, lead, and hydrogen sulfide. Operation of these monitoring stations is expected to begin in 1987, providing air-quality data in the immediate vicinity of the KCP.

3.1.3.3 Meteorological Monitoring

The KCP operates a meteorological monitoring station atop Building 13. Hourly values of wind speed, wind direction, air temperature, relative humidity, dew point, barometric pressure, and precipitation are transmitted to a data logger in the East Boiler House. Hourly data for each 24-hour period are printed as part of a summary for the day. Once the hard copy is produced for the day, the computer is cleared to begin receiving data for the subsequent day. Hard copies are filed weekly for future reference. Instrument calibrations are rechecked at 13-week intervals.

The wind instruments are placed about 12 to 15 feet above the roof level, which may not provide sufficient separation to avoid interference to air flow by Building 13 and by the nearby Electrical Products Building that is higher than Building 13.

3.1.4 Findings and Observations

3.1.4.1 Category I

None.

3.1.4.2 Category II

None.

3.1.4.3 Category III

1. Emissions of Volatile Organic Compounds to the Atmosphere. An estimated 239 tons per year of volatile organic compounds (VOC) are being emitted to the atmosphere from a wide variety of operations at KCP. These compounds react photochemically in the atmosphere to form ozone, a criteria pollutant that has not met the ambient air-quality standard in the counties surrounding KCP.

   Sources of VOCs at KCP include degreasing and cleaning devices that use organic solvents, solvent recovery stills, paint spray booths, solvent floor stripping, and a wide variety of other applications that individually use minor amounts of solvents. VOCs emitted to room air and to vents from these sources are exhausted to the atmosphere by more than 500 exhaust systems. Because of the complexity of the sources and exhausts, the emissions estimate was based on knowledge of amounts of solvents used and amounts of waste solvents hauled away for disposal, the difference assumed to have evaporated to the atmosphere.

3.1.4.4 Category IV

1. NESHAP-Listed Substances Being Emitted to Atmosphere. Trichloroethene and methylene chloride (dichloromethane) are being emitted to the atmosphere through ventilation systems

serving various cleaning and degreasing operations. Both substances are being considered for regulation by USEPA because of their possible carcinogenic effects on humans. During CY1985, KCP reported using 32,796 gallons of trichloroethene and 17,784 gallons of methylene chloride, with about 50 percent of each being lost to the atmosphere through evaporation.

2. Dust Emissions from Paper Shredder Baghouse. As a result of inadequate seals around access doors to baghouses that serve classified waste paper shredders in Building 73, finely divided paper dust is being emitted to the atmosphere during the air pulse cycle, which occurs frequently (2 or 3 times per minute). Although the quantity released is small, the emission adds to the atmospheric total suspended particulate load.

3. Degreasers Do Not Comply with KC Air Regulations. Degreasers and solvent cleaners at KCP do not meet certain specifications of the Kansas City Air Code Section 18.89 relating to (1) minimum equipment requirements, (2) operator and supervisor training, and (3) operating procedures. Although solvent emissions from degreasers may not exceed the 100-ton-per-year threshold that activates the specifications, the threshold may be revised downward as part of the state of Missouri's ozone implementation plan revision process. In that event, the following shortcomings were noted:

- Some lids were not easily operated by one hand.
- Some spray wands were fitted with inappropriate nozzles that produced finely divided spray rather than an unbroken stream.
- Some units lack a vapor-level safety thermostat.
- Some older units had water-cooled condensers rather than refrigerated coils.
- No KCP-specific operating instructions were posted.
- No annual operator and supervisor training programs were practiced.
- Lids were left open on some units while not in use.
- Cleaned parts were observed being removed without appropriate drip-dry time in the degreaser.

4. Potential for Release of Volatile Organic Compounds From Solvent Recovery Still. Operation of the solvent recovery still in Building 59 without a fail-safe means to detect excessively warm or no water flow in the condenser jacket could result in the release of uncondensed solvent vapor to the atmosphere thus add to the existing ozone problem. Such an incident occurred at another still at KCP in August 1984 when cooling water flow was inadequate (UOR, 1984).

5. Visible Emissions from Diesel-Powered Stationary Equipment. Four of the eight stationary diesel internal combustion engines at KCP did not meet Kansas City Air Regulation 18.86(F)(1) concerning visible emissions. Six of the engines power emergency electric generators, and two serve back-up fire-protection pumps. All eight units are used only on an emergency basis or during brief weekly test periods. During the Survey, the diesel exhaust stacks were observed while each engine was started and operated for one minute. Two of the diesel-powered generators (Capital Equipment Nos. 24255 and 44521) and the two diesel-powered pumps showed visible emissions for a period exceeding the allowable 5 seconds.

6. Calculation of Maximum Allowable Particulate Emissions. KCP calculations have slightly overstated the maximum allowable particulate emission rate for the West Boiler House. Those calculations were based on the design heat input of the four boilers but did not take into account the design heat input of other indirect heating units that serve the heat-transfer oil systems in Departments 26 and 27. Kansas City air-quality regulations require that the total heat input of all indirect heating units be used in the calculation of the maximum allowable particulate emission limit.

7. Particulate Emission Exceedances at West Boiler House. Stack tests conducted in 1978 at the West Boiler House showed that Boiler Nos. 1, 3, and 4 exceeded the allowable particulate emission limit when the boilers were being fired with No. 6 fuel oil at 60 and 80 percent load levels and at the 40 percent load level on Boiler No. 4. The boilers generally fire natural gas except during periodic tests of the oil system or during natural gas interruptions. No significant use of No. 6 fuel oil has occurred since 1983.

3.2 Soil

3.2.1 Background Environmental Information

Soils are important both because of their role as a supporting medium and source of nutrition for plants, and because of their physical and chemical properties in retarding contaminant migration.

Soil surveys as conducted by the U.S. Soil Conservation Service generally consider soil properties such as grain size, permeability, ion exchange capacity, and amount of natural organic material present. The migration of soil contamination, if present, is influenced by these properties. Soil contamination generally results from airborne deposition, surface spills and releases, or leakage from underground tanks and piping. Burial sites produce soil contamination only if migration of leachate from the site occurs. Leaching of contaminated soil by precipitation may lead to groundwater pollution. Surface runoff may transport contaminated soil particles to streams and ponds. Some contaminants may be taken up by plants. The contaminated soil itself may be hazardous by direct contact, inhalation, or ingestion.

Preliminary Soil Conservation Service studies described in Kearl et al., (1984) indicate that soils at the Kansas City Plant have surface layers with permeabilities of 0.6 to 2.0 inches of water per hour. They tend to be rich in organic matter (humic acids) and exchangeable cations. These constituents would tend to retard the migration of organic compounds and metals. Soils in the higher parts of the floodplain on which the site is located have an underlying layer rich in clay, which would tend to retard contaminant migration. A detailed soil survey of Jackson County, Missouri, is available (Preston, 1984).

The following section describes soil contamination problems at the Kansas City Plant.

3.2.2 General Description of Pollution Sources/Controls

There are no continuing sources of soil contamination at the KCP, and therefore there are no controls to prevent or monitor such contamination. The major control to prevent isolated occurrences of spills and releases with the potential for resulting soil contamination is the use of standard spill prevention and control procedures.

The known occurrences of soil contamination at the KCP are the results of past spill and release incidents. These incidents are described in detail in other sections of this report, as referenced below. The spills and releases involved various materials such as heat-transfer oil containing polychlorinated biphenyls (PCBs), waste oil containing PCBs, rainwater from PCB-containing sumps, fuel oil, and organic solvents. Spent acids and plating waste may have also been dumped in open areas (Korte and Kearl, 1984).

Major spills and leaks of heat-transfer oil containing PCBs occurred at Department 26 and Department 27, as described in Sections 4.2.1.3 and 4.5.2.6. Some of the soil contaminated by these spills has been removed, and the remainder has been paved over (see Sections 3.2.3.7 and 3.2.3.8).

The only possible mechanism for transport of PCB-containing subsurface soils is by infiltration into deteriorated storm sewers. An investigation of this problem is described in Section 3.2.3.9.

Rainwater collecting in sumps near Department 26 was dumped along a road in the northeast part of the site. The sumps contain PCBs from spills in the Department 26 areas, and dumping of this rainwater caused detectable PCB contamination in surface soil. Some metal contamination was also found in surface soil samples in this area. These residual levels of metals are thought to be due to dumping of spent acids and plating wastes. Such material would tend to be dissipated by rainwater and soil buffering. Surface soil analyses are described in Section 3.2.3.1.

PCB-containing waste oil leaked from an underground tank near the West Boiler House. Spills and leaks of fuel oil also occurred near the West Boiler House. Descriptions of these incidents are presented in Section 4.5.2.4. Subsurface soil is known to be contaminated with oil in this area (see Section 3.2.3.5), but the heavy oil appears to remain with the soil rather than moving with the groundwater. Thus, little migration potential exists for this contamination.

Significant concentrations of oil and grease and minor occurrences of volatile organic solvents have been found in the soil at the Underground Tank Farm as a result of leaks from underground tanks. These data are presented in Section 3.2.3.4. Tanks, piping, and contaminated soil to a depth of 15 feet are to be excavated at this location.

The only location at the KCP where significant concentrations (up to 290 µg/g) of organic solvents have been found in soil (see Section 3.2.3.6) is the Old Railroad Dock Area, the site of a trichloroethene (TCE) solvent recovery still and of TCE spills. This site is described in Section 4.5.2.5. Engineering designs for remediation of this soil contamination have been prepared.

Several studies have been conducted to determine the extent of contamination from past spills and releases and to evaluate the need for remedial action. In addition, studies have been performed to evaluate potential sources of soil contamination, such as wastewater lagoon operations (North Lagoon) and burial sites (IRS Landfill). These studies are discussed in the following section.

3.2.3 Environmental Monitoring Program

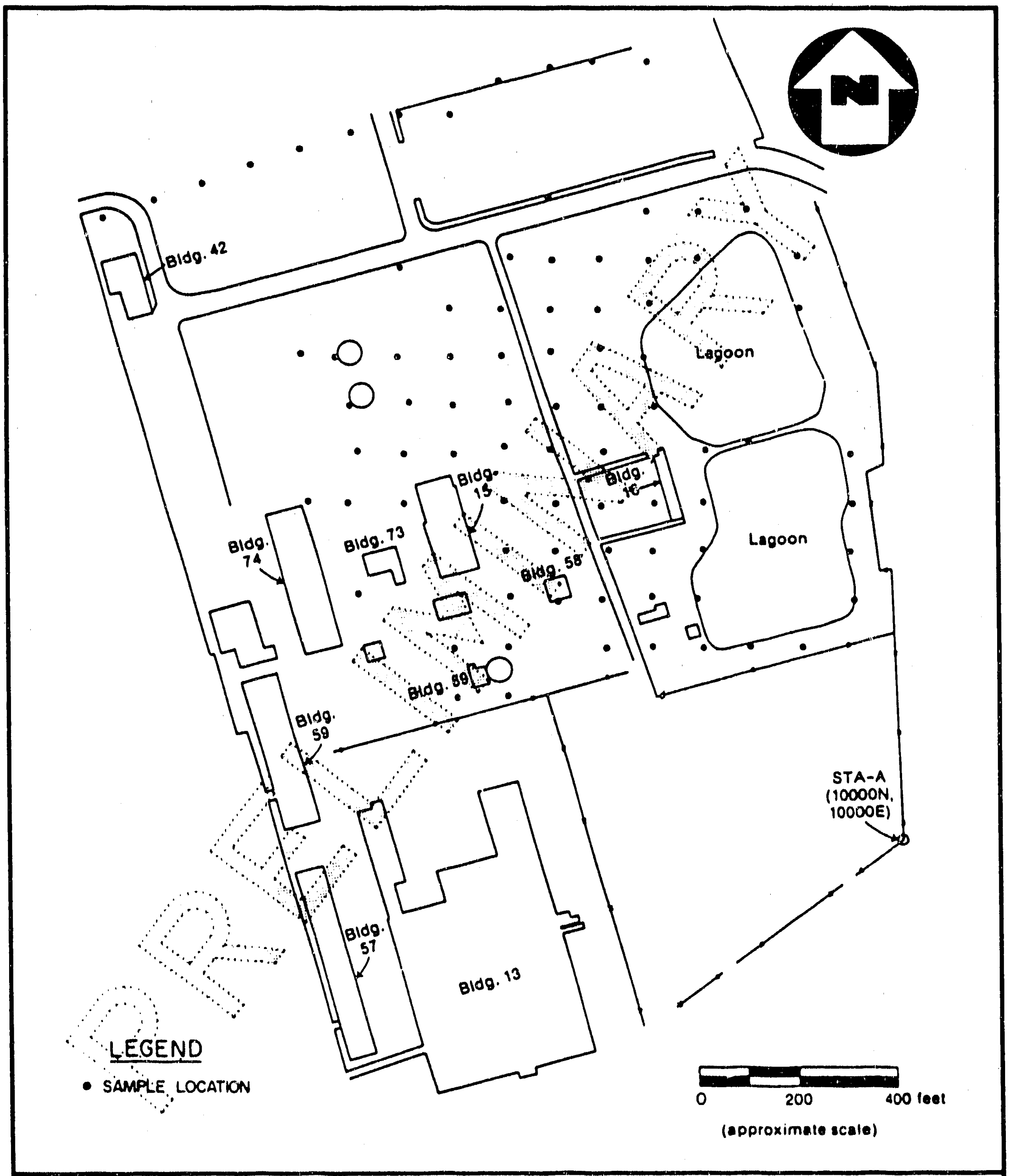
3.2.3.1 <u>Reconnaissance Surface Soil Study</u>

Reconnaissance sampling of surface soil (0 to 15 cm) was conducted during 1984 in the eastern part of the Kansas City Plant, between the lagoons and the Underground Tank Farm. This part of the plant has been open ground throughout the history of plant operations. It has never been used for manufacturing, but may have been a waste disposal area. The objectives of this surface soil sampling were to locate areas of contamination, determine concentrations of various known or potential pollutants, and characterize background distributions.

Sampling was conducted on a square grid with nodes spaced 100 feet apart. Sampling locations are shown on Figure 3-3. Sampling and analysis procedures are described in Korte et al., (1985). Inorganic and cyanide analyses were done by the Analytical Chemistry Laboratory at Grand Junction, Colorado. PCBs and volatile organics were analyzed by the Midwest Research Institute (MRI) in Kansas City, Missouri.

Results of metal analyses were examined to distinguish background levels from levels indicating contamination. This is important because, unlike synthetic organic compounds, most metals have natural or background concentrations in soil. Although background is often expressed as a single value, it is in fact a distribution with a range of values. It is therefore necessary to distinguish the distribution of the background population from that of the superimposed contaminant population. The concentration at which a sample is considered to be contaminated with waste or process materials is referred to as the threshold (Korte et al., 1985). The threshold divides the data into two sets, a contaminant population and a background population. The mean of the latter (i.e., data less than the threshold value) may be taken to represent the average background concentration of the metal under consideration. This average background value should be similar to literature values for soils derived from similar rock types. The determination of contamination thresholds from cumulative probability graphs is discussed in Korte et al., 1985. Values obtained by this method are shown on Table 3-8.

Metal concentrations in surface soil (0-15 cm) obtained from this study are shown on Table 3-8. One or more metals at concentrations in excess of threshold values were found in 28 of 80 soil samples. General locations for these contaminated samples are shown on Figure 3-4. A modified EP Toxicity test was performed on the four most metal-contaminated surface soil samples (identified on Figure 3-4) to determine whether these metals are present in a leachable form and are therefore hazardous waste by definition under the Resource Conservation and Recovery Act (RCRA). The method was modified by using a liquid-solid ratio of 4:1 instead of the recommended 20:1. Because of the higher solids concentration, this modification should result in a higher concentration of leachable metals in the liquid. Of the four samples chosen for the EP Toxicity test, sample MCV768 had detectable levels of all six metals, including the highest chromium (230 ppm), highest



SOURCE: Korte et al., 1985 (GJ-31)

FIGURE 3-3

LOCATIONS OF SURFACE SOIL SAMPLES IN THE EASTERN PART OF THE KANSAS CITY FACILITY KANSAS CITY PLANT – KANSAS CITY, MISSOURI

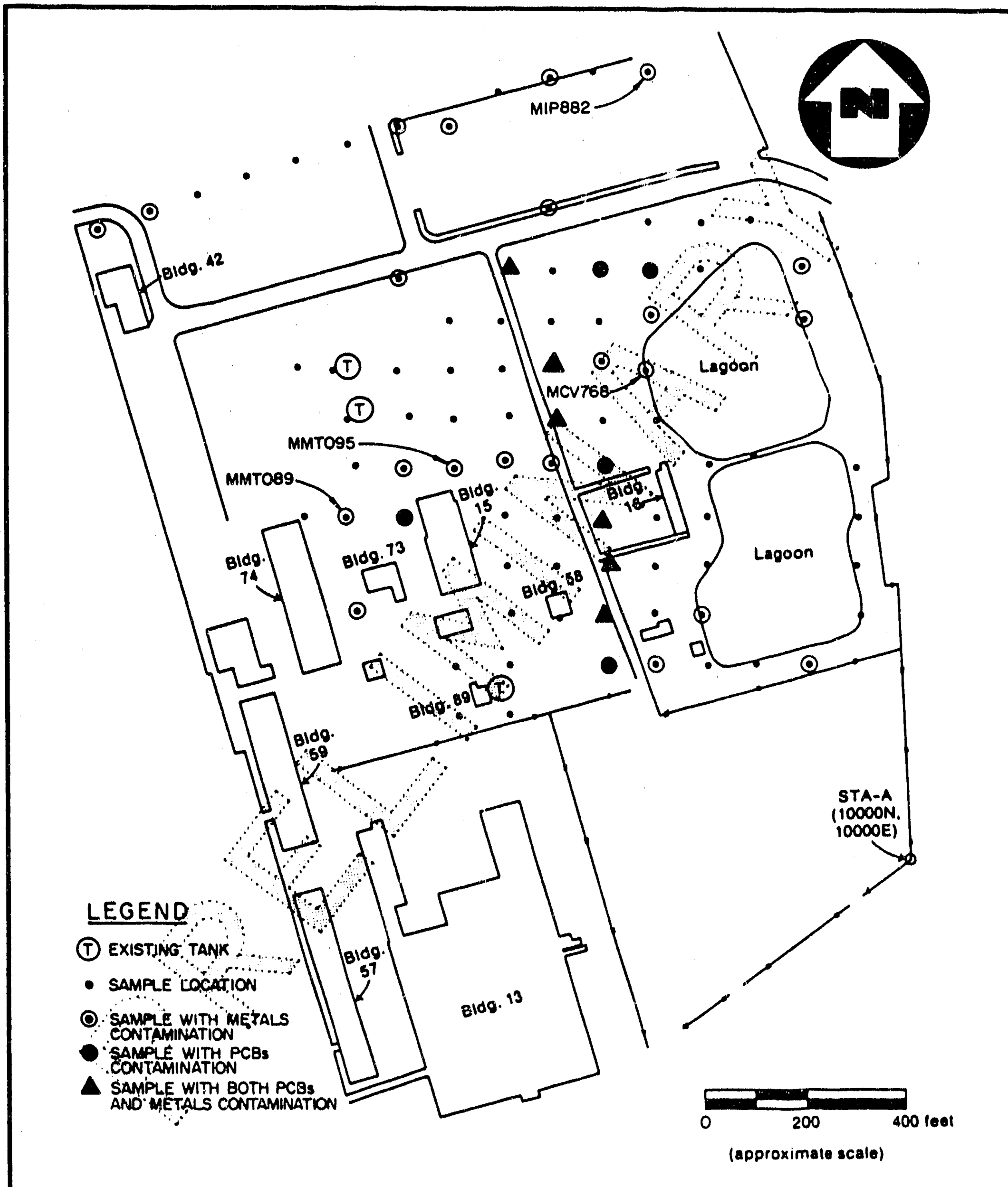
TABLE 3-8

METAL CONCENTRATIONS IN SURFACE SOIL
All Values are in ppm (mg/kg)
KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Parameter	Range	Mean of All Data	Median of All Data	Contamination Threshold	Average Background
Beryllium	0.2-7.2	2.8	2.7	None	2.8
Cadmium	0.2-6.2	0.9	0.7	1.4	0.7
Chromium	20.0-230	68.3	70.0	110	65
Copper	<10-910	32.1	18.5	72	19
Lead	14-173	36.9	26.0	38	23
Mercury	<0.5-0.7	(a)	(a)	None	<0.5
Nickel	<10-185	28.1	26.0	60	26
Zinc	46-1,060	140.2	85.0	158	87

Source: Korte et al., 1985 (GJ-31).

(a) Not calculated; only 7 of 80 samples contained detectable quantities.



SOURCE: Modified from Korte et al., 1985 (GJ-31) Plates 1-7.

FIGURE 3-4

LOCATIONS OF CONTAMINATED SURFACE SOIL SAMPLES
KANSAS CITY PLANT – KANSAS CITY, MISSOURI

copper (910 ppm), highest nickel (185 ppm), and highest cadmium (6.2 ppm). Sample MIP882 had the highest zinc concentration (1,060 ppm) and the second highest lead (153 ppm). The maximum lead concentration in any sample was 173 ppm. All metals except chromium were detectable in sample MMT089. Despite these elevated concentrations in the soil samples themselves, the EP Toxicity test results show that these metals are not hazardous due to leachability. Results of the modified EP Toxicity test are presented in Table 3-9. No sample released detectable quantities of chromium, copper, lead, or cadmium. Detectable quantities of nickel and zinc were extracted from sample MCV768, but these are not considered EP Toxicity metals by the Environmental Protection Agency. These results imply that spills or releases of metal-containing materials such as plating wastes did occur, but that the metal contamination present in the areas sampled is not geochemically available for transport by groundwater or surface water.

All samples were analyzed for cyanide, extractable organic halogen (EOX), and purgeable organic halogen (POX). The EOX results are similar to the total organic halogen content of the sample, while the POX results measure volatile organic halogen. All samples with positive EOX results were analyzed for PCBs; those with positive POX results were analyzed for specific volatile organics. General locations for samples contaminated with PCBs are also shown on Figure 3-4. With one exception west of Building 15, the pattern suggests that dumping of PCB-containing rainwater was restricted to convenient areas along a road in the northeast part of the site, as shown on Figure 3-4. Only 11 samples had detectable PCBs and only 3 of these 11 had concentrations greater than 10 ppm. The highest PCB value found in surface soil was 15.7 ppm.

Cyanide was detected in 23 samples at 0.10 to 0.24 ppm. Benzene, toluene, and chloroform were identified in 11 samples. Maximum concentrations were 0.47 ppm benzene, 8.1 ppm toluene, and 1.2 ppm chloroform.

The above results indicate that only a few areas of relatively low-level surface contamination exist. Beyond identification of these areas, this reconnaissance soil sampling was useful for determination of site-specific background levels for comparison to other, more contaminated, sediment and subsurface soil samples.

TABLE 3-9

RESULTS OF A MODIFIED EXTRACTION PROCEDURE (EP) TOXICITY ANALYSIS OF SELECTED SAMPLES KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Sample Number	Concentration (mg/l)					
	Chromium	Copper	Lead	Nickel	Zinc	Cadmium
MCV768	<0.5	<0.5	<0.5	2.0	1.0	<0.25
MIP882	<0.5	<0.5	<0.5	<0.5	<0.25	<0.25
MMT089	<0.5	<0.5	<0.5	<0.5	<0.25	<0.25
MMT095	<0.5	<0.5	<0.5	<0.5	<0.25	<0.25
EP Toxicity Limit	5.0	(a)	5.0	(a)	(a)	1.0

Source: Korte et al., 1985 (GJ-31).

(a) This metal is not considered an EP Toxicity metal by the Environmental Protection Agency.

3.2.3.2 North Lagoon Subsurface Soil

The North Lagoon was built in 1962 and operated until 1985, when it was decommissioned. The lagoon received wastewater that was discharged from the KCP industrial wastewater system. The wastewater included rinse water and drain discharges from various process operations, as well as treated cooling waters. It is possible that other liquid wastes could have been discharged to the lagoon. The history of this lagoon is discussed in Section 4.5.2.1.

Two separate studies were undertaken to determine the type and extent of contamination resulting from operation of the North Lagoon. The following discussion is taken from the RCRA Closure Plan for the North Lagoon (Bendix, 1987a).

The Closure Plan (Bendix, 1987a) summarizes a 1984 study that consisted of the collection and analysis of sediment samples while the lagoon was in operation. Five samples were analyzed for a series of heavy metals (EP Toxicity tests), cyanide, pesticides, herbicides, PCBs, total organic halogen, and phenols. The EP Toxicity test demonstrated that the heavy metals were not present in a leachable form. Similarly, phenols, pesticides, and herbicides were absent. PCBs were present in concentrations of 1 ppm or less in four of the five samples. The absence of organic halogen, except in the sample that contained PCBs, is consistent with the absence of recorded, large releases of chlorinated solvents to the lagoon. Other tests made at the same time demonstrated that lagoon samples were neither ignitable, corrosive, nor reactive. The lack of corrosivity is further supported by the near-neutral pH of the sediment.

The data from this first study were used to guide a later study carried out in the spring of 1985. The purpose of the second study was to provide the data necessary to develop a decommissioning plan for removal of sediments from the lagoon. That study consisted of the following sampling and analysis program:

- Eighteen soil borings; total footage drilled was 221 feet.

- One hundred forty-three split-spoon soil samples, twenty-three lagoon sediment samples.

- One hundred fifty-eight samples analyzed for metals, twenty-three samples analyzed for PCBs, and thirty-four soil samples and one sediment sample for metals by the EP-Toxicity Method (EP-TOX).

Previous sample data collected from the 1984 study indicated that the North Lagoon sediment did not have hazardous characteristics, as defined by the EP Toxicity method, and did not have characteristics of ignitability, corrosivity, and reactivity. Soil samples collected in the second study, from 0 to 3 feet in each boring, and samples of lagoon sediment were subjected to leach tests, using both water and acetate, to verify the earlier data.

Chromium and lead in lagoon sediments were not water-extractable. The other metals were water-extractable to varying extents (e.g., 7.7 mg/l Cd, 6.8 mg/l Cu, and 56 mg/l Zn), nickel being the most readily extractable (88 mg/l). Only one sample exceeded the EP Toxicity limit for any metal (7.7 mg/l of cadmium in the leachate compared to a limit of 1.0 mg/l). With this exception the earlier study was verified.

Metals with EP Toxicity limits were not extractable by either water or acetate in soil samples. Zinc was extracted from one soil sample by water.

The average concentrations in surface soil, lagoon subsurface soil, and lagoon sediment are presented in Table 3-10 (These are actual soil or sediment concentrations, not measurements on leachate). It is obvious from the table that metal concentrations in the lagoon sediments are high, but those in lagoon subsurface soil are low. The average concentrations for the lagoon soil samples were determined from cumulative frequency plots. These are in agreement with the averages from the reconnaissance surface soil survey described above (see Section 3.2.3.1), a fact which indicates that background levels were correctly established and could be used for establishing remediation levels.

Eight samples of lagoon sediment collected near each of the borings on the lagoon floor were analyzed for PCBs. These data are shown on Figure 3-5. All of the sediment samples had detectable concentrations of PCBs, most greater than 10 ppm. When these results were obtained, the uppermost soil sample retrieved from each boring on the lagoon floor was submitted for PCB analysis. As indicated on Figure 3-5, the PCBs are largely confined to the sediment and have not migrated to the subsurface soil below. Sediment PCB levels range from 3.9 to 290 ppm, whereas subsurface soil PCB levels range from undetectable to less than 3.0 ppm.

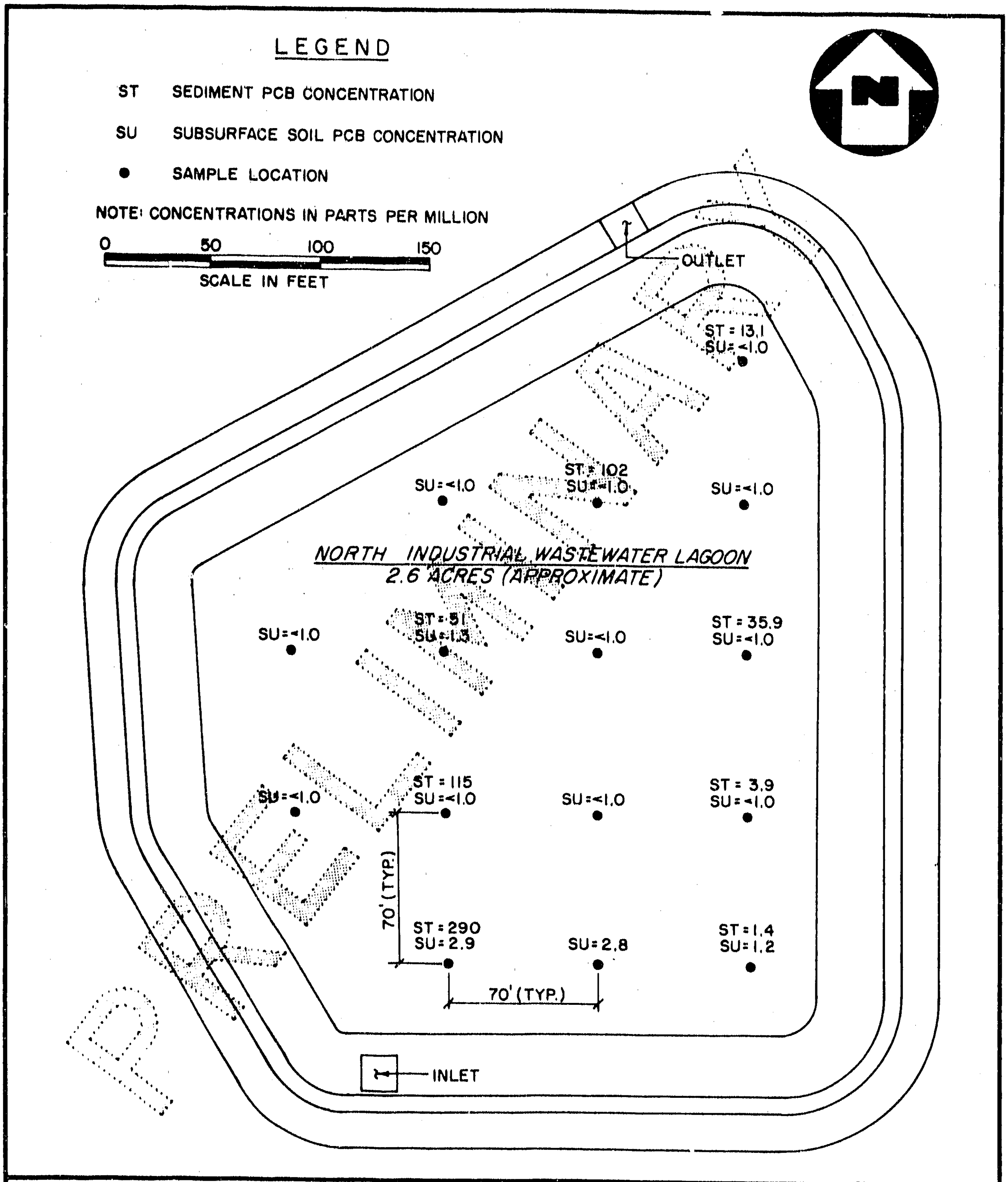
TABLE 3-10

AVERAGE CONCENTRATION OF METALS TAKEN FROM THE NORTH LAGOON SOIL AND SEDIMENT SAMPLES
All values in ppm (mg/kg)
KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Sample	Cadmium	Chromium	Copper	Lead	Nickel	Zinc
Surface Soil*	0.7	65	19	23	26	87
Lagoon Sediment	292	7,361	12,025	2,777	2,324	1,362
Lagoon Subsurface Soil	<1	55	23	<20	37	87

Source: Bendix, 1987a

* Average background; see Table 3-8 of this report.



SOURCE: Bendix, 1987a.

FIGURE 3-5
PCB LEVELS IN NORTH LAGOON SEDIMENT AND SUBSURFACE SOIL
KANSAS CITY PLANT – KANSAS CITY, MISSOURI

The results of the second study can be summarized as follows:

- The sediment contained significant quantities of Cd, Cr, Cu, Pb, Ni, and Zn, as shown on Table 3-10, but these metals were not leachable at concentrations above EP Toxicity levels.

- Twenty-two of twenty-three sediment samples showed no characteristics of hazardous waste by RCRA definition. The only sample that exhibited hazardous waste characteristics showed cadmium in excess of the EP Toxicity limit of 1.0 mg/l.

- Soil underlying the lagoon sediment generally contained background levels of the elements found in the sediment. A few locations showed concentrations over background levels in the upper 1-foot of the underlying soil.

- PCBs in concentrations up to 290 ppm were found in sediment samples in isolated locations (see Figure 3-5).

- Subsoil adjacent to the sediment did not contain appreciable PCBs (less than 3.0 ppm). Eleven of fifteen samples tested showed levels less than 1 ppm. The remaining four samples ranged from 1 to 3 ppm.

These studies indicate that contamination from North Lagoon operations was restricted to lagoon sediments and did not migrate into the underlying soil beyond 1 foot of depth. The contaminated sediment and subsurface soil have since been removed from the North Lagoon.

3.2.3.3 IRS Landfill Waste Characterization

The IRS Landfill, east of the KCP off DOE property, was used by several contributors (including the KCP) from the 1940s to 1964 for burial of plant wastes. It is described in Sections 3.4.2.5 and 4.5.2.2. There are no records to indicate the types and quantities of wastes disposed of at this location, although it is believed that general plant refuse, various liquid and plating wastes, and metal shavings were buried.

In 1985, a study was conducted to determine whether waste material buried in the IRS Landfill has hazardous characteristics that can contribute to groundwater pollution. Groundwater is known to be contaminated in the IRS Landfill area, as discussed in Section 3.4.3.5. The following discussion is taken from a report that summarizes the findings of this study (Fleischhauer et al., 1986).

Six borings were drilled in June 1985, from which a total of 26 split-spoon samples were retrieved. The boring locations are shown in Figure 3-6. In borings IRS 85-1, -2, and -3, samples were collected from both the fill and the subjacent alluvium. Samples from IRS 85-4, -5, and -6 were fill material only. Twenty-two samples were analyzed for metals by the Bendix Grand Junction Office Analytical Chemistry Laboratory. Eight of these samples that had high metal concentrations were also subjected to a leach test; the EP Toxicity Method was applied to six metals (i.e., Cd, Cr, Cu, Pb, Ni, and Zn). A total of nine samples were analyzed by Midwest Research Institute for volatile and semivolatile priority pollutants and for PCBs. Table 3-11 lists the concentrations of metals in the IRS Landfill samples. As shown on the table, metal concentrations are as high as 7,120 ppm copper, 5,820 ppm chromium, 16.2 ppm cadmium, 5,600 ppm nickel, 3,290 ppm zinc, and 1,130 ppm lead.

Because the IRS Landfill is believed to contain plating wastes as well as metal shavings from machining operations, either waste material could produce the high concentrations observed in the data presented in Table 3-11.

The results of the leach test demonstrated that none of the samples were hazardous with respect to cadmium, chromium, and lead. EP Toxicity test limits for these metals are 1.0 mg/l for cadmium and 5.0 mg/l for chromium and lead. Copper, nickel, and zinc are not EP Toxicity metals. Data indicate that these three metals were not leachable in any case.

Analysis by gas chromatography/mass spectrometry (GC/MS) was conducted for 56 semivolatile organic compounds in samples from the IRS Landfill. Those detected included 2,4-dinitrotoluene (maximum 0.2 ppm); 4-chlorophenyl-phenyl ether (maximum 6.4 ppm); two phthalates, di-n-butyl phthalate (maximum 2.6 ppm) and bis-(ethylhexyl) phthalate (0.02 ppm); and a number of polynuclear aromatic hydrocarbons (PAHs) such as anthracene (9.0 ppm), fluoranthene (32 ppm), fluorene (1.8 ppm), and phenanthrene (10 ppm). The uses of 2,4-dinitrotoluene and 4-chlorophenyl-phenyl ether at the Kansas City Facility are not known, although the latter compound is used industrially as a dielectric and as a solvent for crystalline polymers. Phthalates are used in plastics manufacturing. The PAH compounds occur in crude oil, petroleum fuels, and other petroleum products and are also produced by combustion of petroleum fuels.

Three samples were collected in the alluvium beneath the fill. Semivolatiles are generally absent in these samples, an observation which is evidence for the immobility of these compounds.

The highest concentration of PAHs occurs in a sample for which asphalt was observed in the sampling interval during drilling and sample collection. This asphalt is the probable source of the relatively high concentrations (up to 44 ppm) of benzo(k)fluoroanthene.

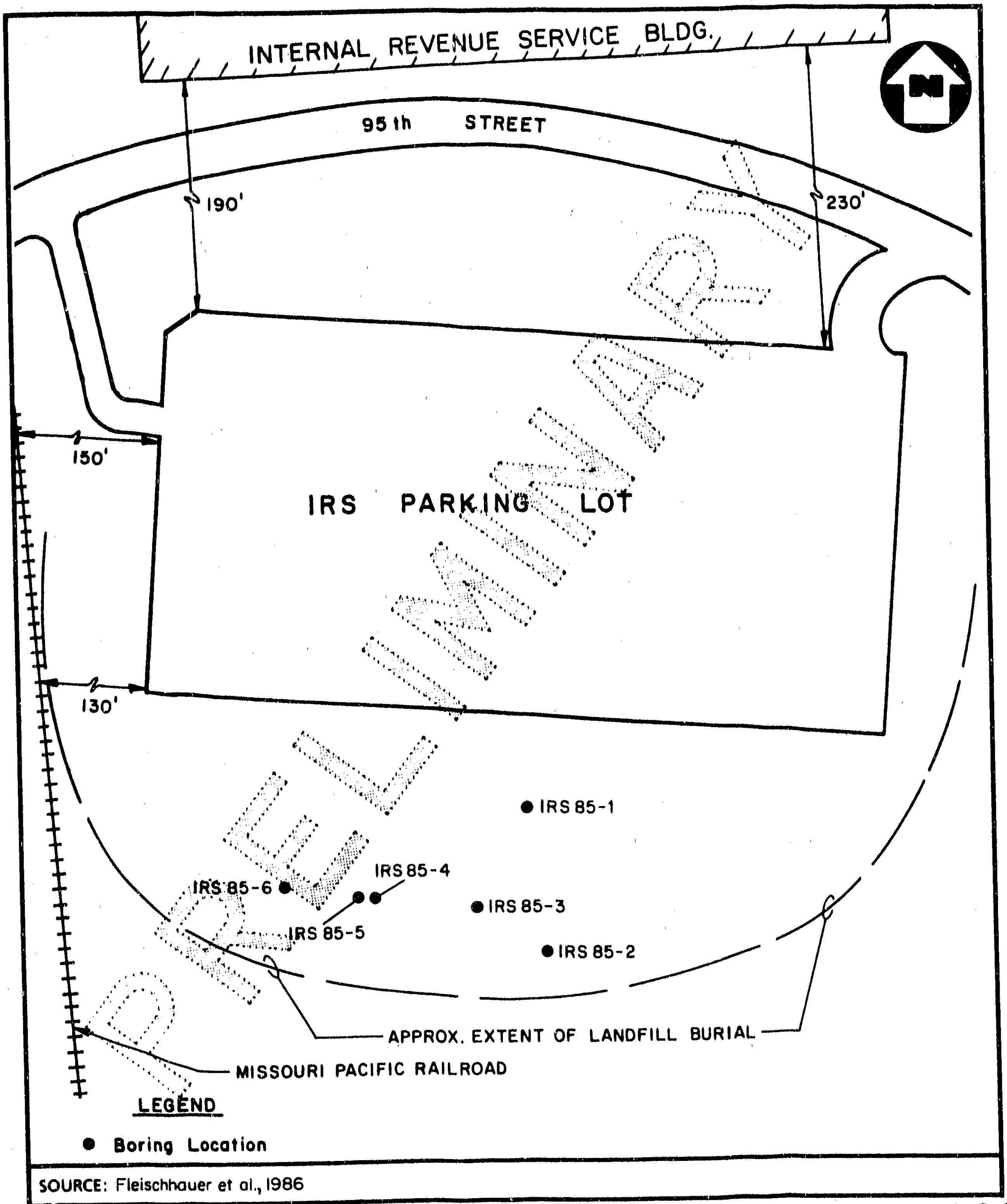


FIGURE 3-6

SCHEMATIC OF

BORING LOCATIONS IN THE IRS LANDFILL KANSAS CITY PLANT – KANSAS CITY, MISSOURI

TABLE 3-11

CONCENTRATIONS OF SELECTED TRACE METALS IN SUBSURFACE SAMPLES FROM THE IRS LANDFILL KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Boring Number	Depth Interval (feet)	Sample Number	Concentration (ppm)					
			Cadmium	Chromium	Copper	Lead	Nickel	Zinc
IRS85-1	3.0 - 4.5	MMT 561	<1.0	108	66	58	44	148
	9.0 - 10.5	MMT 562	<1.0	66	16	24	25	74
	12.0 - 13.5	MMT 563	<1.0	86	17	24	37	83
	13.5 - 15.0	MMT 564	<1.0	90	16	22	34	89
	15.0 - 16.5	MMT 565	<1.0	79	17	24	36	90
	16.5 - 18.0	MMT 566	<1.0	67	14	21	23	75
	18.0 - 19.5	MMT 567	<1.0	70	13	<20	24	71
IRS85-2	3.0 - 4.5	MMT 568	<1.0	212	50	34	69	91
	10.5 - 12.0	MMT 569	2.7	179	153	164	96	470
	12.0 - 13.5	MMT 570	<1.0	68	20	28	30	86
	13.5 - 15.0	MMT 571	4.1	92	37	422	58	958
	16.5 - 18.0	MMT 572	<1.0	80	22	26	39	102
	19.5 - 21.0	MMT 573	<1.0	116	49	82	47	295
IRS85-3	3.0 - 4.5	MMT 574	<1.0	74	20	28	27	88
	12.0 - 13.5	MMT 575	8.2	5,780	7,120	772	5,600	3,290
	15.0 - 16.5	MMT 576	6.3	5,820	3,330	578	3,130	2,680
	18.0 - 19.5	MMT 577	4.9	4,320	2,040	392	2,440	1,830
IRS85-4	1.5 - 3.0	MMT 578	<1.0	129	43	54	83	113
IRS85-5	7.5 - 9.0	MMT 579	10.0	236	832	358	192	810
	12.0 - 13.5	MMT 580	16.2	456	760	1,130	284	1,240
	19.5 - 21.0	MM5 583	2.6	505	280	728	274	118
IRS85-6	3.0 - 4.5	MMT 584	<1.0	74	20	193	36	98
Median			<1.0	100	40	56	45.5	107.5
Minimum			<1.0	66	13	<20	23	71
Maximum			16.2	5,820	7,120	1,130	5,600	3,290

Source: Fleischhauer et al., 1986

An analysis was conducted for volatile organic compounds in samples from the IRS Landfill. All of the reported concentrations for volatile compounds were less than 1 ppm. Methylene chloride and benzene were the most pervasive contaminants, although benzene was only slightly above the detection limit (0.05 ppm) in four of the five samples in which it occurred.

Trichloroethene (TCE), a commonly used solvent at the Kansas City Facility, was found in only two samples of fill at concentrations of 0.14 and 0.93 ppm and not at all in the alluvial substratum. However, TCE has been detected in water samples from nearby monitoring wells at concentrations up to 15 micrograms per liter (ppb). Trichloroethene decomposes by microbial action into compounds such as 1,2-dichloroethene and vinyl chloride. The compound 1,2-dichloroethene occurred at concentrations of 0.09 and 0.08 ppm in two samples of fill, one of which also contained TCE. In addition, 1,2-dichloroethene was observed at concentrations as high as 366 ppb in water samples from a nearby groundwater well (i.e., KC84-16). This concentration was higher than that which would be expected, based on the concentrations reported for the soil samples. Vinyl chloride was not found in any of the IRS Landfill soil samples, although it has been reported at concentrations as high as 220 ppb in water samples from well KC84-16, located downgradient from the landfill.

Results of PCB determinations indicate low or no contamination. All samples from the landfill borings had less than 4 ppm PCB.

In summary, high concentrations of trace metals were found in the IRS Landfill samples. Based on results of the leach test, however, none of the samples could be considered to be hazardous waste by RCRA definitions in terms of cadmium, chromium, and lead EP Toxicity limits. Downgradient monitoring wells confirm that metals apparently are not being leached (see Section 3.4.3.5).

A number of semivolatile Priority Pollutants, notably polynuclear aromatic hydrocarbons, were detected in the IRS Landfill samples. With the exception of one sample, concentrations of PAH compounds were low. The relatively high concentrations observed in one sample were attributed to asphalt contained in the sample. In general, these PAH compounds are characterized by low solubility in water and have a strong tendency to adsorb on particles, especially organic matter.

Volatile Priority Pollutants such as methylene chloride and benzene were detected in several samples, but all at concentrations less than 1 ppm. Compounds such as trichloroethene occur in downgradient monitoring wells, a fact which suggests that the IRS Landfill may be a potential source for volatile organic compounds in groundwater (see Section 3.4.3.5).

In addition to the above study, a soil gas investigation was recently completed at the IRS Landfill during March-April 1987. When data from this study become available, they will be reviewed and summarized in the Interim Report.

3.2.3.4 Soil Contamination at the Underground Tank Farm

The Tank Farm consists of 28 underground tanks, which were installed in 1943 to store fuels, coolants, and solvents. None of the tanks are in current use, but tank leakage is known to have occurred. The following discussion on the assessment of the soil around the Tank Farm is taken from Fleischhauer et al., 1986.

The KCP initiated a drilling program in 1983 to determine if contaminants from the tanks were present in the soil and groundwater (for a discussion of groundwater contamination at the Tank Farm, see Section 3.4.3.1). A series of borings 14, 16, and 40 feet deep were drilled for soil characterization. Analytical results for samples collected from these borings indicated that chlorinated compounds were, for the most part, below detection limits. Samples with detectable quantities generally had concentrations of a few tens of parts per billion, with only a few concentrations ranging up to a few parts per million.

In July 1985, a second drilling program was initiated in the Tank Farm area to determine the concentrations of chlorinated solvents and petroleum products in soil and to determine the distribution of contaminants with depth. These data were used to develop engineering recommendations for the Tank Farm RCRA closure.

Nineteen borings were drilled to approximately 40 feet, the depth of the alluvium-bedrock contact. Split-spoon samples were collected at 5-foot intervals. A total of 150 samples were recovered for analysis.

Results of the oil and grease determinations for the Tank Farm area are presented in Appendix C of Fleischhauer et al., 1986. Oil and grease were detected in 78 of 150 samples, with at least one such sample occurring in each of the 19 borings. Concentrations ranged up to 3,440 ppm. The median concentration for the above-detection-limit data was 205 ppm. Samples with detectable concentrations were collected at all depths. The highest concentrations were most frequently observed in the interval 5 to 15 feet, which corresponds with the depth to the water table and/or the base of sandy fill. However, concentrations exceeding 1,000 ppm were found in samples of alluvium collected at depths of 25 to 40 feet.

Diesel fuel was detected in 26 of the 150 samples at concentrations ranging up to 45,660 ppm. Gasoline was detected in 14 of the 150 samples at concentrations ranging up to 473,150 ppm. Gasoline and diesel fuel occurred most frequently in samples from 5- and 10-foot depths. These liquids had specific gravities less than one, so they would be expected to float on the water table. Diesel fuel detected in samples collected at depths of 25, 35, and 40 feet (below the water table) could represent dissolved fuel.

Concentrations of halogenated organic compounds in the soil samples are quite low. The highest concentration found was for methylene chloride, which was measured in one sample (10 feet deep) to be 2.27 ppm. The low concentrations are consistent with results obtained by previous drilling projects conducted by the KCP.

Data were analyzed in one boring (10 feet and 15 feet deep) for the semivolatile Priority Pollutants and for PCBs. Certain Priority Pollutants seem to be present, but at concentrations below the listed detection limits. PCBs were detected but at concentrations less than 1 ppm.

In summary, petroleum fuels are the most significant soil contaminants in the Tank Farm area. Oil, gasoline, and diesel fuel are generally restricted to the sandy fill and occur at depths less than about 15 feet, corresponding to the depth of the water table in this area. Volatile organic compounds were detected in only 4 of the 150 samples, and the concentrations were low in these samples. The data indicate that soil is not extensively contaminated with volatile organic compounds and suggest that contaminated soil must be localized around the waste storage tanks. The possibility that contaminated soil occurs directly beneath the solvent tanks cannot be ruled out. All tanks, piping, and contaminated soil to a depth of 15 feet are to be removed. Contamination at greater depth will be remediated by groundwater extraction and treatment.

3.2.3.5 Subsurface Soil Contamination at the West Boiler House

The West Boiler House, located at the west end of KCP, has been the site of underground tank leaks and surface spills (see Section 4.5.2.4 for a description of site history). Two underground tanks which held diesel fuel and PCB-containing waste oil have been removed, but two underground tanks for storage of No. 6 fuel oil remain. Surface spills of fuel oil have also occurred during fuel transfer operations.

Recognizing the potential for soil contamination around the tanks and the fuel transfer area, KCP initiated a subsurface soil investigation in 1985 for confirmatory purposes. Four borings were each drilled to a depth of 21 feet, and up to five samples were collected from each hole using a split-spoon sampler. The boring locations are shown on Figure 3-7. Samples collected from the borings were analyzed for oil and grease. Samples taken from the boring (WB85-1) which was adjacent to the two waste oil tanks were also analyzed for PCBs. The analytical data are presented in Table 3-12.

Higher levels of oil and grease were found in samples from boring WB85-1 (adjacent to the waste oil tank) than from the other boring locations. The highest level measured was 2,430 ppm oil and grease at a depth of 2 feet. The PCB concentration was less than 10 ppm.

Samples from the other borings indicated pronounced concentrations of oil and grease. The presence of fuel at a depth of 20 feet cannot be readily explained from the data. Oil is expected to float to the water table, which at this site is about 10 feet deep. The data for WB85-2 and WB85-3 indicate that the oil and grease concentrations actually increase with depth below the water table. It appears that this contamination is not being flushed into the groundwater and therefore has little potential for migration.

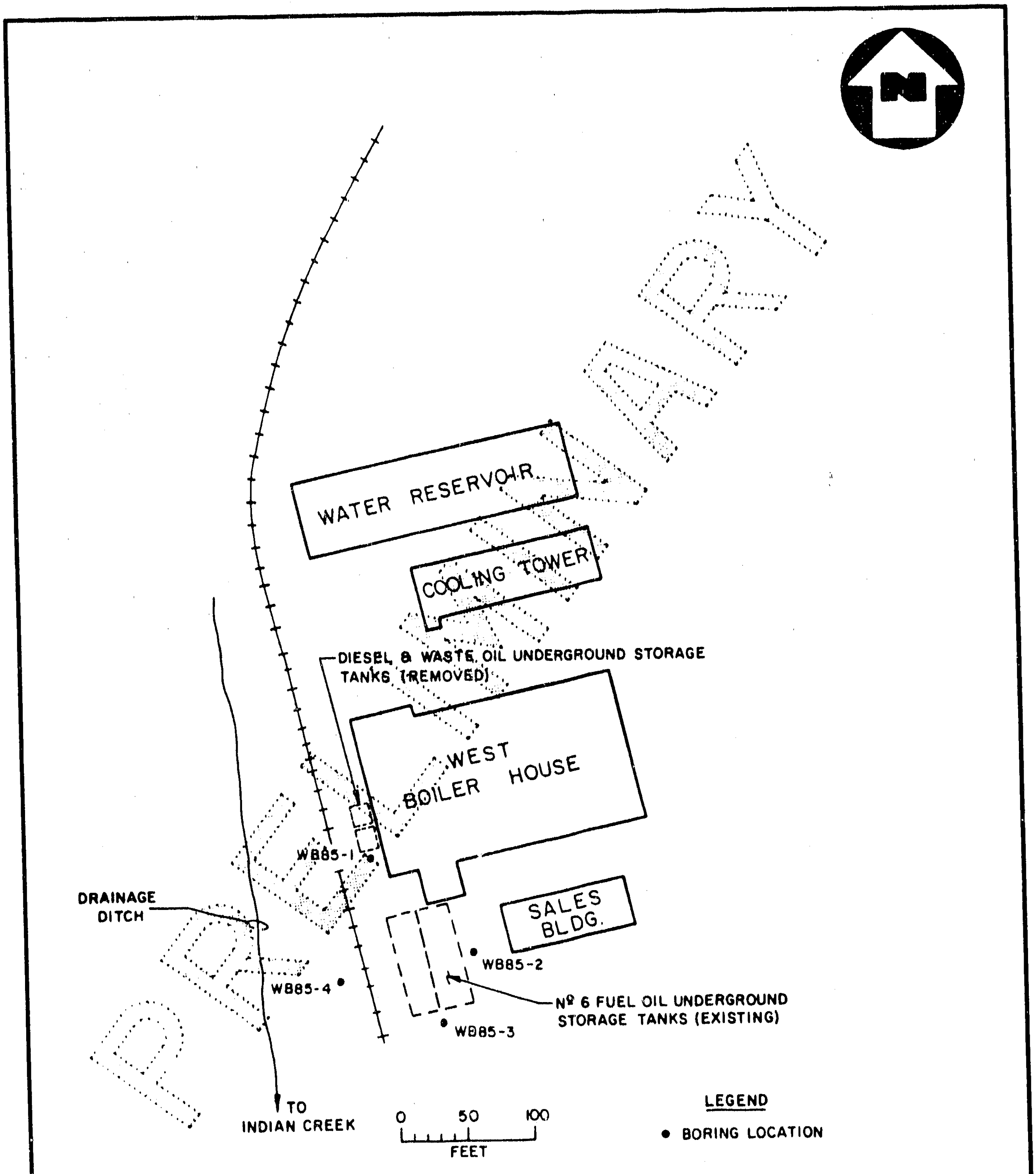
3.2.3.6 Soil Borings at the Old Railroad Dock Area

The Old Railroad Dock is located inside of the main building near the north end of Building 59. The site is described in Section 4.5.2.5. This dock area was the site of a TCE solvent recovery still and of TCE spills.

In 1984, a study was conducted to determine whether the soil around the dock area was contaminated. The following discussion is taken from a report that summarizes this investigation (Fleischhauer et al., 1987).

The KCP drilled a number of shallow borings at the Old Railroad Dock area. The maximum depth was 14 feet, although most borings did not penetrate deeper than 6 feet. Eight of the 26 samples had TCE concentrations above the detection limit [0.01 micrograms per gram (ppm)], with a maximum concentration of 11.4 ppm. Ten samples had detectable 1,2-dichloroethene (1,2-DCE) concentrations, with the maximum concentration 5.4 ppm. In general, this sampling indicated only low-level contamination at shallow depths.

Later, in October 1985, additional samples were collected to determine the maximum depth of migration of the solvents. Two borings were drilled through the alluvium to bedrock, a depth of nearly 40 feet. Samples were collected in increments of about 5 feet, with a total of 15 samples recovered.



SOURCE: Fleischhauer et al., 1986.

FIGURE 3-7

BORING LOCATIONS NEAR THE WEST BOILER HOUSE
KANSAS CITY PLANT – KANSAS CITY, MISSOURI

TABLE 3-12

ANALYTICAL DATA FOR SOIL SAMPLES COLLECTED IN THE AREA OF THE WEST BOILER HOUSE KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Boring Number	Depth Interval (feet)	Concentration (ppm)	
		Oil and Grease	PCB[a]
WB85-1	4.5-6.0	1,660	2.8
	9.5-11.0	1,065	2.2
	14.5-16.0	347	8.8
	19.5-21.0	2,430	3.8
WB85-2	4.5-6.0	1,920	
	9.5-11.0	264	
	14.5-16.0	430	
	19.5-21.0	560	
WB85-3	4.5-6.0	500	
	9.5-11.0	149	
	14.5-16.0	690	
	19.5-21.0	830	
WB85-4	0-1.5	511	
	4.5-6.0	70	
	9.5-11.0	153	
	14.5-16.0	530	
	19.5-21.0	230	

Source: Fleischhauer et al., 1986.

(a) Only samples from WB85-1 were analyzed for PCBs.

The results from this soil investigation indicated that trichloroethene is much more pervasive and occurs at higher concentrations than in the earlier samples; however, the maximum concentrations of 1,2-DCE in the two studies were equal. The 1985 study indicated that trichloroethene concentrations ranged from 1.8 to 290 ppm. Two samples (approximately 5 to 10 feet deep) had concentrations of 38 ppm and 190 ppm, which are higher than those found in the earlier study at these depths. Concentrations in the soil at greater depths remained relatively low, except at a depth of 21 feet, where in one boring the TCE concentration was analyzed to be 290 ppm.

Other volatile compounds (e.g., tetrachloroethene, benzene) had relatively lower concentrations and were generally restricted to the upper 11 feet of the soil. The most notable exception was 1,2-DCE, which occurred at a concentration from 3.4 to 5.4 ppm at depths between 30 and 35 feet in the borehole. The overall pattern indicates that the upper 10 feet of soil (fill and alluvium) has retained significant concentrations of solvents and that the solvents have migrated downward and accumulated near the contact of alluvium and Knobtown Sandstone (approximate 40 foot depth). However, the potential migration of solvents within the Knobtown Sandstone appears to be low because this unit has low permeability.

PCBs were found at all depths sampled in the alluvium, but at very low concentrations. The median concentration of PCBs was 0.170 ppm, and the maximum concentration was about 0.5 ppm. Polychlorinated biphenyls were detected only once in each of three downgradient monitoring wells; consequently, low-level contamination of soil by this compound does not appear to pose a threat to groundwater. However, the volatile organic solvents present in this area have affected the groundwater (see Section 3.4.3.2)

3.2.3.7 Soil Borings Near Department 27

Spills and leaks of heat-transfer oil containing PCBs have occurred outside the Main Building near Department 26 and Department 27. These incidents are described in Sections 4.2.1.3 and 4.5.2.6.

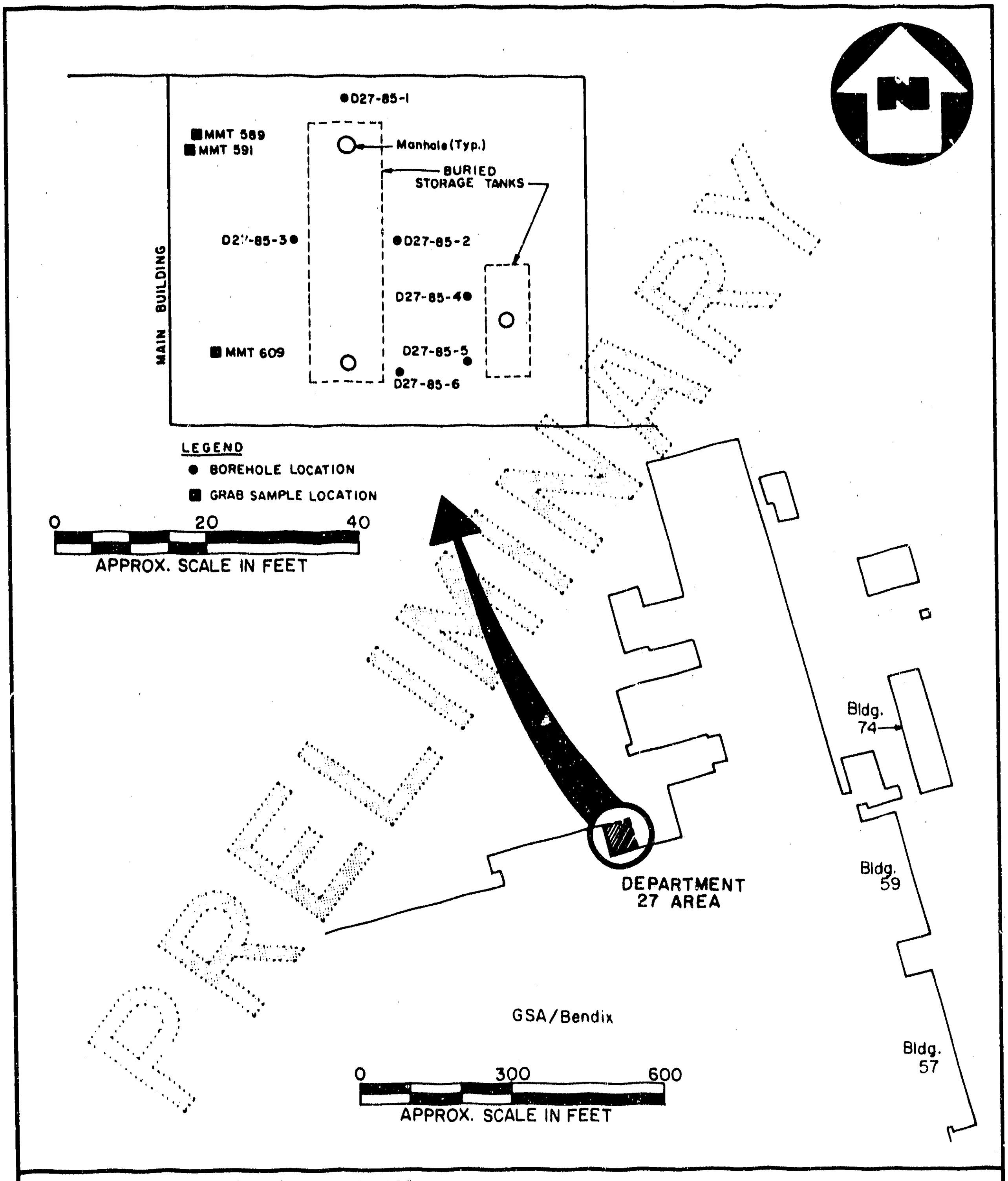
Two underground tanks that may have leaked were removed from Department 27 in 1985. One was a storage tank for PCB oil. The other was an interceptor tank used to collect surface runoff. Prior to removal of these tanks, soil borings were performed to gather data on the extent of PCB contamination in the subsurface soil (this area is presently overlain by concrete and asphalt). The following discussion is taken from a report that summarizes the findings of this sampling and analysis (Fleischhauer et al., 1986).

Twenty split-spoon samples of subsurface soil were collected from six borings around the tanks (see Figure 3-8). In addition, three grab samples of surface soil were collected at locations different than the soil borings but in the general area of the underground tanks. Also, twelve additional samples were also collected along an area that was to be excavated for the installation of underground utilities. Up to 12 inches of concrete and asphalt pavement were removed prior to sampling at this area. The twelve samples were collected at the soil surface and at a depth of approximately 3 feet below the soil surface. Finally, four grab samples were collected following the removal of the two underground tanks. These samples were collected at depths of about 12 to 15 feet below the pavement.

The analytical data are presented in Table 3-13. Borings D27-85-1, -2, -3, and -6 were drilled adjacent to the large storage tank and penetrated sand fill for the entire depth. For boring D27-85-1, the concrete slab at the base of the tank was encountered at a depth of 11 feet. The PCB concentration at this depth (Sample MMT590) was 760 ppm. The soil boring rig was moved about 1 foot to the north and a new hole augered through some 10.5 feet of clayey silt, the texture of the natural soil. Sample MMT592, collected from approximately the same depth (11 to 12.5 feet), yielded a PCB concentration of 5.2 ppm, a fact which indicates that PCBs have migrated laterally but that attenuation of the concentration is extreme over very short distances. This further suggests that subsurface migration of PCBs is not extensive. A concentration of 460 ppm was detected in D27-85-6 at a depth of 10.5 to 12 feet, further evidence that PCBs appeared to have concentrated mainly near the base of the storage tank.

Borings D27-85-4 and -5 were drilled near the interceptor tank. These borings penetrated clayey silt the entire depth. All samples contained concentrations of PCBs less than 23 ppm. Grab samples of surface soil yielded the highest concentrations of PCBs in the area of the two tanks (2,700-7,400 ppm PCB). Some samples collected outside the area of the underground tanks indicated similar levels of contamination. High concentrations ranging from 3,800 ppm to 4,000 ppm (e.g., MM519 and MM521) are likely the result of surface spills. Grab samples collected following the removal of the underground tanks indicated that the average residual contamination (after removal of PCB contaminated soil) was less than 2 ppm.

In summary, high concentrations of PCBs were found in the soil around the Department 27 area. The highest concentrations were generally found in the surface soil (up to 7,400 ppm PCB), although



SOURCE: Modified from Fleischhauer et al., 1986

FIGURE 3-8

LOCATIONS OF BOREHOLES AND SURFACE GRAB SAMPLES IN THE DEPARTMENT 27 AREA KANSAS CITY PLANT – KANSAS CITY, MISSOURI

TABLE 3-13

PCB RESULTS FOR SOIL SAMPLES
COLLECTED IN THE DEPARTMENT 27 AREA
KANSAS CITY PLANT, KANSAS CITY, MISSOURI

SPLIT-SPOON SAMPLES TAKEN FROM SOIL BORINGS

Borehole Number	Sample Number	Depth Interval (feet)	PCB Concentration (ppm)
D27-85-1	MMT 587	0-1.5	3
	MMT 588	5.0-6.5	8
	MMT 590	10.5-11.0	760
	MMT 592	11.0-12.5	5.2
D27-85-2	MMT 593	0-1.5	3.4
	MMT 594	5.0-6.5	1.2
	MMT 595	10.5-12.0	1.8
D27-85-3	MMT 596	0-1.5	<1
	MMT 597	5.0-6.5	<1
	MMT 598	10.5-12.0	<1
D27-85-4	MMT 599	0-1.5	5.5
	MMT 600	3.0-4.0	23
	MMT 601	4.0-6.5	10
	MMT 602	6.5-8.0	3.7
D27-85-5	MMT 603	0-1.5	10
	MMT 604	3.0-4.5	4.5
	MMT 605	6.5-8.0	14
D27-85-6	MMT 606	0-1.5	42
	MMT 607	5.0-6.5	145
	MMT 608	10.5-12.0	460

SURFACE GRAB SAMPLES

	MMT 589	Surface	7,400
	MMT 591	Surface	2,700
	MMT 609	Surface	3,200
	MMT 542	Surface	2,800

TABLE 3-13
PCB RESULTS FOR SOIL SAMPLES
COLLECTED IN THE DEPARTMENT 27 AREA
KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE TWO

SAMPLES TAKEN WITH RESPECT TO UNDERGROUND UTILITIES

Borehole Number	Sample Number	Depth Interval (feet)	PCB Concentration (ppm)
1	MMT 515	0-0.5	13
	MMT 516	3.0-3.5	5
2	MMT 517	0-0.5	44
	MMT 518	3.0-3.5	21
3	MMT 519	0-0.5	3,800
	MMT 520	3.0-3.5	3.4
4	MMT 521	0-0.5	4,000
	MMT 522	3.0-3.5	75
5	MMT 523	1.0-1.5	20
	MMT 524	3.0-3.5	50
6	MMT 525	1.0-1.5	9.6
	MMT 701	3.0-3.3	5.8

SAMPLES TAKEN WITH RESPECT TO TWO UST REMOVALS

A	MMC 207	Surface	2.5
B	MMC 208	Surface	<1
C	MMC 209	Surface	<1
D	MMC 210	Surface	<1

Source: Fleischhauer et al., 1986.

significant levels were observed near the base of the PCB oil storage tank (460 ppm PCB). Excavation of the contaminated fill and soil around the underground storage tanks has reduced residual PCB concentrations to low levels (<2 ppm PCB). Likewise, excavation of the trench for underground-utility installation resulted in removal of the PCB-contaminated soil. It is reasonable to assume, however, that PCB-contaminated soil remains below the pavement elsewhere in this general area.

3.2.3.8 Shallow Soil Borings Near Department 26

Spills and releases of PCB oil have occurred outside of Department 26 as well as Department 27. These incidents are described in Sections 4.2.1.3 and 4.5.2.6.

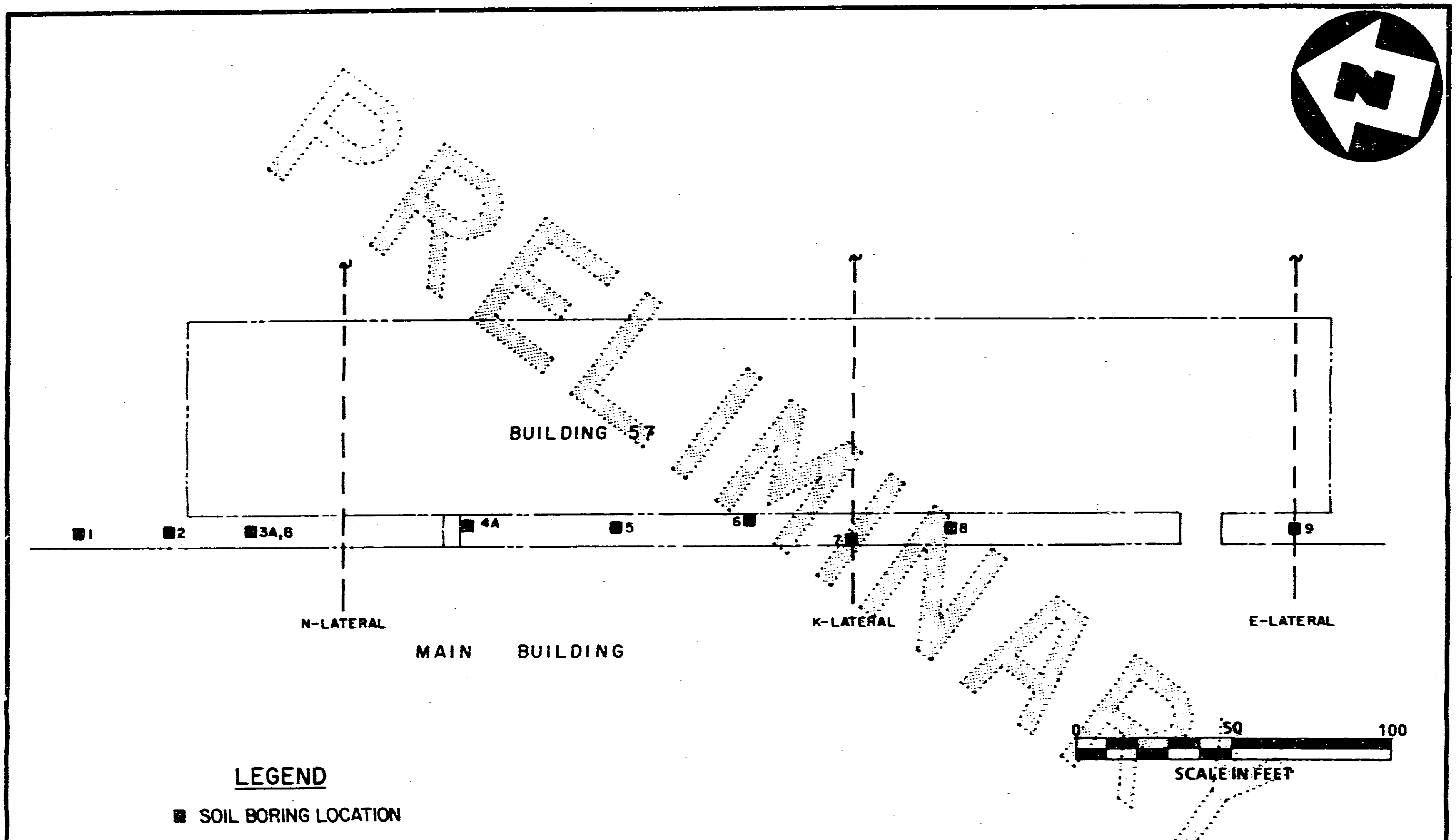
In 1985, an investigation of PCB contamination in soils was performed in this area. The following discussion is taken from Fleischhauer et al., 1986.

Shallow subsurface samples were collected at depths of 1 and 3 feet in the area between Building 57 and the Main Building. Sampling locations, designated 1 through 9, are shown on Figure 3-9. The results of the PCB analysis are presented in Table 3-14. Field splits were taken of selected samples.

Subsurface samples from locations 1 through 3B, closest to the area where the spill occurred, have PCB contamination up to 1,000 ppm. Two samples were collected at the 1-foot depth at location 3. Though spaced only about 4 feet apart, samples 3A and 3B differ by two orders of magnitude in PCB concentration (1,000 and 34 ppm, respectively). The sample collected at the 3-foot depth at the site of 3B has a PCB concentration of <1.0 ppm. PCBs do not disperse homogeneously, and the high spatial variability exhibited at this location is typical of PCB contamination in soil.

Also sampled were oily surface residues near sumps in the area between Building 57 and the Main Building. These areas had high PCB concentrations (1,500-43,000 ppm PCBs).

In summary, there remains major subsurface PCB contamination between Building 57 and the Main Building. This contamination ranges from several thousand parts per million at the surface down to several hundred parts per million (and less) to a depth of 3 feet. Sumps around the heat transfer system remain contaminated up to 43,000 ppm PCB. The entire area is now paved. Building 57 is scheduled for demolition in FY1988, and at least part of the soil contamination will be cleaned up at that time.



SOURCE: Modified from Fleischhauer et al., 1986 (GJ-40) Plate 3.

FIGURE 3-9

LOCATIONS OF SHALLOW SOIL BORINGS NEAR DEPARTMENT 26
KANSAS CITY PLANT – KANSAS CITY, MISSOURI

TABLE 3-14

PCB RESULTS FOR SOIL SAMPLES COLLECTED BETWEEN BUILDING 57 AND THE MAIN BUILDING KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Sampling Location	Depth (feet)	PCB Concentration (ppm)[a]
1	1	25
	3	13
2	1	120 (286)
3A	1	1,000
3B	1	34 (103)
	3	ND (2.2)
4A	Surface	2,600 (2,800)
5	1	ND
	3	ND
6	1	240 (2,540)
	3	ND (0.646)
7	1	ND (0.306)
	3	ND (0.149)
8	1	ND (18)
	3	ND (0.344)
9	1	120 (196)
	2[b]	700 (4,410)

Source: Fleischhauer et al., 1986.

(a) ND = Not Detected; concentration was <1.0 ppm. The number in parentheses is the result for a field split of the sample. The detection limit for the field splits was 0.004 ppm.

(b) An obstacle prevented sampling below 2 feet at this location.

3.2.3.9 Soil Borings Near Sewer Laterals

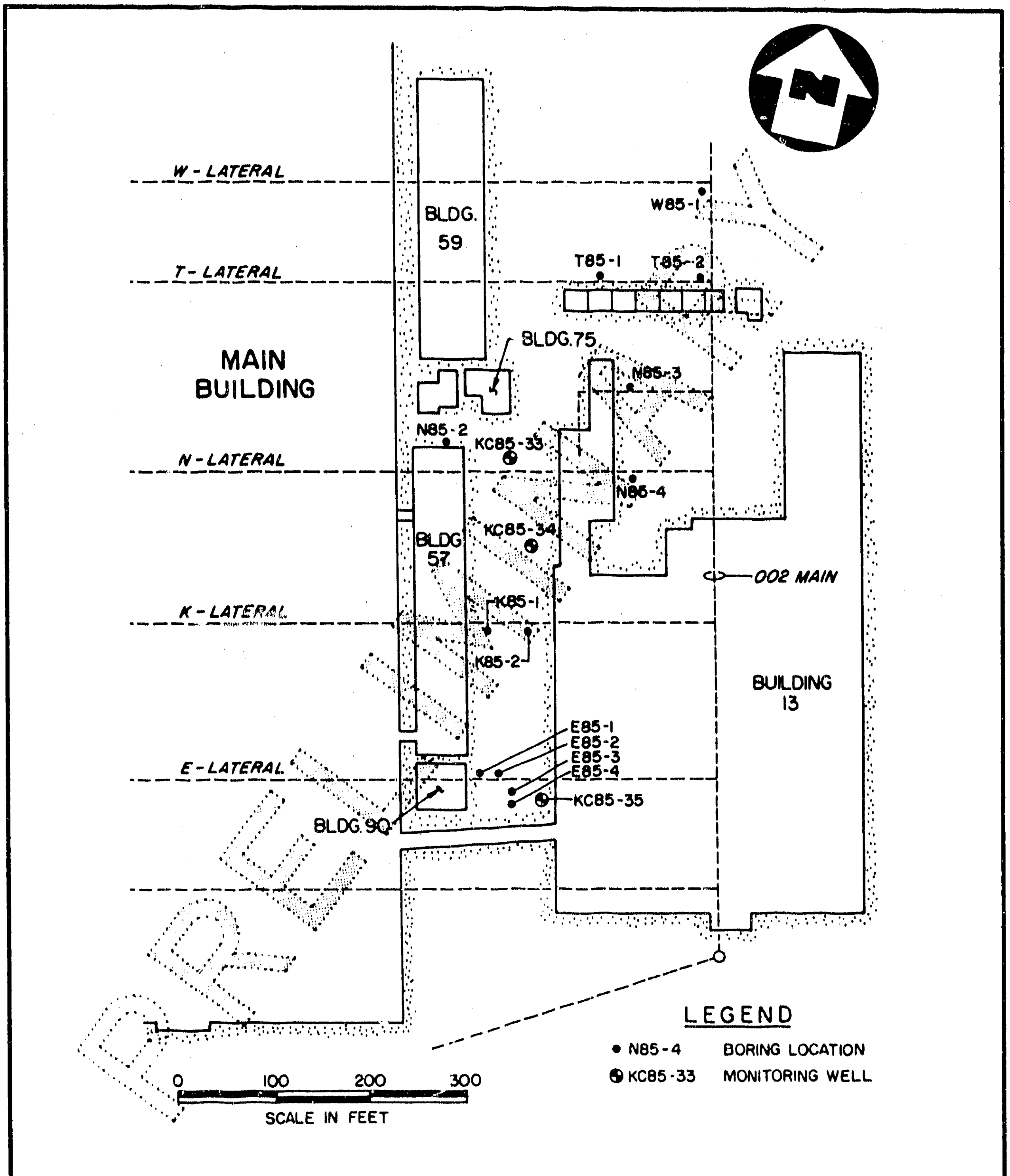
A study of subsurface pathways for entry of PCBs into the 002 Storm Sewer System was conducted in 1985. This study was initiated because concentrations of PCBs in effluent of the 002 System have exceeded the NPDES regulatory discharge limit of no detectable PCBs. Three potential subsurface pathways were considered:

- Seepage of groundwater containing dissolved PCBs.
- Infiltration of PCB-contaminated soil surrounding sewer pipes.
- Migrations and seepage of PCB oil as a second liquid phase in the groundwater system.

The following discussion of this study is taken from Fleischhauer et al., 1986. Soil samples were collected during installation of three monitoring wells between Building 57 and the Manufacturing Support Building (Building 13). Locations of these wells are shown on Figure 3-10, and PCB concentrations in soils at various depths are shown on Table 3-15. The presence of PCBs at depths to 26 feet suggests that spilled PCB oil moved as a liquid phase in the northern part of the area between Buildings 57 and 13. The PCB concentration found at this depth, 48 ppm, is the highest found in the area. Despite contamination in the surrounding soil, groundwater samples from this well had detectable PCBs in only one sampling round.

A total of 12 borings were drilled adjacent to the five lateral storm sewer lines. The boring locations are shown on Figure 3-10, and PCB concentrations are given in Table 3-16. Each boring number begins with the letter of the sewer line to which it is closest. Borings N85-2 and E85-3 were 6 feet deep; all others were 19.6 feet deep. Boring N85-2, in the vicinity of well KC85-33, is located near buried tanks and near a 1969 PCB spill (see Sections 4.2.1.3 and 4.5.2.6). PCBs occur in low concentrations throughout its 6-foot depth. Boring N85-3, located adjacent to a catchment basin feeding an independent, unnamed lateral, is contaminated throughout its 19.6-foot depth. The source of PCB contamination for this boring, however, is unknown; no spills are documented as having occurred in this area. Sediment collected from a nearby catchment basin yielded a PCB concentration of 81 ppm. No spills are known from the area of boring T85-2, but spillage of PCB-containing rainwater has been documented near W85-1.

Soil contamination near the E- and N-laterals appears to have the potential for providing the highest levels of PCB contamination to the 002 Storm Sewer System by way of subsurface pathways (although all samples from the T-lateral were contaminated, only one exceeded 3.9 ppm). However,



SOURCE Fleischhauer et al., 1986. (GJ-40)

FIGURE 3-10

LOCATION OF SUBSURFACE SOIL BORINGS BETWEEN BUILDINGS 57 & 13 KANSAS CITY PLANT – KANSAS CITY, MISSOURI

TABLE 3-15

PCB CONCENTRATIONS IN SOIL SAMPLES COLLECTED
DURING MONITORING-WELL INSTALLATION
KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Well No.	Depth Interval (Feet)	PCB Concentration (ppm)[a]
KC85-33	5.0–5.5	ND
	11.0–11.5	38 (Aroclor 1260)
	15.0–15.5	31 (Aroclor 1260)
	20.5–21.0	32 (Aroclor 1260)
	25.5–26.0	48 (Aroclor 1260)
KC85-34	5.5–6.0	10 (Aroclor 1260)
	10.0–10.5	ND
	15.0–15.5	ND
	20.0–20.5	ND
KC85-35	0–1.0	ND
	4.5–5.0	ND
	9.5–10.0	ND
	14.5–15.0	ND
	19.5–20.0	ND

Source: Fleischhauer et al., 1986 (GJ-40).

(a) ND = Not Detected; concentration is < 1.0 ppm.

TABLE 3-16

SUMMARY OF PCB DATA FOR SAMPLES COLLECTED FROM BORINGS IN THE AREA OF THE 002 STORM SEWER SYSTEM KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Boring Number	Range of PCB Concentrations (ppm)[a]		Maximum Depth of Contamination (feet)	Number of Samples	
	Minimum	Maximum		Analyzed	Contaminated
E85-1	ND	ND	0	5	0
E85-2	ND	2.3	15	5	1
E85-3	5.1	13.0	6	2	2
E85-4	2.2	14.0	19.5	6	6
K85-1	ND	2.1	3	6	1
K85-2	ND	1.8	3	6	1
N85-2	2.0	4.7	6	3	3
N85-3	2.3	32.0	19.5	6	6
N85-4	ND	3.3	19.5	6	4
T85-1	1.9	20.0	19.5	6	6
T85-2	2.0	3.1	19.5	6	6
W85-1	1.6	2.9	19.5	6	6

Source: Fleischhauer et al., 1986 (GJ-40).

(a) ND = Not Detected; concentration is < 1.0 ppm.

effluent in the K-lateral was found by KCP personnel (personal communication from J. Frerichs to authors of Fleischhauer et al., 1986) to have the most significant concentrations of PCBs in the 002 system. Because this lateral was subsequently lined, concentrations of PCBs at the 002 outfall were reduced. It is possible that the soil borings, which were located far enough from the sewer laterals to avoid damage, missed PCB containing soil immediately adjacent to pipes in areas where infiltration is possible.

3.2.4 Findings and Observations

3.2.4.1 Category I

None.

3.2.4.2 Category II

None.

3.2.4.3 Category III

1. There are Category III findings on release of PCBs to the environment in Section 4.2.3.1 and on contamination from the heat exchange system at Department 26 and 27 in Section 4.5.3.3.

2. There is a Category III finding on contamination at the West Boiler House in Section 4.5.3.3.

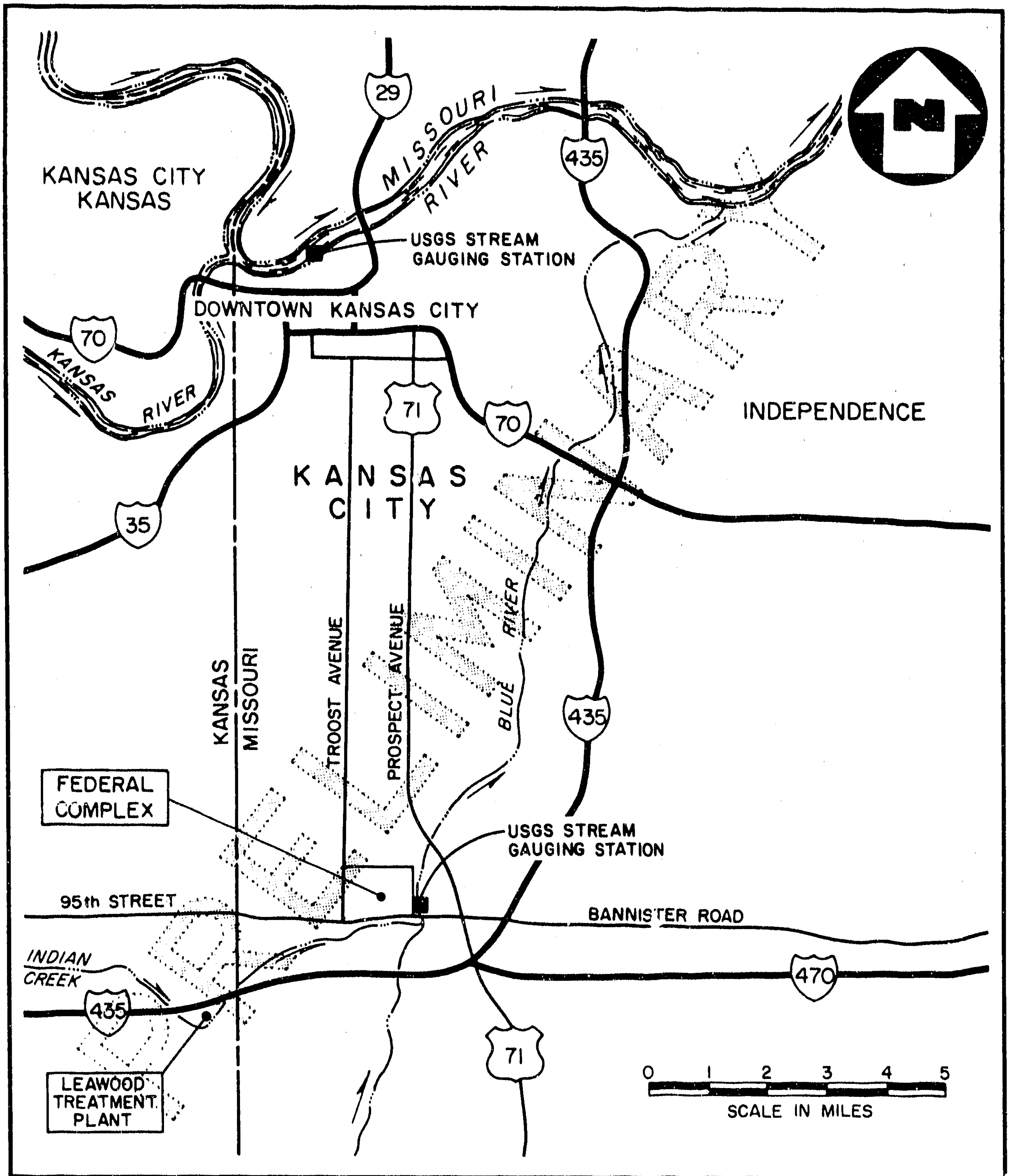
3.2.4.4 Category IV

None.

3.3 Surface Water

3.3.1 Background Environmental Information

Surface waters affected by the KCP are Indian Creek, the Blue River, and the Missouri River. The relation of these streams to the plant is shown in Figure 3-11. Indian Creek flows west to east along the southern edge of the plant. This stream has no flow in most years (at times of little precipitation) upstream of the discharge of the Leawood, Kansas, Sewage Treatment Plant (USGS, 1985).



SOURCE: Modified from Korte et al., 1985 (GJ-31) Plates 1-7.

FIGURE 3-11

SURFACE WATERS AFFECTED BY KCP
KANSAS CITY PLANT – KANSAS CITY, MISSOURI

The discharge from this secondary treatment plant assures a continuous flow in Indian Creek as it passes the KCP. The Blue River flows from south to north along the eastern boundary of the Federal complex on which the KCP is situated. A USGS stream gauging station at the Bannister Road Bridge continuously monitors the flow in the Blue River. During the Water Year 1985 (October 1984-September 1985), the average flow at this station was 269 cubic feet per second (cfs). During this same period, the maximum flow was 7,380 cfs on November 1 and the minimum flow was 15 cfs on October 2.

The USGS does not sample for water quality in either the Blue River or Indian Creek. However, it does operate a water quality station on the Missouri River at St. Joseph, Missouri, 82 miles upstream from Kansas City. Data from this station for the Water Year 1985 is presented in Table 3-17. The flow at this station averaged 51,110 cfs, whereas the flow at Kansas City averaged 60,210 cfs. The Kansas River, which enters the Missouri 1.4 miles upstream of the Kansas City gauging station, had a flow of 7,649 cfs (USGS, 1986).

The KCP samples the Blue River and Indian Creek as part of the environmental monitoring program. These data are presented in Section 3.3.3. There are no radioactive materials machined or processed at KCP and, therefore, there are no radioactive materials in the surface water effluents. Accordingly, analyses for radionuclides are not part of the plant's monitoring program, nor was it appropriate to obtain this type of background data for the survey.

The KCP lies within the floodplain of the Blue River. The U.S. Army Corps of Engineers built a dike and flood wall around most of the site in the early 1970s. However, General Services Administration funding to complete Phase III of the project was not provided, and as a consequence, the plant only has protection for up to a once-in-70-year flood. Section 4.1.3.2 contains a Category II finding relating to waste management areas within a 100-year floodplain. It is estimated that the cost to complete the original project by October 1990 would approach $3.7 million (Barber, 1986).

3.3.2 General Description of Pollution Sources/Controls

3.3.2.1 Plating - Wastewaters

This category includes, but is not limited to, sources of wastewater from electroplating, electroless plating, anodizing, coating, and chemical etching and milling processes from the various departments throughout the plant. The plating and chemical etching and milling operations in Departments 97 and 61 account for approximately 60 percent and 30 percent, respectively, of the 0.4 million gallons per day (mgd) flow to the lagoon. The common bond linking the handling of

TABLE 3-17

USGS DATA FOR WATER YEAR 1985
MISSOURI RIVER AT ST. JOSEPH, MISSOURI

Parameters	Unit	Maximum	Minimum	Average
Specific Conductance	µS/cm	870	660	760
pH	SU	8.3	7.9	--
Temperature	°C	27.0	0.5	12.5
Turbidity	NTU	110	6.5	45.4
Dissolved Oxygen	mg/l	15.8	6.2	9.9
Coliform, Fecal	COLS/100 ml	25,000	460	6,193
Hardness	mg/l	330	220	272
Calcium, Dissolved	mg/l	85	55	69
Magnesium, Dissolved	mg/l	28	20	24
Sodium, Dissolved	mg/l	72	49	61
Potassium, Dissolved	mg/l	6.9	5.3	5.9
Sulfate, Dissolved	mg/l	210	150	185
Chloride, Dissolved	mg/l	24	11	18
Fluoride, Dissolved	mg/l	0.5	0.4	0.5
Silica, Dissolved	mg/l	17	8.9	12.0
Nitrogen, Ammonia Dissolved	mg/l	0.67	0.04	0.15
Phosphorus, Total	mg/l	0.65	0.12	0.28
Sediment, Suspended	mg/l	1,970	27	58.1
Solids, Residue Dissolved	mg/l	560	418	491
Aluminum, Dissolved	µg/l	30	<10	<18
Arsenic, Dissolved	µg/l	3	2	2
Barium, Dissolved	µg/l	140	83	108
Beryllium, Dissolved	µg/l	<0.5	<0.5	<0.5
Cadmium, Dissolved	µg/l	<1	<1	<1
Chromium, Dissolved	µg/l	<1	<0.5	<1
Cobalt, Dissolved	µg/l	<3	<3	<3
Copper, Dissolved	µg/l	4	2	3

TABLE 3-17
USGS DATA FOR WATER YEAR 1985
MISSOURI RIVER AT ST. JOSEPH, MISSOURI
PAGE TWO

Parameters	Unit	Maximum	Minimum	Average
Iron, Dissolved	µg/l	11	<3	<6
Lead, Dissolved	µg/l	6	<1	<3
Lithium, Dissolved	µg/l	51	39	45
Manganese, Dissolved	µg/l	16	2	6
Mercury, Dissolved	µg/l	0.3	<0.1	<0.2
Molybdenum, Dissolved	µg/l	10	<10	<10
Nickel, Dissolved	µg/l	26	4	14
Selenium, Dissolved	µg/l	3	<1	<2
Silver, Dissolved	µg/l	1	<1	<1
Strontium, Dissolved	µg/l	610	450	535
Vanadium, Dissolved	µg/l	<6	<6	<6
Zinc, Dissolved	µg/l	24	12	14

Source: USGS, 1986.

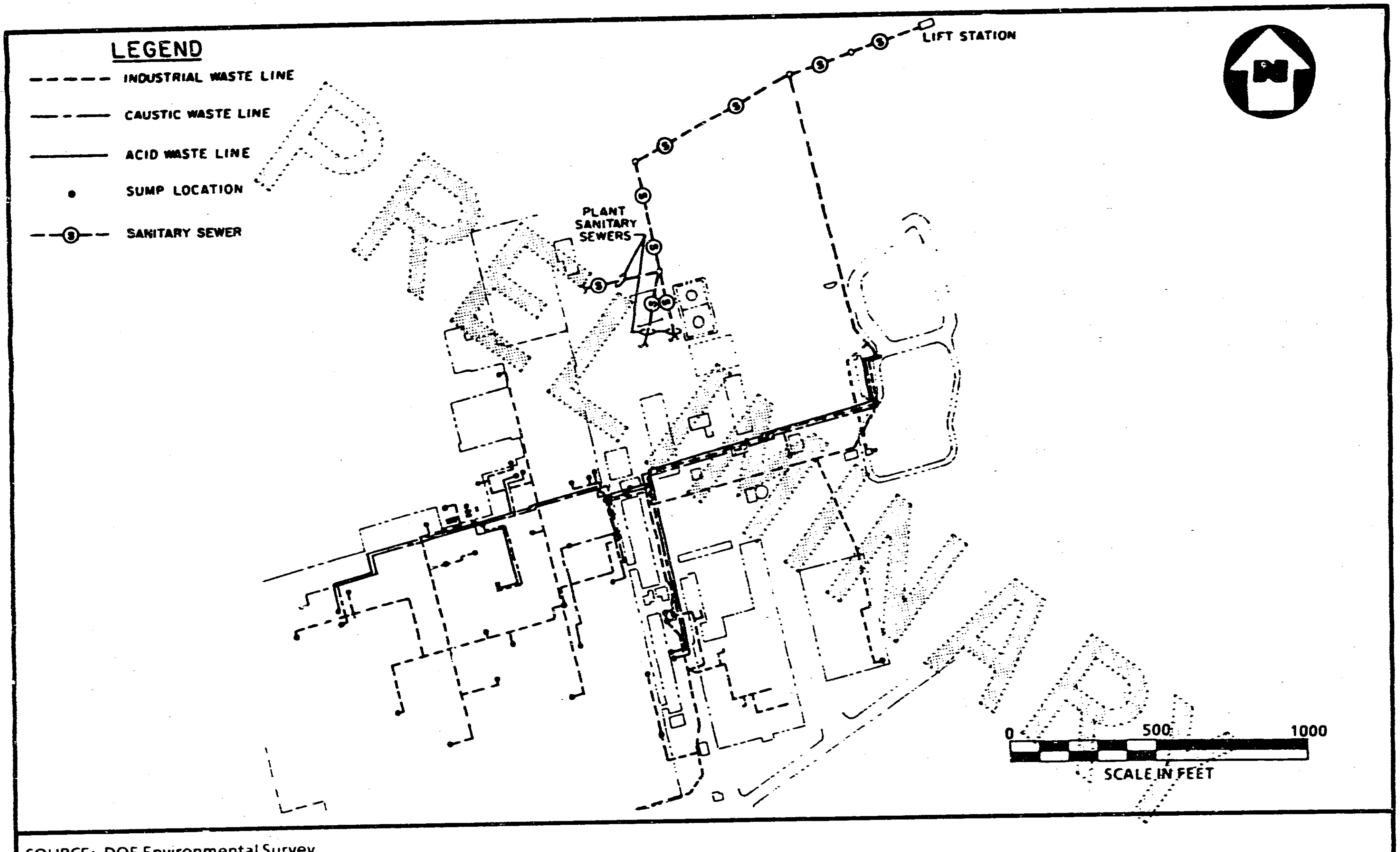
these wastes is that the concentrated spent solutions are pumped to carboys or tanks for transfer to the Waste Management Services Department, where they are prepared for shipment to an off-site disposal contractor (Section 4.1.2.1). The rinse waters used in these operations are conducted to the lagoon through sewers, as shown in Figure 3-12 and described in Section 3.3.2.5. The acidic, caustic, and neutral waters are kept segregated until they reach the receiving basin at the lagoon.

3.3.2.2 Machining Wastewaters

The coolant used in the machining operations throughout the plant is a mixture of 5 percent soluble oil (Jon Cool 800) and 95 percent water. The coolant system on each machine is self-contained. When the spent coolant has to be drained from the machine, the Waste Management Services Department does the draining and replaces the coolant. The waste coolant is transferred to the Waste Management Services area in Building 59, where it is passed through a fiberglass filter to remove solid materials before being pumped to the Thermal Emulsion Breaker (TEB) Feed Tank. The spent emulsion is heated in the TEB to thermally separate the oil from the water. The oil that floats to the top of the TEB feed tank is combined with the oil removed by the TEB and is sent to the tank farm for storage for disposal (Section 4.1.2.1). The water removed by the TEB and water collected from sumps and pits throughout the plant (that have visible oil on the surface) are put into the feed tank for the Oil Master (coalescer). In a coalescer the water passes through small spaces between surfaces of a material having an affinity for oil. The oil coalesces on these surfaces, and having a lower specific gravity than the water, rises along the surface of the material. The separated oil accumulates at the top of the coalescer and is removed periodically. The oil skimmed from the top of the feed tank as well as the oil removed by the coalescer is assumed to contain PCBs and is put into barrels to be stored at the PCB storage area (Section 4.1.2.1). The water discharged from the bottom of the coalescer goes to the lagoon.

3.3.2.3 Plastics Forming

One of the sources of wastewaters from plastic forming operations is the wash water from the silicone foam operation in Department 37. In this operation a mixture of urea and cellular silicone are molded into the desired shape. The parts, thus formed, are then put into large washing machines where deionized (DI) water is used to remove the residual urea. The waste water from this washing operation, as well as the acidic and caustic wastes from the regeneration of the deionization units, are sent to the lagoon.



SOURCE: DOE Environmental Survey

FIGURE 3-12

INDUSTRIAL WASTE SYSTEM
KANSAS CITY PLANT – KANSAS CITY, MISSOURI

In addition to the above, the polymers used in the manufacture of polyimide resins are made in the Polymer Building (Bldg. 15) at KCP. Wastewater containing dimethyl formamide (DMF) from the polyimide resin production facility is sent to the "bug farm" (east of Bldg. 15) for treatment prior to being discharged to the plant sanitary sewer. The bug farm is a 16,000-gallon aerated tank containing aerobic bacteria. These bacteria utilize the DMF in their metabolic process, ultimately converting it to carbon dioxide, ammonia, and water. The contents of the tank are tested to assure that the DMF concentration is < 10 mg/l before any of the wastewater is discharged to the sewer.

When first operated in the late 1960s or early 1970s the heat transfer fluid, used in the molds in the process in Departments 26 and 27 to form the plastics into various shapes, contained essentially pure PCBs. The molds have been drained and refilled several times beginning in 1974, so that when last tested in 1983, the PCB content was less than 50 ppm. The spills and leaks of this material in the past have resulted in contamination of the sewers in the plant. The problem of PCB contamination is discussed in greater detail in Section 4.2.1.3.

3.3.2.4 Laboratory Operations

The Materials Evaluation Laboratory (Department 816) in the Manufacturing Support Building (MSB) is the largest laboratory operation at the KCP. The laboratory has instituted an effective system to handle liquid wastes. Bottles having unique shapes and colored labels are used for each type of waste. A 4-liter rectangular bottle with a red label is used for acid wastes, a 2-liter square bottle with a blue label is used for basic wastes, a 1-liter round bottle with a black label for cyanide wastes, and a 4-liter hexagonal bottle with a yellow label for persulfate wastes. These bottles are kept by the sink in each laboratory. Laboratory personnel are trained to put the concentrated solutions and the first rinses into these containers. Subsequent rinses go to the sinks which, in this area, are connected to the plant sanitary sewer. The bottles are taken to the waste storage area in the MSB, where their contents are emptied and rinsed into 30-gallon carboys. The carboys are taken by the Waste Managment Services Department for disposal when they are full.

Other laboratories in the plant also use administrative procedures to prevent concentrated wastes from being discharged to the sewers. Sinks in other laboratories and other areas of the plant can be connected to either the plant sanitary sewer or sewer systems leading to the lagoon, depending upon the location of the sink and the proximity of a particular sewer.

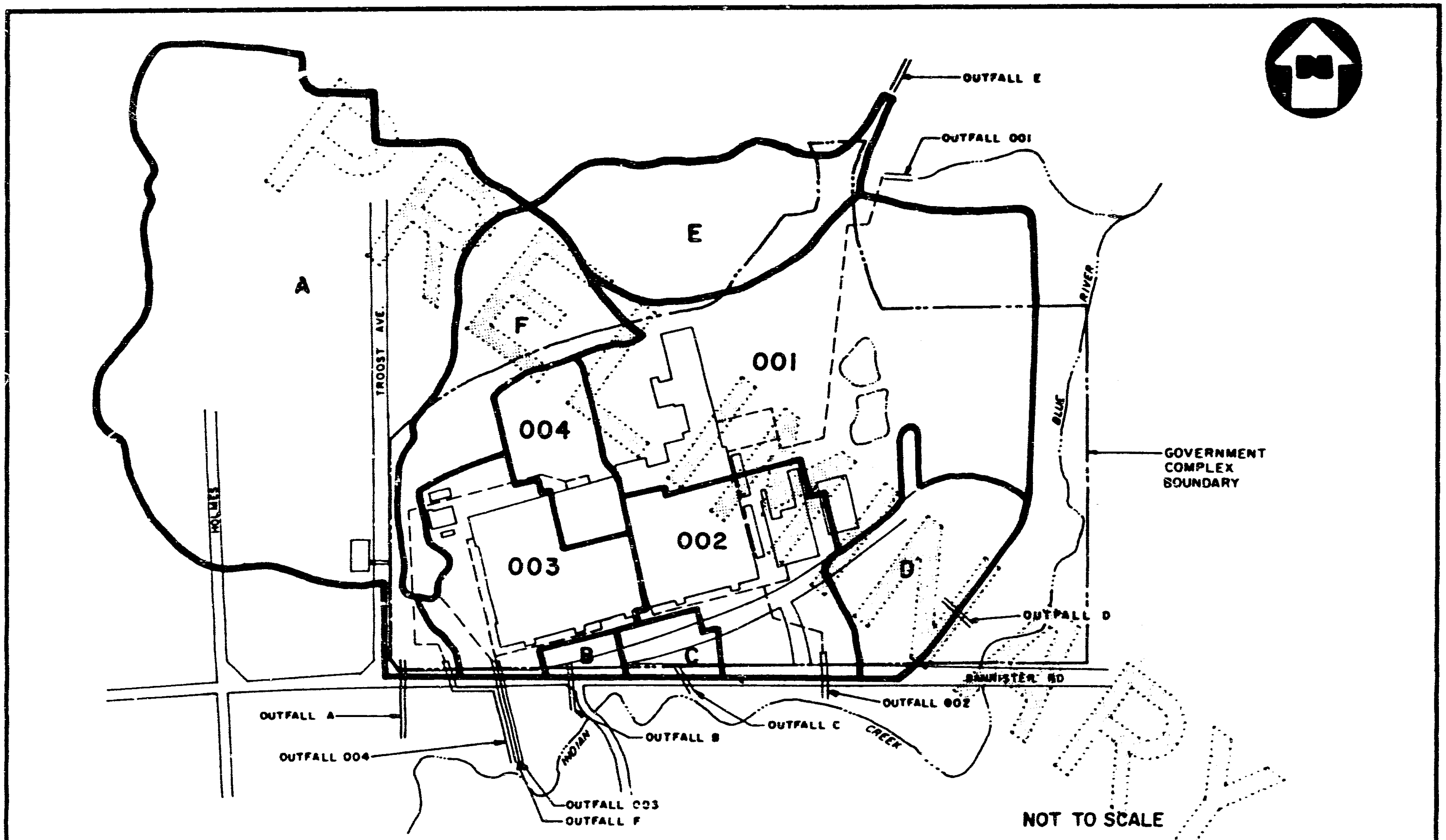
3.3.2.5 Sewer Systems

There are three sewer systems at the KCP: the storm sewer system, the industrial waste sewer system, and the sanitary sewer system. These last two systems combine prior to discharging to the municipal sewer. Discharges from four of the storm sewers are covered under NPDES Permit No. MO-0004863 administered by the Missouri Department of Natural Resources (MDNR). The discharge from the combined industrial waste and sanitary sewer, which flows to the municipal sewer northeast of KCP, is covered by industrial waste discharge Permit No. 74, issued by the City of Kansas City, Missouri (KCMO), Pollution Control Department.

The drainage areas of the various storm sewers that discharge waters originating on the Federal complex are shown in Figure 3-13. The four that are covered by the NPDES permit are designated outfalls 001 through 004. Six other outfalls do not collect stormwater from process areas of the plant and therefore are not covered by permits. These outfalls are designated outfalls A through F. It is expected that regulations written to implement the February 4, 1987, amendments to the Clean Water Act will require that permits be obtained for at least some of the other outfalls. This could require expansion of the current discharge monitoring program. The existing NPDES permit is issued to KCP. However, not all of these areas are under the jurisdiction of KCP, who might become responsible for all the discharges from the Federal complex.

The sanitary sewer system at KCP discharges to a 24-inch gravity sewer line, which ties into the KCMO municipal sewer system northeast of the plant. Some industrial wastewaters (e.g., the blowdowns and backwashes from the West Boiler House, laboratory sinks, etc.) flow directly into the KCP sanitary sewer system in the plant because there is no industrial waste line in these areas to receive the discharges. Other industrial wastewaters flow through the industrial waste sewer system to a lagoon prior to combining with the sanitary sewer for discharge to the municipal sewer. A combination flow monitoring and lift station permits KCP to monitor this combined discharge to the city sewer.

The industrial waste sewers deliver their waters to the lagoon located in the northeast area of the plant. Three sewer systems actually converge at the lagoon inlet basin to comprise the industrial waste sewer system (Figure 3-12). The systems include an acid sewer which receives waters that typically have low pH; a caustic sewer, which receives waters with a high pH; and the industrial waste sewer, which is intended to receive only waters that are neutral. The wastes entering the lagoon contain heavy metals such as copper, chromium, cadmium, nickel, and zinc, which are used in the various plating solutions, as well as cyanide and organic solvents, which are also used in some of the processes.



SOURCE: Booker, 1985.

FIGURE 3-13

STORM DRAINAGE AREAS
KANSAS CITY PLANT – KANSAS CITY, MISSOURI

Two lagoons have been used. However, the North Lagoon, which was built in 1962, was closed in 1986, and the South Lagoon, which was built in 1977 (Section 4.1.2.1), is to be closed in 1988. The North Lagoon was initially installed to control the direct discharge to the Blue River, and subsequent to 1967 when the discharges were prohibited, to the municipal sewer system. The system at the lagoons contained equipment to feed either acid or alkaline materials to adjust the pH of the effluent as well as a means of pumping lagoon effluent back to the influent if the discharge was outside the pH limits of 6.0 to 10.0. The use of pH-adjusting chemicals was discontinued when it was determined that normal pH variation in the lagoon influent stream would usually return the pH to an acceptable level within 24 hours if the lagoon effluent was simply recirculated to the influent. Neither the feed of chemicals nor the recirculation of lagoon contents resulted in 100 percent compliance with the pretreatment discharge standards imposed by KCMO (Section 3.3.3.2).

At the time of the on-site Survey, plans were in place to install a wastewater treatment plant to remove the pollutants to acceptable limits before this industrial wastewater is discharged to the sanitary sewer. Operations are scheduled to begin in November 1988. This plant will be able to treat concentrated acidic and alkaline spent baths, which are presently being sent to an outside contractor for disposal as hazardous wastes, as well as being able to treat the wastes now being sent to the lagoon. The plant as designed will treat cyanide, chromium, and heavy metals, but has no provisions to specifically treat organic wastes. However, treatability studies made during the design of the plant indicated that the proposed treatment scheme would also remove 69 percent of the organics. A decision has been made to meet the organic discharge limits by a combination of administrative controls and the level of treatment that will be provided by the treatment facility. The KCP Solvent Management Plan is the administrative control that is being used to limit organic discharges. This plan identifies the solvents and their usage, storage, and disposal by department at KCP. It also tabulates actions, both existing and planned, to prevent and/or contain future releases. This includes education and training of departmental employees in solvent-handling procedures. Space for the addition of organic treatment facilities has been included in the design if a satisfactory level of compliance can not be achieved by these means.

3.3.2.6 Water Distribution System

The water distribution system at KCP is supplied with water from the Missouri River through the City of Kansas City, Missouri, distribution system. Water can enter the KCP through meters in three locations (i.e., northeast of the plant, south of the plant by Bannister Road, and northwest of the plant on Troost Avenue). The Troost Avenue meter pit supplies a 1×10^6 gallon reservoir that is used to keep the boiler operating if city water pressure is lost. The distribution system in the plant is divided into two separate systems. The Fire Protection system has a loop around the entire outside perimeter of the building. There are 500,000-gallon reservoirs at both the east and west sides of the plant that provide storage for this system. The domestic water system is looped inside the main building. Process water users take their feed from the domestic water system. Backflow preventers are used to keep possible flows from the process water users from contaminating the potable portion of the system if pressure is lost in the main water line. KCP procedures require all new construction to have backflow preventers installed where the domestic water is being supplied to process users. A backflow preventer inspection program had been in effect that required inspections once per month, but it fell into disuse due to organizational restructuring. KCP is preparing a new program which is to be in place by October 1, 1987 (Gwinn and Mast, 1987).

3.3.3 Environmental Monitoring Program

The environmental monitoring program at KCP does not address radionuclides in waters, since no radioactive materials are processed at this site. However, KCP does sample for both organic and inorganic chemicals in the water entering the plant distribution system, in discharges from the plant, and in the surface waters adjacent to the plant. The results of these analyses are used to track the plant's compliance with discharge limits and to prepare reports required by the State of Missouri for NPDES discharges and the City of Kansas City for discharges to the municipal sanitary sewer system. No analyses or reports are required for the plant's potable water distribution system, since it receives the water directly from the City of Kansas City's distribution system. However, sampling and analysis of the intake of city water to KCP is needed for determination of the NPDES discharge limits.

In order to comply with various permit conditions as well as to monitor the plant's effect on the environment, the following parameters are routinely determined in the samples taken at KCP:

Ammonia (as N)	Sulfate	Cadmium
B.O.D. (5 day)	PCBs (FR-1)	Chromium - Total
C.O.D.	Terphenyls (Therminol 66)	Chromium - Hexavalent
Chloride	Temperature	Copper
Chlorinated Hydrocarbons	Water Appearance	Iron
Cyanide	pH	Lead
Nitrate (as N)	Aluminum	Mercury
Oil and Grease	Arsenic	Nickel
Phenol	Barium	Selenium
Phosphorus (as P)	Beryllium	Silver
Solids - Total Suspended	Boron	Zinc
Solids - Total Dissolved		

The water sampling locations at the KCP are described in Table 3-18 and are shown in Figure 3-14. Monthly samples are taken at all locations except for Indian Creek at 99th Street and the Blue River at Red Bridge and Prospect Bridge. Samples are no longer taken at these three locations on a regular basis because the other samples provide sufficient data to monitor the effect of KCP on the environment. In addition to these monthly samples, samples are also taken semi-monthly at the two city water intake locations and the four NPDES outfalls.

An outside contractor, Langston Laboratories, Inc., collects and analyses the surface-water samples for the KCP. Their sampling and analysis procedures were reviewed during the quality assurance portion of the Survey (Section 4.4.1.1). Although some deficiencies were noted, they were not of sufficient magnitude to compromise the data obtained.

3.3.3.1 NPDES Monitoring

NPDES Permit No. MO-0004863 issued to the KCP on April 16, 1982, allows the plant to discharge uncontaminated cooling water and storm-water runoff through outfalls 001-004. Limitations on the discharge of total dissolved solids (TDS), temperature, pH, and PCBs, the required sampling frequency, and those parameters which Part A of the permit requires the plant to only monitor and report are listed in Table 3-19. In addition, Part D of the permit also requires the plant to notify the state if a discharge of a toxic pollutant (as defined in Section 307(a)(1) of the Clean Water Act), not limited by the permit, has or will exceed a "notification level." The "notification levels" for pollutants that may possibly be discharged from the plant are shown in Table 3-20. These levels are defined in the permit as the higher of either 100 µg/l or five times the maximum concentration value reported for that pollutant in the permit application. Table 3-20 also lists the maximum limitations for the protection of aquatic life contained in the Missouri water quality standards. The KCP compares their performance against these standards because Missouri has designated these streams adjacent to the KCP for aquatic life use (10 CSR 20-7.031).

The NPDES monitoring records for KCP show that in 1986 the PCB limit of "no detectable" was exceeded 37 times; the TDS limit of intake concentrations plus 10 percent, 29 times; and the pH limit 4 times (once less than the lower limit of 6.0 and the others above the upper limit of the intake water pH value). In addition, the toxic pollutant "notification levels" were exceeded 5 times for total chromium, two times for hexavalent chromium, and one time each for copper, nickel, and zinc.

Twenty-three of the 37 PCB exceedances were in samples collected at outfall 002, whereas the other 14 exceedances were in outfall 001. Only six samples in 002 and three samples in 001 were above 1 µg/l; the highest reading was 3.8 µg/l.

TABLE 3-18

WATER SAMPLING LOCATIONS AT KCP
KANSAS CITY, MISSOURI

INTAKE WATER

East Intake	City water at East Boiler House within the perimeter fence.
West Intake	City water at West Boiler House within the perimeter fence.

STORMWATER/COOLING WATER

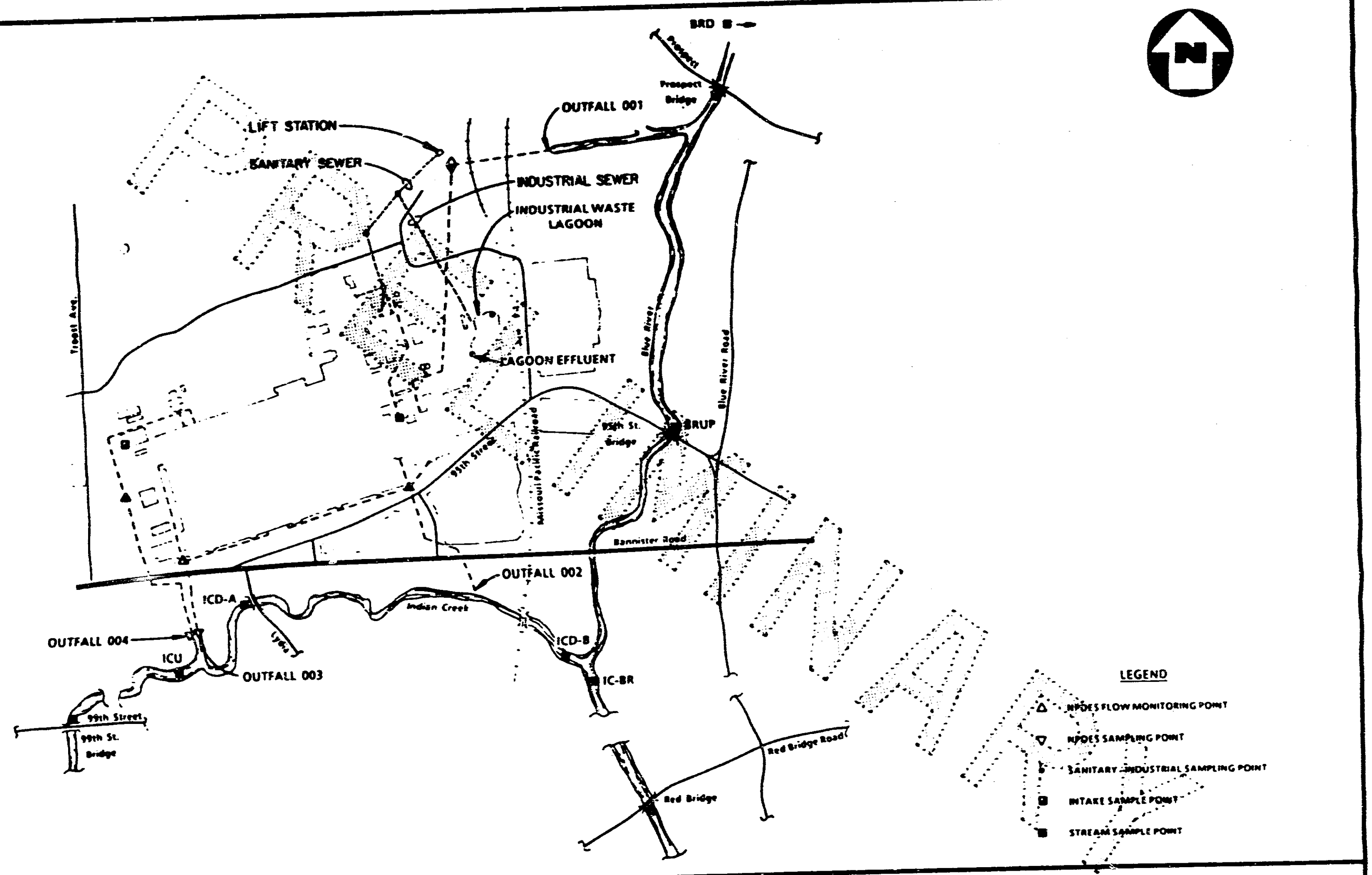
Outfall 001	At flow monitoring manhole, north of IRS parking lot, empties into Blue River.
Outfall 002	At discharge into Indian Creek, south of Highway W to the southeast of plant.
Outfall 003	East pipe at GSA outfall, located south of GSA to southwest of plant, empties into Indian Creek.
Outfall 004	West pipe at GSA outfall, located south of GSA to southwest of plant, empties into Indian Creek.

SANITARY/INDUSTRIAL WASTEWATER

CSS	At sanitary pump station, located on north side of facility outside the perimeter fence. Sanitary sewer and lagoon combined.
SPSS	Located on north side of the facility inside the perimeter fence. Sanitary sewer only.
LIN	Located at the influent of the South Lagoon.
LE	Located at the effluent of the South Lagoon.

SURFACE WATERS

ICU	Indian Creek upstream of the confluence of Outfall 003 and 004 with Indian Creek.
ICD-A	Indian Creek downstream of Outfall 003 and 004 and upstream of Outfall 002, where Indian Creek runs under Lydia Street.
ICD-B	Indian Creek downstream of Outfall 002 just before Indian Creek discharges into the Blue River.
IC-BR	Above the confluence of Indian Creek and Blue River, 100 yards upstream of confluence in Blue River.
BRUP	Blue River, upstream of Outfall 001, at the 95th Street Bridge.
BRD	Blue River, downstream of Outfall 001, north of the Prospect Bridge.
99th	Indian Creek at 99th Street Bridge.
Red Bridge	Blue River at Red Bridge.
Prospect	Blue River at Prospect Bridge.



SOURCE: DOE Environmental Survey.

FIGURE 3-14

WATER MONITORING LOCATIONS
KANSAS CITY PLANT – KANSAS CITY, MISSOURI

TABLE 3-19

NPDES DISCHARGE LIMITS AND MONITORING REQUIREMENTS
KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Parameter	Effluent Limitations	Frequency
Flow	Monitor only	Continuous
Total Dissolved Solids	Intake + 10%	Twice/month
Temperature	(1)	Twice/month
pH	6.0 - Intake pH	Twice/month
Polychlorinated Biphenyls	No measured quantity	Twice/month
Aluminum	Monitor only	Once/month
Barium	Monitor only	Once/month
Iron	Monitor only	Once/month
Mercury	Monitor only	Once/month
Nickel	Monitor only	Once/month

Source: NPDES Permit No. MO-0004863

(1) Beyond the mixing zone, water contaminants shall not raise or lower the temperature of a stream more than five degrees (5°) F. Water contaminants shall not cause or contribute to stream temperatures in excess of ninety degrees (90°) F.

TABLE 3-20

ADDITIONAL NPDES MONITORING LIMITS
KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Parameter	Section 307 Notification Levels	Missouri Aquatic Life Limits
Arsenic	0.100	0.020
Beryllium	0.100	0.005
Cadmium	0.100	0.012
Chromium (Total)	0.150	0.100
Chromium (Hexavalent)	0.100	
Copper	0.140	0.020
Cyanide	0.100	0.005
Lead	0.375	0.050
Mercury	0.100	0.002
Nickel	0.530	0.100
Selenium	0.100	0.010
Silver	0.100	0.005
Zinc	0.565	0.100
Phenol	0.100	0.100

Source: NPDES Permit No. MO-0004863 and Missouri Code of State Regulations (10 CSR 20-7.031).

The MDNR issued an abatement order in December 1984, which required KCP to prepare plans and take action to reduce the discharge of PCB to 1 microgram per liter by July 31, 1985. Even though 170 barrels of PCB-contaminated sediment were removed from the 002 storm sewer, compliance with the 1 µg/l limit was not achieved. MDNR then issued a Stipulation and Modification to the abatement order, which required KCP to meet the 1 µg/l monthly average limit for PCB by December 31, 1986. A consultant, hired as a result of this action, concluded that although PCBs were found in various locations, there were no major sources identified that singularly contributed to the problem. The consultant also concluded that analytical results showing <3 µg/l PCB were unreliable (Fleischhauer et al., 1986). As a result, KCP has requested the state to set the limit at 3 µg/l. While the consultant's study was going on, plant personnel made equipment drain modifications, sealed the upper end of the 002 main trunk line, and relined a lateral with plastic pipe to prevent further intrusion of PCB contamination into the sewer. Only two samples (both at outfall 002) have contained greater than 1 µg/l PCB between July 31 and December 31, 1986. Other discussions on the PCB problem at KCP are contained in Sections 3.2 and 4.2.

Nine of the 27 TDS exceedances were at outfall 001, two at outfall 002, eight at outfall 003, and ten at outfall 004. The TDS limit for KCP, as stated in the NPDES permit, is "limited to the concentration of the intake water Total Dissolved Solids at the time the effluent is monitored with an allowance for a maximum variance of ten (10) percent." To calculate this limit the plant averages the TDS in the east and west intakes and adds 10 percent to the value obtained. Thus, during 1986 the maximum TDS limit ranged from a low of 288 mg/l to a high of 546 mg/l. By way of comparison, the limit for TDS in the secondary drinking water standards (40 CFR 143.3) is 500 mg/l. Only four discharge samples had TDS concentrations greater than 500 mg/l, but only two of these were exceedances. This was because of the high TDS in the intake water used to calculate the limit. KCP has requested that this parameter be eliminated from the new permit.

The pH and toxic pollutant "notification level" exceedances were associated with outfalls 001 and 002. The copper (3.27 mg/l), nickel (1.71 mg/l), zinc (2.03 mg/l), low pH (3.2), and highest total chromium (0.485 mg/l), as well as the highest TDS (728 mg/l), were all found in one sample from outfall 001. The reason for this is not known; however, plant records (Author unknown, 1986) indicate an unknown amount of material sprayed onto the west driveway (which was cleaned up) from a waste acid reaction that occurred in the acid storage lot on June 13, 1986, three days prior to the sampling. The other exceedances were random occurrences.

Tables 3-21 and 3-22 contain summaries of the 1986 monitoring results for the semi-monthly samples taken from the intakes and NPDES discharges, respectively, at KCP. The sampling locations for

TABLE 3-21

1986 INTAKE MONITORING RESULTS
(Concentrations are in mg/l)
KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Parameters	East Intake			West Intake		
	Maximum	Minimum	Average(1)	Maximum	Minimum	Average(1)
pH (SU)	10.7	9.0	N/A	10.8	9.0	N/A
Ammonia (as N)	0.6	0.1	0.4	0.8	0.1	0.4
BOD (5 day)	5	<1	<2	6	<1	<2
COD	102	<4	<13	21	<1	<7
Chloride	29	13	21	27	16	21
Chlorinated Hydrocarbons	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cyanide	0.003	<0.001	<0.001	<0.001	<0.001	<0.001
Nitrate (as N)	3.7	0.9	2	3.4	0.7	2.0
Oil & Grease	<0.5	<0.5	<0.5	1.8	<0.5	<0.5
Phenol	<0.001	<0.001	<0.001	0.012	<0.001	<0.003
Phosphorus (as P)	0.17	0.04	0.09	0.87	0.03	0.12
Solids - Total Suspended	4	<1	<2	9	1	3
Solids - Total Dissolved	471	260	370	505	259	368
Sulfate	206	82	140	211	79	142
PCBs (FR-1)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Terphenyls - (Therminol 66)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002

TABLE 3-21
1986 INTAKE MONITORING RESULTS
(Concentrations are in mg/l)
KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE TWO

Parameters	East Intake			West Intake		
	Maximum	Minimum	Average(1)	Maximum	Minimum	Average(1)
Aluminum	0.22	<0.01	<0.06	0.28	0.01	<0.07
Arsenic	<0.001	<0.001	<0.001	0.001	<0.001	<0.001
Barium	0.090	0.010	<0.031	0.100	0.003	0.032
Beryllium	<0.001	<0.001	<0 001	<0.001	<0.001	<0.001
Boron	0.49	0.05	0.15	0.60	0.01	0.16
Cadmium	<0.001	<0.001	<0.001	0.001	<0.001	<0.001
Chromium - Total	0.02	<0.01	<0.01	0.02	<0.01	<0.01
Chromium - Hexavalent	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Copper	0.03	<0.01	<0.01	0.26	<0.01	<0.01
Iron	2.2	<0.01	<0.13	3.0	<0.01	<0.19
Lead	0.05	<0.01	<0.01	0.02	<0.01	<0.010
Mercury	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	0.02	<0.01	<0.01	0.01	<0.01	<0.01
Selenium	0.002	<0.001	<0.001	0.002	<0.001	<0.001
Zinc	0.04	<0.01	<0.02	0.06	<0.01	<0.02

Source: DOE Survey, 1987, from data supplied by KCP

(1) Averages were calculated by using the detection limit for all values reported as less than the detection limit. The average was then reported as less than the value thus obtained to indicate that the true average is really less than the value reported.

TABLE 3-22

1986 NPDES OUTFALL MONITORING RESULTS
(Concentrations are in mg/l)
KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Parameters	Outfall 001			Outfall 002			Outfall 003			Outfall 004		
	Maximum	Minimum	Average(1)	Maximum	Minimum	Average(1)	Maximum	Minimum	Average(1)	Maximum	Minimum	Average(1)
Flow (MGD)	0.78	0.33	0.51	3.3	0.76	1.5	0.34	0.15	0.23	0.85	0.41	0.49
Temperature (°F)	82	46	63	83	45	64	81	46	63	47	84	62
Water Appearance	Turbid	Clear		Turbid	Clear		Turbid	Clear		Turbid	Clear	
pH (SU)	10.4	3.2	N/A	10.1	8.7	N/A	9.8	8.0	N/A	9.4	7.7	N/A
Ammonia (As N)	1.33	0.29	0.77	1.23	0.05	0.60	0.7	0.1	0.4	0.8	0.1	0.4
BOD (5 day)	14	<1	<5	7	<1	<4	12	<1	<5	14	<1	<5
COD	38	4	18	44	4	16	40	8	17	64	4	16
Chloride	114	11	30	67	3	24	47	22	32	71	15	38
Chlorinated Hydrocarbons	2.05	<0.005	<0.109	<0.005	<0.005	<0.005	0.97	<0.005	<0.045	<0.005	<0.005	<0.005
Cyanide	0.003	<0.001	<0.001	0.018	<0.001	<0.002	0.013	<0.001	<0.003	0.020	<0.001	<0.018
Nitrate (As N)	3.40	0.98	2.12	3.7	0.92	2.0	6.3	0.73	2.1	6.9	0.77	2.0
Oil & Grease	3.4	<0.5	<0.8	4.8	<0.5	<0.6	1.6	<0.5	<0.5	2.6	<0.5	<0.5
Phenol	0.09	<0.001	<0.008	0.03	<0.001	<0.005	0.043	<0.001	<0.006	0.056	<0.001	<0.006
Phosphorus (As P)	0.60	0.10	0.25	0.34	0.06	0.17	0.20	0.04	0.11	0.25	0.05	<0.11
Solids - Total Suspended	60	2	15	572	<1	<45	160	<1	<16	230	3	20
Soldis - Total Dissolved	728	241	396	490	218	360	320	320	393	525	289	397
Sulfate	205	73	138	170	23	120	651	71	145	195	65	119
PCBs (FR-1)	0.0038	<0.0001	<0.0005	0.0026	<.0001	<0.0009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Terphenyls - (Therminol 66)	0.472	<0.002	<0.078	0.009	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0002	<0.0002	<0.0002

TABLE 3-22
1986 NPDES OUTFALL MONITORING RESULTS
(Concentrations are in mg/l)
KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE TWO

Parameters	Outfall 001			Outfall 002			Outfall 003			Outfall 004		
	Maximum	Minimum	Average(1)	Maximum	Minimum	Average(1)	Maximum	Minimum	Average(1)	Maximum	Minimum	Average(1)
Aluminum	17.03	<0.01	<0.85	15.0	0.01	0.77	3.1	0.011	0.23	3.1	<0.01	<0.25
Arsenic	002	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	0.004	<0.001	<0.001
Barium	0.36	<0.001	<0.048	0.26	<0.01	<0.04	0.14	0.003	0.05	0.14	0.005	0.060
Beryllium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	0.55	0.05	0.18	0.50	<0.01	<10.17	0.41	0.003	0.146	0.45	0.04	0.14
Cadmium	0.006	<0.001	<0.002	0.006	<0.001	<0.001	0.002	<0.001	<0.001	0.004	<0.001	<0.001
Chromium - Total	0.49	<0.001	<0.07	0.22	<0.01	<0.04	0.02	<0.01	<0.01	0.03	<0.01	<0.01
Chromium - Hexavalent	0.25	<0.1	<0.02	0.17	<0.01	<0.02	<0.01	<0.01	<0.01	0.04	<0.01	0.01
Copper	3.3	<0.01	<0.16	0.05	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Iron	16.9	<0.01	<0.09	21	0.02	1.15	4.8	<0.01	<0.30	4.1	0.02	0.41
Lead	0.10	<0.01	<0.013	0.08	<0.01	<0.01	0.1	<0.01	<0.02	0.20	<0.01	<0.01
Mercury	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	1.7	<0.001	<0.11	0.08	<0.01	<0.02	0.020	<0.01	<0.01	0.02	<0.01	<0.01
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	0.003	<0.001	<0.001	0.004	<0.001	<0.001	0.003	<0.001	<0.030	0.06	<0.01	<0.02
Zinc	2.0	<0.01	<0.122	0.13	<0.01	<0.04	0.30	<0.01	<0.030	0.06	<0.01	<0.02

Source: DOE Survey, 1987, from data supplied by KCP

(1) Averages were calculated by using the detection limit for all values reported as less than the detection limit. The average was then reported as less than the value thus obtained to indicate that the true average is really less than the value reported.

outfalls 002, 003 and 004 are at the ends of the discharge pipes as they empty into Indian Creek. Outfall 001 is sampled at a flow monitoring station located in the sewer line upstream of the actual discharge into the Blue River. The intake samples are collected from taps in the East and West Boiler Houses (Figure 3-14).

3.3.3.2 Sanitary Sewer Monitoring

Discharges to the Kansas City sewer system are governed by Kansas City Ordinance No. 26578 and the pretreatment standards for discharges to Publicly Owned Treatment Works (POTWs) contained in 40 CFR 403 and 433.15. The general pretreatment regulations for all discharges to POTWs are contained in 40 CFR 403, whereas 40 CFR 433.15 contains specific pretreatment standards (discharge limits) for existing sources in the metal-finishing point-source category. Since KCP's industrial waste is mixed with sanitary and other unregulated flows (Section 3.3.2.5) prior to entering the city's sewer system, alternate standards calculated under 40 CFR 403.6(e) apply. This section of the regulations prescribes the mathematical formula to be used to take into account the effects of the boiler and cooling tower blowdown, sanitary wastes, or other nonregulated streams entering the sewer system that would dilute the regulated pollutants in the point-source category discharges. The effluent limitations under the city ordinance, the metal-finishing point-source pretreatment standards, and the alternatives calculated for KCP are listed in Table 3-23. The discharge from KCP must meet the most restrictive of these limits. The metal-finishing guidelines, which became effective on February 15, 1986, place a limit on the total toxic organics (TTO) in addition to placing a limit on the amount of cyanide and metals that may be discharged. TTO is defined as the total concentration of all the organic compounds published in 40 CFR 433.11 which are detected in a sample. These compounds are listed in Table 3-24.

To comply with the monitoring requirements, twice a year, KCP collects samples of the discharge to the POTW for 6 days within a 2 week period. These samples are obtained at the lift station outside the perimeter fence north of the plant (Figure 3-14). These results are reported to the city in June and December each year in accordance to regulations contained in 40 CFR 403.12(b)(5). The results of the two rounds of samples collected in 1986 are presented in Table 3-25. In addition to this required monitoring, KCP collects samples at the lagoon influent, lagoon effluent, sanitary sewer prior to mixing with the lagoon effluent, and the designated effluent monitoring point on a monthly basis. The results of these more frequent analyses give the plant an earlier warning of possible problems than the required semiannual samples provide. Table 3-26 summarizes results of these analyses for the lagoon effluent, sanitary, sewer, and the combined sewer during 1986. The data in Tables 3-25 and 3-26 show that the KCP is discharging metals and TTO in excess of the

TABLE 3-23

KANSAS CITY PLANT SANITARY SEWER/PRE-TREATMENT EFFLUENT STANDARDS
(Concentration Units are in mg/l)
KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Parameter	KCMO Ordinance	Metal-Finishing Regulations			
		Pretreatment Standards(2)		KCP Alternatives(3)	
		Daily Maximum	Monthly Average	Daily Maximum	Monthly Average
pH (units)	6.0 – 10.0	----	----	----	----
Temperatures (°F)	150° Maximum	----	----	----	----
BOD, 5 day	300	----	----	----	----
Chlorine Solvents	Restricted	----	----	----	----
Cyanides	2.0	1.20	0.65	0.15	0.08
Phenols	10.0	----	----	----	----
Soluble Oils	100.0	----	----	----	----
Suspended Solids	400.0	----	----	----	----
Boron	1.0 (1)	----	----	----	----
Cadmium	2.0 (1)	0.69	0.26	0.08	0.03
Chromium (T)	10.0 (1)	2.77	1.71	0.34	0.21
Chromium (Hex)	5.0 (1)	----	----	----	----
Copper	2.0 (1)	3.38	2.07	0.42	0.25
Iron	15.0 (1)	----	----	----	----
Lead	0.1 (1)	0.69	0.43	0.08	0.05
PCBs	Restricted	----	----	----	----
Nickel	3.0 (1)	3.98	2.38	0.49	0.29
Silver	----	0.43	0.24	0.05	0.03
Zinc	2.0 1	2.61	1.48	0.32	0.18
TTOs (4)	----	2.13	----	0.262	----

(1) Missouri Effluent Guidelines for Municipal Control of Industrial Wastes; no Kansas City Ordinance Limit.
(2) Pretreatment Standards for existing sources (40 CFR 433.15).
(3) Kansas City Plant alternative standards are calculated using a combined wastestream formula factor of 0.123, derived using the formula in 40 CFR 403.6(e). This factor is based on a metal finishing flow of 0.263 mgd and a total sewer discharge flow of 2.139 mgd. Example calculation: Cyanide-1.20 mg/l (Regulatory daily maximum standard) x 0.123 (combined wastestream formula conversion factor) = 0.15 mg/l (KCP alternative standard).
(4) Refer to Table 3-24.

TABLE 3-24

TOTAL TOXIC ORGANICS

Acenaphthene	2,4-Dimethylphenol
Acrolein	2,4-Dinitrotoluene
Acrylonitrile	2,6-Dinitrotoluene
Benzene	1,2-Diphenylhydrazine
Benzidine	Ethylbenzene
Carbon tetrachloride (tetrachloromethane)	Fluoranthene
Chlorobenzene	4-Chlorophenyl phenyl ether
1,2,4-Trichlorobenzene	4-Bromophenyl phenyl ether
Hexachlorobenzene	Bis(2-chloroisopropyl) ether
1,2-Dichloroethane	Bis(2-chloroethoxy)methane
1,1,1-Trichloroethane	Methylene chloride (dichloromethane)
Hexachloroethane	Methyl chloride (chloromethane)
1,1-Dichloroethane	Methyl bromide (bromomethane)
1,1,2-Trichloroethane	Bromoform (tribromomethane)
1,1,2,2-Tetrachloroethane	Dichlorobromomethane
Chloroethane	Chlorodibromomethane
Bis(2-chloroethyl) ether	Hexachlorobutadiene
2-Chloroethyl vinyl ether (mixed)	Hexachlorocyclopentadiene
2-Chloronaphthalene	Isophorone
2,4,6-Trichlorophenol	Naphthalene
Parachlorometa cresol	Nitrobenzene
Chloroform (trichloromethane)	2-Nitrophenol
2-Chlorophenol	4-Nitrophenol
1,2-Dichlorobenzene	2,4-Dinitrophenol
1,3-Dichlorobenzene	4,6-Dinitro-o-cresol
1,4-Dichlorobenzene	N-nitrosodimethylamine
3,3-Dichlorobenzidine	N-nitrosodiphenylamine
1,1-Dichloroethylene	N-nitrosodi-n-propylamine
1,2-Trans-dichloroethylene	Pentachlorophenol
2,4-Dichlorophenol	Phenol
1,2-Dichloropropane (1,3-dichloropropene)	Bis(2-ethylhexyl) phthalate

TABLE 3-24
TOTAL TOXIC ORGANICS
PAGE TWO

Butyl benzyl phthalate	Endrin aldehyde
Di-n-butyl phthalate	Heptachlor
Di-n-octyl phthalate	Heptachlor epoxide (BHC-hexachlorocyclohexane)
Diethyl phthalate	Alpha-BHC
Dimethyl phthalate	Beta-BHC
1,2-Benzanthracene (benzo(a)anthracene)	Gamma-BHC
Benzo(a)pyrene (3,4-benzopyrene)	Delta-BHC (PCB-polychlorinated biphenyls)
3,4-benzofluoranthene (benzo(b)fluoranthene)	PCB-1242 (Aroclor 1242)
11,12-Benzofluoranthene (benzo(k)fluoranthene)	PCB-1254 (Aroclor 1254)
Chrysene	PCB-1221 (Aroclor 1221)
Acenaphthylene	PCB-1232 (Aroclor 1232)
Anthracene	PCB-1248 (Aroclor 1248)
1,12-Benzoperylene (benzo(g,h,i)perylene)	PCB-1260 (Aroclor 1260)
Fluorene	PCB-1016 (Aroclor 1016)
Phenanthrene	Toxaphene
1,2,5,6-Dibenzanthracene (dibenzo(a,h)anthracene	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)
Indeno(1,2,3-cd)pyrene (2,3-o-phenlene pyrene)	
Pyrene	
Tetrachloroethylene	
Toluene	
Trichloroethylene	
Vinyl chloride (chloroethylene)	
Aldrin	
Chlordane (technical mixture and metabolites)	
4,4-DDT	
4,4-DDE (p,p-DDX)	
4,4-DDD (p,p-TDE)	
Alpha-endosulfan	
Beta-endosulfan	
Endosulfan sulfate	
Endrin	

Source: 40 CFR 433.11

TABLE 3-25

POTW DISCHARGE MONITORING DATA
(Concentrations are in mg/l)
KANSAS CITY PLANT, KANSAS CITY, MISSOURI

DATA REPORTED IN JUNE 1986

Parameter	Actual Daily Readings						Actual 6-Day Average(1)
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	
Cyanide	<0.001	0.005	0.002	0.005	<0.001	0.004	<0.003
Cadmium	0.0047	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0016
Chromium(T)	0.580	0.252	0.241	0.110	0.124	0.123	0.238
Copper	0.906	0.135	0.101	0.117	0.113	0.104	0.246
Lead	0.119	<0.010	<0.010	<0.010	0.023	<0.010	<0.030
Mercury	0.0032	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0014
Nickel	0.180	0.081	0.065	0.034	0.082	0.129	0.095
Silver	0.0017	0.0155	0.0056	0.0132	0.0065	0.0089	0.0086
Zinc	0.614	0.047	0.048	0.080	0.401	0.082	0.212
Total Toxic Organics (TTOs)	0.2750	0.2071	0.0405	0.1202	0.3653	0.5484	0.259
Daily Flow (mgd)	1.82	1.74	1.62	1.24	1.65	1.70	1.63

DATA REPORTED IN DECEMBER 1986

Cyanide(T)	0.012	0.005	0.001	<0.001	<0.001	<0.001	<0.004
Cadmium	0.004	0.002	0.001	0.018	<0.001	0.007	<0.006
Chromium(T)	0.025	0.091	0.019	0.905	0.252	0.170	0.244
Copper	0.520	0.152	0.028	1.750	0.407	0.330	0.531
Lead	0.020	<0.010	0.022	<0.010	0.025	0.044	<0.022
Mercury	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	0.035	0.024	0.033	0.117	0.099	0.071	0.063
Silver	0.007	0.005	0.005	0.0327	0.0059	0.0065	0.010
Zinc	0.145	0.046	0.106	0.479	0.172	0.216	0.194
Total Toxic Organics (TTOs)	0.1509	0.0578	0.0492	0.044	0.1029	0.0852	0.082
Daily Flow (mgd)	1.84	1.73	1.42	1.62	1.66	1.98	1.71

Source: DOE Survey, 1987, from data sampled by KCP.

(1) Averages were calculated by using the detection limit for all values reported as less than the detection limit. The average was then reported as less than the value thus obtained to indicate that the true average is really less than the value reported.

TABLE 3-26

1986 DISCHARGE TO POTW ANALYSES
(Concentrations are in mg/l)
KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Parameters	Lagoon Effluent			Sanitary Sewer			Discharge to POTW		
	Maximum	Minimum	Average(1)	Maximum	Minimum	Average(1)	Maximum	Minimum	Average(1)
Flow (MGD)	0.617	0.187	0.439	1.413	0.884	1.269	1.910	1.367	1.708
Temperature (°F)	81	45	61	86	50	67	84	44	63
Water appearance	Turbid	Clear	N/A	Murky	Clear	N/A	Murky	Clear	N/A
pH (SU)	10.0	8.1	N/A	9.7	7.4	N/A	9.4	7.6	N/A
Ammonia (as N)	6.76	0.69	1.96	36.21	4.74	13.32	13.6	1.35	6.97
BOD (5 day)	76	<1.0	<12.0	380	65	150	341	42	113
COD	196	12	42	480	98	234	734	8.2	276
Chloride	60	21	43	112	7	59	124	31	62
Chlorinated Hydrocarbons	11.28	<0.005	<1.22	0.281	<0.005	<0.096	5.55	<0.001	<0.627
Cyanide	0.025	<0.001	<0.006	0.030	<0.001	<0.005	0.013	<0.001	<0.003
Nitrate (as N)	6.20	1.42	2.87	0.18	<0.01	<0.05	1.48	<0.01	<0.26
Oil and grease	80	<0.5	<10.2	32	3.4	13	73	<0.5	20
Phenol	0.033	<0.001	<0.010	0.080	<0.001	0.023	0.211	<0.001	0.038
Phosphorus (as P)	2.17	0.33	0.85	7.21	2.6	3.79	9.22	0.91	3.6
Solids-Total Suspended	164	4	37	180	35	115	705	80	285
Solids-Total Dissolved	566	382	456	700	339	539	796	440	538
Sulfate	263	105	171	285	91	168	260	113	162
PCBs (FR-1)	0.0026	<0.0001	<0.0006	0.0019	0.0001	0.0055	0.0088	0.0019	0.0078
Terphenyls-(Therminol 66)	112	<2	<18.3	0.039	<0.002	<0.010	0.062	<0.002	<0.02

TABLE 3-26
1986 DISCHARGE TO POTW ANALYSES
(Concentrations are in mg/l)
KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE TWO

Parameters	Lagoon Effluent			Sanitary Sewer			Discharge to POTW		
	Maximum	Minimum	Average(1)	Maximum	Minimum	Average(1)	Maximum	Minimum	Average(1)
Aluminum	2.370	0.016	0.368	0.590	0.06	0.22	1.13	0.03	0.45
Arsenic	0.0013	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	0.096	0.018	0.039	0.113	0.038	0.056	0.191	0.031	0.079
Beryllium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	0.478	0.074	0.227	0.26	0.07	0.16	0.31	0.14	0.198
Cadmium	0.014	<0.001	<0.0024	0.006	<0.001	0.003	0.048	<0.001	<0.002
Chromium-Total	1.116	0.052	0.275	0.07	<0.01	0.024	0.74	0.01	0.14
Chromium-Hexavalent	0.742	<0.010	<0.140	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Copper	1.950	0.088	0.371	0.11	0.02	<0.05	0.37	<0.01	<0.200
Iron	7.820	0.160	1.148	2.92	0.19	1.03	5.78	0.22	1.63
Lead	0.153	<0.010	<0.034	0.06	<0.01	<0.02	0.09	<0.01	<0.03
Mercury	<0.0010	<0.0010	<0.0010	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	0.298	0.014	0.094	0.03	<0.01	<0.015	0.29	<0.01	0.080
Selenium	<0.0010	<0.0010	<0.0010	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	0.016	<0.001	<0.003	0.006	<0.001	0.028	0.018	<0.001	<0.004
Zinc	0.607	0.020	0.101	0.23	0.037	0.10	0.43	0.03	0.17
TTOs	11.283	<0.006	1.230	0.3116	0.0017	0.1240	5.5796	0.0055	0.7279

Source: DOE Survey, 1987, from data supplied by KCP

(1) Averages were calculated by using the detection limit for all values reported as less than the detection limit. The average was then reported as less than the value thus obtained to indicate that the true average is really less than the value reported.

amount permitted by the pretreatment standards. Chlorinated solvents and PCB, which are prohibited in any amount by the Kansas City regulations, are also being discharged.

3.3.3.3 Stream Monitoring

In addition to monitoring the storm-water outfalls and the discharge to the POTW for compliance purposes, KCP also takes monthly samples from the streams adjacent to the plant to assess KCP's effect on them. The locations of these sampling points are shown in Figure 3-14. The results of the analyses of samples taken in 1986 from points in Indian Creek upstream and downstream of the KCP outfalls are presented in Table 3-27. A comparison of these results show that while there is a wide fluctuation between the minimum and maximum concentrations of various parameters at a sampling point, there is little difference in the concentrations between the upstream and downstream sampling points. This indicates that the effluents from the KCP to Indian Creek have a relatively minor effect on the water quality. The same can be said about the effect of the KCP on the Blue River. Those results are presented in Table 3-28. This table includes a sampling point located after the confluence of Indian Creek with the Blue River but prior to the discharge of outfall 001 in addition to the upstream and downstream analyses. This was done to give a truer picture of the effect of KCP on the Blue River, since the upstream water quality is better in the Blue River than it is in Indian Creek.

3.3.3.4 Sediment Sampling

The KCP does not collect sediment samples as part of its monitoring program. However stream sediment samples were collected as part of the hydrogeologic site characterization of KCP, performed by a consultant (Fleischhauer et al., 1987). The data contained in the consultant's report confirms the discharge of contamination from the site through the stormwater outfalls (e.g., the PCB concentrations found in the sediments in 002 outfall drainage channel). However, the periodic flooding of Indian Creek and Blue River results in the flushing of sediments from the stream beds so that contaminants are not accumulating in these streams adjacent to KCP.

3.3.4 Findings and Observations

3.3.4.1 Category I

None.

TABLE 3-27

1986 INDIAN CREEK MONITORING RESULTS
(Concentrations are in mg/l)
KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Parameters	Upstream			Downstream		
	Maximum	Minimum	Average(1)	Maximum	Minimum	Average(1)
Temperature (°F)	81	39	59	83	40	59
Water appearance	Murky	Clear	N/A	Murky	Clear	N/A
Ammonia (as N)	3.16	0.04	1.55	2.52	<0.01	1.13
BOD (5 day)	24	<1	10	19	<1	10
COD	137	25	53	78	21	39
Chloride	104	4	67	99	4	60
Chlorinated hydrocarbons	<0.005	<0.001	<0.005	<0.005	<0.001	<0.005
Cyanide	0.099	<0.001	<0.020	0.074	0.002	0.018
Nitrate (as N)	6.2	0.4	3.5	7.31	1.00	4.32
Oil and Grease	2.0	<0.5	0.9	3.2	<0.5	1.0
Phenol	0.023	<0.001	<0.010	0.037	<0.001	0.012
Phosphorus (as P)	3.56	0.86	2.50	3.78	0.63	2.40
Solids-Total Suspended	2,700	10	359	1050	10	214
Solids-Total dissolved	591	240	498	574	252	445
Sulfate	84	6	53	87	6	55
PCBs (FR-1)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Terphenyls - (Therminol 66)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002

TABLE 3-27
1986 INDIAN CREEK MONITORING RESULTS
(Concentrations are in mg/l)
KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE TWO

Parameters	Upstream			Downstream		
	Maximum	Minimum	Average(1)	Maximum	Minimum	Average(1)
Aluminum	44.24	<0.01	<4.55	29.65	0.08	3.57
Arsenic	0.051	<0.001	<0.006	0.030	<0.001	<0.004
Barium	0.240	0.004	0.114	0.321	0.067	0.122
Beryllium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	0.32	0.10	0.15	0.23	0.07	0.140
Cadmium	0.004	<0.001	<0.001	0.002	<0.001	<0.001
Chromium-Total	<0.01	<0.01	<0.01	0.02	<0.01	<0.01
Chromium-Hexavalent	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Copper	0.06	<0.01	0.02	0.04	<0.01	0.015
Iron	63.25	0.16	6.20	35.85	0.06	4.36
Lead	0.03	<0.01	<0.01	0.04	<0.01	<0.01
Mercury	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	0.14	<0.01	<0.03	0.03	<0.01	<0.01
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	1.72	0.02	0.17	0.10	0.02	0.05

Source: DOE Survey, 1987, from data supplied by KCP

(1) Averages were calculated by using the detection limit for all values reported as less than the detection limit. The average was then reported as less than the value thus obtained to indicate that the true average is really less than the value reported.

TABLE 3-28

1986 BLUE RIVER MONITORING RESULTS
(Concentrations are in mg/l)
KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Parameters	Upstream of Plant			After Confluence with Indian Creek			Downstream of Plant		
	Maximum	Minimum	Average(1)	Maximum	Minimum	Average(1)	Maximum	Minimum	Average(1)
Temperature (°F)	83	40	59	83	38	59	81	38	59
Water Appearance	Murky	Clear	N/A	Murky	Clear	N/A	Murky	Clear	N/A
pH (SU)	8.8	7.6	N/A	9.1	7.4	N/A	8.8	7.4	N/A
Ammonia (as N)	0.54	<0.01	<0.18	2.44	<0.01	<0.50	2.55	0.01	0.57
BOD (5 day)	39	<1	<9	26	<1	7	19	<1	8
COD	54	8	24	79	16	36	95	13	32
Chloride	32	2	29	91	4	45	89	5	47
Chlorinated Hydrocarbons	<0.005	<0.001	<0.005	<0.005	<0.001	<0.001	<0.005	<0.001	<0.001
Cyanide	0.031	<0.001	<0.006	0.029	<0.001	<0.011	0.039	<0.001	<0.014
Nitrate (as N)	7.6	0.9	2.4	5.0	1.00	3.2	5.2	0.69	3.2
Oil and Grease	7.6	<0.5	<1.3	3.2	<0.5	<1.2	5.6	<0.5	1.1
Phenol	0.034	<0.001	<0.017	0.030	<0.001	<0.009	0.038	<0.001	0.012
Phosphorus (as P)	1.16	0.06	0.42	3.31	0.073	1.76	2.24	0.57	1.56
Solids-Total Suspended	274	6	97	1,340	8	250	1,400	11	197
Solids-Total Dissolved	413	295	339	1,148	232	455	546	311	400
Sulfate	56	8	30	76	12	42	68	7	43
PCBs (FR-1)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Terphenyls-(Therminol 66)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002

TABLE 3-28
1986 BLUE RIVER MONITORING RESULTS
(Concentrations are in mg/l)
KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE TWO

Parameters	Upstream of Plant			After Confluence with Indian Creek			Downstream of Plant		
	Maximum	Minimum	Average[1]	Maximum	Minimum	Average[1]	Maximum	Minimum	Average[1]
Aluminum	4.40	0.07	1.34	26.29	0.05	3.21	29.16	0.10	3.35
Arsenic	0.004	<0.001	<0.001	0.027	<0.001	<0.004	0.0-03	<0.001	<0.003
Barium	0.147	0.089	0.12	0.470	0.04	0.129	0.490	0.08	0.137
Beryllium	0.002	<0.001	<0.001	0.001	<0.001	<0.001	0.001	<0.001	<0.001
Boron	0.32	0.02	0.092	0.23	0.04	0.10	0.49	0.05	0.143
Cadmium	0.002	<0.001	<0.001	0.002	<0.001	<0.001	0.004	<0.001	<0.001
Chromium-Total	0.02	<0.01	<0.01	0.07	<0.01	0.01	0.04	<0.01	<0.01
Chromium-Hexavalent	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Copper	0.03	<0.01	<0.01	0.22	<0.01	<0.03	0.03	<0.01	0.01
Iron	6.72	0.17	1.66	37.3	0.12	4.26	43.90	0.24	4.83
Lead	0.04	<0.01	<0.018	0.03	<0.01	<0.01	0.03	<0.01	<0.01
Mercury	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	0.03	<0.01	<0.01	0.06	<0.01	<0.01	0.03	<0.01	<0.01
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	0.002	<0.001	<0.001	0.002	<0.001	<0.001	0.003	<0.001	<0.001
Zinc	0.08	<0.01	<0.04	0.13	<0.01	0.05	0.12	0.01	0.05

Source: DOE Survey, 1987, from data supplied by KCP

(1) Averages were calculated by using the detection limit for all values reported as less than the detection limit. The average was then reported as less than the value thus obtained to indicate that the true average is really less than the value reported.

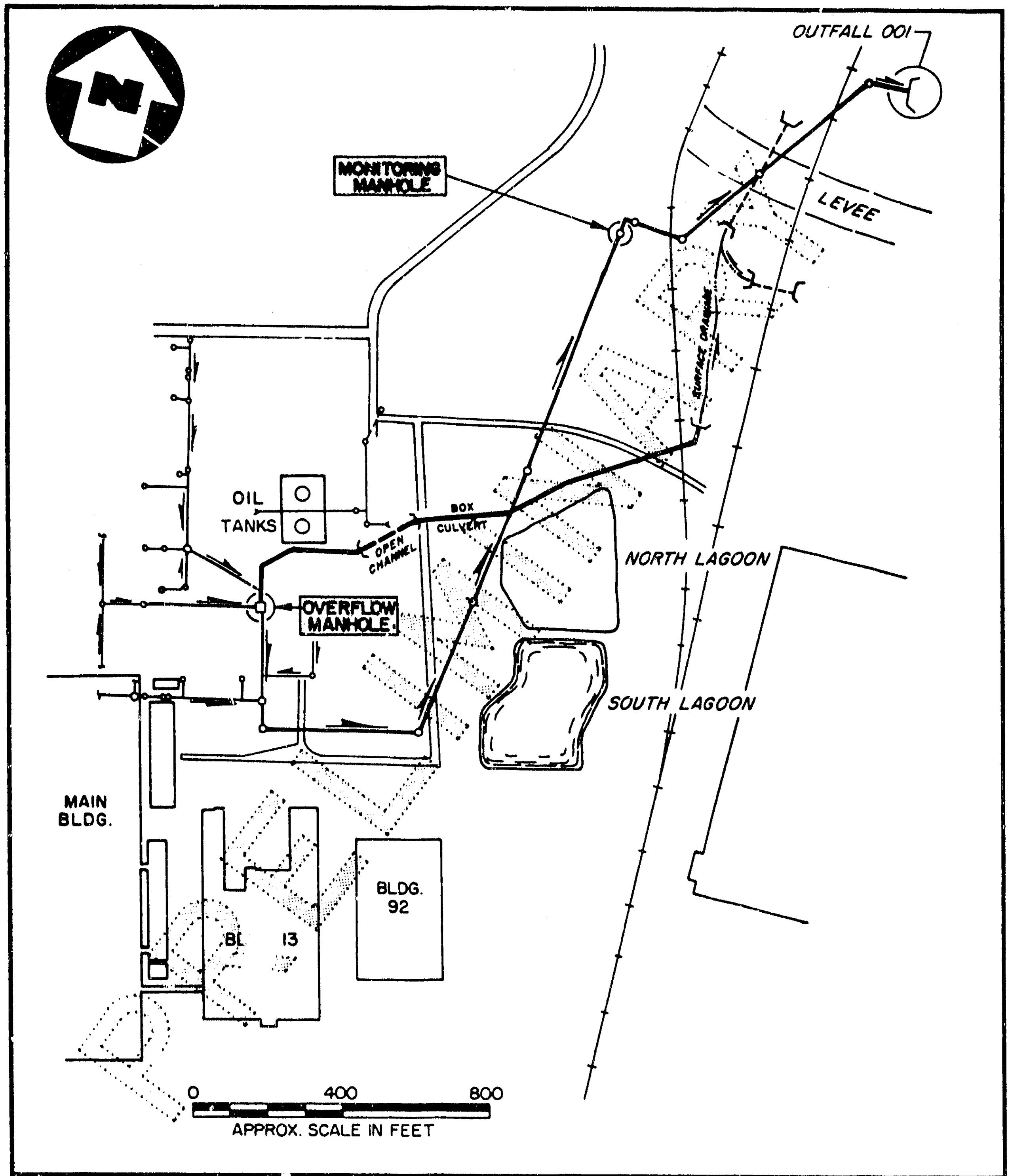
3.3.4.2 Category II

1. Outfall 001 Monitoring Point Bypass. NPDES monitoring reports for outfall 001 may be under-reporting the pollutants being discharged to the Blue River because a portion of the total flow to this outfall bypasses the monitoring point.

   The storm sewer that discharges through outfall 001 is constructed so that during periods of high water, a portion of the flow can overflow out of a manhole inside the plant and be conducted most of the way to the outfall by surface drainage. This helps to keep water from backing up into the plant. As shown in Figure 3-15, this drainage course also receives the normal stormwater flow from portions of the plant. Flow is measured and monitoring samples are taken at the manhole in the 54-inch sewer line indicated on the figure. Thus all the water exiting outfall 001 is not monitored. Survey-related sampling is planned.

2. Backflow Preventers. The lack of a formal backflow-preventer inspection and maintenance program could result in contamination of the potable water through an inoperable device. The KCP does not have a backflow-preventer inspection and maintenance program at this time. A program was in place several years ago which required inspection once a month. At that time there were 60 to 70 backflow preventers installed in the plant. There is no record of the number in use now, although the plant's new construction specifications require backflow preventers on all cross connections. Bendix, Kansas City Division, is aware of this problem and is preparing a program which it expects to have in place by October 1, 1987 (Gwinn and Mast, 1987).

3. Discharges to Storm Sewers. Contamination of surface waters may occur through unauthorized discharges to storm sewers. The NPDES permit issued to KCP allows only uncontaminated cooling water and storm water runoff to be discharged through the storm sewer outfalls. A member of the Survey team observed an employee emptying a drum just outside a door on the east side of Building 59 so that it flowed into a storm drain. The area inside the building houses a self-contained drum cleaner used by waste management personnel to steam clean and wash out drums which had contained hazardous materials. This drum cleaner drains to a sump that discharges to the industrial waste sewer. Discussion with waste management personnel ascertained that the employee who did the dumping was from another department. Other departments use an area adjacent to the drum cleaner to wash out drums and other equipment. This adjacent area is not served by the sumps that get the waste from the drum cleaner.



SOURCE: DOE Environmental Survey team.

FIGURE 3-15

DISCHARGES TO OUTFALL 001
KANSAS CITY PLANT – KANSAS CITY, MISSOURI

3.3.4.3 Category III

1. Discharges To The Kansas City Sewer System. Contamination of off-site surface water is possible because the discharges to the Kansas City sewer system exceed the pretreatment guidelines for the metal-finishing category (Table 3-18).

The City of Kansas City's Blue River Sewage Treatment Plant, which receives the sanitary sewage from KCP, only provides primary treatment to the wastes it receives. As a result, metals and organics may pass through it untreated. The 1986 discharge monitoring reports submitted to the city by KCP show that the daily maximum value allowed for metals was exceeded in nine of the 96 analyses performed and the daily maximum for total toxic organics was exceeded in three of the twelve analyses for this parameter. The limit for average metal concentrations for the 6-day sampling period was also exceeded in five of the 16 averages.

The KCP has already taken steps to address this problem. A treatment plant for chromates, cyanides, and metals has been designed and is being installed to be operational by November 1988. Pilot studies indicated that this plant will also reduce the organic levels in the effluent as well. A decision was made not to include specific organic treatment processes in the design but to allow sufficient space for them to be incorporated at a later date if the use of administrative controls and the removal obtained in the treatment plant does not lower the TTO concentration to levels that are acceptable for discharge to the sanitary sewer .

3.3.4.4 Category IV

None.

3.4 Groundwater (Hydrogeology)

3.4.1 Background Environmental Information

The Kansas City Plant (KCP) site is located in the Great Plains physiographic province. The KCP is built on alluvium (unconsolidated stream deposits) laid down by the Blue River. These deposits are approximately 45 feet thick and are of Quaternary age. They partially fill a valley previously cut by the river into Paleozoic sedimentary rocks. These sedimentary rocks underlie the alluvium and are exposed as bluffs along the margin of the Blue River valley.

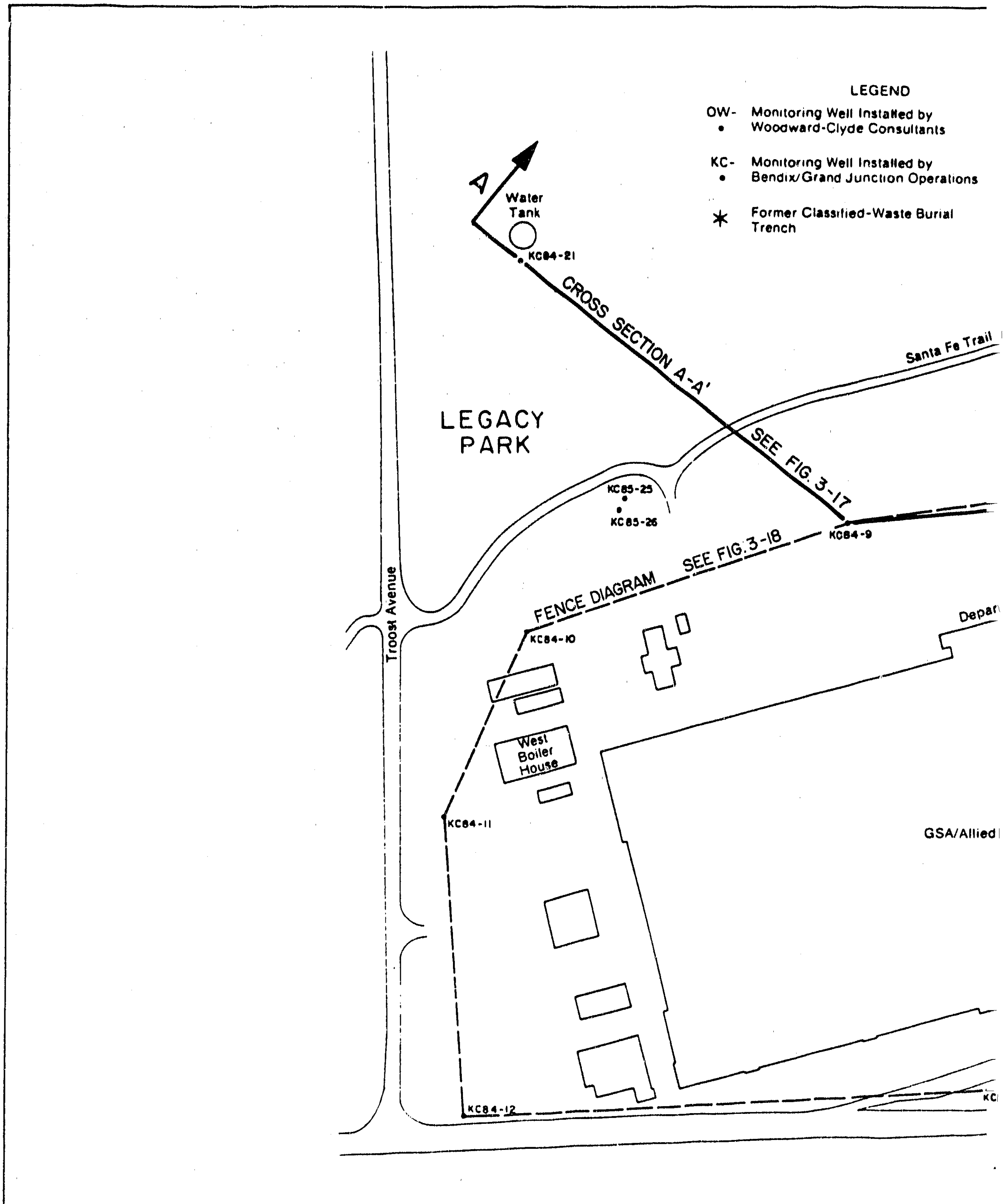
The alluvium is more permeable to groundwater than are the underlying rocks. Because of this contrast in permeability, groundwater tends to move downward until it reaches the base of the alluvium and then horizontally towards the river and its tributaries. Thus, groundwater beneath the KCP tends to discharge into the Blue River and its tributary Indian Creek, rather than moving downward into the sedimentary rocks.

The Paleozoic sedimentary rocks are 2,400 feet thick and rest on a Precambrian crystalline basement complex. Only the uppermost part of the Paleozoic sequence is pertinent to the site. The rocks exposed in the bluffs underlying Legacy Park directly north of the site are predominantly limestone and belong to the Kansas City Group of Upper Pennsylvanian age. The sedimentary rocks (bedrock) underlying the alluvium on which the KCP is built are sandstones and shales of the Pleasanton Group, which is also of Pennsylvanian age. Figure 3-16 is a map of the site showing the location of the geologic cross section on Figure 3-17. These figures and the site information in this section are from Madril et al., 1986 (Report Number GJ-46).

3.4.1.1 Site-Specific Geology

Figure 3-17 is a geologic cross section which summarizes subsurface information obtained during the drilling of boreholes for the monitoring wells indicated on the section. (On this section the alluvium is shown as a single unit; subunits within the alluvium are discussed below.)

As mentioned previously, the important bedrock units underlying the alluvium beneath the KCP are the sandstones and shales of the Pleasanton Group (Figure 3-17). The sandstones in this group are the Knobtown sandstone and the Hepler sandstone, which serve as aquifers (defined as saturated geologic units that can transmit significant quantities of water under ordinary hydraulic gradients). Prior to the hydrogeologic site characterization conducted at the KCP, the Knobtown sandstone was thought to be present only beneath the bluffs at the valley margins where the Kansas City Group is exposed. However, core holes drilled for the site characterization in 1984 and 1985 indicated that the Knobtown sandstone is present beneath the alluvium under as much as one-third of the KCP site. This relationship is shown on Figure 3-17. The presence of the sandstone beneath the alluvium implies that any contaminants present in the alluvial aquifer can potentially move directly downward into the sandstone aquifer. However, as mentioned previously, groundwater (and any contaminants present in groundwater) will tend to move horizontally at the base of the alluvium rather than vertically from the alluvium into the bedrock, due to differences in permeability between the alluvium and the bedrock (Madril et al., 1986).



SOURCE: Adapted from Madril et al., 1986 (GJ-46)

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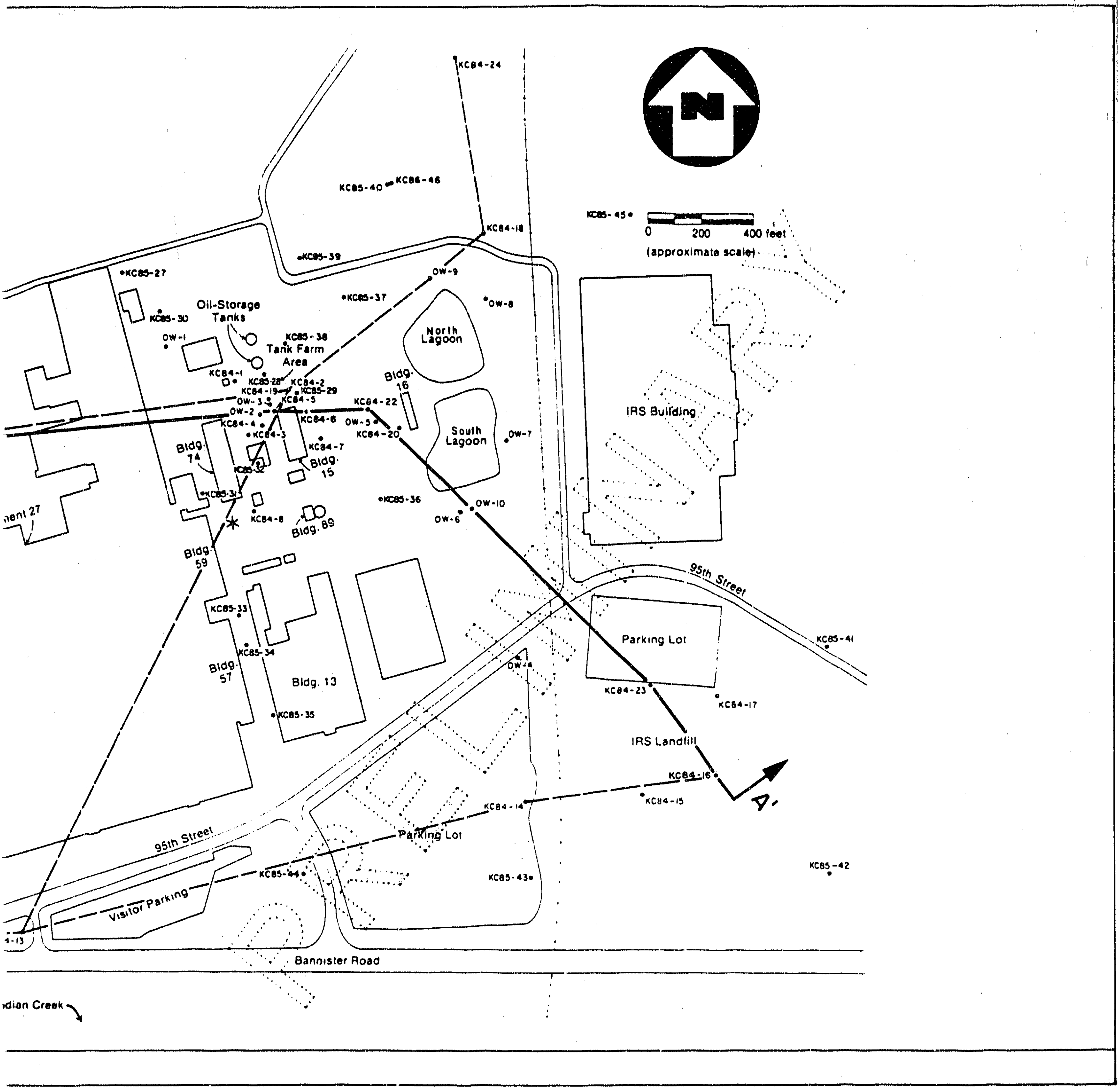
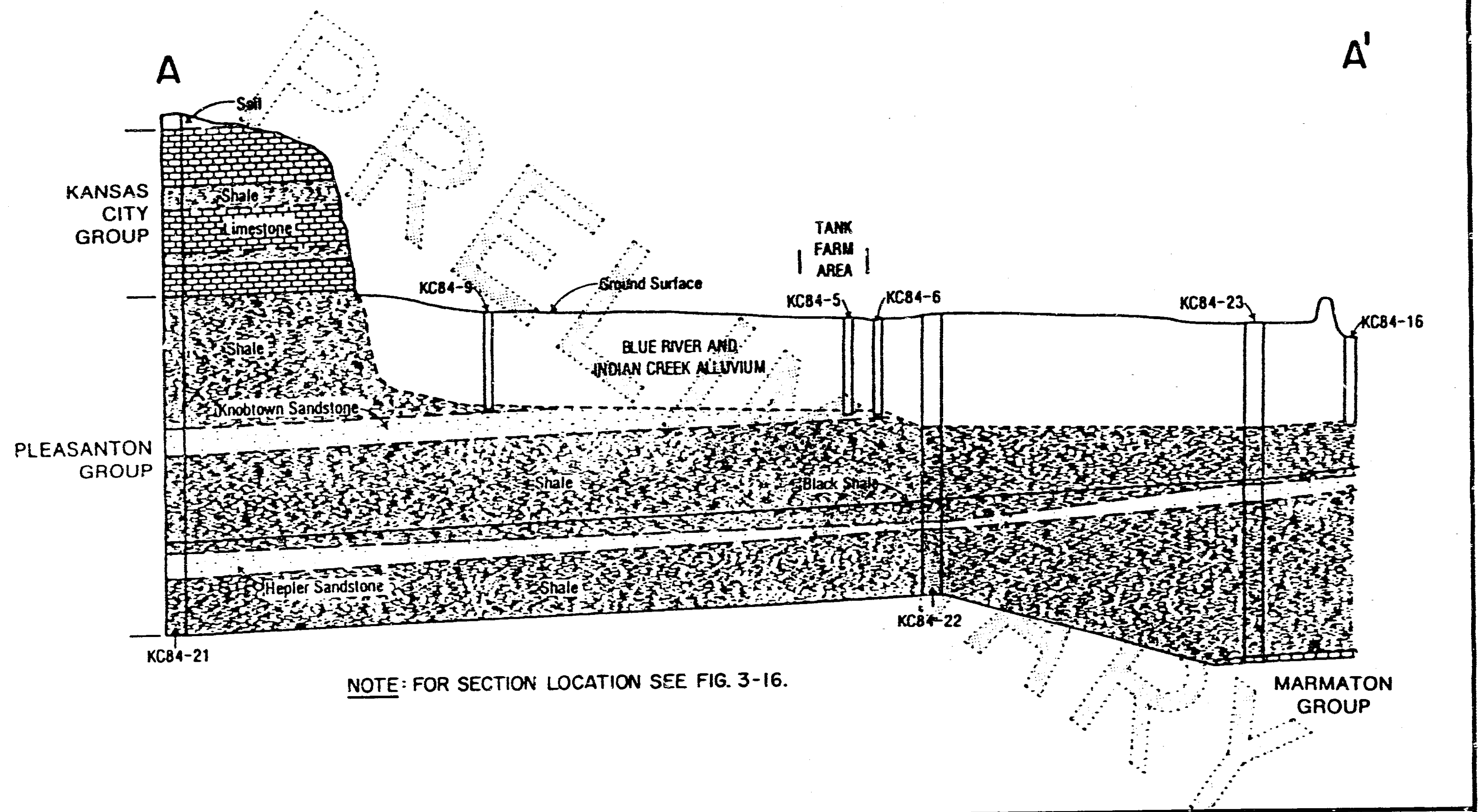


FIGURE 3-16

TINENT AREAS, AND MON ORING WELLS
NSAS CITY FACILITY
NT – KANSAS CITY, MISSOURI



SOURCE: Madril et al., 1986 (GJ-46)

FIGURE 3-17

GEOLOGIC CROSS SECTION ILLUSTRATING THE RELATIONSHIP BETWEEN BEDROCK AND ALLUVIUM AT THE SITE KANSAS CITY PLANT – KANSAS CITY, MISSOURI

The alluvium (alluvial aquifer) in general consists of clayey silt, sand, and gravel. The distribution of various facies (layered deposits that can be distinguished from one another by appearance or composition) is shown in Figure 3-18. This figure is a fence diagram, which is a three-dimensional perspective composite of several geologic cross sections. The location of this fence diagram is indicated on Figure 3-16. The diagram summarizes subsurface information obtained during the drilling of boreholes for the installation of monitoring wells at the indicated locations. Unlike Figure 3-17, the fence diagram shows the alluvium only.

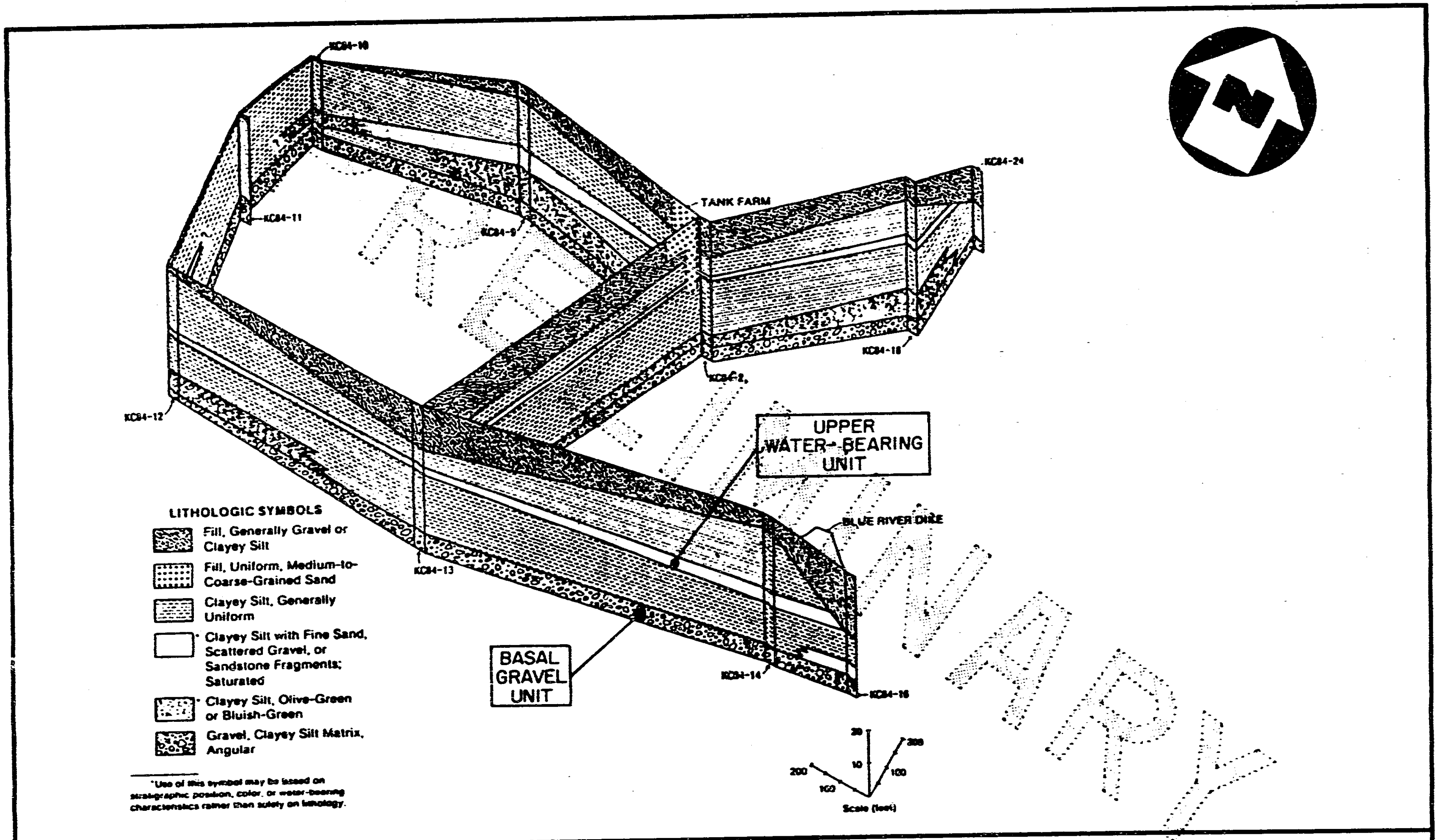
Two water-bearing subunits are present within the alluvium, a basal gravel and an upper sand-clay-silt unit. An olive-green to blue-green clayey silt unit separates the upper and basal water-bearing units. These units were identified on the basis of observations during borehole drilling.

The basal gravel unit is continuous throughout the site and ranges in thickness from 2 to 8 feet. It consists of angular limestone and sandstone gravel with a sand-silt-clay matrix. A seepage front emanates from the base of the alluvium along the west bank of the north-flowing Blue River, indicating that groundwater in this unit discharges to the river.

The upper water-bearing unit within the alluvium consists of thin-bedded sequences of sand and clayey silt, with minor amounts of gravel present near the valley margins. The gravel content tends to decrease near the present-day drainages (Blue river and Indian Creek). This unit was generally identified on the basis of a substantial amount of water entering the borehole during drilling. Groundwater in this unit tends to move downward through the underlying clayey silt until it reaches the basal gravel unit, although water in the upper unit can also move horizontally to wells.

The olive-green to blue-green clayey silt unit was identified on the basis of higher density (as evidenced by a slower drilling rate) and lower moisture content than the water-bearing units that it separates. The fine-grained texture of the unit suggests that it retards the downward migration of contaminant-bearing fluids. It is important to note that water does flow through this clayey silt unit, but at a reduced rate.

This olive-green to blue-green clayey silt unit was not found throughout the site. As shown on Figure 3-18, a less distinctive, uniform clayey silt makes up the entire interval between the two water-bearing units in the southeastern part of the site.



SOURCE: Madril et al., 1986 (GJ-46)

FIGURE 3-18

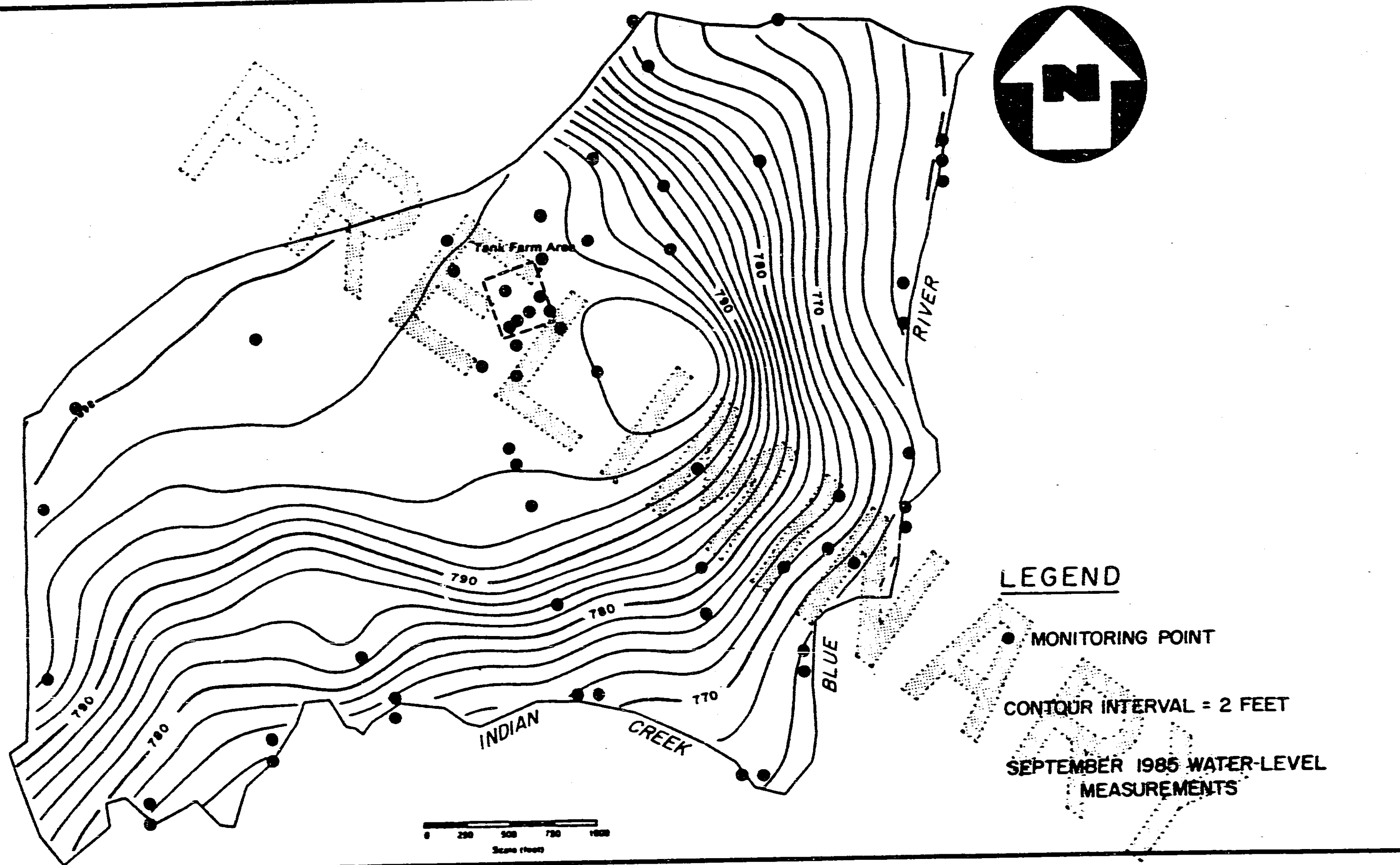
FENCE DIAGRAM ILLUSTRATING FACIES DISTRIBUTION IN ALLUVIUM UNDERLYING THE KANSAS CITY FACILITY KANSAS CITY PLANT – KANSAS CITY, MISSOURI

3.4.1.2 Site-Specific Hydrogeology

Bail tests, packer tests, a short-term pumping test, and laboratory permeability measurements were used to determine hydraulic characteristics pertinent to contaminant migration in groundwater through the above units. Details of these tests are presented in Madril et al., 1986. Results are discussed in the following paragraphs.

Hydraulic conductivity is a property of the subsurface material through which groundwater flows. It can vary over 13 orders of magnitude, so that a knowledge of the order of magnitude of its value can be useful (Freeze and Cherry, 1979). Hydraulic conductivity has high values (10^{-4} - 10^{2} cm/sec) for sand and gravel and low values (10^{-11} - 10^{-4} cm/sec) for clay and most rocks. It is used, together with measurements of hydraulic gradient (difference in water levels over a given distance), to estimate groundwater flow rates. Hydraulic conductivity values from bail tests in wells installed at KCP in 1984 averaged 2×10^{-4} cm/sec (0.6 ft/d) for both the upper and lower water-bearing units of the alluvium. This fact suggests that the sand-clay-silt matrix in the upper water-bearing unit and that in the basal gravel have similar hydraulic characteristics. Two wells installed in 1985, KC85-42 and KC85-44, had higher hydraulic conductivities of 7.2×10^{-4} cm/sec (2.03 ft/d) and 9.0×10^{-4} cm/sec (2.54 ft/d), respectively, for the basal unit. These wells, shown on Figure 3-16, are located near Blue River and Indian Creek where this basal unit has a high sand content. (As sand content increases, hydraulic conductivity tends to increase).

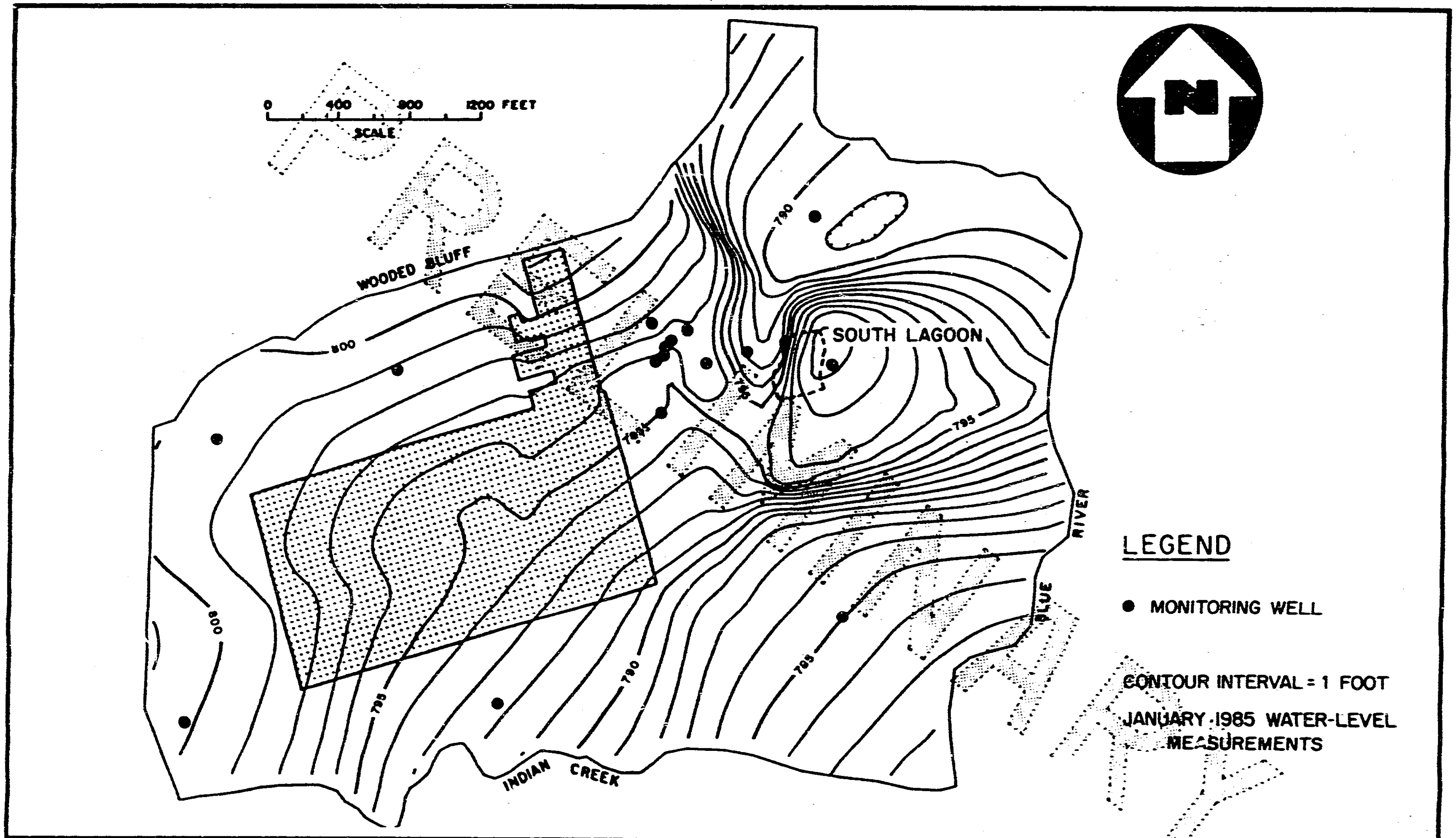
A downward vertical hydraulic gradient exists between the upper water-bearing unit and the basal gravel unit of the alluvium, which implies that groundwater and any contaminants dissolved in groundwater will move downward into the basal unit. Therefore, most potentiometric surface maps generated for the KCP show the basal unit. Figure 3-19 is a typical example of the potentiometric surface in this basal unit, compiled form water level measurements from September 1985. The monitoring points on this figure include water levels of surface streams, which are discharge areas for groundwater. (A potentiometric surface is an imaginary surface representing the total head of a groundwater system and defined by the level to which water will rise in a well. The water table is an example of a particular potentiometric surface.) It can be seen from the contour spacing in Figure 3-19 that the potentiometric surface in the basal unit is relatively flat in the area that directly underlies the plant, and steepens as it approaches Blue River and Indian Creek. A map for the upper water-bearing unit is shown on Figure 3-20. This map shows a mound in the potentiometric surface in the area underlying the South Lagoon. This means that water from the lagoon is infiltrating into the groundwater and moving outward in all directions when it reaches the water table. In addition to groundwater recharge from the South Lagoon, recharge occurs from precipitation in the open areas surrounding the plant and from inflow along the western site boundary north of Indian Creek.



SOURCE: Madril et al., 1986 (GJ-46)

FIGURE 3-19

POTENTIOMETRIC SURFACE MAP FOR BASAL UNIT OF THE ALLUVIAL AQUIFER
KANSAS CITY PLANT – KANSAS CITY, MISSOURI



SOURCE: Korte et al., 1985 (GJ-31)

FIGURE 3-20

POTENTIOMETRIC SURFACE MAP FOR THE UPPER ALLUVIAL WATER-BEARING UNIT KANSAS CITY PLANT – KANSAS CITY, MISSOURI

The alluvial aquifer discharges into Indian Creek and Blue River south and east of the KCP. The average groundwater flow rate (calculated from hydraulic conductivity and hydraulic gradient) for the alluvial aquifer is approximately 30 feet/year.

Hydraulic conductivity values determined for the bedrock (Table 3-29) are generally one to two orders of magnitude lower (10^{-2} - 10^{-3} ft/d) than those determined for the overlying alluvium (0.6 - 2.54 ft/d). As a result, most of the contaminant flow is restricted to the alluvial aquifer.

3.4.1.3 Groundwater Use

There is no recorded use of groundwater from the bedrock aquifers in either the city (Kansas City, Missouri) or county (Jackson County, Missouri) in which the KCP is located. The nearest pertinent groundwater data on these aquifers is from Kansas, which is actually downgradient of the KCP due to the westward dip of the bedrock units (refer to Figure 3-17). The information from Kansas is contradictory with regard to the suitability of groundwater from the bedrock aquifers for water supply use. O'Connor (1971) states that groundwater from the Pleasanton Group and older rocks is believed to have more than 10,000 mg/l dissolved solids throughout Johnson County, Kansas, which is the county west of that in which the Kansas City Plant is located. The secondary standard for total dissolved solids in drinking water is 500 mg/l, so such water would be considered unpotable. Water quality in the Pleasanton Group is described by O'Connor (1971) as very saline, and well yields are low (0-20 gpm). However, two wells drilled in Pleasanton strata in Kansas (locations not available) are used for domestic and stock supplies (Spruill and Kenny, 1981), suggesting that yields may be high enough and salinity low enough in some places to serve some domestic needs. One of these wells is in the Hepler sandstone. No information is available on whether the other is in the Hepler or the Knobtown sandstone. It is probable that these aquifers are rarely used. In any case, there appears to be little or no likelihood of contaminant migration from the KCP into these bedrock aquifers because the preferred groundwater flow path is toward discharge into surface water rather than vertical flow into bedrock.

There is no recorded use of groundwater from the alluvial aquifer in the vicinity of the KCP. In the case of the alluvial aquifer, salinity and total dissolved solids are not a problem as they are in the bedrock aquifers. However, well yields are low. It has been calculated that the alluvial aquifer underlying the KCP can only produce 2 to 3 gallons per minute from a 4-inch-diameter well, a yield that is marginally adequate for private use (Madril et al., 1986). There are no public records of any domestic water supplies using this alluvium because there are no regulations requiring domestic water wells in Missouri to be documented. However, the low yield makes such uses unlikely, and

TABLE 3-29

HYDRAULIC CONDUCTIVITY IN THE SANDSTONE INTERVAL OF THE BEDROCK AQUIFER, DETERMINED FROM THREE DIFFERENT METHODS KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Well No.	Hydraulic Conductivity (ft/d)		
	Packer Test (average)	Bail Test	Lab Test
KC85-25	8.5×10^{-3}	4.8×10^{-2}	1.6×10^{-1}
KC85-26	3.6×10^{-2}	----	----
KC85-27[a]	3.0×10^{-1}	----	----
KC85-28	8.5×10^{-3}	2.9×10^{-3}	1.0×10^{-3}
KC85-29	1.7×10^{-2}	6.1×10^{-3}	2.5×10^{-3}
KC84-21	4.0×10^{-2}	----	----
KC84-22	No Flow	6.0×10^{-3}	----
KC84-23	2.4×10^{-2}	6.6×10^{-3}	----

(a) Drilled in weathered bedrock, which is not representative of the Knobtown Sandstone as an aquifer.

Source: Madril et al., 1986 (GJ-46)

none are known to exist in the site vicinity. Attempts to identify groundwater users within a 4-mile radius of the KCP have been documented (DOE, 1986b).

In summary, groundwater is not used as a water supply source in the vicinity of the KCP. All groundwater that could be affected by past and present KCP operations discharges to Blue River and Indian Creek.

3.4.2 General Description of Pollution Sources/Controls

The Kansas City Plant has several known sources of groundwater contamination, as well as areas in which groundwater contamination exists but the source has not been located. The major groundwater problem is the presence of chlorinated organic solvents, particularly trichloroethene. The potential environmental problem is discharge of contaminated groundwater to surface streams. Although there is no evidence of such an occurrence, remedial action will be required to prevent discharge of contaminated groundwater to the surface streams.

Known pollution sources and potential source areas are discussed in this section. Available groundwater monitoring data on these areas are discussed in Section 3.4.3.

3.4.2.1 Underground Tank Farm

The Tank Farm consists of 28 underground tanks, which were installed in 1943 to store fuels, coolants, and solvents. None of the tanks are in current use, although at least four were used until 1983 (Bendix, 1987b). These four tanks were used to store waste oil, waste coolants, flammable solvents, and nonflammable solvents, including chlorinated solvents such as trichloroethene. The four tanks were called RCRA tanks because they were used to store wastes which were hazardous by RCRA definitions, and not because they met RCRA design specifications under current regulations. The four tanks have since been drained and cleaned with high-pressure soap and water. Of the remaining tanks, six are filled with sand; six are filled with water, some of which may have leaked out; and 12 have been drained. Further information on the history and status of the Underground Tank Farm is presented in Sections 4.1.2 and 4.5.2.3 of this report.

Monitoring wells installed in 1982 to meet RCRA requirements revealed parts per million (ppm) levels of trichloroethene, methylene chloride, and 1,1,1-trichloroethane in groundwater (maximum levels for these compounds in drinking water are 5 to 200 ppb). The plume is migrating southward toward Indian Creek at a rate of 0.05 foot per day. An expanded well network, intended to determine the extent of contamination, is in place, and quarterly sampling and analysis is being conducted. The well network consists of 19 wells at 9 locations, although some of these wells also monitor adjacent sources. Data are also available from an additional two-well cluster, which was recently destroyed by building expansion. The groundwater monitoring data are discussed in Section 3.4.3.

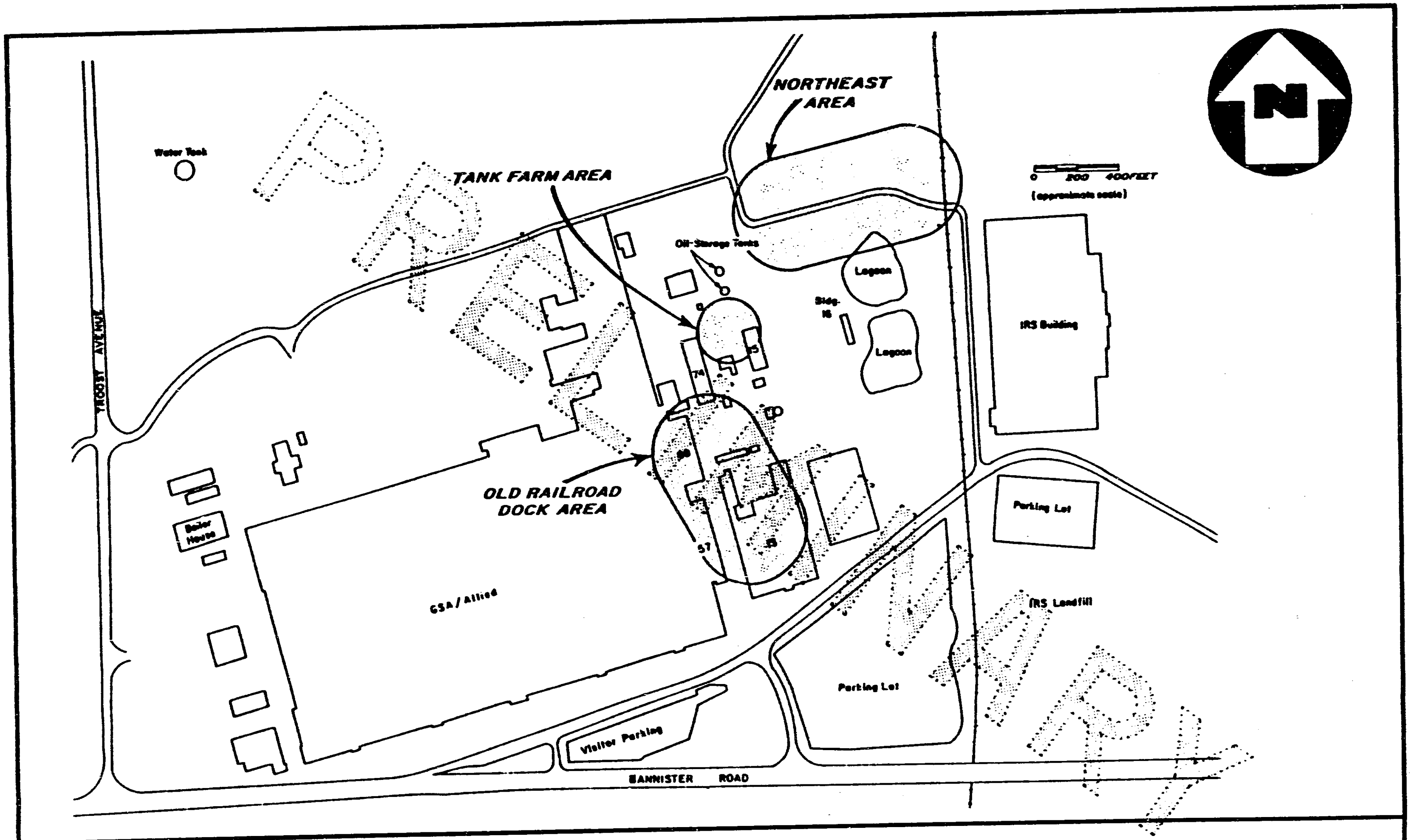
Closure of the Underground Tank Farm, which is scheduled for 1987, will remove all tanks, associated piping, concrete supports, and surrounding soil and fill to a depth of approximately 15 feet. Three production wells for extraction of contaminated groundwater have been installed in preparation for groundwater remediation. Permission from the city of Kansas City has not yet been obtained for discharge of treated groundwater to the municipal sewage treatment plant. Further details on the treatment process may be found in Section 3.4.3.1.

3.4.2.2 Old Railroad Dock Area

The Old Railroad Dock Area, near the Underground Tank Farm, is an additional source of groundwater contamination. The Old Railroad Dock is located at the northeast corner of the Main Building, where a railroad spur formerly entered the building. In the early 1950s, a solvent recovery still was operated on this dock near the entrance of the spur. Numerous spills occurred during this operation. Subsurface soil sampling has found trichloroethene at concentrations as high as 290 ppm. Organic solvents have migrated to depths of about 40 feet, corresponding to the contact of alluvium with the Knobtown Sandstone. In the 35 years since the recovery operation ceased, a groundwater contaminant plume has migrated approximately 500 feet in a south-southeasterly direction, as discussed in Section 3.4.3.2. This plume and those within the plant boundaries that are attributed to other sources are shown on Figure 3-21. The Old Railroad Dock Area is monitored by 13 wells at 5 locations.

3.4.2.3 Northeast Area

The Northeast Area also contains ppm levels of trichloroethene and other chlorinated solvents in groundwater. Several separate sources seem to be required to explain the depth and location of contaminants. This area has been largely open ground throughout the history of plant operations and has never been the site of manufacturing operations. Part of the area was formerly occupied by the Blue River, which was rerouted when a levee was constructed. There is evidence that the open-ground area was used for disposal of plant wastes. A sludge dumping area now underlies a parking lot used by the GSA, and rainwater collected from sumps contaminated with PCBs was dumped along a road. The result of these activities is detectable surface soil contamination (refer to



SOURCE: Madril et al., 1986 (GJ-46)

FIGURE 3-21

IN-PLANT AREAS CHARACTERIZED BY CONTAMINATION OF ALLUVIAL GROUNDWATER
KANSAS CITY PLANT – KANSAS CITY, MISSOURI

Sections 3.2.2 and 3.2.3).Monitoring data are available for 21 wells at nine locations, but additional wells were installed in March 1987, just prior to the on-site portion of the Environmental Survey.

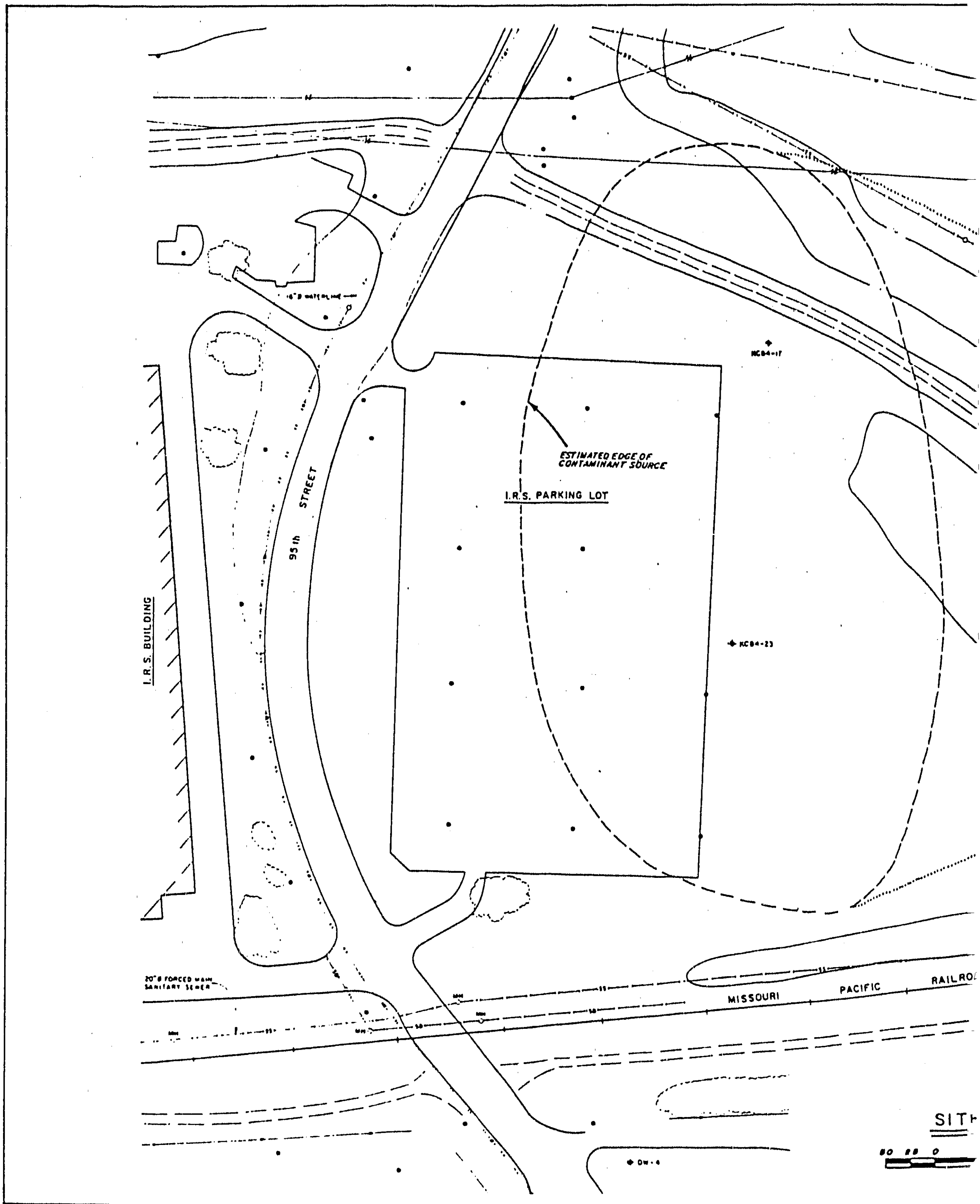
3.4.2.4 Lagoon Area

Since 1962 the Kansas City Plant has been using lagoons for pH stabilization of industrial wastewater prior to discharge. Metals and PCBs are found in lagoon sediments. However, neither the decommissioned North Lagoon nor the active South Lagoon appear to be sources of groundwater contamination. The metals found in lagoon sediments are rarely found in monitoring wells. Organic solvents are found in certain wells, but the chemical nature and pattern of occurrence seem unrelated to the presence of the lagoons. These organic solvents are primarily degradation products or mobile compounds such as methylene chloride, a fact which suggests that organics may be migrating from other sources on site. However, trenches, pipelines, and ponds existing in the lagoon areas prior to lagoon construction may have caused this organic contamination (see Section 3.4.3.3). The South Lagoon has 24 monitoring wells at 14 locations. Wells near the former North Lagoon are considered part of the Northeast area monitoring network discussed above.

3.4.2.5 IRS Landfill

The area south of 95th Street and east of the railroad tracks (Figure 3-22) was used as a landfill by Pratt-Whitney, Westinghouse, and the Kansas City Plant prior to its closure in the early 1960s. The landfill is now referred to as the IRS Landfill because of its proximity to the Internal Revenue Service center and parking lot in the Federal Complex. Although the landfill is not on DOE property, the Kansas City Plant contributed to disposals at this site.

The history of waste disposal at the IRS Landfill is discussed in Section 4.5.2.2. Data from a waste characterization study on samples from June 1985 borings in the landfill are presented in Section 3.2.3.3. Wells monitoring the alluvial aquifer have been installed at eight locations near the landfill. Two locations have multiple wells, for a total of 12 wells. A bedrock core hole has also been drilled in the area. Volatile organic compounds at concentrations up to 366 parts per billion (ppb) are present in downgradient wells, but the source of these organics within the landfill has not been located. Groundwater monitoring data and relevant waste characterization results are discussed in Section 3.4.3.5.



SOURCE: Meininger and Madril, 1987a.

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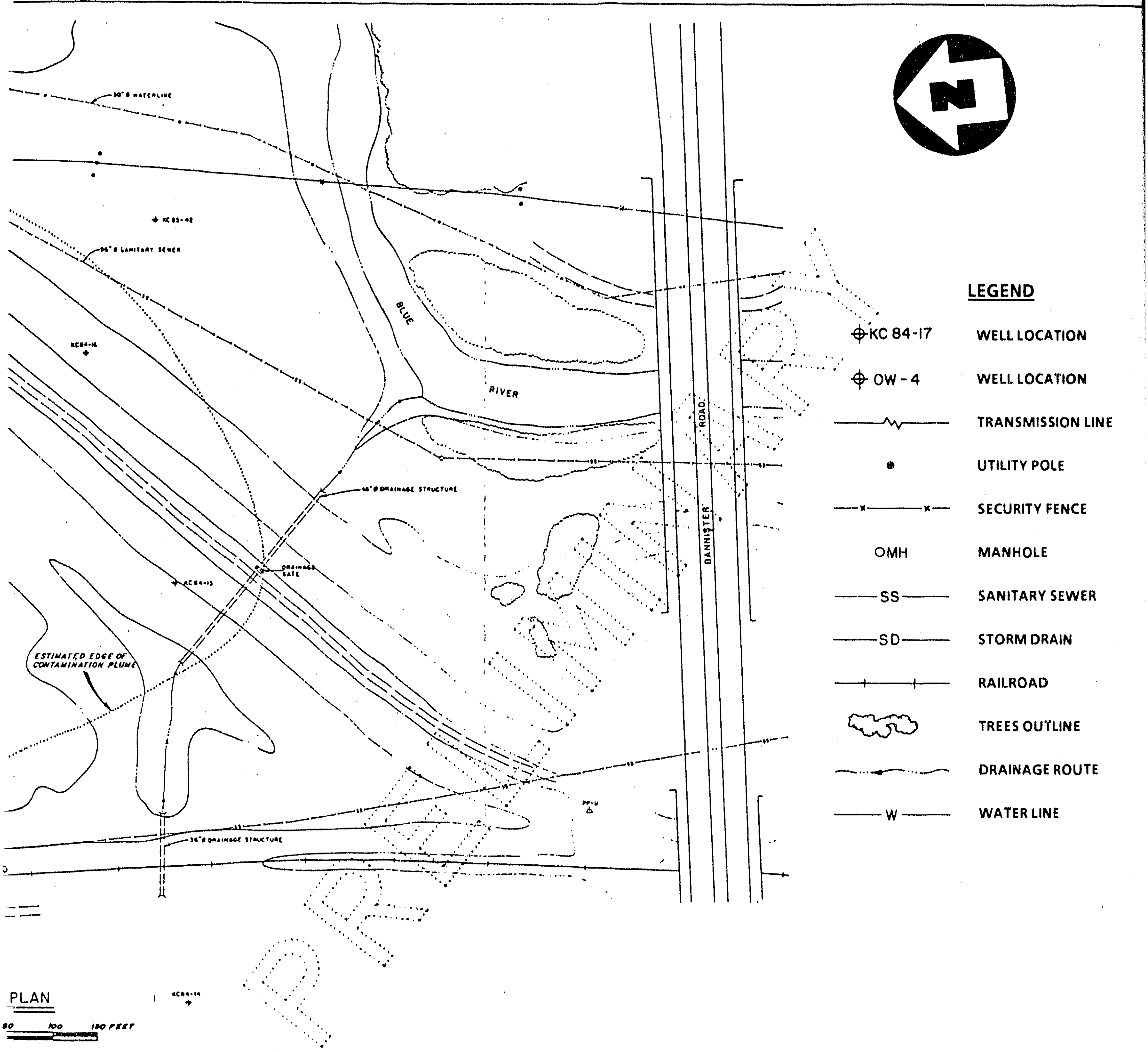


FIGURE 3-22

'T OF CONTAMINATION AT THE IRS LANDFILL
NT – KANSAS CITY, MISSOURI

3.4.3 Environmental Monitoring Program

This section discusses the existing groundwater monitoring program at the Kansas City Plant, the historical development of the program, and the interpretation of data obtained from site characterization efforts.

Alluvial monitoring wells are present at 58 locations at the Kansas City Plant; these locations provide a total of 124 sampling points due to multiple wells at different depths at many locations. Bedrock wells have been installed at seven locations. Construction activities have caused abandonment of an additional bedrock well and of alluvial wells at two additional locations, but data are available for these wells prior to abandonment.

Wells are sampled quarterly by a sampling crew supplied by an outside contractor from the DOE Grand Junction Projects Office, Grand Junction, Colorado. This contractor was formerly Bendix Field Engineering Corporation and is now UNC Technical Services, Inc.

Samples are collected from 50 to 60 sampling points each quarter. Wells that are expected to provide little new information are not routinely sampled; the emphasis is on the tracking of contaminant migration rather than on obtaining complete sampling rounds each quarter. Wells to be sampled quarterly under RCRA regulations are still being designated by agreement betweenKCP and regulatory agencies. Additional RCRA wells have been installed at several locations, and the issue involves designation of the most appropriate upgradient and downgradient wells for the entire facility and for individual sites.

Sample collection is done with a non-gas-contact bladder pump according to procedures documented in an Environmental Sciences Procedure Manual (BFEC, 1986a). The collection methods, preservation methods, and holding times are designed to conform with Environmental Protection Agency standards and recommendations (Korte and Kearl, 1985).

Groundwater monitoring at the Kansas City Plant has been driven by the Resource Conservation and Recovery Act (RCRA) of 1976. RCRA includes provisions for a waiver of groundwater monitoring requirements [40 CFR, Part 265, Subpart F, Section 265.90(c)] if it can be demonstrated that there is a low potential for migration of hazardous waste or waste constituents from a facility by way of the uppermost aquifer to water supply wells or surface water. A geological survey was conducted (Woodward-Clyde, 1981) to determine whether such a waiver was possible for the Kansas City Plant. Three facts were established by this survey. Groundwater was encountered at relatively shallow depths of 7 to 21 feet during the drilling of exploratory soil borings. The direction of groundwater flow appeared to be east-southeast toward Blue River. The water-deposited, unconsolidated sediments underlying the site were likely to contain permeable layers and lenses. For these three reasons, it was considered unlikely that groundwater monitoring requirements could be waived, and a system of 10 monitoring wells was installed in 1982 (Woodward-Clyde, 1982). These wells are designated OW (observation well) 1 through OW-10 and are included on Figure 3-16.

3.4.3.1 Underground Tank Farm

Wells OW-2 and OW-3 are in the area of the Underground Tank Farm. Samples collected from Well OW-2 during the time period June 2, 1983, to February 20, 1984, contained the following maximum concentrations of chlorinated organic compounds (Kearl et al., 1984):

Compound	µg/l (ppb)
Trichloroethene (TCE)	24,900
1,2-Dichloroethene	6,000
1,1,1-Trichloroethane (TCA)	4,400
Methylene Chloride	3,200
1,2-Dichloroethane	1,500
Tetrachloroethene (PCE)	~100
1,1-Dichloroethene	~50
1,1-Dichloroethane	~50

Maximum contaminant levels set by the EPA for these compounds in drinking water range from 5 ppb for TCE to 200 ppb for TCA. These data and a tank inspection conducted in June 1983 led to the draining and cleaning of the four "RCRA tanks" (see Section 3.4.2), which had been in use for storage of waste solvents, oil, and coolants.

Additional monitoring wells were installed in 1984 and 1985. Data on VOC concentrations in these wells, as well as OW-2 and OW-3, are given in Table 3-30. Well locations are shown on Figure 3-16. Most of these locations have multiple wells at various depths, as indicated on Table 3-30. Several generalizations can be made from these data. Wells that monitor the basal gravel layer (lower water-bearing zone) in the alluvium tend to have higher contaminant levels than wells at the same location that tap more shallow zones. The chlorinated solvents found as contaminants in this area tend to move downward. They are denser than water, tend to move through clay by causing shrinkage and cracking, and are flushed downward by precipitation. This is consistent with the fact that only 4 of 150 soil samples collected from borings drilled to bedrock in the Tank Farm area

TABLE 3-30

VOC CONCENTRATIONS IN GROUNDWATER SAMPLES FROM THE UNDERGROUND TANK FARM AREA KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Well Number	Sampling Date	Concentration (ug/l)								
		TCE(1)	1,2-DCE	TCA	PCE	Methylene Chloride	1,1-DCE	1,1-DCA	Vinyl Chloride	Other
										Trichloro-fluoromethane
OW-2	12/84	1530	2460	286	319	680	<2.8	124	<10	111
	3/85	1940	622	242	179	<2.8	<2.8	<4.7	<10	<40
	7/85	1690	1440	244	192	<2.8	<2.8	40.8	29.9	28.9
	10/85	19.6	5800	7.61	<4.1	<2.8	<2.8	<4.7	<10	<10
	1/86	1210	2790	237	251	230	<28	<47	<100	<1 00
	4/86	987	1840	188	215	4.07	6.28	34.5	181	27.8
	7/86	238	5780	944	82	111	<56	<94	<200	<200
	10/86	1500	11000	300	300	<100	300	<100	<100	NA(3)
	1/87(2)	440	1770	80	160	<5	6	60	680	NA
OW-3	12/84	<10	--	--	--	15	--	--	--	--
	3/85	<1.9	--	--	--	<2.8	--	--	--	--
	7/85(4)	5.51	--	--	--	<2.8	--	--	--	--
KC 84-1U(5)	12/84	<10	44	--	--	11	--	--	--	<10
	3/85(4)	11.4	195	--	--	<2.8	--	--	-	11.9
KC84-1L	12/84	<10	22	--	--	78	--	--	--	--
	3/85(4)	8.7	31.9	--	--	<2.8	--	--	--	--

TABLE 3-30
VOC CONCENTRATIONS IN GROUNDWATER SAMPLES FROM THE UNDERGROUND TANK FARM AREA
KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE TWO

Well Number	Sampling Date	Concentration (ug/l)								
		TCE(1)	1,2-DCE	TCA	PCE	Methylene Chloride	1,1-DCE	1,1-DCA	Vinyl Chloride	Other
KC84-2U	12/84	62	29	--	--	--	--	--	--	--
	3/85(4)	<2.8	<1.6	--	--	--	--	--	--	--
KC84-2M	12/84	--	31	--	--	14	--	--	--	--
	3/85(4)	--	54.2	--	--	<2.8	--	--	--	--
KC84-2L	12/84	36	51	--	--	850	--	--	--	--
	3/85(4)	25.1	45.3	--	--	<2.8	--	--	--	--
							--			Chlorobenzene
KC84-3U(6)	12/84	<10	<10	39	--	<10	--	--	<10	<10
	3/85	75	87.4	4.2	--	<2.8	--	--	32.2	18.4
	7/85(4)	52	79.1	3.8	--	7.51	--	--	81.6	10.0
KC84-3L(6)	12/84	4760	3240	56	<10	90	15	23	43	--
	3/85	1670	982	118	20.9	6.6	52.1	41.8	112	--
	7/85(4)	2510	1570	147	81.2	<2.8	72.5	69.9	165	--
										Ethylbenzene
KC84-4U	12/84	<10	<10	--	--	<10	--	<10	--	<10
	3/85	18.2	13.4	--	--	<2.8	--	5	--	10.8
	7/85(4)	<1.9	11.0	--	--	6.0	--	9.5	--	<7.2

TABLE 3-30
VOC CONCENTRATIONS IN GROUNDWATER SAMPLES FROM THE UNDERGROUND TANK FARM AREA
KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE THREE

Well Number	Sampling Date	Concentration (ug/l)								
		TCE(1)	1,2-DCE	TCA	PCE	Methylene Chloride	1,1-DCE	1,1-DCA	Vinyl Chloride	Other
										Benzene
KC84-4L	12/84	503	240	66	<10	<28	15	12	17	<10
	3/85	481	377	51.4	5.8	<28	12.6	11	72.8	14.6
	7/85	1650	703	145	22.2	<28	45.4	26.4	108	12.1
	10/85	1600	701	119	<41	<28	<28	<47	<100	<44
	1/86	2120	740	162	<41	164	<28	<47	103	<44
	4/86	1600	850	118	23.1	3.02	28.8	23.6	91.1	9.51
	7/86	1680	580	130	<41	<28	38.1	<47	<100	<44
	10/86	1100	680	70	30	<10	30	<10	130	20
KC84-5U	12/84	20	66	--	--	14	--	<10	<10	<10
	3/85	11.4	98.1	--	--	<3	--	5.8	19.2	17.9
	7/85(4)	19.4	192	--	--	2.8	--	15.1	62.4	15.7
KC84-5L	12/84	<10	<10	--	--	70	--	--	--	--
	3/85	3	5	--	--	<2.8	--	--	--	--
	7/85(4)	10.7	12.6	--	--	<2.8	--	--	--	--
								Toluene	Ethyl-benzene	Benzene
KC84-6U	12/84	--	--	--	--	--	--	8620	2220	1620
	3/85	--	--	--	--	--	--	<6.0	<7.2	27
	7/85(4)	--	--	--	--	--	--	<6.0	<7.4	6.2

TABLE 3-30
VOC CONCENTRATIONS IN GROUNDWATER SAMPLES FROM THE UNDERGROUND TANK FARM AREA
KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE FOUR

Well Number	Sampling Date	Concentration (ug/l)								
		TCE(1)	1,2-DCE	TCA	PCE	Methylene Chloride	1,1-DCE			Other
								Toluene	Ethyl-benzene	Benzene
KC84-6M	12/84	<10	<10	--	--	--	--	--	--	--
	3/85	2.8	12.8	--	--	--	--	--	--	--
	7/85(4)	<1.9	<10	--	--	--	--	--	--	--
KC84-6L	12/84	<10	<10	--	--	<10	--	3050	176	1530
	3/85	9/8	38	--	--	8	--	<6.0	,7/2	<44
	7/85(4)	<1.9	12.0	--	--	<2.8	--	<6.0	<7.2	<4.4
								1,1-DCA	Vinyl Chloride	Benzene
KC84-7U	12/84	<10	22	--	--	--	--	<10	--	--
	3/85	3.8	14.9	--	--	--	--	<4.7	--	--
	7/85(4)	45.9	28.5	--	--	--	--	8.32	--	--
KC84-7L	12/84	<10	21	--	--	59	--	<10	<10	--
	3/85	<1.9	107	--	--	6.6	--	<4.7	31.4	--
	7/85	8.28	165	--	--	<2.8	--	5.97	52.7	--
	10/85(4)*									

TABLE 3-30
VOC CONCENTRATIONS IN GROUNDWATER SAMPLES FROM THE UNDERGROUND TANK FARM AREA
KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE FIVE

Well Number	Sampling Date	Concentration (µg/l)								
		TCE(1)	1,2-DCE	TCA	PCE	Methylene Chloride	1,1-DCE	1,1-DCA	Vinyl Chloride	Other
KC85-32U (7)	7/85	7.78	--	--	--	8.0	<2.8	--	--	--
	10/85	<1.9	--	--	--	<2.8	7.05	--	--	--
KC85-32M (8)	7/85	1.9	--	--	--	<2.8	--	--	--	--
	10.85	<1.9	--	--	--	<1.9	--	--	--	--
KC85-32L (9)	7/85	8.34	--	--	--	8.0	--	--	--	--
	10/85	<1.9	--	--	--	<2.8	--	--	--	--

Source: DOE Environmental Survey Team, 1987. Adapted from "Summary of Kansas City Well H_2O Data; 12/84 to 7/86," "Summary of Kansas City RCRA Well Data," raw data from October 1986 sampling and QA sample data from January 1987.

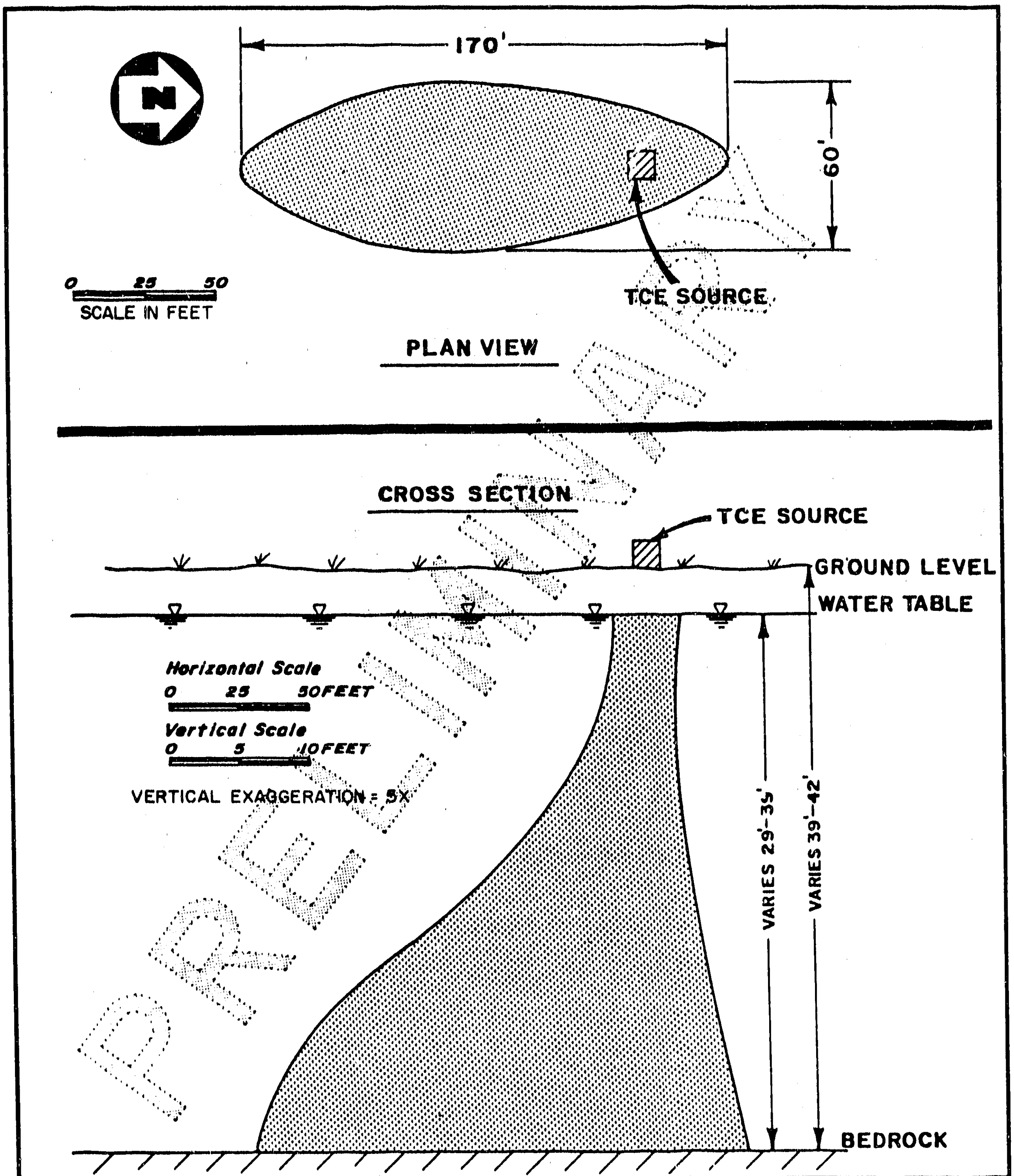
(1) Abbreviations for volatile organic compounds
TCE = Trichloroethene
1,2-DCE = 1,2-Dichloroethene
TCA = 1,1,1-Trichloroethane
PCE = Tetrachloroethene
1,1-DCE = 1,1-Dichloroethene
1,1-DCA = 1,1-Dichloroethane
(2) Data from Oak Ridge Gaseous Diffusion Plant, Analytical Chemistry Department
(3) Not analyzed
(4) Last sampling round
(5) U = upper, M = middle, L = Lower water-bearing zone. Wells without these designations are in lower zone.
(6) Well destroyed because of expansion of Building 73.
(7) Only TOX run in 1986. Maxium 45 µg/l.
(8) Only TOX run in 1986. Maximum 21 µg/l.
(9) Only TOX run in 1986. Maximum 20 µg/l.
* Not analyzed for volatile organics. TOX 65, 60 µg/L (dupl.)
-- Not detected.

contained detectable VOCs (see Section 4.5.2). Organic solvents are apparently flushed into the groundwater and do not remain in the soil.

The most contaminated wells in the Tank Farm area are OW-2, KC84-3L, and KC84-4L. Concentrations can vary by orders of magnitude from one sampling round to another. Few wells are totally uncontaminated, a fact which suggests that low levels of VOCs may be present in groundwater over parts of the site between contaminant sources. However, the trace levels found in Well KC85-32 make it possible to separate the contaminant plume in the Tank Farm area from that due to an adjacent source, the Old Railroad Dock Area. This relatively clean well lies between contaminated well KC84-3 in the Tank Farm area, and wells KC85-31 and KC84-8, which are associated with the Old Railroad Dock (see Section 3.4.3.2).

The monitoring well data delineate a contaminant plume migrating from the Tank Farm in a southerly direction. Results of computer modeling (Madril et al., 1986) suggest that a period of 10 years would be required for the groundwater flow regime to transport the contaminants to the extent observed between the last contaminated and the first uncontaminated monitoring well. The identity of several of the contaminants can be traced directly to inventories of the tanks; other constituents probably result from biodegradation of certain of these known contaminants. Plan and cross-sectional views of the contaminant plume emanating from the Tank Farm Area are presented in Figure 3-23. The depth of the water table in the vicinity of the Tank Farm ranges from 3 to 10 feet below ground level and thus reflects seasonal fluctuations. The bedrock formation (Knobtown sandstone) occurs at a depth of 39 to 42 feet below ground level in the Tank Farm Area and has an average hydraulic conductivity of 0.0063 feet per day, some two orders of magnitude less than that of the alluvium (Table 3-29, KC85-28 and -29). Moreover, this relatively impermeable layer of Knobtown Sandstone is underlain by Pleasanton shales having hydraulic conductivities below detection limits of field packer tests (Korte et al., 1985). Therefore, these two bedrock formations should be a sufficient barrier to protect against downward migration of contaminants to any deeper aquifers.

Results of the transport modeling indicate a plume measuring 60 feet wide by 170 feet long, and having a saturated thickness of 34 feet (Figure 3-23). These dimensions, together with the cross section shown in Figure 3-23, define a plume volume of 306,000 gallons of contaminated water. Based on an alluvial hydraulic conductivity of 1.5 feet per day, a hydraulic gradient of 0.004, and a plume width of 60 feet, it is estimated from Darcy's law that the flow across the width of the plume (i.e., the total flow in a north-to-south direction from the top of the water table to the top of the bedrock and extending 60 feet in an east-west direction) is 92 gallons per day.



SOURCE: Madril et al., 1986 (GJ-46).

FIGURE 3-23

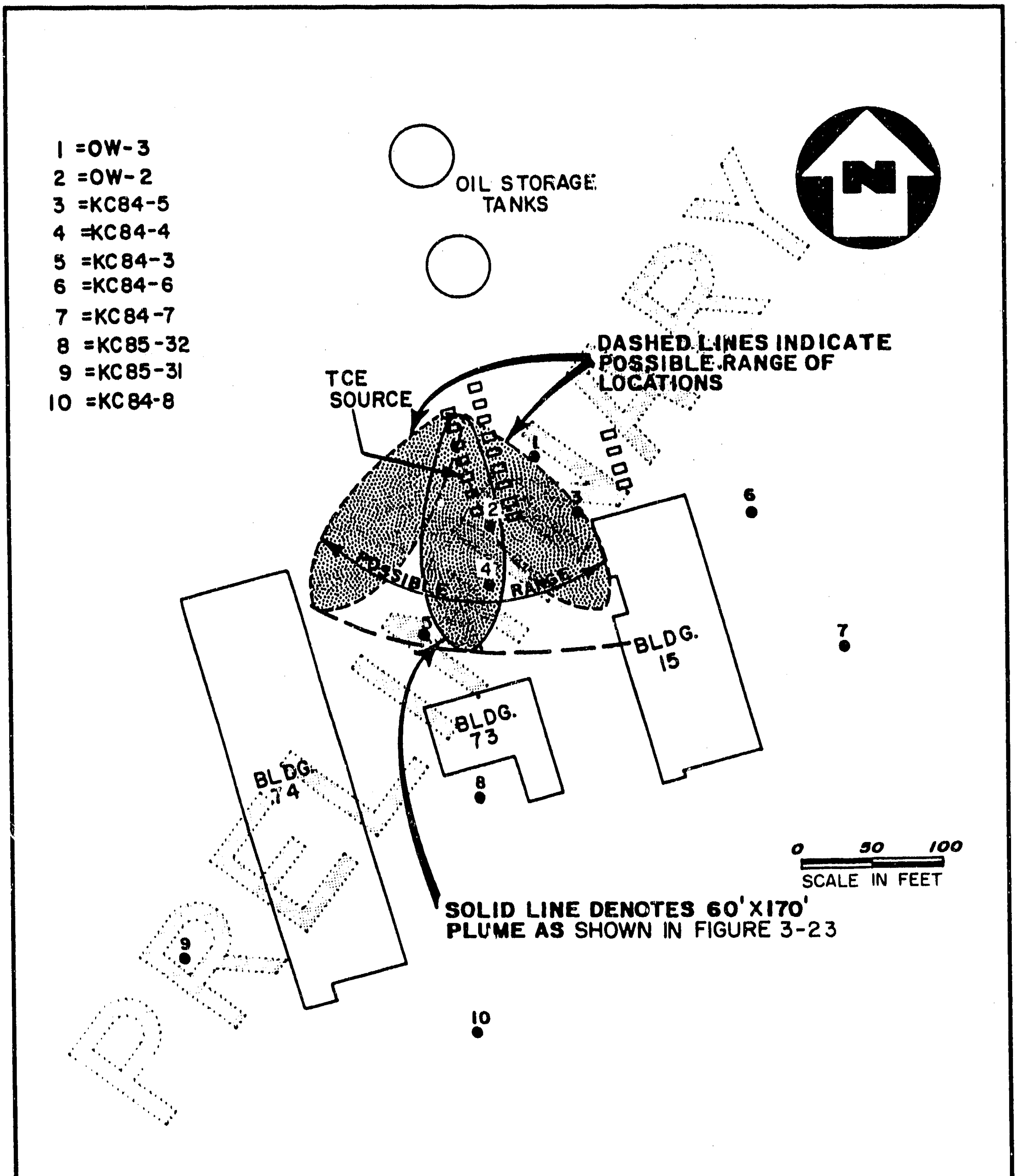
PLAN & CROSS-SECTIONAL VIEWS OF THE APPROXIMATE ALLUVIAL CONTAMINANT PLUME IN THE TANK FARM AREA KANSAS CITY PLANT – KANSAS CITY, MISSOURI

As mentioned in Section 3.4.2, the plume is migrating in a southerly direction at a rate of 0.05 foot per day. Because of the extremely low hydraulic parameters in the area, however, the exact orientation of the plume is difficult to determine. The range of possible locations is illustrated in Figure 3-24. The planned groundwater treatment system will treat the plume regardless of its orientation.

Three pumping wells (KC87-61, -62, -63) have been installed in the locations shown approximately on Figure 3-25. (Neither this figure nor Figure 3-24 show the extension of Building 73 and the consequent destruction of well KC84-3. No accurate map of the current building configuration is available). These are 6-inch-diameter wells installed to a depth of approximately 40 feet (to bedrock), with 32 feet of sand pack and 11 or 12 feet of screen. Figure 3-25 shows the aquifer response to these three wells determined from computer modeling. The extracted groundwater will be treated by catalytic oxidation, using ultraviolet/ozone/hydrogen peroxide liquid phase treatment. In this process, ozone is introduced into an aqueous solution. The ozone and/or hydrogen peroxide react with the organic compounds present to form carbon dioxide, nitrogen, hydrogen, and water, and thereby destroy the contaminants. The process is slow, however, and requires large quantities of ozone and/or hydrogen peroxide to achieve complete oxidation. Ultraviolet light is therefore used to catalyze the oxidation process. A secondary benefit of the UV-light application is the generation of additional ozone that can be utilized in the process (Bendix, 1987b). The plan involves discharge of treated groundwater to the sanitary sewer and the Kansas City treatment plant. This discharge has not yet been approved by the City of Kansas City.

3.4.3.2 <u>Old Railroad Dock Area</u>

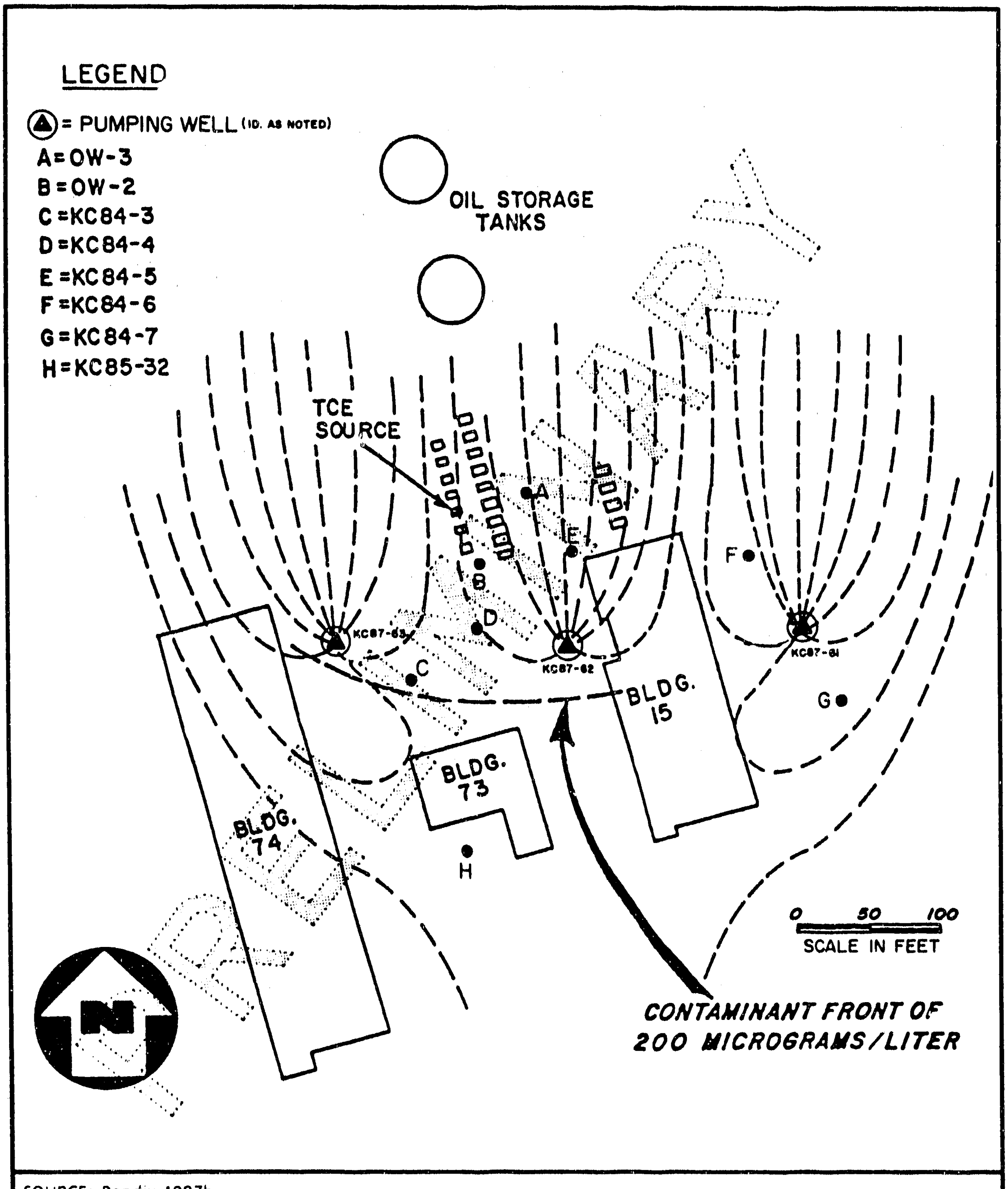
An adjacent plume from the Old Railroad Dock Area is migrating in a southerly direction past wells KC85-33 and -34 (Figure 3-26). Analytical data from wells monitoring the Old Railroad Dock Area are shown in Table 3-31. The first well installed in this area, KC84-8, is near a former Classified Waste Burial Trench, and the high (up to 1,090 ppb) concentrations of organic solvents found in the monitoring wells were at first thought to be related to this burial site. However, there was no evidence that chlorinated solvents had been associated with disposals in this trench (see Section 4.5.2.10 for more information on disposal history). Additional wells were installed in 1985 between the Main Building and the Manufacturing Support Building (MSB), also known as Building 13. These wells were originally intended for the study of PCB contamination from a major spill in this area (see Section 3.2.3). PCBs were detected only once in each of three wells (Table 3-32), but organic solvent contamination was significant (up to 8,570 ppb TCE, 2,800 ppb 1,2-dichloroethene, and 1,665 ppb vinyl chloride).



SOURCE: Madril et al., 1986 (GJ-46).

FIGURE 3-24

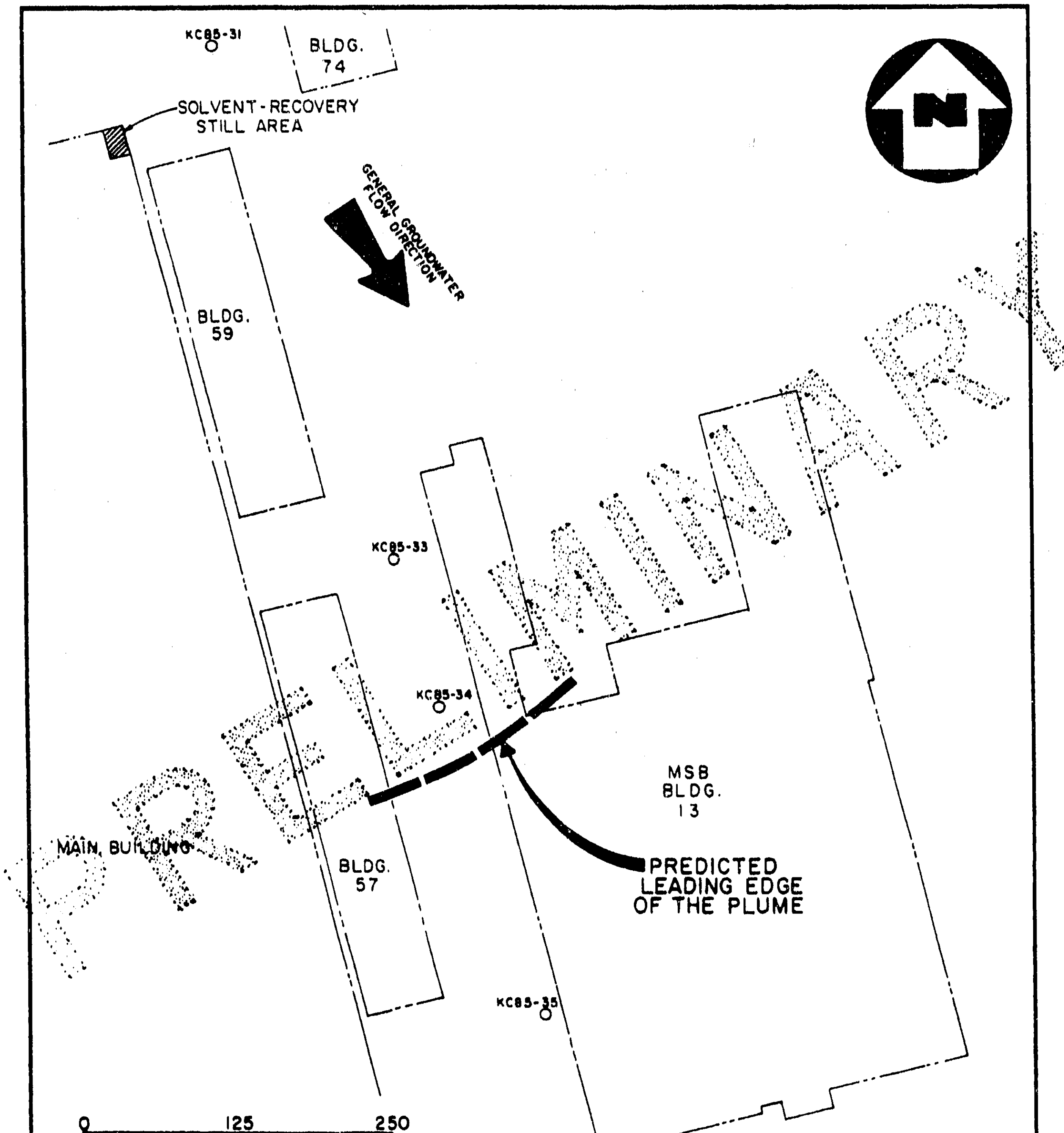
RANGE OF POSSIBLE ORIENTATIONS OF THE ALLUVIAL CONTAMINANT PLUME IN THE TANK FARM AREA KANSAS CITY PLANT – KANSAS CITY, MISSOURI



SOURCE: Bendix, 1987b.

FIGURE 3-25

AQUIFER RESPONSE TO THREE WELLS PUMPING AT A RATE OF TWO GPM EACH KANSAS CITY PLANT – KANSAS CITY, MISSOURI



SOURCE: Fleischhauer et al., 1987. (GJ-55)

FIGURE 3-26

EXTENT OF THE CONTAMINANT PLUME IN THE OLD RAILROAD DOCK AREA
KANSAS CITY PLANT – KANSAS CITY, MISSOURI

TABLE 3-31

VOC CONCENTRATIONS IN GROUNDWATER SAMPLES FROM THE OLD RAILROAD DOCK AREA KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Well Number	Sampling Date	Concentration (µg/l) TCE (1)	1,2-DCE	Other	Other	Methylene Chloride	Other	1,1-DCA	Vinyl Chloride	Other
				Ethylbenzene	Toluene		1,2-DCA			Benzene
KC-84-8U (2)	12/84	<10	179	148	1,090	38	14	<2.8	13	369
	3/85	53.9	307	<7.2	8.6	<2.8	<2.8	<2.8	13.7	50.5
	7/85	6.65	83.3	<7.2	<6.0	7.20	<2.8	<2.8	<10.0	12.0
	10/85	32.2	680	<7.2	<6.0	<2.8	<2.8	<2.8	68	47.9
	1/86	24.5	605	22.7	<6.0	<2.8	<2.8	<2.8	136	42.1
	4/86	31.1	605	<7.2	<6.0	2.92	<2.8	2.90	55.4	11.8
	7/86	21.0	914	<7.2	<6.0	<2.8	<2.8	<2.8	210	23.0
	10/86	50.0	990	10	<10	<10	<10	<10	210	30
				Chloroethane			1,1-DCE			
KC-84-8L	12/84	<10	184	24	--	210	<10	--	54	<10
	3/85	5.8	2,150	<10	--	<2.8	3.6	--	349	6
	7/85	<1.9	4,220	<10.0	--	4.80	11.0	--	681	12.3
	10/85	<1.9	2,650	<10.0	--	<2.8	<2.8	--	<10	<4.4
	1/86	<1.9	556	<10.0	--	18.7	<2.8	--	129	<4.4
	4/86	<1.9	2,050	<10.0	--	<2.8	<2.8	--	474	<4.4
	7/86	<1.9	943	<10.0	--	<2.8	<2.8	--	377	<4.4
	10/86	100	3,700	<10.0	<100	<100	<100	<100	900	<100
	1/87(3)	<5	2,240	<10	1	<5	6	<5	1,665	5

TABLE 3-31
VOC CONCENTRATIONS IN GROUNDWATER SAMPLES FROM THE OLD RAILROAD DOCK AREA KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE TWO

Well Number	Sampling Date	Concentration (µg/l)								
		TCE (1)	1,2-DCE	Other	Other	Methylene Chloride	Other	1,1-DCA	Vinyl Chloride	Other
				TCA	PCE		1,1-DCE			Benzene
KC 85-31U	6/85	7.4	22.0	<3.8	--	17.0	--	--	--	--
	7/85*	--	--	--	--	--	--	--	--	--
	10/85	58.1	34	<3.8	--	<2.8	--	--	--	--
	1/86	47.9	21.6	15.7	--	<2.8	--	--	--	--
	4/86	47.4	16.2	16.7	--	4.66	--	--	--	--
	7/86	27.6	6.86	19.5	--	<2.8	--	--	--	--
	10/86	30	16	16	3	<1	<1	4	<1	<1
KC 85-31M	6/85	7.5	24.3	--	--	<2.8	--	--	--	--
	7/85	8.9	48.8	--	--	10.8	--	--	--	--
	10/85	6.89	34.0	--	--	<2.8	--	--	--	--
	1/86	5.46	39.8	--	--	<2.8	--	--	--	--
	4/86	<1.9	31.5	--	--	4.84	--	--	--	--
	7/86	<1.9	17.5	--	--	<2.8	--	--	--	--
	10/86	<1	24	<1	<1	<1	<1	3	2	<1
				TCA	PCE		1,1-DCE			Benzene
KC 85-31L	6/85	--	7.0	--	--	<2.8	--	--	--	--
	7/85	--	<10	--	--	3.66	--	--	--	--
	10/85	--	6.2	--	--	<2.8	--	--	--	--
	1/86	--	8.47	--	--	<2.8	--	--	--	--
	4/86	--	11.0	--	--	<2.8	--	--	--	--
	7/86	--	<1.6	--	--	<2.8	--	--	--	--
	10/86	2	2	<1	2	<1	<1	<1	<1	<1
	1/87(3)	1	8	0.7	<5	<5	<5	<5	<10	<5

TABLE 3-31
VOC CONCENTRATIONS IN GROUNDWATER SAMPLES
FROM THE OLD RAILROAD DOCK AREA
KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE THREE

Well Number	Sampling Date	Concentration (µg/l)								
		TCE (1)	1,2-DCE	Other	Other	Methylene Chloride	Other	1,1-DCA	Vinyl Chloride	Other
										Chloroform
KC 85-33U	6/85	63.7	8.2	--	<4.1	<2.8	4.0	5.5	--	<1.6
	7/85	160	13.8	--	5.08	5.1	<2.8	<4.7	--	2.41
	10/85	84.4	8.66	--	<4.1	13.6	<2.8	<4.7	--	2.27
	1/86	52.7	<1.6	--	<4.1	8.03	<2.8	<4.7	--	4.72
	4/86	75.9	<1.6	--	<4.1	<2.8	<2.8	<4.7	--	6.20
	7/86	55.0	5.01	--	<4.1	<2.8	<2.8	<4.7	--	5.82
	10/86	38	18	<1	<1	<1	<1	<1	<1	4
KC 85-33M	6/85	81.5	11.3	--	--	<2.8	7.6	8.2	<10	--
	7/85	24.4	22.8	--	--	<2.8	19.1	14.5	32.6	--
	10/85	11.7	11.9	--	--	<2.8	5.0	<4.7	10.5	--
	1/86	9.63	13.9	--	--	7.91	3.86	<4.7	24.0	--
	4/86	9.18	32.2	--	--	4.80	<2.8	<4.7	34.1	--
	7/86	8.44	26.7	--	--	<2.8	<2.8	<4.7	29.8	--
	10/86	<1	57	<1	<1	<1	<1	<1	7	<1
				TCA	PCE		1,1-DCE			Chloroform
KC 85-33L	6/85	1,186	9.2	--	--	<2.8	<2.8	4.8	<10	--
	7/85	2,680	73.7	--	--	<2.8	31.4	37.0	60.3	--
	10/85	655	23.4	--	--	<2.8	<2.8	11.6	42.5	--
	1/86	343	21.0	--	--	20.8	6.54	8.43	83.7	--
	4/86	420	30.0	--	--	6.46	<2.8	<4.7	91.2	--
	7/86	291	32.1	--	--	<2.8	<2.8	<4.7	75.3	--
	10/86	280	57	<1	<1	<1	3	5	130	<1
	1/87 (3)	220	45	<5	<5	<5	2	4	140	3

TABLE 3-31
VOC CONCENTRATIONS IN GROUNDWATER SAMPLES
FROM THE OLD RAILROAD DOCK AREA
KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE FOUR

Well Number	Sampling Date	Concentration (µg/l)								
		TCE (1)	1,2-DCE	Other	Other	Methylene Chloride	Other	1,1-DCA	Vinyl Chloride	Other
				2-Hexanone	MIBK		1,1-DCE			Benzene
KC 85-34U	6/85	14.9	10.3	--	--	<2.8	--	--	--	--
	7/85	11.1	<10	--	--	46.9	--	--	--	--
	10/85	2.85	3.18	--	--	4.93	--	--	--	--
	1/86	28.9	9.59	--	--	<2.8	--	--	--	--
	4/86	21.3	9.58	--	--	<2.8	--	--	--	--
	7/86	12.9	11.1	--	--	<2.8	--	--	--	--
	10/86	12	10	7	4	<1	<1	<1	<1	2
				TCA	PCE		1,1-DCE			Chloroform
KC 85-34M	6/85	32.0	21.0	--	<4.1	<2.8	--	--	<10	2.4
	7/85	16.2	30.5	--	<4.1	6.31	--	--	<10	<1.6
	10/85	4,130	759	--	49.6	5.71	--	--	17.4	<1.6
	1/86	311	856	--	<41	<28	--	--	<100	<16
	4/86	66.5	1,040	--	<4.1	<2.8	--	--	18.7	<1.6
	7/86	80.7	751	--	<4.1	<2.8	--	--	<10	<1.6
	10/86	30	1,300	<10	<10	<10	<10	<10	50	<10
KC 85-34L	6/85	154.5	17.0	--	<4.1	<2.8	<2.8	--	<10	4.2
	7/85	6,690	1,000	--	52.9	<2.8	12.3	--	36.7	<1.6
	10/85	166	407	--	<4.1	6.1	<2.8	--	<10	<1.6
	1/86	4,760	650	--	93.5	5.92	12.1	--	21.2	<1.6
	4/86	8,570	1,900	--	63.4	<2.8	14.3	--	23.2	<1.6
	7/86	7,040	1,430	--	48.5	<2.8	9.86	--	23.4	<1.6
	10/86	6,200	2,800	<10	50	<10	10	<10	40	<10

TABLE 3-31
VOC CONCENTRATIONS IN GROUNDWATER SAMPLES FROM THE OLD RAILROAD DOCK AREA KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE FIVE

Well Number	Sampling Date	Concentration (µg/l)								
		TCE (1)	1,2-DCE	Other	Other	Methylene Chloride	Other	1,1-DCA	Vinyl Chloride	Other
										TOX
KC 85-35U	6/85	<1.9	–	–	–	<2.8	–	–	–	77
	7/85	4.73	–	–	–	3.21	–	–	–	–
	10/85	<1.9	–	–	–	3.61	–	–	–	18
	1/86	<1.9	–	–	–	6.15	–	–	–	–
	4/86	–	–	–	–	–	–	–	–	20
	7/86	–	–	–	–	–	–	–	–	26
				TCA	PCE		1,1-DCE			TOX
KC 85-35L	6/85	–	–	–	–	<2.8	–	–	–	25
	7/85	–	–	–	–	7.84	–	–	–	–
	10/85	–	–	–	–	<2.8	–	–	–	60
	1/86	–	–	–	–	<2.8	–	–	–	–
	4/86	–	–	–	–	–	–	–	–	6
	7/86	–	–	–	–	–	–	–	–	19

Source: DOE Environmental Survey Team, 1987. Adapted from "Summary of Kansas City Well H_2O Data, 12/84 to 7/86," raw data from October 1986 sampling, and QA sample data from January 1987.

* Laboratory error, data lost

(1) Abbreviations for volatile organic compounds

- TCE = Trichloroethene
- 1,2-DCE = 1,2-Dichloroethene
- TCA = 1,1,1-Trichloroethane
- PCE = Tetrachloroethene
- 1,1-DCE = 1,1-Dichloroethene
- 1,1-DCA = 1,1-Dichloroethane
- MIBK = 4-Methyl-2-pentanone (Methyl Isobutyl Ketone)

(2) U = upper; M = middle; L = lower water-bearing zone. Wells without these designations are in lower zone.

(3) Data from Oak Ridge Gaseous Diffusion Plant, Analytical Chemistry Department

– Not detected

TABLE 3-32

PCBs IN GROUNDWATER SAMPLES
KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Well Number	PCB (µg/l)	Sampling Date					
		6/85	7/85	10/85	1/86	4/86	7/86
KC 85-31U [1]	PP PCBs	--	< 1.0	*	< 1.0	< 1.0	--
KC 85-31M	PP PCBs	< 1.0	*	< 1.0	< 1.0	--	--
KC 85-31L	Aroclor 1254	2.4	*	< 1.0	< 1.0	--	--
KC 85-33U	Aroclor 1242 Aroclor 1254	< 1.0 < 1.0	-- --	1.7 1.1	< 1.0 < 0.6	-- --	-- --
KC 85-33M	PP PCBs	< 1.0	--	< 1.0	< 1.0	--	--
KC 85-33L	PP PCBs	< 1.0	--	< 1.0	< 1.0	--	--
KC 85-34U	PP PCBs	< 1.0	--	< 1.0	< 1.0	--	--
KC 85-34M	PP PCBs	< 1.0	--	< 1.0	< 1.0	--	--
KC 85-34L	Aroclor 1242	< 1.0	--	1.7	< 10	--	--
KC 85-35U	PP PCBs	< 1.0	--	--	< 1.0	--	--
KC 85-35L	PP PCBs	< 1.0	--	--	< 1.0	--	--
KC 84-18L	PP PCBs	--	--	--	< 1.0	--	--

Source: DOE Environmental Survey Team, 1987. Adapted from "Summary of Kansas City Well H_2O Data: 12/84 to 7/86".

(1) U = upper; M = middle; L = lower water-bearing zone
* Laboratory error, data lost
-- No sample collected.

Results of computer modeling (Fleischhauer et al., 1987) suggest that a period of 35 years would be required for the groundwater flow regime to transport the contaminants to the extent observed in the monitoring wells. Hydraulic characteristics of the alluvium in this area are similar to those for the Underground Tank Farm area. Because of this similarity, this plume is also estimated to be migrating at a rate of 0.05 foot per day. Remedial action alternatives for soil and groundwater cleanup have been proposed (Meininger and Madril, 1987b). Their recommendation for groundwater restoration is a system of extraction wells, with ultraviolet/ozone liquid phase treatment, as planned for the plume in the Tank Farm Area.

3.4.3.3 Northeast Area

The Northeast Area has known groundwater contamination from unknown sources. The following discussion is taken from Madril et al., 1986 and Meininger and Madril, 1987b. In 1984, monitoring wells were installed to define the regional groundwater flow regime. Chemical analysis of groundwater from wells KC84-18 and OW-9 indicated high concentrations of trichloroethene (up to 5,780 ppb) and 1,2-dichloroethene (up to 5,830 ppb). At that time, it was thought that the Tank Farm was the source of these contaminants. Consequently, monitoring wells installed in 1985 were designed to delineate a plume emanating from the Tank Farm and moving northeastward. High contaminant concentrations were observed in wells KC85-37 and -39, but less than 10 ppb trichloroethene were detected in KC85-38. The fact that well KC85-38 is located between KC85-37 and the Tank Farm rules out the possibility that the contaminants are originating in the Tank Farm area. Well locations are shown on Figure 3-16; analytical data are summarized on Table 3-33.

Subsequently, a buried trench was uncovered during decommissioning of the North Lagoon. This trench ran eastward across the area occupied by the northern part of the North Lagoon and predated the lagoon itself. The trench formerly emptied into the Blue River but was rerouted during lagoon construction and was eventually filled and abandoned. Old paint cans and an empty solvent drum were found in the trench, but much of the debris was cafeteria trash. It was thought that the presence of this trench could possibly account for the contamination found in wells OW-9 and KC84-18. These wells are northeast (downgradient) of the trench. However, the high concentrations found in KC85-37 and KC85-39 required other sources, since they are not in the vicinity of the trench. Well KC85-37 is unusual in that it shows the highest contaminant concentrations in the shallowest well (KC85-37U) at this location. The fact that downward contaminant migration is not extensive indicates a nearby source.

A geophysical survey using a Geonics EM-31 terrain conductivity instrument was then conducted (Madril et al., 1986) to search for buried drums or areas of high conductivity in groundwater.

TABLE 3-33

VOC CONCENTRATIONS IN GROUNDWATER SAMPLES FROM THE NORTHEAST AREA KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Well Number	Sampling Date	Concentration (µg/l)									
		TCE(1)	1,2-DCE	Other	Other	Methylene Chloride	Other	Other	Vinyl Chloride	Other	Other
				TCA	PCE		1,1-DCE	1,1-DCA		Toluene	Chloroform
OW-8	12/84	<10	<10	<10	–	18	<10	11	–	–	–
	03/85	17.7	1.6	60.4	–	<2.8	9	139	–	–	–
	07/85	32.1	21.7	31.7	–	8.48	31.2	182	–	–	–
	10/85	15.7	16.3	13.1	–	<2.8	14	111	–	–	–
	01/86	17.2	11.6	19.0	–	3.0	13.6	73.7	–	–	–
	04/86	10.7	7.72	9.37	–	<2.8	8.09	39.6	–	–	–
	07/86	<10.3	9.84	<3.8	–	3.54	6.39	46.1	–	–	–
	10/86	17	23	<1	1	<1	11	44	9	3	<1
				Benzene	PCE		1,1-DCE	1,1-DCA		Toluene	Chloroform
OW-9	12/84	5,780	5,830	<10	–	<10	–	<10	<10	636	<10
	03/85	678	673	8.8	–	<3.0	–	39.1	<10	<6.0	<1.6
	07/85	3,590	2,870	4.63	–	3.4	–	91.7	<10	<6.0	4.6
	10/85	278	436	<4.4	–	<2.8	–	120	27.5	<6.0	13.1
	01/86	66.9	198	<4.4	–	6.81	–	121	15.6	<6.0	<1.6
	04/86	439	746	<4.4	–	64.9	–	65.9	<10.0	<6.0	<16
	07/86	173	286	<4.4	–	<2.8	–	98.2	16.3	<6.0	<1.6
	10/86	40	160	<1	<1	<1	<1	98	28	<1	<1

TABLE 3-33
VOC CONCENTRATIONS IN GROUNDWATER SAMPLES FROM THE NORTHEAST AREA KANSAS CITY PLANT, KANSAS CITY, MISSOURI PAGE TWO

Well Number	Sampling Date	Concentration (µg/l)									
		TCE[1]	1,2-DCE	Other	Other	Methylene Chloride	Other	Other	Vinyl Chloride	Other	Other
				Benzene	PCE		1,1-DCE	1,1-DCA		Toluene	Chloroform
KC84-18U[2]	3/85	6.5	60 3	–	–	<2.8	–	–	–	–	–
	7/85	106	474	–	–	3.22	–	–	–	–	–
	10/85	38.5	220	–	–	5.2	–	–	–	–	–
	1/86	<19	216	–	–	202	–	–	–	–	–
	4/86	12 1	48 3	–	–	<2.8	–	–	–	–	–
	7/86	6.67	107	–	–	<2.8	–	–	–	–	–
	10/86	9	87	<1	<1	<1	<1	<1	3	<1	<1
	1/87[3]	5	70	<5	<5	1	<5	<5	2	1	3
				TCA	PCE		1,1-DCE	1,1-DCA		Toluene	Chloroform
KC 84-18M	12/84	112	4,500	18	–	<10	<10	22	115	–	–
	03/85	83.8	10,400	18.1	–	<2.8	9	33.2	230	–	–
	07/85	119	8,720	24.5	–	12.6	19.0	56.8	555	–	–
	10/85	93.9	6,640	<4.4	–	<28	<2.8	<47	480	–	–
	01/86	57.4	12,300	19 2	–	38.8	40.1	41 6	327	–	–
	04/86	<38	6,980	<88	–	169	<56	<94	282	–	–
	07/86	<2.8	4,860	<4 4	–	<1.9	<2.8	<4.7	207	–	–
	10/86	<100	9,400	<100	<100	<100	<100	<100	<100	<100	<100

TABLE 3-33
VOC CONCENTRATIONS IN GROUNDWATER SAMPLES FROM THE NORTHEAST AREA KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE THREE

Well Number	Sampling Date	Concentration (µg/l)									
		TCE(1)	1,2-DCE	Other	Other	Methylene Chloride	Other	Other	Vinyl Chloride	Other	Other
				Benzene	PCE		1,1-DCE	1,1-DCA		Toluene	Chloroform
KC 84-18L	12/84	61	3,140	11	–	<10	<10	31	<10	–	–
	03/85	129	7,410	19.8	–	<2.8	14.8	74.8	<10	–	–
	07/85	411	11,600	29.8	–	7.07	40.5	169	<10	–	–
	10/85	17.2	9,260	20	–	2.86	22.8	118	172	–	–
	01/86	26.5	11,000	22.9	–	32.2	19.7	115	244	–	–
	04/86	<38	10,200	<88	–	2.36	<56	166	262	–	–
	07/86	<1.9	12,200	<4.4	–	2.97	<2.8	<4.7	10.0	–	–
	10/86	<100	12,000	<100	<100	<100	<100	<100	<100	<100	<100
				Benzene	PCE		1,1-DCE	1,1,2-TCA		Toluene	Chloroform
KC 85-37U	06/85	5,340.2	3,238.5	11.9	<4.1	<2.8	13.9	16.4	159.1	–	11.3
	07/85	5,070	5,060	18.3	<4.1	2.8	11.5	<5.0	324	–	<1.6
	09/85	21,600	22,100	<44.0	<4.1	1,080	<28	<5.0	1,040	–	<16.0
	10/85	16,500	19,800	<440	<4.1	<2.80	<280	<500	<1,000	–	<160
	01/86	9,610	12,500	30.2	9.41	6.10	12.4	<5.0	510	–	<1.6
	04/86	7,900	16,100	<220	<210	203	<140	<250	<500	–	<1.6
	07/86	11,200	16,200	43.3	13.0	<2.8	18.6	<5.0	533	–	<1.6
	10/86	10,000	22,000	<100	<100	<100	<100	<100	600	100	<100
	01/87(3)	1,880	3,670	40	11	2	16	<5	860	5	4

TABLE 3-33
VOC CONCENTRATIONS IN GROUNDWATER SAMPLES FROM THE NORTHEAST AREA
KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE FOUR

Well Number	Sampling Date	Concentration (µg/l)									
		TCE(1)	1,2-DCE	Other	Other	Methylene Chloride	Other	Other	Vinyl Chloride	Other	Other
				Benzene	TCA		1,1-DCE	1,1,2-TCA		Toluene	Chloroform
KC 85-37M	06/85	1,356 6	687 3	<4 4	<3.8	<2 8	11 2	18 2	321	--	9 8
	07/85	12,400	4,880	16.5	<3.8	<2.8	15 2	<5.0	244	--	<1.6
	09/85	7,000	6,110	<44	382	2,360	<28	<5 0	<100	--	<16
	10/85	3,770	9,110	18.1	<3.8	<2.8	21	<5 0	656	--	<1.6
	01/86	867	8,420	11.9	<3.8	7 23	8 54	<5 0	286	--	<1.6
	04/86	655	9,220	<44	<3.8	38 5	<28	<5.0	283	--	<1 6
	07/86	202	5,770	9.17	<3.8	<2.8	6 86	<5 0	208	--	<1.6
	10/86	2,500	6,100	<100	<100	<100	<100	<100	<100	100	<100
				Benzene	PCE		1,1-DCE	1,1-DCA		Toluene	Chloroform
KC 85-37L	06/85	125 1	808 0	13.4	--	<2.8	4.9	35.0	37.0	--	--
	07/85	56	176	<4.4	--	8.8	<2.8	<4 7	<10	--	--
	09/85	11 7	76 7	<4.4	--	2.81	<2.8	<4.7	<10	--	--
	10/85	49 1	270	<4.4	--	4.0	<2.8	<4.7	18.2	--	--
	01/86	109	617	<4.4	--	<2.8	<2.8	<4 7	26.7	--	--
	04/86	165	890	<4.4	--	3.60	3.10	<4 7	26.3	--	--
	07/86	471	672	<4.4	--	12 1	<2 8	<4.7	24.7	--	--
	10/86	210	840	<10	<10	<10	<10	<10	<10	<10	<10
				Benzene	TCA		1,1-DCE	1,1-DCA		TOX	Chloroform
KC 85 38U	07/85	--	--	--	--	6 2	--	--	--	--	--
	09/85	--	--	--	--	<2.8	--	--	--	<5	--
	10/85	--	--	--	--	<2.8	--	--	--	6	--
	01/86	--	--	--	--	--	--	--	--	<5	--
	04/86	--	--	--	--	--	--	--	--	<5	--
	07/86	--	--	--	--	--	--	--	--	8	--

TABLE 3-33
VOC CONCENTRATIONS IN GROUNDWATER SAMPLES FROM THE NORTHEAST AREA KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE FIVE

Well Number	Sampling Date	Concentration (µg/l)									
		TCE(1)	1,2-DCE	Other	Other	Methylene Chloride	Other	Other	Vinyl Chloride	Other	Other
				Benzene	TCA		1,1-DCE	1,1-DCA		TOX	Chloroform
KC 85-38M	07/85	1 92	--	--	--	--	--	--	--	--	--
	09/85	<1.9	--	--	--	--	--	--	--	<5	--
	10/85	<1.9	--	--	--	--	--	--	--	7	--
	01/86	--	--	--	--	--	--	--	--	<5	--
	04/86	--	--	--	--	--	--	--	--	170	--
	07/86	--	--	--	--	--	--	--	--	21	--
KC 85-38L	07/85	5.21	--	--	--	--	--	--	--	--	--
	09/85		--	--	--	--	--	--	--	<5	--
	10/85	2.	--	--	--	--	--	--	--	6	--
	01/86	71	--	--	--	--	--	--	--	<5	--
	04/86		--	--	--	--	--	--	--	15	--
	07/86	3	--	--	--	--	--	--	--	18	--
		83									
		--									
		--									
		--									

TABLE 3-33
VOC CONCENTRATIONS IN GROUNDWATER SAMPLES FROM THE NORTHEAST AREA KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE SIX

Well Number	Sampling Date	Concentration (µg/l)									
		TCE(1)	1,2-DCE	Other	Other	Methylene Chloride	Other	Other	Vinyl Chloride	Other	Other
				Benzene	TCA		1,1-DCE	1,1-DCA		TOX	Chloroform
KC 85-39U	07/85	113	215	--	--	<2.8	--	--	29.6	--	--
	09/85	42.2	165	--	--	17.0	--	--	33.0	172	--
	10/85	41.7	273	--	--	<2.8	--	--	69.4	219	--
	01/86	60.1	467	--	--	3.99	--	--	51.8	--	--
	04/86	29.1	307	--	--	14.0	--	--	26.5	--	--
	07/86	40.8	440	--	--	<2.8	--	--	36.9	--	--
	10/86	40	770	<10	<10	<10	<10	<10	110	--	--
				Benzene	TCA		1,1-DCE	1,1-DCA		TOX	Chloroform
KC 85-39M	07/85	379	816	--	--	<2.8	13.2	--	78.2	--	--
	09/85	246	722	--	--	17.9	11.4	--	93.8	518	--
	10/85	258	724	--	--	5.0	<2.8	--	107	406	--
	01/86	152	726	--	--	4.33	7.65	--	62.1	--	--
	04/86	99.3	654	--	--	3.57	8.48	--	71.0	--	--
	07/86	53.9	680	--	--	<2.8	<2.8	--	91.2	--	--
	10/86	50	1,000	<10	<10	<10	10	<10	230	--	<10

TABLE 3-33
VOC CONCENTRATIONS IN GROUNDWATER SAMPLES FROM THE NORTHEAST AREA
KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE SEVEN

Well Number	Sampling Date	Concentration (µg/l) TCE[1]	1,2-DCE	Other	Other	Methylene Chloride	Other	Other	Vinyl Chloride	Other	Other
				Benzene	TCA		1,1-DCE	1,1,2-TCA		TOX	Chloroform
KC 85-39L	06/85	15,300	6,660	--	--	<2.8	17.2	66.9	26.2	--	--
	07/85	351	830	--	--	<2.8	3.99	<5.0	<10	264	--
	10/85	2,470	1,970	--	--	4.4	10.0	19.2	32.8	732	--
	01/86	4,600	3,320	--	--	4.57	7.02	29.5	21.1	--	--
	04/86	3,130	2,070	--	--	3.24	6.82	13.5	19.8	--	--
	07/86	467	905	--	--	6.56	6.80	<5.0	21.7	--	-
	10/86	760	1,400	<10	<10	<10	20	<1.0	50	--	<10
				Benzene	PCE		1,1-DCE	1,1,2-TCA		TOX	Chloroform
KC 85-40U	06/85	2.2	54	--	--	<2.8	8.5	43.2	--	20	12.3
	07/85	<1.9	<10	--	--	<2.8	<2.8	<5.0	--	--	<1.6
	10/85		<10	--	--	<2.8	3.37	<5.0	--	18	<1.6
	01/86	2.		--	--	16.3	<2.8	<5.0	--	--	<1.6
	04/86	36	3.	--	--	--	--	--	--	--	<1.6
	07/86	<1.9	41	--	--	8.87	<2.8	<5.0	--	--	--
	10/86	--	--	<1	1	<1	<1	<1	<1	--	<1.6
		<1.9	<10								
		<1	6								

TABLE 3-33
VOC CONCENTRATIONS IN GROUNDWATER SAMPLES FROM THE NORTHEAST AREA KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE EIGHT

Well Number	Sampling Date	Concentration (µg/l)									
		TCE(1)	1,2-DCE	Other	Other	Methylene Chloride	Other	Other	Vinyl Chloride	Other	Other
				Benzene	PCE		1,1-DCE	1,1,2-TCA		TOX	Chloroform
KC 85-40M	06/85	<1.9	4.3	--	--	<2.8	--	--	--	22	--
	07/85	<1.9	19.8	--	--	<2.8	--	--	--	--	--
	10/85	<1.9	23.1	--	--	10.3	--	--	--	18	--
	01/86	2.44	24.5	--	--	14.9	--	--	--	--	--
KC 85-40L	06/85	<1.9	<10	--	--	<2.8	--	--	--	32	--
	07/85	<1.9	<10	--	--	<2.8	--	--	--	--	--
	10/85	4.0	9.14	--	--	19.0	--	--	--	17	--
	01/86	<1.9	9.54	--	--	18.6	--	--	--	--	--
	04/86	--	--	--	--	--	--	--	--	--	--
	07/86	<1.9	17.0	--	--	8.94	--	--	--	--	--
	10/86	<1	25	<1	<1	<1	<1	<1	<1	--	<1
	01/87(3)	<5	25	<5	<5	<5	<5	<5	<10	--	3

TABLE 3-33
VOC CONCENTRATIONS IN GROUNDWATER SAMPLES FROM THE NORTHEAST AREA
KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE NINE

Well Number	Sampling Date	Concentration (µg/l)									
		TCE(1)	1,2-DCE	Other	Other	Methylene Chloride	Other	Other	Vinyl Chloride	Other	Other
				Benzene	PCE		1,1-DCE	1,1-DCA		TOX	Chloroform
KC 85-45U	07/85	108	192	--	--	13.0	--	--	--	--	--
	10/85	53.9	175	--	--	5.2	--	--	--	--	--
	01/86	48.4	192	--	--	<2.8	--	--	--	176	--
	04/86	31.5	149	--	--	<2.8	--	--	--	--	--
	07/86	18.3	181	--	--	3.28	--	--	--	--	--
	10/86	80	<1	<1	<1	<1	230	<1	2	--	<1
KC 85-45L	07/85	93.2	92.7	--	--	<2.8	--	--	--	--	--
	10/85	74.6	97.8	--	--	7.0	--	--	--	99	--
	01/86	68.0	118	--	--	<2.8	--	--	--	--	--
	04/86	94.0	120	--	--	<2.8	--	--	--	--	--
	07/86	60.3	97.9	--	--	5.94	--	--	--	--	--
	10/86	84	160	1	3	2	2	<1	2	--	<1
KC 86-49U	04/86	<1.9	21.8	<4.4	--	<2.8	<2.8	<4.7	<10.0	42	--
	07/86	<1.9	15.5	<4.4	--	4.26	<2.8	<4.7	<10.0	29	--
	10/86	<1	8	<1	<1	<1	<1	<1	<1	--	<1

TABLE 3-33
VOC CONCENTRATIONS IN GROUNDWATER SAMPLES FROM THE NORTHEAST AREA KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE TEN

Well Number	Sampling Date	Concentration (µg/l)									
		TCE(1)	1,2-DCE	Other	Other	Methylene Chloride	Other	Other	Vinyl Chloride	Other	Other
				Benzene	2-Butanone						
KC 86-49L	04/86	<1.9	63.4	<4.4		<2.8	<2.8	<4.7	56.8	--	--
	07/86	52.6	99.1	<4.4	--	15.1	<2.8	<4.7	42.5	<5	--
	10/86	<1	63	<1	86	<1	<1	<1	54	--	<1

Source: DOE Environmental Survey team, 1987. Adapted from "Summary of Kansas City Well H_20 Data; 12/84 to 7/86," "Summary of Kansas City RCRA Well Data," raw data from October 1986 sampling, and QA sample data from January 1987.

(1) Abbreviations for volatile organic compounds
TCE = trichloroethene
1,2-DCE = 1,2-dichloroethene
TCA = 1,1,1-trichloroethane
1,1,2-TCA = 1,1,2-trichloroethane
PCE = tetrachloroethene
1,1-DCE = 1,1-dichloroethene
1,1-DCA = 1,1-dichloroethane
TOX = total organic halogen

(2) U = upper, M = middle, L = lower water-bearing zone
Wells without these designations are in lower zone.

(3) Data from Oak Ridge Gaseous Diffusion Plant, Analytical Chemistry Department.

-- Not detected.

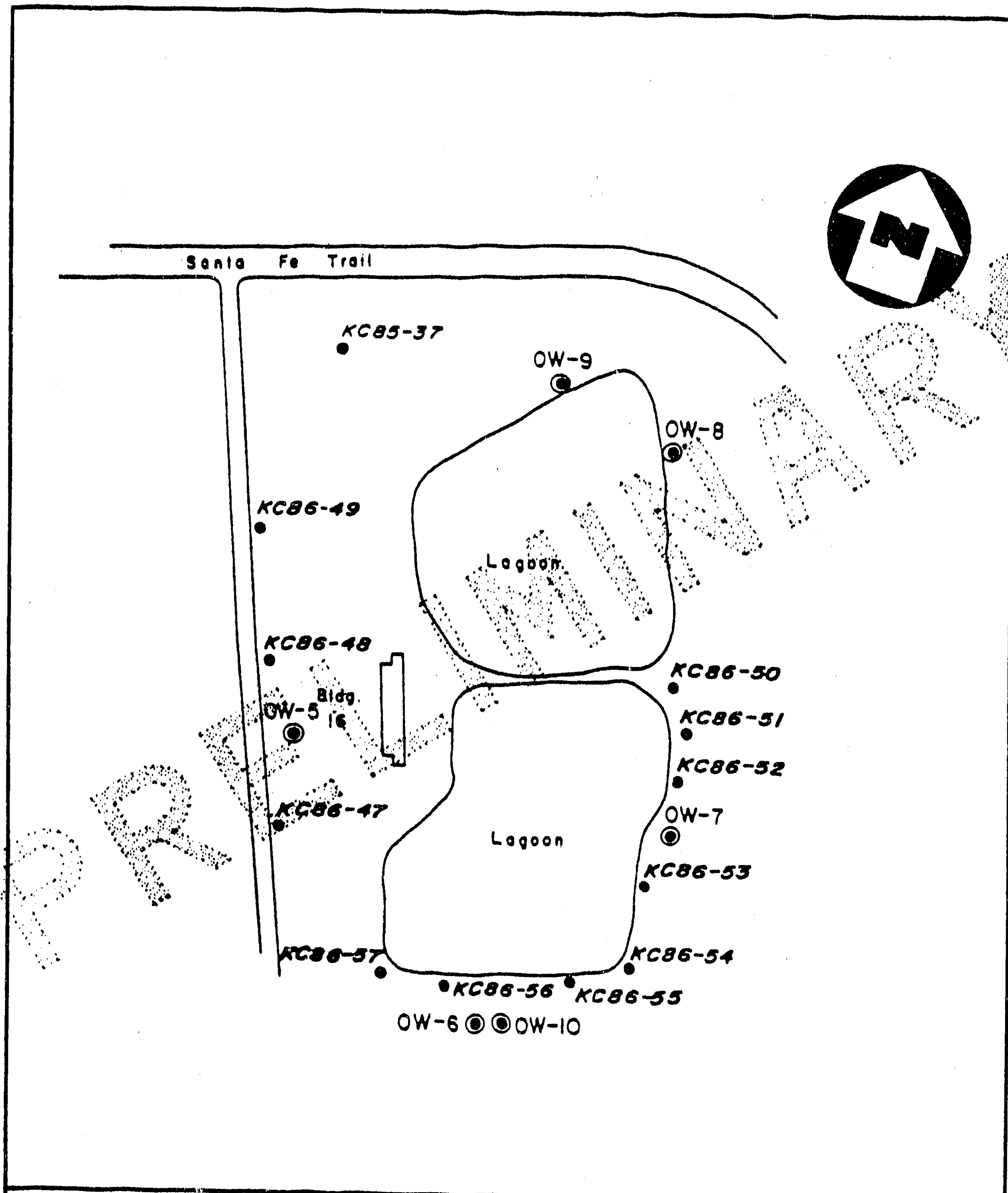
Several anomalous areas, other than underground utility lines, were found, including two areas beneath the floor where the North Lagoon had been located. These anomalies were from a subsurface level beneath that of the buried trench discussed above, which was itself beneath the level of the floor of the North Lagoon. Subsequent excavation uncovered three sections of pipe which had been undiscovered prior to the geophysical investigation (Bendix, 1987a). Two pipes were found to contain oil contaminated with PCBs (less than 350 ppm) and some solvents. The Closure Plan for the North Lagoon (Bendix, 1987a) states that the Kansas City Plant has committed funds to remove these pipes, their contents, and the surrounding soil and to perform appropriate analyses required for determining proper disposal.

Two other possible sources for contamination in the Northeast Area have been identified. These include a sludge dumping area and three small ponds that existed prior to construction of the North Lagoon. These areas are described in Section 4.5.2.8. Wells OW-9 and KC85-37 are in proximity to the former ponds, a fact which suggests that these ponds may have been solvent disposal sites. Well KC85-39 is near the dumping site for fuel-oil sludge (Meininger and Madril, 1987b).

An additional 16 wells at eight locations were installed in the Northeast Area in March 1987. Two wells of different depths are present at each location. These monitoring wells are intended to aid in source identification and contaminant plume definition. Remedial action alternatives for the Northeast Area have been proposed (Meininger and Madril, 1987b). These proposals involve remediation of the groundwater contamination by slurry wall containment, extraction, and treatment regardless of whether or not it is possible to identify the sources of contamination.

3.4.3.4 Lagoon Area

The area formerly occupied by the North Lagoon has been discussed as part of the Northeast Area. The active South Lagoon is considered by the Environmental Protection Agency and the State of Missouri to be a hazardous waste impoundment. Analytical data on sediments in this lagoon are presented in Tables 4-3 and 4-4 in the Waste Management Section of this report (4.1.1). A groundwater monitoring program is in place that includes 24 wells at 14 locations. These wells, shown on Figure 3-27, were installed in 1982 and 1986. Wells OW-5, KC86-47, and KC86-48 should be upgradient of the South Lagoon with respect to groundwater flow eastward to the Blue River. However, water from the South Lagoon is known to infiltrate the subsurface soil and cause mounding of the groundwater table. The result is movement ot water outward in all directions from the lagoon. Therefore, wells at all 14 locations may be downgradient of the lagoon with respect to this localized mounding.



SOURCE: Bendix, 1987a.

FIGURE 3-27

MONITORING WELLS IN THE LAGOON AREA
KANSAS CITY PLANT – KANSAS CITY, MISSOURI

Quarterly samples from the South Lagoon wells are analyzed for groundwater contamination indicators (pH, specific conductance, total organic carbon [TOC], and total organic halogen [TOX]), groundwater quality indicators, priority pollutant volatile organics, PCBs, cyanide, and metals. Data on VOC concentrations are shown on Table 3-34. On this table, values below detection limits are not shown in order to emphasize the relatively few positive detections of volatile organics in this area. Only well OW-7 has shown consistently detectable organics (positive detections in all but the first sampling round). The presence of organics in the adjacent new well KC86-52U in its first three sampling rounds may indicate a small source in the immediate vicinity of these two shallow wells. If the lagoon itself were a source of VOC contamination, VOCs would be expected to show up at comparable levels and with similar consistency in other wells adjacent to the lagoon, not just in OW-7 and KC86-52U. Thus, there is no evidence that the VOCs in these wells or the low sporadic levels in other wells are related to lagoon operations. As mentioned earlier with respect to the Underground Tank Farm, few wells at the KCP are totally clean (i.e., no detectable organics), and low levels of VOCs may be present in groundwater over parts of the site between contaminant sources.

Data on trace metals other than arsenic in South Lagoon monitoring wells are shown in Table 3-35. Arsenic data are discussed below. Total cadmium was detected in one well (KC85-55U) at a concentration (0.013 mg/l) in excess of the drinking water standard (0.01 mg/l). Dissolved cadmium rather than total cadmium was detected in only one well (KC86-52U) at a concentration (0.006 mg/l) below the drinking water standard. All positive cadmium detections were from the April 1986 sampling round. Total lead was detected in four wells at concentrations below the drinking water standard (0.05 mg/l). Total chromium was detected in many samples from the July 1986 sampling round and in some samples from the April 1986 round, but chromium in the corresponding dissolved fractions was below the detection limit. These total chromium values frequently exceeded the drinking water standard of 0.05 mg/l. Routine monitoring of these wells will be continued by the KCP to determine if the total chromium concentration decreases as particulate material is removed by repeated sampling. Metals are apparently not dissolving in groundwater and therefore are not being transported.

3.4.3.5 IRS Landfill

The IRS Landfill area has 12 monitoring wells at eight locations. Well locations are shown on Figure 3-28. Water levels from wells in the basal gravel unit of the alluvium show that groundwater flows to the southeast and east toward the Blue River. Thus, well OW-4 is upgradient of the landfill, the well clusters at locations KC84-14 and KC85-43 are southwest of the landfill and should therefore be unaffected, and the remaining five locations (KC84-15, -16, -17 and KC85-41, -42) are downgradient. Concentrations of volatile organic compounds determined in groundwater from

TABLE 3-34

VOC CONCENTRATIONS IN GROUNDWATER SAMPLES FROM THE SOUTH LAGOON AREA KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Well Number	Sampling Date	Concentration (μg/l)						
		TCE(1)	1,2-DCE	Vinyl Chloride	TCA	1,1-DCA	Methylene Chloride	1,1-DCE
Upgradient Wells								
OW-5	12/84	--	--	--	--	--	--	--
	3/85	6.5	--	--	--	--	--	--
	4/86	--	--	--	47.0	10.6	--	--
	7/86	--	--	--	9.28	--	4 4	--
	10/86	--	--	--	7	--	--	--
KC 86-47U(2)	4/86	--	--	--	--	--	--	--
	7/86	--	--	--	--	--	4.48	--
	10/86	--	--	--	--	--		--
KC 86-47L	4/86	--	--	--	--	--	5.54	--
	7/86	--	--	--	--	--	6.17	--
	10/86	--	--	--	--	--	--	--
	10/86(3)	--	--	--	--	--	--	--
KC 86-48U	4/86	--	--	--	--	--	16 8	--
	*							
KC 86-48L	4/86	--	--	--	--	--	--	--
	*							

TABLE 3-34
VOC CONCENTRATIONS IN GROUNDWATER SAMPLES
FROM THE SOUTH LAGOON AREA
KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE TWO

Well Number	Sampling Date	Concentration (µg/l)						
		TCE	1,2-DCE	Vinyl Chloride	TCA	1,1-DCA	Methylene Chloride	1,1-DCE
Downgradient Wells								
OW-6	12/84(4)							
	4/86	–	–	–	–	–	–	–
	7/86	6.06	–	–	–	–	21.3	–
	10/86	–	–	–	–	–	–	–
OW-7	12/84	–	–	–	–	–	–	–
	3/85	3.5	3.4	–	–	35.4	–	–
	7/85	3.55	20.4	12.3		24.9	8.58	
	10/85	–	4.24	16.1	–	23.7	11.8	–
	1/86	–	3.07	–	–	12.7	6.07	–
	4/86	–	–	–	–	14.6	7.67	–
	7/86	–	–	–	–	12.2	–	–
	10/86	–	–	4	–	1	–	–

PRELIMINARY

TABLE 3-34
VOC CONCENTRATIONS IN GROUNDWATER SAMPLES FROM THE SOUTH LAGOON AREA KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE THREE

Well Number	Sampling Date	Concentration (µg/l)						
		TCE	1,2-DCE	Vinyl Chloride	TCA	1,1-DCA	Methylene Chloride	1,1-DCE
Downgradient Wells								
OW-10	12/84	–	–	–	–	–	15	–
	3/85	–	–	–	–	–	–	–
	7/85	–	–	–	–	–	5.3	–
	10/85	–	–	–	–	–	8.8	–
	1/86	–	–	–	–	–	–	–
	4/86	–	–	–	–	–	–	–
	7/86	–	–	–	–	–	19	–
	10/86	–	–	–	–	–	–	–
KC 86-50U	4/86	–	–	–	–	–	–	–
	7/86	–	–	–	–	–	12.1	–
	10/86	–	–	–	–	–	–	–
KC 86-50L	4/86	–	–	–	–	–	–	–
	7/86	–	–	–	–	–	–	–
	10/86	–	–	–	–	–	–	–
KC 86-51U	4/86	–	–	–	–	–	5.89	–
	7/86	–	–	–	–	–	–	–
	10/86	–	57	–	–	–	–	–

TABLE 3-34
VOC CONCENTRATIONS IN GROUNDWATER SAMPLES FROM THE SOUTH LAGOON AREA
KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE FOUR

Well Number	Sampling Date	Concentration (μg/l)						
		TCE	1,2-DCE	Vinyl Chloride	TCA	1,1-DCA	Methylene Chloride	1,1-DCE
Downgradient Wells								
KC 86-51L	4/86	—	—	—	—	—		—
	7/86	—	—	—	—	—	—	—
	10/86	—		—	—	—	—	—
KC 86-52U	4/86	—	—	—	—	63.8	3.67	6.61
	7/86	—	—	-	—	65.4	—	6.29
	10/86	7	—	—	3	73	—	25
KC 86-52L	4/86	—	—	—	—	—		—
	7/86	—	—	—	—	—	5.10	—
	10/86	—		—	—	—	—	—
KC 86-53U	4/86	—	—	—	—	—	—	—
	7/86	—	—	—	—	—	—	—
	10/86	—	—	—	—	—	—	—
KC 86-53L	4/86	—	—	—	—	—	6.4	—
	7/86	—	—	—	—	—	10.5	—
	10/86	—	3	—	—	4	—	—
KC 86-54U	4/86	—	—	—	—	—	5.20	—
	7/86	—	—	—	—	9.66	9.34	—
	10/86	—	—	—	—	18	—	3

TABLE 3-34
VOC CONCENTRATIONS IN GROUNDWATER SAMPLES FROM THE SOUTH LAGOON AREA KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE FIVE

Well Number	Sampling Date	Concentration (µg/l)						
		TCE	1,2-DCE	Vinyl Chloride	TCA	1,1-DCA	Methylene Chloride	1,1-DCE
Downgradient Wells								
KC 86-54L	4/86	--	--	--	--	--	--	--
	7/86	--	--	--	--	--	7.74	--
	10/86	--	--	--	--	--	--	--
KC 86-55U	4/86	--	--	--	--	--	--	--
	7/86	--	--	--	--	--	7.92	--
	10/86	--	1	--	2	9	--	5
KC 86-55L	4/86	--	--	--	--	--	--	--
	7/86	--	--	--	--	--	--	--
	10/86	--	--	--	--	--	--	--
KC 86-56U	4/86	--	--	--	--	--	--	--
	7/86	--	--	--	--	15.9	--	--
	10/86(5)							
KC 86-56L	4/86	--	--	--	--	--	--	--
	7/86	--	--	--	--	--	6.41	--
	10/86	--	--	--	--	--	--	--

TABLE 3-34
VOC CONCENTRATIONS IN GROUNDWATER SAMPLES
FROM THE SOUTH LAGOON AREA
KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE SIX

Well Number	Sampling Date	Concentration (µg/l)						
		TCE	1,2-DCE	Vinyl Chloride	TCA	1,1-DCA	Methylene Chloride	1,1-DCE
Downgradient Wells								
KC 86-57U	4/86	–	–	–	–	5.75	–	–
	7/86	–	–	–	–	8.45	–	–
	10/86	1	2	–	3	34	–	9
KC 86-56U	4/86	–	–	–	–	–	6.3	–
	7/86	–	–	–	–	–	–	–
	10/86	–	–	–	–	–	–	–
	10/86(3)	–	–	–	–	–	–	–

Source: DOE Environmental Survey Team, 1987. Adapted from "Summary of Kansas City Well H_20 Data, 12/84 to 7/86," "Summary of Kansas City RCRA Well Data," and raw data from October 1986 sampling.

(1) Abbreviations for volatile organic compound
TCE = trichloroethene
1,2-DCE = 1,2-dichloroethene
TCA = 1,1,1-trichloroethane
1,1-DCA = dichloroethane
1,1-DCE = 1,1-dichloroethene
(2) U = Upper, L = Lower water-bearing zone. Wells without these designations are in the lower zone except for OW-7.
(3) Duplicate sample
(4) VOA not detected
(5) Data not available
* Well damaged, 7/86 sampling round not possible.
-- Not detected.

TABLE 3-35

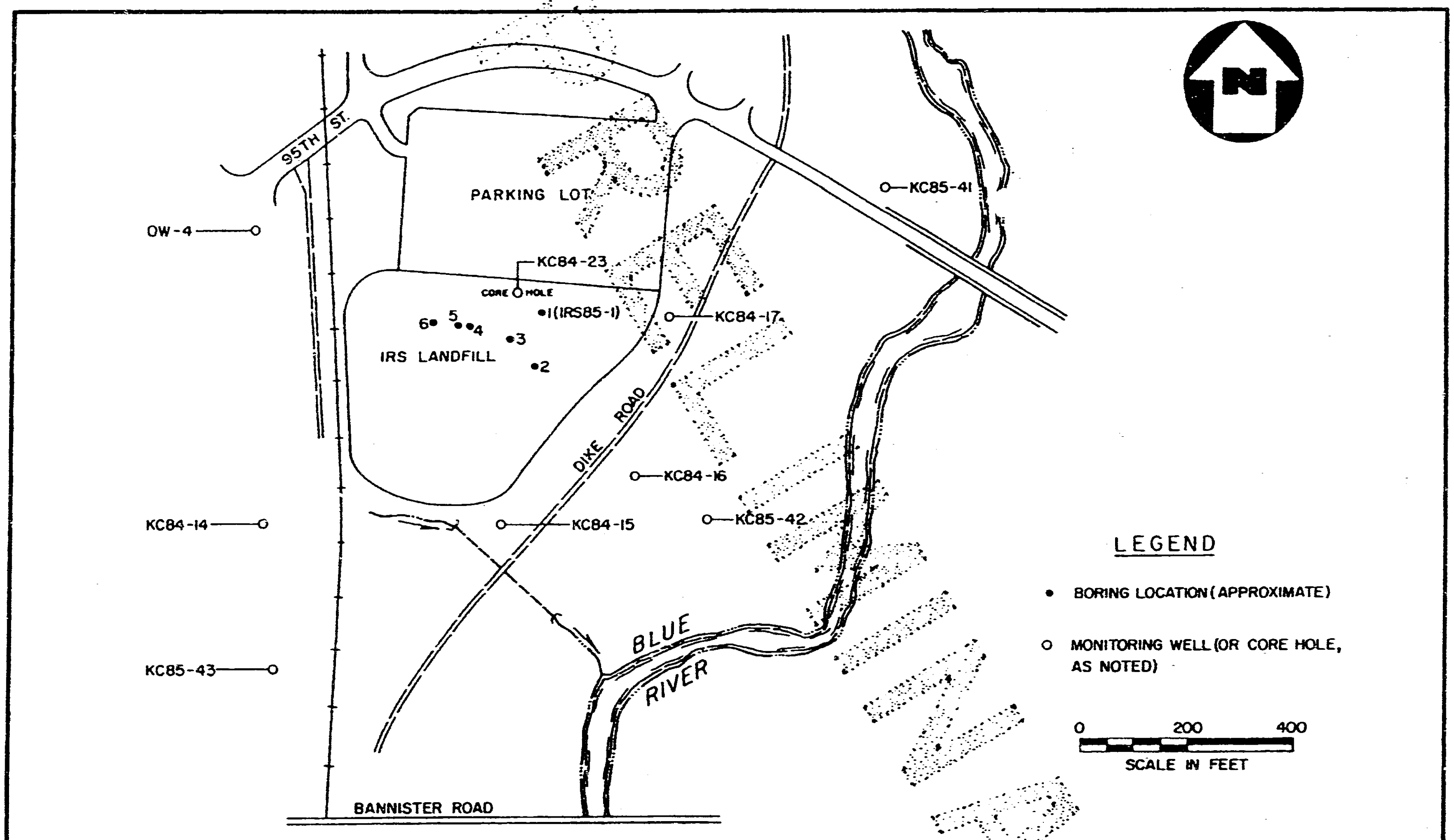
METALS IN SOUTH LAGOON MONITORING WELLS
KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Well Number	Sampling Date	Concentration (mg/l)					
		Cadmium		Chromium		Lead	
		Dissolved	Total	Dissolved	Total	Dissolved	Total
OW-5	7/86			<0.025	0.007		
OW-6	7/86			<0.025	0.066		
	4/86	<0.005	0.008				
OW-7	7/86			<0.025	0.065		
	4/86	<0.005	0.006				
OW-10	7/86			<0.025	0.037		
KC 86-47U	7/86			<0.025	0.045		
KC 86-47L	7/86			<0.025	0.040		
KC 86-48L	4/86	<0.005	0.006	<0.025	0.044		
KC 86-50U	4/86			<0.025	0.025		
	7/86			<0.025	0.050		
KC 86-50L	7/86			<0.025	0.060		
KC 86-51U	7/86			<0.025	0.065		
KC 86-51L	7/86			<0.025	0.040		
KC 86-52U	4/86	0.006	0.006	<0.025	0.026		
	7/86			<0.025	0.035		
KC 86-52L	7/86			<0.025	0.280		
KC 86-53U	4/86	<0.005	0.006	<0.025	0.048		
	7/86			<0.025	0.110		
KC 86-53L	4/86			<0.025	0.090		

TABLE 3-35
METALS IN SOUTH LAGOON MONITORING WELLS
KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE TWO

Well Number	Sampling Date	Concentration (mg/l)					
		Cadmium		Chromium		Lead	
		Dissolved	Total	Dissolved	Total	Dissolved	Total
KC 86-54U	4/86	<0.005	0.007	<0.025	0.052	<0.025	0.030
	7/86			<0.025	0.040		
KC 86-54L	4/86	<0.005	0.005				
	7/86			<0.025	0.065	<0.025	0.034
KC 86-55U	4/86	<0.005	0.013	<0.025	0.061	<0.025	0.038
	7/86			<0.025	0.030		
KC 86-55L	4/86	<0.005	0.007				
	7/86			<0.025	0.065		
KC 86-56U	4/86	<0.005	0.009	<0.025	0.049	<0.025	0.028
	7/86			<0.025	0.170		
KC 86-56L	7/86			<0.025	0.160		
KC 86-57U	4/86			<0.025	0.036		
	7/86			<0.025	0.065		
KC 86-57L	7/86			<0.025	0.180		

Source: DOE Environmental Survey Team, 1987. Adapted from "Summary of Kansas City RCRA Well Data."



SOURCE: Modified from Fleischhauer et al., 1987 (GJ-55).

FIGURE 3-28

**LOCATIONS OF MONITORING WELLS AND CORE HOLE (KC84-23) IN THE IRS LANDFILL AREA
KANSAS CITY PLANT – KANSAS CITY, MISSOURI**

these 12 wells are shown in Table 3-36. It can be seen from this table that KC84-16 and -17 are the most contaminated wells in the area (up to 366 ppb), and that KC84-15, KC85-41, and KC85-42 are affected to a lesser extent. The sporadic occurrence of VOCs in the cluster at KC85-43 could be due to a small source other than that affecting KC84-16. It is possible that this source could be CEARP Site 4, an unconfirmed burial site near the Southeast Parking Lot (see Section 4.5.2.9).

The volatile organic compounds 1,2-dichloroethene and vinyl chloride are considered to be biodegradation products of trichlorethene (TCE). An old spill (or spills) of TCE onto the soil of the IRS Landfill is a probable explanation for the downgradient groundwater contamination observed. Attempts have been made to locate such a source area within the landfill, by means of soil borings into the waste material during 1985 (see Section 3.2.3.3) and a soil-gas study in 1987. Locations of borings into the landfill are shown on Figure 3-28. TCE was found in only two of 26 split-barrel samples taken. The two samples containing TCE were from just above the level of water-saturated fill (9-10.5 feet) in borings IRS 85-1 and IRS 85-5. Concentrations of TCE in these samples were less than 1 ppm. It is possible that most of the original source material has migrated into the groundwater, so that the source is no longer active.

In contrast to the low levels of volatile organics found in landfill borings, high metal concentrations (up to 5,820 ppm Cr, 7,120 ppm Cu, 1,130 ppm Pb, 5,600 ppm Ni, and 2,390 ppm Cu) were present in fill material. These data are consistent with reported disposals of plating wastes and metal shavings from machining operations. The EP toxicity test showed that these metals were not leachable under the test conditions. The results of this test are supported by the absence of these metals in groundwater samples obtained from the wells. Thus, metals are present in the landfill but do not appear to be contaminating the groundwater. VOCs are present in the groundwater but have been found only sporadically in the fill material. A small localized spill would be sufficient to generate the relatively low (i.e., ppb rather than ppm) levels of VOCs found in groundwater in this area, unlike the leaking tanks or repeated spills which are sources for VOC contamination in other parts of the Kansas City Plant area.

3.4.3.6 Elevated Levels of Arsenic and Manganese in Groundwater

Elevated levels of metals not associated with plating wastes or machining operations have been found sporadically in various plants of the Kansas City Plant. These metals are arsenic and manganese. Table 3-37 summarizes the locations where arsenic has been found in excess of the drinking water standard of 0.05 mg/l. The only documented release of materials that may have contained arsenic is a 1981 spill of 3,200 gallons of oil and coolants in the Underground Tank Farm area. A considerable amount of these fluids was cleaned up immediately following the incident

TABLE 3-36

VOC CONCENTRATIONS IN GROUNDWATER SAMPLES FROM THE IRS LANDFILL AREA KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Well Number	Sampling Date	Concentration (µg/l)					
		TCE	1,2-DCE	Vinyl Chloride	Methylene Chloride	Chlorobenzene	Chloroform
OW-4	3/85(1)						
KC84-14U(2)	7/85	--	--	--	15	--	--
	1/87	--	--	--	<2.8	--	--
KC84-14L	7/85	--	--	--	<2.8	--	--
	1/87	--	--	--	<2.8	--	--
KC84-15	3/85	--	35	--	--	--	--
	1/87	5	33	--	--	--	--
KC84-16	12/84	--	238	36	<10	<10	--
	3/85	--	230	59.5	<2.8	6.5	--
	7/85	--	217	40.1	<2.8	<6.0	--
	10/85	--	366	220	7.4	7.79	--
	1/86	--	283	75.1	12.2	9.01	--
	4/86	--	182	47.9	<2.8	<6.0	--
	7/86	--	300	107	<2.8	<12.0	--
	10/86	--	330	80	<10	<10.0	--
	1/87	--	220	90	<2.8	<6	--
KC84-17	12/84	<10	29	--	<10	--	<1.6
	3/85	10.4	151	--	<2.8	--	<1.6
	7/85	15.4	154	--	3.6	--	<1.6
	10/85	13.0	174	--	7.80	--	<1.6
KC84-17	1/86	10.5	188	--	<2.8	--	<1.6
	4/86	72.5	<1.6	--	<2.8	--	5.86
	7/86	11.5	222	14.4	5.58	--	<1.6
	10/86	11.0	<1	18	<1	--	190
	1/87	12	240	16	<2.8	--	<1.6

TABLE 3-36
VOC CONCENTRATIONS IN GROUNDWATER SAMPLES
FROM THE IRS LANDFILL AREA
KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE TWO

Well Number	Sampling Date	Concentration (µg/l)					
		TCE	1,2-DCE	Vinyl Chloride	Methylene Chloride	Chlorobenzene	Chloroform
KC85-41U	7/85	4.21	<1.6	--	3.0	--	--
	10/85	5.27	6.4	--	6.6	--	--
	1/86	<1.9	4.86	--	7.75	--	--
	4/86	<1.9	<1.6	--	7.23	--	--
	7/86	<1.9	<1.6	--	<2.8	--	--
	10/86	<1.0	<1.0	<1.0	<1.0	--	--
	1/87	<1.9	<1.6	--	<2.8	--	--
KC85-41L	7/85	15.0	<1.6	--	<2.8	--	--
	10/85	24.4	58	--	6.6	--	--
	1/86	<1.9	3.02	--	2.99	--	--
	4/86	<1.9	<1.6	--	6.29	--	--
	7/86	<1.9	<1.6	--	8.00	--	--
	10/86	<1.0	<1.0	<1.0	<1.0	--	--
	1/87	<1.9	2	--	<2.8	--	<1.6
KC85-42	7/85	--	17.1	--	<2.8	--	--
	10/85	--	6.3	--	5.6	--	--
	1/86	--	5.73	--	13.0	--	--
KC85-42	4/86	--	14.1	--	<2.8	--	--
	7/86	--	9.29	--	<2.8	--	--
	10/86	<1.0	5	2	<1.0	--	--
	1/87	--	1	--	<1.0	--	--

TABLE 3-36
VOC CONCENTRATIONS IN GROUNDWATER SAMPLES
FROM THE IRS LANDFILL AREA
KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE THREE

Well Number	Sampling Date	Concentration (µg/l)					
		TCE	1,2-DCE	Vinyl Chloride	Methylene Chloride	Chlorobenzene	Chloroform
KC85-43U	7/85	12.1	<1.6	<10	<2.8	--	--
	10/85	<1.9	<1.6	<10	<2.8	--	--
	1/86	21.9	<1.6	<10	47.3	--	--
	4/86	9.02	153	10.7	3.20	--	--
	7/86	<1.9	<1.6	<10	<2.8	--	--
	1/87	<1.9	<1.6	<1.0	<2.8	--	--
KC85-43M	7/85	6.24	--	--	<2.8	--	--
	10/85	<1.9	--	--	<2.8	--	--
	1/86	<1.9	--	--	<2.8	--	--
	4/86	<1.9	--	--	14.3	--	--
	7/86	<1.9	--	--	<2.8	--	--
	1/87	<1.9	-	--	<2.8	--	--
KC85-43L	7/85	5.0	--	--	--	--	--
	10/85	<1.9	--	--	--	--	--
	1/86	<1.9	--	--	--	--	--
	4/86	<1.9	--	--	--	--	--
	7/86	<1.9	--	--	--	--	--
	1/87	<1.9	--	--	--	--	--

Source: DOE Environmental Survey Team, 1987. Adapted from "Summary of Kansas City Well H_2O Data; 12/84 to 7/86," raw data from October 1986 sampling, and QA sample data from January 1987.

(1) TOX 360-450 µg/l, VOAs not detected; 1/87 VOAs < 1.0.
(2) U = upper, M = middle, L = lower water-bearing unit. Wells without these designations are in the lower unit.

TABLE 3-37

MONITORING WELLS SHOWING ELEVATED ARSENIC LEVELS (mg/l) KANSAS CITY PLANT, KANSAS CITY MISSOURI

Monitoring Well	Sampling Date						
	12/84	3/85	7/85	10/85	1/86	4/86	7/86
Upgradient							
KC 84-9L[1]	-	0.23	0.28	0.24	0.291	0.281	0.27
Underground Tank Farm Area							
KC 84-4U	-	0.086	0.13[2]				
KC 84-6L	-	0.081	0.072[2]				
Old Railroad Dock Area							
KC 84-8U	-	0.051	0.074	0.07	0.044	0.046	0.065
KC 84-8L	-	0.19	0.14	0.09	0.027	0.072	0.062
KC 85-34L	NI[3]	NI	<0.01	<0.01	<0.01	<0.10	0.11
Northeast Area							
KC 84-24	-	0.39	0.048	0.05	0.031	0.041	0.046
KC 85-39L	NI	NI	0.02	0.06	0.021	0.022	0.074
KC 85-45L	NI	NI	0.14	0.21	0.180	0.159	0.20
Southeast Parking Lot							
OW-4	-	0.21[2]					
KC 84-14U	-	0.075	0.066[2]				
KC 84-14L	-	0.12	0.11[2]				
KC 85-43L	NI	NI	0.072	0.07	0.067	0.069	0.095
IRS Landfill							
KC 85-41L	NI	NI	0.021	<0.01	0.038	0.045	0.051

TABLE 3-37
MONITORING WELLS SHOWING ELEVATED ARSENIC LEVELS (mg/l)
KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE TWO

Monitoring Well	Sampling Date						
	12/84	3/85	7/85	10/85	1/86	4/86	7/86
South Lagoon Area							
OW-5	-	0.070	-	-	-	0.090	0.19
OW-6	-	-	-	-	-	0.29	0.48
OW-7	<0.01	0.082	0.089	0.08	0.070	0.073	0.092
KC 85-36M	NI	NI	0.06	0.04	0.181(4)		
KC 85-36L	NI	NI	0.34	0.43	0.476(4)		
KC 86-47L	NI	NI	NI	NI	NI	0.22	0.32
KC 86-48L	NI	NI	NI	NI	NI	0.13	-
KC 86-50L	NI	NI	NI	NI	NI	0.25	0.33
KC 86-51L	NI	NI	NI	NI	NI	0.21	0.36
KC 86-52U	NI	NI	NI	NI	NI	0.032	0.060
KC 86-52L	NI	NI	NI	NI	NI	0.085	0.21
KC 86-53U	NI	NI	NI	NI	NI	0.055	0.100
KC 86-53L	NI	NI	NI	NI	NI	0.031	0.080
KC 86-54U	NI	NI	NI	NI	NI	0.055	0.11
KC 86-54L	NI	NI	NI	NI	NI	0.027	0.082
KC 86-55U	NI	NI	NI	NI	NI	0.056	0.046
KC 86-55L	NI	NI	NI	NI	NI	0.15	0.35
KC 86-56L	NI	NI	NI	NI	NI	0.22	0.31
KC 86-57L	NI	NI	NI	NI	NI	0.33	0.47

Source: DOE Environmental Survey Team, 1987. Adapted from "Summary of Kansas City Well H_2O Data; 12/84 to 7/86" and "Summary of Kansas City RCRA Well Data."

(1) U = Upper, M = Middle, L - Lower water-bearing zone. Wells without these designations are in the lower water-bearing zone except for OW-7 (30 feet deep).
(2) Last sampling round
(3) NI = Not installed
(4) Well destroyed due to construction
\- No data

(Korte and Kearl, 1984). It can be seen from Table 3-37 that only two (of 19) wells in the Tank Farm area show elevated levels of arsenic and that much higher levels are found elsewhere on-site. Concentrations 5 times the drinking water standard have been found routinely in well KC84-9L, which is upgradient of the Main Building. High levels are also present in KC84-45L in the former meander of the Blue River northeast of the site. In general, wells in the basal gravel unit of the alluvium (lower zone) show the highest arsenic concentrations. The only areas in which several wells seem to be affected are the three wells at the Southeast Parking Lot and the ring of wells around the South Lagoon. It is unlikely that arsenic is related to lagoon operations because arsenic is low or absent in samples of lagoon sediments and was not leachable by the EP toxicity test (see Section 4.1.2.1). However, infiltration of water from the South Lagoon is known to create a groundwater mound in this area, which causes movement of water outward from the lagoon in all directions. Thus, if any pre-existing arsenic were present in the South Lagoon area, this groundwater mound could account for its presence in wells all around the lagoon. The source of the elevated levels of arsenic remains unknown; it may be natural or due to agricultural chemicals.

Manganese levels are generally high throughout the KCP facility and are not associated with high levels of iron. It is unusual to have manganese concentrations greater than 1 mg/l in groundwater unless special conditions such as acid mine drainage or manganese oxide deposits are present. However, manganese in groundwater at the KCP rarely falls below 1 mg/l, and levels of 1-5 mg/l are common. Table 3-38 summarizes the locations where manganese exceeds 10 mg/l. This value is 200 times the secondary drinking water standard of 0.05 mg/l. With the exception of the anomalous value of 46.8 mg/l found in one sampling round for well KC85-34M in the Old Railroad Dock Area, manganese levels are consistently high only near the IRS Landfill and the Southeast Parking Lot. The elevated levels in shallow wells at the Southeast Parking Lot suggest that an unconfirmed burial site (CEARP Site 4) may be present and that chemical disposals may have occurred here. Both arsenic and VOCs have also been found in groundwater in this area.

3.4.4 Findings and Observations

3.4.4.1 Category I

None.

3.4.4.2 Category II

None.

TABLE 3-38

MONITORING WELLS SHOWING ELEVATED MANGANESE LEVELS (mg/l) KANSAS CITY PLANT, KANSAS CITY, MISSOURI

	Sampling Date						
	12/84	3/85	7/85	10/85	1/86	4/86	7/86
Northeast Area							
KC 85-39L(1)	NI(2)	NI	7.38	10.8	7.19	7.86	11.5
Old Railroad Dock Area							
KC 85-33M	NI	NI	6.89	5.16	21.4	5.56	4.85
KC 85-34U	NI	NI	11.2	13.1	12.0	10.6	9.28
KC 85-34M	NI	NI	8.84	10.3	46.8	9.56	9.47
Lagoon Area							
OW-7	--	6.9	6.36	6.84	6.14	14.0	14.1
KC 86-48U	NI	NI	NI	NI	NI	24	(3)
KC 86-49U	NI	NI	NI	NI	NI	13	13.2
KC 86-49U	NI	NI	NI	NI	NI	14	16.3
IRS Landfill							
KC 84-16	17.3	17	15.2	14.8	14.6	12.6	13.2
KC 85-41U	NI	NI	13.5	7.44	7.12	9.79	6.26
KC 85-41L	NI	NI	12.5	15.7	10.1	6.90	4.50
KC 85-42	NI	NI	7.31	12.4	11.7	13.3	12.0
Southeast Parking Lot							
KC 84-14U	--	17	19.7(4)				
KC 85-43U	NI	NI	19.4	20.1	21.0	22.1	21.4

Source: DOE Environmental Survey Team, 1987. Adapted from "Summary of Kansas City Well H_20 Data; 12/84 to 7/86" and "Summary of Kansas City RCRA Well Data."

(1) U = upper, M = middle, L = lower water-bearing zone. OW-7 is in the upper zone.
(2) NI = Not Installed.
(3) Well damaged, no 7/86 sampling.
(4) No further sampling.
-- No data.

3.4.4.3 Category III

1. Groundwater Contamination by Organic Solvents. Groundwater at the Kansas City plant is contaminated by chlorinated organic solvents, particularly trichloroethene and its biodegradation products. The contaminated groundwater will eventually discharge into Blue River or Indian Creek; therefore, the environmental problem is potential degradation of surface water. Neither the groundwater nor these surface streams are used for water supplies.

Four major areas of organic solvent contamination have been identified. These are the Northeast Area, the Old Railroad Dock Area, the Underground Tank Farm, and the IRS Landfill. The first three are on DOE property. The IRS Landfill is on adjacent property, which is not under DOE control.

- Northeast Area

This area has been largely open ground throughout the history of plant operations and has never been the site of manufacturing operations. Although monitoring wells show concentrations of volatile organic compounds as high as those found elsewhere on-site (up to 22 ppm), sources of contamination have not been located. The Northeast Area includes the area formerly occupied by the northern part of the North Lagoon, but there is no evidence that organic contamination is related to lagoon operation. A trench and pipelines below the level of the former North Lagoon may be sources of contamination, in addition to a sludge dumping site and several small ponds that may have been used for waste disposal prior to construction of the North Lagoon. Additional monitoring wells were installed in early 1987 in this area to aid in source identification and contaminant plume definition. A soil-gas study, using vacuum pumping rather than passive adsorption of rising gases, is to be conducted under CEARP. Whether or not the sources of contamination are identified, recommendations have been made to remediate the groundwater contamination by containment within a slurry wall to prevent further migration, followed by groundwater cleanup. No groundwater sampling by the Survey is needed, but soil borings are planned in the area of the former ponds.

- Old Railroad Dock Area

This dock is the location of a trichloroethene solvent recovery still that operated during the early 1950s, as well as other plant operations that resulted in solvent spills. Trichloroethene contamination is found to depths of 40 feet in the soil and at concentrations up to 8.5 ppm in the groundwater. Engineering designs for source removal and groundwater treatment in this area have been prepared. The Kansas City plant will continue groundwater monitoring; no Survey sampling is needed.

- Underground Tank Farm

  This area is the location of 28 underground tanks installed in 1943 to store fuels, coolants, and solvents. Organic solvents are present in groundwater at concentrations up to 11 ppm. A closure plan for this site was submitted in March 1987, and production wells for groundwater restoration have been installed. Permission to discharge treated groundwater has not yet been granted. No Survey sampling is required because the problem has been sufficiently investigated.

- IRS Landfill

  Monitoring wells downgradient of this landfill on property adjacent to the plant area near the Blue River show organic solvents at concentrations up to 366 ppb, two orders of magnitude less than those observed in the northeast area. The source of this organic contamination is thought to be in the landfill area, but has not been located and may be no longer active. A soil gas study is in progress, which may help to trace the contaminant plume back to the former source location. No Survey sampling is required due to investigations in progress under CEARP.

2. <u>Elevated Levels of Arsenic in Groundwater</u>. Arsenic is present in groundwater at concentrations approaching 10X the drinking water standard. Elevated arsenic levels are both widespread and sporadic, with no apparent pattern of contamination. The source of the elevated arsenic levels is unknown. It may be natural or due to agricultural chemicals, although the use of arsenic biocides in cooling water has been reported historically by plant workers at KCP. Alleged coolant spill areas do not show arsenic in groundwater. Elevated concentrations are found in wells near the South Lagoon, but the low levels of arsenic found in lagoon sediments indicate that this metal is not related to lagoon operations.

   Arsenic levels in excess of the drinking water standard will create a problem for groundwater remedial action projects. Pump-and-treat remediation of groundwater contaminated by VOCs is under development for many parts of the KCP. The ultraviolet/ozone/hydrogen peroxide liquid phase treatment planned for removal of organics will not affect arsenic, so the groundwater may have to undergo further treatment. This may be done in the pretreatment plant under development for wastewater discharges from the KCP to a POTW.

3. Manganese Contamination in Groundwater near the Southeast Parking Lot. Manganese levels in groundwater exceed the secondary drinking water standard of 0.05 ppm throughout the site, a fact which suggests a high natural background. However, levels are consistently high (up to 22.1 ppm) in wells near the Southeast Parking Lot, where an unconfirmed burial site (CEARP Site 4) may be located. This area is near Indian Creek. Although manganese is not considered toxic, it is an undesirable impurity in water supplies because it tends to deposit black oxide stains. The existence of such high levels of manganese is probable evidence of contamination in the area, possibly from disposal of chemicals.

3.4.4.4 Category IV

None.

4.0 NON-MEDIA-SPECIFIC FINDINGS AND OBSERVATIONS

This section discusses findings and observations pertaining to waste management, toxic and chemical materials, radiation, quality assurance, and inactive waste sites and releases. These discussions do not include a background environmental information section because the areas addressed are not necessarily tied to one medium, as was the case with the discussions in Section 3.0. These discussions include an environmental monitoring program section, where appropriate and where information was available. The findings for hazardous, radioactive, mixed, and solid waste management are summarized in a section addressing waste management.

4.1 Waste Management

4.1.1 Background Information

KCP operations generate a variety of solid and liquid wastes, including hazardous wastes, low-level radioactive wastes, and nonradioactive/nonhazardous wastes. Only small amounts of low-level radioactive wastes are generated at KCP, and no high-level radioactive wastes, transuranic wastes, or mixed (i.e., radioactive and hazardous) wastes are generated in KCP departments. The following are brief definitions of these various waste types:

- Hazardous wastes are those wastes identified as such in 40 CFR 261 (i.e., regulated under Subtitle C of the Resource Conservation and Recovery Act--RCRA). Such wastes are either ignitable, reactive, corrosive, or toxic, or contain materials listed in 40 CFR 261.

- Low-Level radioactive wastes (LLW) are described in 10 CFR 61 as radioactive waste not classified as high-level radioactive waste, transuranic waste, spent nuclear fuel, or by-product material as defined in Section 11e.(2) of the Atomic Energy Act (i.e., uranium or thorium tailings and waste). LLW generally consists of naturally occurring radionuclides and of transuranic nuclides at concentrations less than 100 nanocuries per gram.

- Mixed (radioactive and hazardous) wastes are co-contaminated with radioactive and hazardous waste materials.

- Nonradioactive/nonhazardous wastes contain very little or no radioactive contamination (i.e., <32 picocuries per gram) and no chemical contamination as defined under RCRA and the Missouri Hazardous Waste Management Law, Rules, and Regulations (e.g., trash and garbage).

- High-level radioactive wastes (HLW) are defined in 10 CFR 60 as (1) irradiated reactor fuel, (2) liquid wastes resulting from the operation of the first cycle solvent extraction system, or equivalent, and the concentrated wastes from subsequent extraction cycles, or equivalent, in a facility for reprocessing irradiated reactor fuel, and (3) solids into which such liquid wastes have been converted.

- Transuranic waste is defined in 40 CFR 191 as waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes, with half-lives greater than 20 years per gram, except for high-level radioactive wastes.

Some of these wastes are classified (i.e., substances which, in some aspects, reflect information that needs to remain secure).

The management of all these wastes and any existing or potential problems associated with current waste management operations at KCP are discussed in this section. Wastes are discussed in terms of sources, facilities used to manage the wastes, and related waste management operations and practices.

Environmental Survey activities related to the management of KCP wastes involved: (1) inspection of waste generating processes and waste management facilities; (2) interviews with waste management plant personnel; (3) review of relevant records and documents; and (4) comparison of on-site observations with KCP reports and procedures. Emphasis was placed on tracking waste streams that have been identified in KCP's hazardous waste permit application, KCP's Waste Management Site Plan, and the Federal facility waste inventory. A significant amount of time was devoted to inspection of facilities and operations listed in the KCP RCRA Part B permit application. Statutes used as guidance to identify problems include

- The Resource Conservation and Recovery Act (RCRA) and its amendments (specifically 40 CFR 261, 262, and 265).

- Missouri Hazardous Waste Management Law, Rules and Regulations, as amended.

- Kansas City, Missouri, Codes of General Ordinances, Chapter 16.

Hazardous wastes related to KCP are regulated by the EPA and the State of Missouri (i.e., Missouri Department of Natural Resources), and nonhazardous wastes are regulated by the city (i.e., Kansas

City, Missouri). At the time of the Environmental Survey, the State had authorization from EPA to regulate hazardous waste activities under RCRA, but did not have authorization to regulate activities under the Hazardous and Solid Waste Amendments (HSWA) of 1984. In addition to RCRA characteristic or listed wastes (40 CFR 261), the State of Missouri also regulates waste oil and wastes containing more than 50 ppm PCB. KCP has been exempt from provisions of DOE Order 5820.2, which regulates DOE's radioactive wastes. The exemption was granted because KCP does not generate transuranic or high-level radioactive waste, and the low-level radioactive waste volume is extremely low (i.e., usually less than 100 cubic feet per year; refer to Section 4.1.2.2). KCP does not manufacture components from nuclear materials.

KCP is generally in compliance with waste management regulations. The facility has submitted to EPA Region VII a Notification of Hazardous Waste Activity (amended in March 1987), Part A and Part B of a Hazardous Waste Permit Application (the Part A was amended in March 1987; the Part B was last submitted in October 1984 and was revised again in November 1987), and a closure/post closure plan (submitted in November 1987). The facility also submitted hazardous waste registration forms, a Hazardous Waste Management Facility Application, and a Certified Resource Recovery Facility Application to the State of Missouri. Based on these submittals KCP has been granted interim status pursuant to RCRA Section 3005. No permits have yet been granted. There are no current notices of violations. Regulatory violations that had been documented as part of past EPA and state RCRA inspections have been addressed, and deficiencies have been corrected. The Survey team, however, determined that some hazardous waste storage facilities are not adequately protected against flooding. Some of these facilities are located within the 100-year floodplain of the Blue River, and flooding of these facilities could result in the release of hazardous substances into the environment. Storage of hazardous substances in these facilities is not in compliance with RCRA or the Toxic Substances Control Act (TSCA; refer to Section 4.1.3.2).

Details of KCP waste management operations are contained in the Waste Management Site Plan. This plan provides a guide to the Kansas City Plant and its associated waste-handling operations. The plan summarizes the plant administration and organization, its mission, the site setting and layout, environmental controls, and the plant's safety assessment. The Plan also provides a comprehensive survey of radioactive and hazardous waste management facilities, operations, waste descriptions, inventories, and related subjects. Two appendices to the Plan describe the Waste Sampling Plan and all pertinent permits.

4.1.2 General Description of Pollution Sources/Controls

4.1.2.1 Hazardous Wastes

Hazardous waste is generated by a large number of departments carrying out a wide variety of operations within the Kansas City Plant. During FY 1986, 17 types of hazardous waste were managed (Table 4-1). All of these wastes are included in KCP's RCRA Part A permit application, which was amended in February 1987. Hazardous wastes that are generated in the largest quantities include acidic and caustic wastes, spent solvents, waste oils and coolants, and materials contaminated with PCB. PCB liquid and solid wastes are also discussed in Section 4.2.

Hazardous wastes at KCP are generally segregated by waste type; temporarily stored on site in drums, carboys, and bulk tanks; and then shipped off-site for commercial treatment/disposal. Four commercial treatment/storage/disposal facilities are currently being used:

- Chemical Waste Management, Emelle, Alabama, for the treatment and disposal of acidic and alkaline wastes and for the disposal of PCB capacitors;
- Trade Waste Incineration, Sauget, Illinois, for the incineration of waste oil/coolant, paints, paint solvents, and resins;
- Envirosafe Services, Grandview, Idaho, for the landfilling of PCB solids;
- SCA Chemical Services, Chicago, Illinois, for the incineration of waste oil/coolant, bulk solvents, solvent sludge, 4-4' methylene-bis(2-chloroaniline) (MOCA), and PCB liquids.

However, not all wastes are directly shipped off-site for disposal (refer to Tables 4-1 and 4-2). Coolants and some oils are first dewatered, some acidic and alkaline wastes are neutralized and discharged to the industrial sewers as nonhazardous waste, and some solvents are reclaimed on-site for reuse. In addition, some unused foam, rubber, resin, and adhesive components (considered by KCP to be product and not waste), instead of being disposed of as hazardous liquids, are mixed together and become nonhazardous, inert solid waste. This waste is then disposed of in trash containers and taken to the Johnson County, Kansas, landfill by a commercial waste hauler (refer to Section 4.1.2.3). Hazardous classified wastes also are not shipped off-site but stored on-site. No treatment/disposal option acceptable to DOE has been identified for these wastes. At the time of the Environmental Survey, no commercial facility was being used for the disposal of cyanide

TABLE 4-1

HAZARDOUS WASTES GENERATED KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Waste Type	Source	Quantity Generated or Shipped Off-site (FY86)	On-site Management Method
Acidic Wastes	Plating operations Precious metal recovery Laboratory analysis	11,724 ft^3	Stored in carboys and tanks; some neutralized
Alkaline Wastes	Plating operations Precious metal recovery Laboratory analysis	5,619 ft^3	Stored in carboys and tanks; some neutralized
Ammonium Hydroxide	Manufacturing and cleaning operations	128 ft^3	Stored in carboys and tanks; some neutralized
Cyanide Solutions	Plating operations Precious metal recovery Laboratory analysis	337 ft^3	Stored in carboys
Cyanide Salts	Precious metal recovery	68 ft^3	Stored in drums
Halogenated and Non-halogenated Solvents	Manufacturing, degreasing and painting operations	5,398 ft^3	Stored in drums and tanks; some reclaimed
Solvent and Oil-contaminated Filters	Machining, degreasing, and dewatering of oils and cement	89 ft^3	Stored in carboys
Paint and Related Wastes	Painting operations	679 ft^3	Stored in drums; some solidified
4,4' Methylene-bis(2-chloroaniline) (MOCA)	Potting operations	531 ft^3	Stored in drums

TABLE 4-1
HAZARDOUS WASTES GENERATED
KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE TWO

Waste Type	Source	Quantity Generated or Shipped Off-site (FY86)	On-site Management Method
Resins and Rubber Compounds	Potting operations	597 ft^3	Stored in drums; some solidified
Adhesives	Manufacturing and maintenance operations	78 ft^3	Stored in drums; some solidified
Toluene Diisocyanate (TDI)	Molding and encapsulation operations	559 ft^3	Stored in drums; some solidified
Oil/Coolants	Machining and lubrication services	14,324 ft^3	Stored in drums and tanks; some dewatered
PCB Wastes (>50 ppm)	Heat transfer system and electrical units; also oil removed from the coalescer (Oil Master) and its feed tank	7,847 ft^3 (Liquid) +2,110 tons (Solid)	Stored in drums and tanks
Lead Acid Batteries	Vehicle maintenance	66 batteries	Flushed and stored outdoors prior to recycling; drained electrolyte is stored in carboys
Mercury Wastes	Manufacturing operations	29 ft^3	Stored in containers; solid mercury is recycled
Classified Wastes	Manufacturing operations	227 ft^3	Stored in containers

Source: DOE Environmental Survey team, 1987. Adapted from Bendix, 1986.

TABLE 4-2

ACTIVE HAZARDOUS WASTE MANAGEMENT FACILITIES
KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Facility	Description
Staging Area	Receiving point for wastes from all generating departments; used to segregate and inventory wastes, mix compatible wastes, inspect containers, steam clean empty drums, drain and flush lead-acid batteries,and operate an elementary neutralization unit; an open-air area (600 square feet) with concrete flooring and curbing, a sump pit, control valve, and discharge capability to the South Lagoon.
Above-ground Tank Farm	A concrete and curbed area containing six aboveground bulk waste tanks: one 8,000-gallon tank for waste oil/coolant, two 8,000-gallon tanks for spent halogenated solvents, one 8,000-gallon tank for liquid PCB contaminated wastes (containing 50 to 500 ppm PCB), and two 6,000-gallon tanks for acidic and alkaline wastes; each tank is located within a separate concrete spill containment structure; the overall area also has a spill containment sump that can only be manually pumped out.
Acid Pad	An uncovered concrete lot (5,150 square feet) used to store acidic and alkaline wastes (i.e., those that are incompatible with acidic and alkaline wastes stored in the bulk waste tanks; e.g, alkaline liquid wastes containing cyanide) in carboys has 12-inch-high curbing and a spill containment valved sump which feeds to the Staging Area sump; acidic and alkaline wastes are also separated by curbing.
Red-X Lot	A covered, fenced, and locked area (2,400 square feet) used to store mercury wastes, MOCA resin, resin curing agent, paint, paint-related material, rubber compounds, adhesives, sodium potassium, triisobutyl aluminum, and other miscellaneous wastes in drums; has asphalt flooring, a 5-inch-high concrete curbing, and a sump pit without a pump.
Demolition Lot	A large, concrete, curbed pad; a covered portion stores containerized solid and liquid PCB wastes; the uncovered area contains various types of lead-acid batteries to be recycled or commercially disposed of, spent copper etching solution to be recycled, reclaimed halogenated solvents, alkaline liquid waste awaiting cyanide analysis, and drilling wastes awaiting analysis for hazardous characteristics and constituents. Also used for combining unused Polyol ("R" component) and TDI ("T" Component) rigid foam components and curing (hardening) paint and adhesive wastes.
L Lot	An uncovered concrete pad (9,700 square feet), with a 9-inch-high concrete curb, used to store empty returnable containers, barrels containing crushed cans and bottles with residues, and titanium machine turnings contaminated with water-based cutting fluids/coolants; also used as a drain station to remove coolants. Coolants are drained from the turnings to a sump; liquid is pumped from the sump to the oil/water separator located underneath the polymer building (Building No. 15). If liquid is suspected of being contaminated, it is manually pumped out for appropriate management.

TABLE 4-2
ACTIVE HAZARDOUS WASTE MANAGEMENT FACILITIES
KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE TWO

Facility	Description
Waste Storage (Test) Cells	Four enclosed concrete structures; Test Cell Nos. 1 and 2 contain non-classified hazardous waste that was excavated from old burial trenches (707 drums and 1 crate) and that will be shipped off-site for disposal. Cell No. 1 also contains 22 5-gallon carboys of classified mercury alkaline rinsewater (hazardous waste). Cell No. 3 contains classified hazardous waste (55 5-gallon carboys of mercury acid rinsewater, 152 drums and 11 crates of mercury waste, and 11 drums of other wastes. Cell No. 4 contains PCB wastes.
Cyanide Crib	An indoor, wire-caged area (126 square feet) with a concrete floor and spill containment sump; contains two barrels of cyanide salts, one barrel of antimony trioxide, and three carboys of oil and solvent contaminated filters.
Underground Storage Tanks/New Plating Building	Four below-grade, open-topped concrete tanks installed in 1983 (Tank Nos. 16, 18, 20 and 22 on KCP's inventory of process and storage tanks): • A 6,000-gallon tank for spent concentrated acidic solutions • A 6,000-gallon tank for spent concentrated alkaline solutions • A 3,000-gallon tank for spent dilute acidic solutions • A 3,000-gallon tank for spent dilute alkaline solutions All are lined with vinyl ester and located within their own concrete sump in the building basement.
Waste Oil Tank/ Polymer Building	A 44-year-old, 1,300-gallon concrete tank that receives oil from an adjacent oil/water separator (No. 6 on KCP's tank inventory); 2 feet of sludge was cleaned out of the tank and shipped off-site during March 1987.
Waste Oil Tank/ West Boiler House	A 15-year old, 750-gallon concrete tank installed to collect oil from an adjacent oil/water separator (No. 28 on KCP's tank inventory).
Mixing Room	Used to sort and combine small volumes of wastes for volume reduction and to puncture aerosol cans; also used to mix and cure (harden) foam, rubber, resin, and adhesive components; located within Building 59 on a curbed, concrete floor inside a wire mesh cage; equipped with a ventilation hood.
Solvent Distillation Unit	Used to reclaim various spent solvents for reuse (i.e., trichloroethene, 1,1,1-trichloroethane, trichlorotrifluoroethane and perchloroethene); can only store and distill one solvent type at a time; can operate either as a steam-injected or steam coil still. The unit capacity is 100 gallons per hour, and current daily activity averages to 10 gallons per day. Located in Building 59, the area contains two aboveground, 5,000-gallon stainless steel tanks: one for the spent solvent and the other for the reclaimed solvent; the tanks are located in an impervious containment area with an 18-inch-high concrete curb.

TABLE 4-2
ACTIVE HAZARDOUS WASTE MANAGEMENT FACILITIES
KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE THREE

Facility	Description
Thermal Emulsion Breaker	Used to thermally separate water-based coolants and water; handles approximately 300 gallons per day. The dewatered coolant is taken to the waste oil/coolant bulk storage tank, and the water is taken to the Oil Master for additional treatment (see below).
Oil Master	Used to separate oil with trace amounts of PCBs from water; receives oily water from Thermal Emulsion Breaker and sumps with oily rainwater. Processed oils go to bulk PCB waste tank; unit bottoms are handled as PCB solid waste (i.e., drummed, stored in one of the Test Cells, and then shipped off-site); water is sent to the South Lagoon.
Drum Cleaning Unit	A fully enclosed unit that steam cleans empty hazardous waste drums; rinse waters are discharged to a sump and then pumped to the South Lagoon. The unit is located on a diked pad within Building 59.
South Lagoon	An unlined impoundment used for temporary containment of industrial wastewater (e.g., plating rinsewaters, wastewater from mold cleaning operations and regeneration of the deionization units, rinsewaters from the drum cleaning unit, and chemically treated cooling water) before discharge to municipal sewer system; used as a monitoring and control point prior to discharge. Contains heavy-metal-bearing sediments; to be closed in accordance with RCRA standards November 1987.

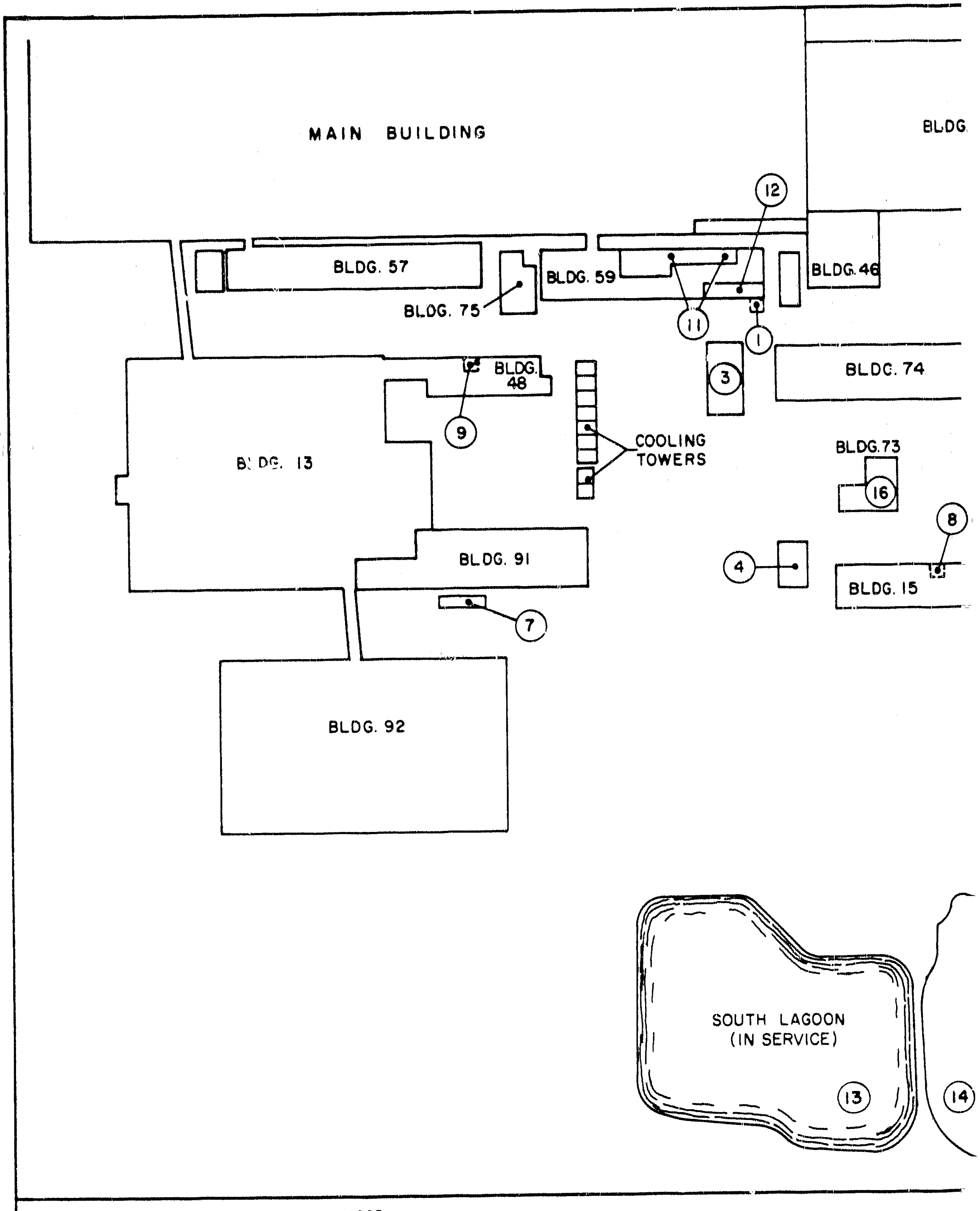
Source: DOE Environmental Survey team, 1987.

solutions and salts. These wastes were being stored on-site, and off-site disposal facilities were being investigated.

KCP uses several on-site facilities to manage its hazardous wastes. Active facilities and their uses are described in Table 4-2. Refer to Figure 4-1 for facility locations. The majority of these facilities are used for the temporary storage of waste prior to disposal. The revised RCRA Part A permit application (March 1987) identifies the use of container storage facilities (design capacity of 382,250 gallons), tanks (design capacity of 40,200 gallons), one impoundment (design capacity of 472,299 gallons), and one solvent distillation unit (design capacity of 10 gallons/day). The solvent distillation unit is the only identified treatment unit. The 1984 Part B permit application did not include the Demolition Lot, the Waste Storage Cells (not used for waste storage until 1987), the two waste oil tanks, the Thermal Emulsion Breaker, the Oil Master, and the drum-cleaning unit. In that permit application, the aboveground tank farm and the solvent distillation unit were included as proposed, and the underground storage tanks at the new plating building (only two out of four) were identified as under construction. There is no active on-site disposal facility at KCP.

The Survey team found that the waste management facilities were in compliance with RCRA requirements, except for flood protection requirements. Some of the facilities are located within the 100-year floodplain of the Blue River, and flooding of these facilities could result in the release of hazardous substances into the environment (refer to Section 4.1.3.2). The 1984 RCRA Part B permit application stated that KCP is situated entirely outside of the 100-year floodplain.

Three hazardous waste management facilities are being closed or will be closed in accordance with Federal and state requirements (40 CFR Parts 265 and 270, and 10 CSR Division 25, Chapter 7, respectively): the Underground Tank Farm and the North Lagoon, both inactive facilities, and the South Lagoon, an active facility (Table 4-2). The North Lagoon was constructed in 1962 to treat industrial wastewater prior to discharge to the Blue River. It became fully permitted in 1964. Treatment consisted of pH adjustment and removal of suspended solids. It received rinsewater from various processes, flows from floor drains located in various operating areas, and chemically treated cooling waters. In 1967 the Missouri Department of Natural Resources began to regulate direct wastewater discharges and thereby prohibited the discharge of the North Lagoon effluent to the Blue River. The lagoon effluent was subsequently rerouted and discharged to the Kansas City (Missouri) municipal sanitary sewer system. In 1985 the North Lagoon was taken out of service. It was unlined, its freeboard had been reduced significantly by accumulated sediment, and the dikes showed signs of erosion. When the lagoon was taken out of service, liquids were pumped to the South Lagoon, and contaminated sediment was removed and shipped to a RCRA-permitted landfill (i.e., the Chemical Waste Management facility in Emelle, Alabama) as part of the Federal Facility



SOURCE: DOE Environmental Survey team, 1987.

UNCLASSIFIED
KANSAS CITY

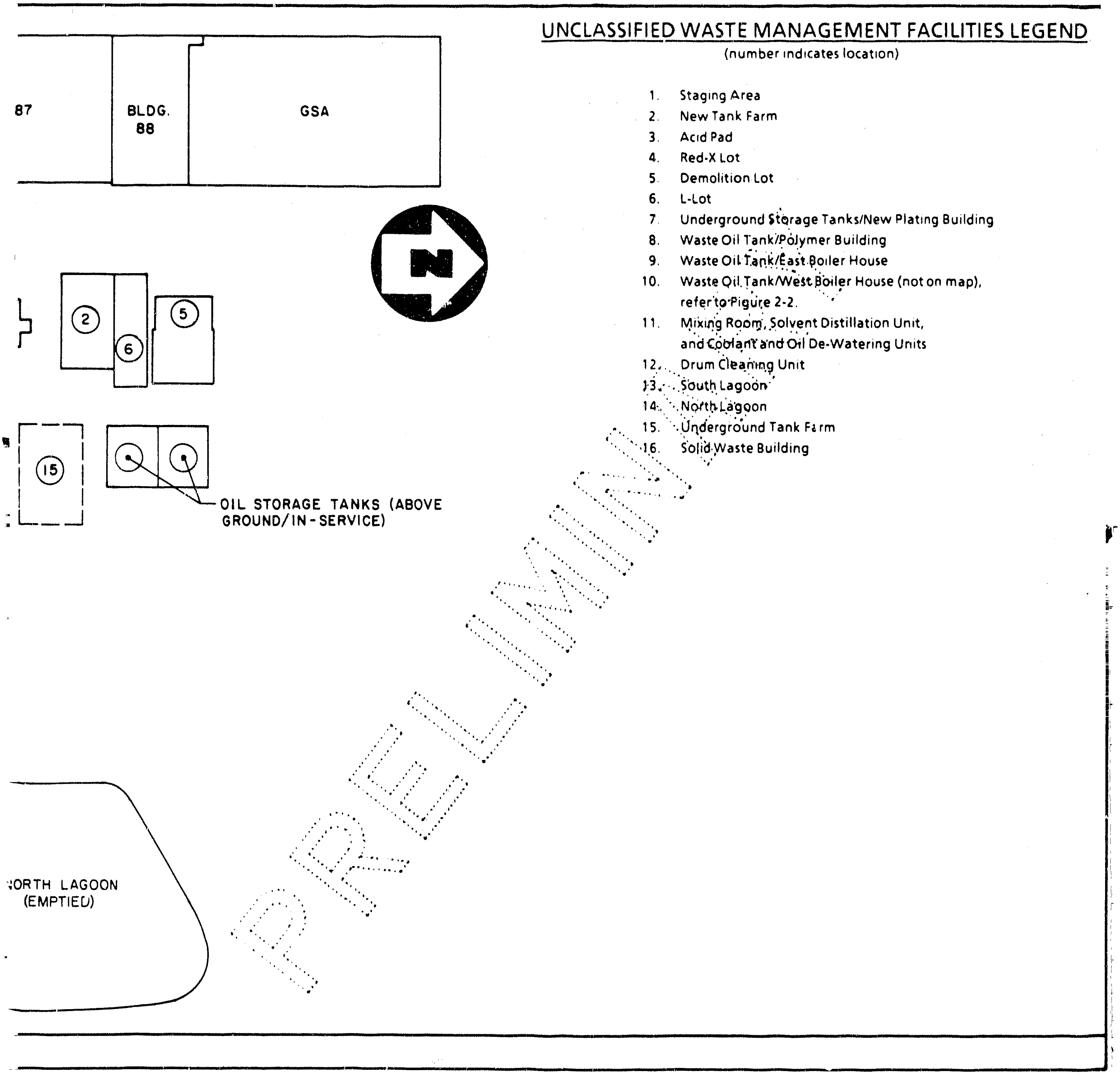


FIGURE 4-1

VASTE MANAGEMENT FACILITIES
LANT – KANSAS CITY, MISSOURI

Compliance Agreement (EPA, 1985). The sediment contained varying concentrations of metals and PCBs (Bendix, 1987a; also see Sections 3.4.3 and 4.5.2.1 of this report for discussions on the extent and nature of contamination). Also removed were wastes (e.g., construction debris, cafeteria waste, and other nonhazardous trash) from a trench which was discovered in the subsurface soil. Closure had been halted at the time of the Environmental Survey due to the discovery of several buried concrete pipes. The history of these pipes was unknown at the time. KCP had scheduled a site assessment of these buried pipes during the summer of 1987. KCP planned to remove the pipes and complete the North Lagoon closure during 1987.

The South Lagoon was constructed in 1977 to accommodate the increased volume of wastewater and stormwater from sewer rerouting projects. To comply with NPDES requirements, chemically treated cooling waters and stormwaters from process areas, which had been discharged to the Blue River via storm sewers, were rerouted to the sanitary sewers, which conveyed flows to the North and South Lagoons for discharge to the municipal sewer system. Since then KCP has significantly reduced the volume of industrial wastewater generated, and thus, the capacity of the South Lagoon is adequate to control flows discharged to the municipal sewer system.

The South Lagoon serves as a control point in the conveyance system to the municipal sewer system before flows are discharged from KCP. Flows conveyed to the lagoon include plating rinsewaters, wastewater from the mold cleaning operation and the regeneration of the deionization units, rinsewaters from the drum cleaning unit, and chemically treated cooling water. When the pH of the lagoon water rises above 10.0 (too basic) or drops below 6.0 (too acidic), automatic outlet valves close, and pumps recirculate the effluent back to the inlet structure until the pH returns to an acceptable level. Additional inflow and normal pH variations in the process stream ordinarily return the pH to an acceptable level within 24 hours. In addition, if there is a spill into the plant's sewer system, the lagoon waters can be treated. During periods of heavy precipitation, the lagoon is used as a holding pond to prevent backup of the industrial drains. The lagoon provides 1.97 acres of water surface area at a depth of 6 feet. Under normal operations, the lagoon's water surface area is approximately 1.72 acres at a depth of 3 feet (i.e., 0.25 acres and 3 feet of additional capacity are normally available).

The South Lagoon is considered by the EPA and the State of Missouri to be a hazardous waste impoundment because of its sediment. The agencies have determined that the sediment is a wastewater sludge from electroplating operations (i.e., F006 waste). The determination is based on the waste source (i.e., the process that generates the waste) and not on whether or not the waste possesses any hazardous characteristics (i.e., is ignitible, reactive, corrosive or toxic). KCP attempted to delist the sediment (i.e., to have it reclassified by EPA as nonhazardous) so that the lagoon would not be considered a hazardous waste impoundment and thus be subject to HSWA requirements (i.e., to be retrofitted to have two or more liners and a leachate collection system by November 1988 pursuant to 40 CFR 265.221). The lagoon is currently unlined. KCP's attempts, however, have not been successful to date, even though the sediment was found not to possess hazardous characteristics (i.e., did not possess toxic levels of metals based on results of EPA's extraction procedure). Table 4-3 presents the results from extraction procedure, PCB, and cyanide analyses of lagoon sediment samples collected in 1984. Table 4-4 presents total concentrations of inorganic constituents of lagoon sediment samples collected in 1984.

KCP is in the process of replacing the South Lagoon with a wastewater pretreatment facility. The facility is under construction and, according to schedule, should be operating in November 1988. KCP wants to take the South Lagoon out of service and close it in accordance with RCRA standards before August 8, 1988. KCP wants to have all sediments removed from the lagoon and shipped off-site to a RCRA disposal facility before the HSWA land disposal restrictions, which regulate F006 waste, become effective (i.e., August 8, 1988). This means that KCP waste waters will have to be discharged directly to the municipal sewer system, without an impoundment providing a control point, until the pretreatment facility is operating (i.e., for 3 or more months). KCP is currently attempting to obtain approval for this plan.

The Underground Tank Farm is currently undergoing RCRA closure. This facility was constructed by Pratt-Whitney, the original KCP contractor, during 1943 and 1944 to store fuels, coolants, lubricants, and solvents (Table 4-5) for different processing purposes at KCP. In 1983, the tanks were inspected and found to be in poor condition (Fleischhauer et al., 1986). Investigations conducted during 1983 and 1985 also found varying levels of petroleum fuels and organic compounds in the surrounding soil and underlying groundwater. The extent and nature of environmental contamination associated with the Underground Tank Farm are discussed in detail in Sections 3.4.3 and 4.5.2 of this preliminary report. None of the 28 tanks were in use at the time of the Environmental Survey, and the exact length of time that all the tanks were used is uncertain, but it is known that at least four (Nos. 22-25) were in use until 1983. These four tanks were used to store hazardous wastes (i.e., flammable and nonflammable solvents, waste oil, and waste coolant) from 1975 to 1983. It is also known from interviews with plant personnel that a certain amount of decommissioning has been performed on each of the 28 tanks, although none were removed (Table 4-5). Some of the unloading stations (i.e., 6 out of 9) were still standing, but none were operational, before closure activities commenced. None of the pumps in the tank farm pumphouse had been recently used, although the building itself had recently been used for other operations. The closure will remove all 28 tanks, associated piping, concrete supports, and surrounding soil and fill to a depth of approximately 15 feet. The waste-handling station, which was constructed in 1975 to accommodate

TABLE 4-3

EXTRACTION PROCEDURE, PCB, AND CYANIDE CONCENTRATIONS IN SOUTH LAGOON SEDIMENT KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Sample Number	Extraction Procedure Levels (mg/l)										Other (ppm)	
	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver	Copper	Nickel	PCB	Cyanide
18 Feb. 1984(a)												
1	<0.005	0.45	0.06	<0.01	<0.025	0.0011	<0.005	<0.01	0.04	9.1	0.1	<0.05
2	<0.005	0.06	0.03	<0.01	<0.025	<0.0002	<0.005	<0.01	0.02	0.8	0.43	<0.05
3	<0.005	0.35	0.09	<0.01	<0.025	0.0015	<0.005	<0.01	0.10	3.0	0.26	<0.05
4	<0.005	0.10	0.03	<0.01	<0.025	<0.0002	<0.005	<0.01	0.04	0.9	1.18	<0.05
5	<0.005	0.10	0.03	<0.01	<0.025	<0.0002	<0.005	<0.01	0.20	11.0	0.15	<0.05
11 June 1984(b)												
1	<0.25	<5.0	<0.05	<0.25	<0.25	<0.01	<0.05	<0.25	NA	NA	<1.0	1.4
2	<0.25	<5.0	<0.05	<0.25	<0.25	<0.01	<0.05	<0.25	NA	NA	<1.0	0.64
3	<0.25	<5.0	<0.05	<0.25	<0.25	<0.01	<0.05	<0.25	NA	NA	<1.0	0.51
4	<0.25	<5.0	<0.05	<0.25	<0.25	<0.01	<0.05	<0.25	NA	NA	<1.0	<0.1
5	<0.25	<5.0	<0.05	<0.25	<0.25	<0.01	<0.05	<0.25	NA	NA	<1.0	<0.1
Regulatory Limits	5	100	1	5	5	0.2	1	5			50	

Source: BFEC, undated, a.

(a) Analyses by General Testing Laboratories, Kansas City, Missouri
(b) Analyses by Langston Laboratories, Leawood, Kansas
NA Not Analyzed

TABLE 4-4

TOTAL CONCENTRATIONS OF INORGANIC CONSTITUENTS IN SOUTH LAGOON SEDIMENTS (mg/l)(a) KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Sample No.	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Silver	Selenium	Beryllium	Copper
1	<5	710	13	333	75	1	17	<5	<5	722
2	6	650	6	370	56	2	14	<5	<5	664
3	6	670	6	296	54	1	12	<5	<5	544
4	7	670	<2	148	32	1	<5	<5	<5	188
5	7	720	<2	123	27	<1	<5	<5	<5	162
Average	<6.2	684	<5.8	254	48.8	<1.2	<10.6	<5	<5	456

Source: BFEC, undated, a.

(a) Samples collected 6-11-84 by Langston Laboratory, Leawood, Kansas. Analyses by Bendix Field Engineering.

TABLE 4-5

INVENTORY OF TANKS IN THE UNDERGROUND TANK FARM(1) KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Tank No.	Type of Construction	Dimensions (feet)	Capacity (gallons)	Weight (tons)	Original Contents	Decommissioning Conducted to Date
1	Steel	11 ϕ x 40(2)	24,289	10.8	Gasoline	Filled with water
2	Steel	11 ϕ x 40	24,289	10.8	Gasoline	Filled with water
3	Steel	11 ϕ x 40	24,289	10.8	Gasoline	Filled with water
4	Steel	11 ϕ x 40	24,289	10.8	Gasoline	Filled with water
5	Steel	11 ϕ x 40	24,289	10.8	Gasoline	Filled with water
6	Steel	11 ϕ x 40	24,289	10.8	Gasoline	Filled with water
7	Concrete	12 x 30 x 11	27,489	123.5	Gasoline	Filled with sand
8	Concrete	12 x 30 x 11	27,489	123.5	Gasoline	Filled with sand
9	Concrete	12 x 30 x 11	27,489	123.5	Gasoline	Filled with sand
10	Concrete	12 x 30 x 11	27,489	123.5	Gasoline	Filled with sand
11	Concrete	12 x 30 x 11	27,489	123.5	Gasoline	Filled with sand
12	Concrete	12 x 30 x 11	27,489	123.5	Gasoline	Filled with sand
13	Steel	10 ϕ x 20	12,522	4.2	Hydraulic Oil	Contents removed
14	Steel	11 ϕ x 18	11,497	3.9	Paraffin	Contents removed
15	Steel	10 ϕ x 20	11,750	4.0	No. 6 Fuel Oil	Contents removed

TABLE 4-5
INVENTORY OF TANKS IN THE UNDERGROUND TANK FARM(1)
KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE TWO

Tank No.	Type of Construction	Dimensions (feet)	Capacity (gallons)	Weight (tons)	Original Contents	Decommissioning Conducted to Date
16	Steel	10 ϕ x 20	11,750	4.0	No. 6 Fuel Oil	Contents removed
17	Steel	11 ϕ x 25	15,869	7.5	No. 6 Fuel Oil	Contents removed
18	Steel	10 ϕ x 20	11,750	7.5	No. 6 Fuel Oil	Contents removed
19	Steel	11 ϕ x 18	11,497	3.9	No. 6 Fuel Oil	Contents removed
20	Steel	11 ϕ x 18	11,497	3.9	No. 6 Fuel Oil	Contents removed
21	Steel	11 ϕ x 18	11,497	3.9	No. 6 Fuel Oil	Contents removed
22	Steel	9 ϕ x 21	9,993	3.7	Oil	Cleaned with high-pressure soap and water
23	Steel	9 ϕ x 21	9,993	3.7	Coolant	Cleaned with high-pressure soap and water
24	Steel	9 ϕ x 20	9,517	3.5	Solvent	Cleaned with high-pressure soap and water
25	Steel	9 ϕ x 20	9,517	3.5	Kerosene	Cleaned with high-pressure soap and water
26	Steel	10 ϕ x 18	10,575	3.7	Kerosene	Contents removed
27	Steel	9 ϕ x 18	8,565	3.2	Waste kerosene	Contents removed
28	Steel	8 ϕ x 12	4,512	2.1	Waste kerosene	Contents removed

Source: Bendix, 1987b.

(1) In Kansas City Plant's inventory of underground process and storage tanks, tanks in the underground tank farm are numbered 10 through 15 and 43 through 64.
(2) The symbol ϕ refers to diameter.

waste storage in the four tanks, will also be removed. In addition, contaminated groundwater will be pumped and treated. All materials will be removed by mid-December 1987, according to plant personnel. The facility to pump and treat the groundwater has been built. Its operation is awaiting manpower commitments (i.e., funding), training of the operators, and approvals to discharge the treated groundwater to the municipal sewer system. Specifics are presented in the KCP Closure Plan for the Underground Tank Farm (Bendix, 1987b).

KCP also has 11 other underground tanks used to store wastes (see Table 4-6). Two are active waste oil tanks connected to oil/water separators (Nos. 6 and 28 in KCP's tank inventory). They are made of concrete and are 15 years old or older. Tank No. 6 is located under the polymer building (Building 15), and Tank No. 28 is located at the West Boiler House. Because of their construction material and age, these tanks could be leaking. KCP has no monitoring program in place to detect leakage from these tanks and has no plans to investigate if leakage from them has occurred. Nor does DOE have plans to replace the tanks. The other nine tanks are inactive; one is empty, another holds water, and seven have been emptied and filled with sand. The tank at the East Boiler House (No. 4) is currently empty and is on standby to contain spills in the Boiler House. Tank No. 9 is inactive and most likely never leaked. It is 5 years old, has cathodic protection, and passed a leak test (Harding Lawson Associates, 1985). In addition, this tank only held waste (i.e., dimethylformamide rinsewater) for a short time (i.e., at the most only between 1982 and 1985) and now contains the water used in the leak test. KCP has not conducted any investigation around the sand-filled tanks to determine if they have leaked, nor do they have plans to conduct any sampling and analysis. DOE has no plans to remove these tanks.

Sixteen of the KCP underground storage tanks were subject to the reporting requirements of Section 9002 of RCRA. In accordance with the requirements, KCP provided information on all of these tanks to MDNR (KCP prepared the notification forms for DOE submittal in April 1986). Three of the tanks are active and contain waste (Tank Nos. 4, 6, and 28), five contain product (Tank Nos. 1, 3, 5, 7, and 8), one is inactive (Tank No. 9), and six have been removed since notification (Tank Nos. 2 and 10-15). Other underground tanks at KCP were excluded because they had been taken out of service before 1974 or never used, had been removed from the ground, are used for storing heating oil for consumptive use on the premises, are used to hold water, are used as pass-through sumps for industrial or sanitary wastewaters, are used for spill containment, or are situated above the floor surface (refer to Section 4.1.3.3, Table 4-7).

TABLE 4-6

KCP UNDERGROUND TANKS USED FOR WASTE STORAGE[1] KANSAS CITY PLANT, KANSAS CITY, MISSOURI

KCP Tank Inventory Number	Location	Installed	Capacity (Gallons)	Content in Storage	Tank Material	Status
4	East Boiler House	1973	800	Waste Oil	Concrete	Empty; on standby for spill containment
6	Building 15	1943	1,300	Waste Oil	Concrete	Active
9	Building 15	1982	5,000	DMF rinsewater[2]	Cathodically protected steel	Inactive; contains water
28	West Boiler House	1972	750	Waste Oil	Concrete	Active
34	Building 57	1943	26,000	Waste Oil	Concrete	Inactive; emptied and filled with sand
35	Test Cells	1943	10,000	Waste Oil	Steel	Inactive; emptied and filled with sand
36	Test Cells	1943	10,000	Waste Oil	Steel	Inactive; emptied and filled with sand
37	Test Cells	1943	1,000	Waste Oil	Steel	Inactive; emptied and filled with sand
67	FY-12	1943	1,880	Waste Oil	Steel	Inactive; emptied and filled with sand
68	FY-12	1943	2,130	Waste Oil	Steel	Inactive; emptied and filled with sand
69	FY-12	1943	2,130	Waste Oil	Steel	Inactive; emptied and filled with sand

Source: DOE Environmental Survey team, 1987. Adapted from KCP's inventory of process and storage tanks.

(1) Does not include tanks used in the Underground Tank Farm (refer to Table 4-7).
(2) DMF Dimethylformamide.

KCP uses various controls to manage its hazardous wastes. Wastes are analyzed and tracked from their generation source to their ultimate off-site disposal point. According to KCP's Waste Management Site Plan (Bendix, 1986) and interviews with waste management personnel, on-going waste streams are sampled and analyzed on a yearly basis, or when process changes occur that alter one or more waste streams. This sampling and analysis is performed to determine how to manage wastes (e.g., as hazardous or nonhazardous) or to ensure that previous determinations are still correct. All nonroutine waste streams are sampled and analyzed when they are generated. Wastes in the bulk tanks at the aboveground tank farm are sampled and analyzed before they are shipped off-site. Recordkeeping files include the following:

- Waste analysis logs
- Waste inventories
- Manifests
- Inspection logs for the above ground tank farm and storage areas.

On-site and off-site hazardous waste management facilities are also inspected regularly. On-site facilities are inspected daily, and off-site facilities are visited annually for re-evaluation. In addition, several policies and procedures have been prepared for the proper management of KCP's hazardous wastes (Bendix, 1986). The DOE Environmental Survey team observed that these policies and procedures generally were adhered to by production departments and waste management staff. For example, containers of hazardous wastes met DOT specifications and were properly labeled; large volumes of wastes were not accumulating at generation sources; wastes were properly segregated; and hazardous waste storage areas had ample capacities (i.e., were not overfilled, meeting designed limits). Waste-management training programs had been established and appeared to be effective.

4.1.2.2 Radioactive Wastes

KCP generates small volumes of low-level radioactive waste on an intermittent basis. KCP does not manufacture components from nuclear materials. No transuranic or high-level radioactive wastes are generated at the facility. The waste consists of election gap tubes, x-ray sources, tritium exit signs, and radioactively contaminated solid waste that is generated during the disassembly and testing of irradiated components (e.g., cleanup towels, disposable gloves, and packaging materials). Usually less than 100 cubic feet of this waste are generated annually. Half of this volume is classified wastes. All radioactive wastes are stored in a restricted access holding area until sufficient quantities accumulate to warrant shipment to the appropriate off-site burial site. Currently, KCP's radioactive wastes are disposed of at the Los Alamos National Laboratory and the Nevada Test Site (Bendix, 1986).

4.1.2.3 Mixed (Radioactive and Hazardous) Wastes

KCP does not generate mixed wastes (i.e., wastes that are co-contaminated with radioactive and hazardous materials).

4.1.2.4 Nonhazardous Wastes

Nonhazardous/nonradioactive wastes are generated by virtually every department of the facility and include conventional trash, scrap material, paper and garbage. Most of this refuse is placed in trash buggies and transported to the Solid Waste Disposal Building (i.e., Building No. 73) for compaction. As the refuse is dumped into the compactor, it is inspected by waste management personnel to ensure that no obvious hazardous wastes are being processed. Compacted wastes are then hauled away daily by a commercial waste hauler and disposed of at the Johnson County, Kansas, Landfill. Refuse generated in remote areas (e.g., the West Boiler House and the North Dock) are placed in trash buggies and picked up directly by the commercial hauler on a daily basis. Construction debris and large items are placed in 20- and 30-cubic-yard trash containers (i.e., dumpsters) located east of the underground tank farm area. These containers are emptied by the commercial hauler when full. Containerized nonhazardous wastes are stored in a staging area adjacent to the dumpsters until hauled away. Some of the containerized waste observed during the DOE Environmental Survey included mixed machining metal chips, sand slurry from sandblasting operations, plastic wastes, solidified urethane waste, and cafeteria waste.

Building No. 73 also contains a paper shredder, a can and bottle crusher, a grinder for soft classified shapes, and a metal grinding operation. During the Environmental Survey, the metal grinding operation was in its developmental phase. It is intended to grind metal chips (e.g., aluminum and steel) for recycling. The operation will involve the generation of waste oil/coolant, which will be collected in barrels or a collection sump, and transferred to the bulk waste oil tank at the aboveground tank farm.

4.1.3 Findings and Observations

4.1.3.1 Category I

None.

4.1.3.2 Category II

1. Inadequate Protection of Waste Management Facilities Against Floods. In the event of a 70-year or more flood at KCP, there is a potential for waste management facilities and, subsequently, waste storage containers to be damaged. Such an event could possibly result in the widespread release of hazardous substances into the environment. In addition, the waste tanks for the new plating building are below grade and have no tops; floodwaters could enter the tanks, and the tank capacities could be exceeded and thus result in the release of hazardous wastes.

   Hazardous wastes generated at KCP, including PCB wastes, are stored on-site until they are shipped off-site for disposal. This storage is not in compliance with the Toxic Substance Control Act (TSCA) or the Resource Conservation and Recovery Act (RCRA), and poses environmental and public health risks. Based on U.S. Army Corps of Engineers' correspondence to GSA (May 1985) and DOE (December 1986), the hazardous waste storage facilities are located within the 100-year floodplain. TSCA requires that PCB wastes being stored for disposal be located outside the 100-year floodplain. RCRA requires that waste management facilities be located outside the 100-year floodplain or be protected from the 100-year flood. If facilities are located within the 100-year floodplain, one of the following conditions should be met:

   - Hazardous waste containers must be removed before the 100-year flood stage is reached.
   - No hazardous waste releases should occur.
   - Any release should not cause adverse impacts.

   In the event of a 100-year storm, it is reportedly unlikely that hazardous waste containers could be removed before the 100-year flood stage is reached, and not all containers are protected to prevent releases and adverse impacts. For example, the Waste Staging Area is totally unprotected, the Demolition Lot and the Acid Pad are not fully enclosed, and the waste tanks in the new plating building are below grade and open to runoff. Resultant releases could contaminate surface waters, including downstream public water supplies.

KCP is reviewing the issue and options available to provide additional flood protection and to comply with TSCA and RCRA.

No additional data are needed to characterize this finding. Therefore, no Environmental Survey related sampling and analysis is planned for this finding.

4.1.3.3 <u>Category III</u>

1. <u>Underground Storage Tanks</u>. Many existing underground storage tanks (USTs) at KCP have deteriorated and are known to have released hazardous substances to the subsurface environment, resulting in contamination of the area soils and groundwater. Others are old and may be releasing hazardous substances to the environment. Sufficient information on these tanks is not available to determine their integrity and whether they are leaking. However, steel tanks that are not cathodically protected and over 15 years old, and concrete tanks over 15 years old, have a high probability of leakage.

   Tanks located in the underground tank farm are known to have leaked (Section 4.1.2.1 and 4.5.2.3). These tanks were used to store fuels, coolants, lubricants, and solvents (Table 4-5). Four of the tanks were also used to store hazardous wastes (i.e., flammable and nonflammable solvents, waste oil, and waste coolant). All of these tanks have been decommissioned. Investigations conducted during 1983 and 1985 found varying levels of petroleum fuels and organic compounds in the soil and groundwater. Oil, gasoline, and diesel fuel are generally present only near the surface in the sandy fill above the water table (i.e., at depths less than about 15 feet, which corresponds to the depth of the water table in this area). Volatile organic compounds were detected in only 4 of the 150 samples, and the concentrations were low in these samples (refer to Section 4.5.2.3). The data indicate that the soil is not extensively contaminated with volatile organic compounds and suggest that contaminated soil must be localized around the four waste storage tanks. The possibility that contaminated soil occurs directly beneath the other solvent tanks cannot be ruled out. Groundwater monitoring wells reveal parts per million (ppm) levels of trichloroethene, methylene chloride, and 1,1,1-trichloroethane (refer to Sections 3.4.2.1 and 3.4.3). This underground tank farm is undergoing RCRA closure. The closure will consist of removing all tanks, associated piping, concrete supports, surrounding soil, and fill to a depth of approximately 15 feet, as well as the waste handling station. In addition, contaminated groundwater will be pumped and treated. Because subsurface contamination in this area has already been characterized, the DOE Environmental Survey will not involve sampling and analysis of soils and groundwater in the area.

One or both of the two underground storage tanks located near the southwest corner of the West Boiler House (Nos. 23 and 24 in KCP's tank inventory) may have leaked No. 6 fuel oil (see Sections 4.2.1.2 and 4.5.2.4). These tanks are made of concrete and were installed in 1943. Both have a 250,000 gallon capacity. Currently, Tank No. 23 is in service and Tank No. 24 is empty. During a subsurface soil investigation conducted in 1985, oil and grease were found in the soil around the tanks. Concentrations ranged from 149 to 1,920 ppm. In addition, cracks were found in Tank No. 24 during a 1984 inspection. DOE's Kansas City Area Office has no plans to replace these two tanks. During the Environmental Survey, the Area Office mentioned that Tank No. 23 may be evaluated during FY1987 as part of a limited underground tank evaluation program. No detailed inventory control program or environmental monitoring programs are in place to determine if Tank No. 23 is leaking fuel. Because fuel contamination has already been found in the soil near the tank, the DOE Environmental Survey will not involve sampling and analysis of soils and groundwater in the area.

The two active waste oil tanks (Nos. 6 and 28 in KCP's tank inventory) also may have leaked (see Table 4-2). Both are connected to oil/water separators, made of concrete, and 14 years old or older. Tank No. 6 is located under the polymer building (Building 15), and Tank No. 28 is located at the West Boiler House. KCP has no monitoring program in place to detect leakage from these tanks and has no plans to investigate if leakage from them has occurred. Nor does DOE have plans to replace the tanks. No sampling and analysis will be conducted as part of the DOE Environmental Survey to determine if leakage has occurred. Sampling around the tanks is not feasible because the tanks are located under buildings. Sampling near the buildings under which the tanks are located is not recommended because any contamination found could not be attributed solely to leaks in the tanks.

Empty, inactive tanks that may have leaked in the past and contaminated the surrounding area include Tank Nos. 4, 32-37, and 66-69. These tanks are described in Table 4-7. Nine are unprotected steel tanks, and two are made of concrete. KCP has not conducted any investigation around these tanks to determine if they have leaked, nor do they have plans to conduct any sampling and analysis. DOE has no plans to remove these tanks. Sampling and analysis will be conducted under the DOE Environmental Survey around Tank Nos. 32 and 33, which held fuel oil for use at the East Boiler House. The area around Tank No. 34 is known to

TABLE 4-7

INACTIVE UNDERGROUND STORAGE TANKS KNOWN OR SUSPECTED TO HAVE LEAKED
KANSAS CITY PLANT, KANSAS CITY, MISSOURI

KCP Tank Inventory Number	Location	Installed	Capacity (Gallons)	Contents	Tank Material	Last Use
2	East Boiler House	1973	800	Water	Concrete	Waste Oil
10	Tank Farm	1943	10,000	Empty	Steel	Waste Oil
11	Tank Farm	1943	10,000	Empty	Steel	Waste Coolants
12	Tank Farm	1943	10,000	Empty	Steel	Waste Solvents
13	Tank Farm	1943	10,000	Empty	Steel	Waste Solvents
14	Tank Farm	1943	20,000	Empty	Steel	Diesel Fuel
15	Tank Farm	1943	20,000	Empty	Steel	Diesel Fuel
32	East Boiler House	1959	15,000	Empty	Steel	No. 6 Fuel Oil
33	East Boiler House	1959	15,000	Empty	Steel	No. 6 Fuel Oil
34	Building 57	1943	26,000	Sand	Concrete	Waste Oil
35	Test Cells	1943	10,000	Sand	Steel	Waste Oil
36	Test Cells	1943	10,000	Sand	Steel	Waste Oil
37	Test Cells	1943	1,000	Sand	Steel	Waste Oil
43	Tank Farm	1943	10,800	Empty	Steel	Kerosene
44	Tank Farm	1943	9,000	Empty	Steel	Waste Kerosene
45	Tank Farm	1943	5,000	Empty	Steel	Waste Kerosene
46	Tank Farm	1943	11,400	Empty	Steel	No. 6 Fuel Oil
47	Tank Farm	1943	11,400	Empty	Steel	No. 6 Fuel Oil
48	Tank Farm	1943	11,400	Empty	Steel	No. 6 Fuel Oil
49	Tank Farm	1943	12,500	Empty	Steel	No. 6 Fuel Oil
50	Tank Farm	1943	15,600	Empty	Steel	No. 6 Fuel Oil
51	Tank Farm	1943	12,500	Empty	Steel	No. 6 Fuel Oil
52	Tank Farm	1943	12,500	Empty	Steel	No. 6 Fuel Oil
53	Tank Farm	1943	11,400	Empty	Steel	Paraffin
54	Tank Farm	1943	12,500	Empty	Steel	Hydraulic Oil
55	Tank Farm	1943	20,700	Sand	Concrete	Gasoline

TABLE 4-7
INACTIVE UNDERGROUND STORAGE TANKS KNOWN OR SUSPECTED TO HAVE LEAKED
KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE TWO

KCP Tank Inventory Number	Location	Installed	Capacity (Gallons)	Contents	Tank Material	Last Use
56	Tank Farm	1943	20,700	Sand	Concrete	Gasoline
57	Tank Farm	1943	20,700	Sand	Concrete	Gasoline
58	Tank Farm	1943	20,700	Sand	Concrete	Gasoline
59	Tank Farm	1943	20,700	Sand	Concrete	Gasoline
60	Tank Farm	1943	20,700	Sand	Concrete	Gasoline
61	Tank Farm	1943	20,000	Water	Steel	Water
62	Tank Farm	1943	20,000	Water	Steel	Water
63	Tank Farm	1943	20,000	Water	Steel	Water
64	Tank Farm	1943	20,000	Water	Steel	Water
66	Test Cells	1943	1,000	Sand	Steel	Kerosene
67	FY-12	1943	1,880	Sand	Steel	Waste Oil
68	FY-12	1943	2,130	Sand	Steel	Waste Oil
69	FY-12	1943	2,130	Sand	Steel	Waste Oil

Source: DOE Environmental Survey team, 1987. Adapted from Kansas City Plant inventory of process and storage tanks.

be contaminated (see Section 4.5.2.6, "Heat Exchange Systems," for an assessment of this area). The other tanks are located under buildings and are not accessible to sampling and analysis.

All other USTs at KCP (i.e., not mentioned above) are in good condition and probably do not leak. Tank Nos. 1, 3, 5, 7, and 8 are fuel and chemical tanks that have passed recent leak tests (see Section 4.2.1.2). Tank Nos. 16, 18, 20, and 22 are tanks at the new plating building that have been lined with vinyl ester and are located within their own concrete sumps (see Section 4.1.2.1). Tank No. 9 is inactive and most likely never leaked. It is 5 years old, has cathodic protection, and passed a leak test (Harding Lawson Associates, 1985). In addition, this tank only held waste (i.e., dimethylformamide rinsewater) for a short time (i.e., at the most only between 1982 and 1985) and now contains the water used in the leak test. Other tanks listed in the KCP inventory are described below:

- Tank Nos. 2, 25, 26, 29, 30, 31, 38, and 39 have been removed. Available records indicate that contaminated soils around the removed tanks were also removed.

- Tank Nos. 27, 40, 41, and 42 were never used.

- Tank Nos. 65, 124, 125, 126 and 127 were used or are currently used to hold clean, non-process waters (e.g, cooling water or water for firefighting).

- Tank Nos. 17, 19, 21, 70-93, and 151 are to be used for spill containment. All have been recently installed or repaired.

- The remaining 46 underground tanks in the inventory of 151 tanks are used as pass-through sumps for industrial or sanitary wastewaters. These are not true tanks and were not evaluated as sources of subsurface chemical contamination.

4.1.3.4 Category IV

None.

4.2 Toxic and Chemical Materials

4.2.1 General Description of Pollutant Sources/Controls

4.2.1.1 Toxics Management

The purchase of process and maintenance chemicals for the KCP plant is the combined responsibility of the KCP Industrial Hygiene, Purchasing, Receiving/Inspection, and Chemical Stores Departments. All products that are used in the plant must be reviewed and approved by the KCP Industrial Hygiene staff prior to purchase. The review consists of an evaluation of the potential hazards associated with the product and the particular manner in which it will be used in the plant. Information on the products which have been approved for purchase is stored in a computer data base termed CAMPS (Computer-Assisted Materials Purchasing System), and all purchase requisitions are reviewed by CAMPS. If the particular product has been approved for purchase, the requisition is processed. Alternatively, if the requisition is for a material which has not been approved for purchase, the requisition is processed, but the KCP Industrial Hygiene Department is notified. Industrial Hygiene has the authority to reject particular purchases due to health or safety concerns. Approximately 3,000 products have been approved for purchase and use at KCP.

All purchases are shipped to the Receiving/Inspection Department, where the purchase order number is input into CAMPS. The data base provides the amount to be received with the order, a shelf life, whether or not the material is toxic or hazardous, and a code that indicates how the material should be stored.

The Chemical Stores Department stores all hazardous materials in the appropriate location in Building 74, the New Chemical Storage Building. A formalized system for segregating incompatible materials and storing all toxic and hazardous chemicals under the proper conditions has been implemented in Building 74. For example, separate storage is provided for flammable materials, compressed gas cylinders, oils and greases, solvents, bases, cryogenic materials and highly reactive chemicals. The various storage rooms are separated by 2-hour fire walls, have automatic fire suppression systems, combustible gas detection systems, and automatic/manual fire alarms. The entrance to each storage location is locked, and each room has a grated trench connected to a separate, outside, spill containment sump. During the Environmental Survey, the interior of Buildi g 74 was clean and dry, with no evidence of spills or leaking containers. Housekeeping practices were exceptional.

A covered, concrete area equipped with adequate spill containment measures and located adjacent to Building 74 is used to store incoming drums of acids and caustics. No evidence of spills or leaking containers was observed.

The Receiving/Inspection Department places a hazard alert symbol generated by CAMPS on all containers of toxic or hazardous materials. A diamond-shaped symbol, divided into four equal-sized squares colored blue, red, yellow, and white and containing a number between 0 and 4, are used to denote the relative health (blue field), flammability (red), and reactivity (yellow) hazards presented by the material. An alphanumeric code (on the white background) indicates the proper type of storage. The KCP system is termed the Hazardous Materials Information System (HMIS). The KCP HMIS is similar to other universally recognized hazardous-materials-labeling systems such as those developed by the National Fire Protection Association (NFPA) and the National Paint and Coatings Association (NPCA). The use of an alphanumeric code to indicate proper storage is unique to the KCP HMIS.

The completed HMIS symbol for each toxic or hazardous chemical is stored in CAMPS, as is the corresponding Material Safety Data Sheet (MSDS). The KCP Industrial Hygiene Department is responsible for rating each toxic or hazardous material according to the HMIS criteria, reviewing all MSDS, and training KCP employees on the HMIS. In addition, the Industrial Hygiene Department maintains an active file of employee concerns for purposes of complying with the Toxic Substances Control Act (Section 8e, Substantial Risk) requirements.

4.2.1.2 Tank Farm Facilities

4.2.1.2.1 Underground Storage Tanks

There are seven underground storage tanks (USTs) at KCP that are (or have been) used to store non-waste hazardous/toxic substances (i.e., products, raw materials or fuels). These USTs and their contents are listed in Table 4-8. For a discussion of active and inactive USTs used by KCP to store waste materials, see Section 4.1.2.1, Section 4.1.3.3 and Section 4.5.2.3 of this report.

Four of the underground storage tanks currently used to store non-waste hazardous/toxic substances (i.e., Nos. 001, 003, 005, and 007) were leak tested and were rated as "tight" (i.e., having a leak rate of less than 0.05 gallons per hour; Harding Lawson Associates, 1985). These four tanks are scheduled to be retested during FY1987 as part of another DOE tank evaluation program (Hoopes, 1987). Tank No. 008 is probably also "tight" because it is a relatively new tank (installed in 1982) with cathodic protection. However, the two underground fuel storage tanks at the West Boiler House are

TABLE 4-8

UNDERGROUND STORAGE TANKS FOR NON-WASTE HAZARDOUS SUBSTANCES KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Tank No.	Location	Installed	Capacity (gallons)	Contents	Tank Material	Integrity Information	Status
001	West Boiler House	1980	1,000	Diesel	Steel	Passed leak test	Currently in use
003	East Boiler House	1962	500	Diesel	Steel	Passed leak test	Currently in use
005	Building 75[a]	1974	750	Diesel	Steel	Passed leak test	Currently in use
007	Building 15	1982	5,000	Acetone	Steel with cathodic protection	Passed leak test	Currently in use
008	Building 15	1982	5,000	Dimethylformamide	Steel with cathodic protection	Was not leak tested	Currently in use
023	West Boiler House	1943	250,000	No. 6 fuel oil	Concrete	To be part of a DOE FY87 tank evaluation program	Currently in use
024	West Boiler House	1943	250,000	Empty (previously used to store No. 6 fuel oil)	Concrete	Has cracks; suspected of having leaked fuel oil in the past	Drained in 1984. Temperarily out of use.

Source: Environmental Survey Team, 1897. Adapted from KCP inventory of process and storage tanks.

probably leaking, since concrete tanks greater than 15 years old generally have a high incidence of leakage. In addition, oil and grease have been found in the soil around the two tanks (Fleischhauer et al., 1986). During a 1984 inspection, cracks were discovered in Tank No. 024; it has not been refilled since that time. Tank No. 023 is also being considered for leak testing during FY1987 as part of the DOE tank evaluation program (Hoopes, 1987).

4.2.1.2.2 Above-Ground Storage Tanks

The location, capacity, contents, construction, and spill-control measures implemented for the above-ground tanks currently used by KCP to store non-waste hazardous substances are shown in Table 4-9. For a discussion of above-ground tanks currently used at KCP to store wastes (i.e., the New Tank Farm), see Section 4.1.2.1. With the exception of the diesel fuel tanks in Room BS-28 and Building 42 (the latter referred to as the "sand house"), all have been provided with secondary containment of equivalent or greater volume. KCP personnel advised the Environmental Survey team that a containment structure for the tank in BS-28 would be constructed in the near future (Mast, 1987a), and that the tank in Building 42 is inspected weekly. The most significant tanks in terms of potential environmental problems are the two 400,000 gallon tanks used to store No. 6 fuel oil. Although the secondary containment which was constructed for the tanks is in good condition, the tanks have not been used since 1979. Consequently, the tank loading lines, which extend beyond the secondary containment, have not been maintained and are deteriorating. All other above-ground tanks at KCP were also inspected during the Environmental Survey, and all appeared to be in good condition with no evidence of leakage.

As required by the EPA Oil Pollution Prevention (40 CFR 112) and Contingency Plan and Emergency Procedures (40 CFR 264) regulations, KCP has prepared a Spill Control Plan (BKCD, 1985). This document specifies the policies and procedures that have been implemented by KCP to minimize the potential for off-site releases of oil and hazardous wastes and materials. As part of the Environmental Survey, the KCP Spill Control Plan was reviewed. In addition, various KCP personnel were interviewed regarding the capability of the plant to respond to releases of hazardous substances.

During daylight working hours, the KCP Environmental Services or Waste Management Departments are notified in the event of a spill. At other times, the Patrol Headquarters is alerted. In turn, the Fire Department and Emergency Coordinator (or his alternate) are notified. The KCP Spill Emergency Response Team, consisting of representatives from various KCP departments, is responsible for the actual spill response activities. The Waste Management Department in particular is responsible for training personnel in proper spill response procedures, furnishing the equipment and materials

TABLE 4-9

ABOVE-GROUND STORAGE TANKS FOR
NON-WASTE HAZARDOUS SUBSTANCES
KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Location	Capacity (gallons)	Contents	Tank Material	Spill Control Measures	Status
Northeast lot	400,000	No. 6 fuel oil	Steel	Secondary containment	Currently in use
Northeast lot	400,000	No. 6 fuel oil	Steel	Secondary containment	Currently in use
Building 89	275	Diesel fuel	Steel	Secondary containment	Currently in use
Building 89	275	Diesel fuel	Steel	Secondary containment	Currently in use
MM-43	88	Diesel fuel	Steel	Secondary containment	Currently in use
BS-28	300	Diesel fuel	Steel	None	Currently in use
Building 42	55	Diesel fuel	Steel	None-inspected weekly	Currently in use
Test cells	750	Acid	Fiberglass	Secondary containment	Currently in use
Test cells	750	Acid	Fiberglass	Secondary containment	Currently in use
Test cells	750	Caustic	Fiberglass	Secondary containment	Currently in use
D/26 (Building 90)		Heat transfer fluid (non PCB)	Steel	Secondary containment	Currently in use
D/27		Heat transfer fluid (non PCB)	Steel	Secondary containment	Currently in use

Source: Mast, 1987b.

necessary to respond to spill emergencies, implementing spill containment and countermeasures, and disposing of the spilled materials. A brief summary of spill events that have occurred at KCP is maintained (KCP, 1961-1986).

The KCP spill response system was evaluated during the Environmental Survey. In general, the Spill Control Plan implemented by KCP appears to be adequate. KCP spill response practices and capabilities are consistent with commonly accepted spill-response procedures: however, a formal system of documenting spill events and any subsequent remedial or preventive measures have not been implemented.

4.2.1.3 Polychlorinated Biphenyls (PCBs)

KCP uses electrical equipment and heat transfer systems that contain fluids which are contaminated with polychlorinated biphenyls (PCBs). In addition, the plant maintains storage facilities for PCB and PCB-contaminated fluids awaiting disposal or re-use. PCBs are disposed off-site through EPA-licensed commercial contractors.

Table 4-10 summarizes the status of PCBs at KCP as of December 31, 1985. This information was derived from the KCP 1985 PCB annual report (KCP, 1986a). At the time of the Environmental Survey, 62 ground- or floor-mounted in-service transformers at KCP contained PCBs. Sixty-one of the 62 in-service KCP PCB transformers contained pure PCB fluid. The remaining transformer at Substation 18 (north end of Building 57) contained mineral oil with a PCB content of 1,600 ppm. Since all transformers with a PCB content of 500 ppm or greater are considered by EPA to be PCB transformers, the transformer at Substation 18 was also classified as a PCB transformer.

There are other ground- or floor-mounted transformers at KCP, but these are "dry" transformers that do not contain oils. In addition to the ground- or floor-mounted transformers, KCP is responsible for approximately 20 pole-mounted transformers. The pole-mounted transformers are tested for PCB content only when they must be repaired (a rare event) and, therefore, the PCB content of all pole-mounted transformers at KCP is not known. However, all pole-mounted transformers were originally specified as non-PCB transformers, and when one pole-mounted transformer at KCP was recently tested during repairs, the PCB content was found to be 3 ppm (Gilmore, 1987). KCP submitted a budget line item request for FY1989 covering the replacement of all PCB transformers on-site which was not funded. However, some of the PCB transformers at the site will be removed, and new non-PCB transformers purchased, with funds budgeted for general equipment maintenance or replacement.

TABLE 4-10

SUMMARY OF PCB ITEMS IN-SERVICE, STORED ON-SITE OR DISPOSED IN CY 1985 KANSAS CITY PLANT, KANSAS CITY, MISSOURI

PCB Item	In-Service		On-Site Storage		Disposal	
	Number	Weight(a)	Number	Weight	Number	Shipping Weight(b)
PCBs/PCB items in containers(c)			194	29,462	1,384	302,704
Transformers	62	146,427			8	15,461
Switches	31	8,781				
Large capacitors	474	29,131				
Miscellaneous equipment(d)			6	6,469	55	27,651
Bulk Liquids					23,663 gallons	86,091
Bulk Solids				15,121		3,751
Contaminated debris from D/27 demolition						1,051,866
Contaminated soil from the North Lagoon						9,056,376

Source: Adapted from KCP, 1986a.

(a) Total weight of PCBs, in kilograms.
(b) Total shipping weight of the items disposed, in kilograms.
(c) PCBs are fluids containing 500 ppm or greater PCBs. PCB items are PCB articles, PCB containers, PCB article containers, or PCB equipment that deliberately or unintentionally contain PCBs.
(d) Transformer cooling tubes, heat exchangers, molds, press platens, etc.

As of May 1, 1986, KCP maintained 77 capacitor banks, each of which contained 10.2 gallons of 100 percent PCB fluid. At the time of the Environmental Survey, 10 of these capacitor banks had been taken out of service and disposed. KCP personnel indicated that all PCB capacitors would be replaced during FY1987 (Gilmore, 1987). Other electrical equipment known to contain small amounts of PCB include light fixture ballasts and electrical power cables that contain paper impregnated with PCBs (Gilmore, 1987).

The Utilities Engineering Department of KCP is responsible for the inspection and maintenance of all PCB electrical equipment. All PCB transformers and switches are inspected weekly for fluid leaks, various operating parameters, and general condition of the substation. A more detailed inspection, as well as preventive maintenance, is performed quarterly. KCP inspection records were reviewed during the Environmental Survey, and no deficiencies or discrepancies were noted. All PCB electrical equipment that was inspected during the Environmental Survey was properly labeled and did not show evidence of current or previous leaks. With few exceptions, the PCB transformers at KCP have been diked to contain PCB spills, and drip pans are placed under all valves.

Departments 26 and 27 are equipped with heat transfer systems that service various high temperature, hydraulic press, molding operations. These heat transfer systems consist of above-ground piping, reservoir tanks, and pumps located both within and outside the main building. The D/26 system has a fluid capacity of 6,500 gallons, whereas 7,400 gallons are contained in the D/27 heat transfer system. A much smaller heat transfer system (125 gallons) is located in Building 15. When these three systems were constructed and operated in the late 1960s and early 1970s, the heat transfer fluid (Therminol FR-1) was essentially pure PCB.

In 1974, all three systems were drained to the extent possible (about 90 percent of the fluid was removed) and refilled with non-PCB fluid (Therminol 55). The D/26 and D/27 systems were subsequently tested and found to contain approximately 100,000 and 150,000 ppm of PCBs, respectively (Ramirez, 1987b). This draining and refilling process was repeated several times between 1974 and 1979 until the D/26 and D/27 systems contained less than 50 ppm PCB. However, when testing was conducted in 1981, the systems were again found to contain PCB concentrations as high as 72 ppm. (This increase in PCB content may be attributed to the leaching of PCBs from porous materials inside the heat transfer systems.) Consequently each system was drained and refilled on at least one additional occasion. When last tested (in April 1983) both heat transfer systems contained less than 50 ppm PCB. (The primary material in the heat transfer systems is now a PCB-free heat transfer fluid with the trade name Therminol 66.) The EPA regulations permit owners of heat transfer systems to discontinue testing when testing reveals that the PCB content of the fluid is less than 50 ppm. No further testing of the systems is anticipated by KCP.

New, non-PCB heat transfer systems are being constructed in both D/26 and D/27. Individual presses in D/26 are being connected to the non-PCB system as production schedules and the progress of the installation of the non-PCB systems allow. However, at the time of the Environmental Survey, none of the D/27 presses had been converted to the non-PCB heat transfer system. Total conversion in both departments is not anticipated until 1990.

The 125-gallon heat transfer system, which serves the resin pilot plant in Building 15, was also drained in 1975 and refilled with non-PCB fluids. This system has not been drained and refilled as often as the D/26 and D/27 systems. However, according to plant personnel, when last tested (approximately 1983) the pilot plant heat transfer system also contained less than 50 ppm PCB. (Ramirez, 1987b). For the reason cited above, no further testing of the building's heat transfer system for PCB content is planned by KCP.

The KCP Waste Management Department is responsible for the transport, storage, and disposal of waste PCBs. A formal internal procedure covering these activities has been developed and implemented (KCP, 1983). Operating units requesting transport of waste PCBs (liquids or solids) must contact Waste Management to receive approved containers and complete appropriate forms. A clarifier located in Building 59 is used to separate oils containing trace amounts of PCBs from water. These oily waters are primarily rainwaters that are collected from sumps and pits throughout the plant. Treated waters are discharged to the South Lagoon while the oil is disposed as PCB waste. No other treatment of waste PCBs is performed at KCP.

Waste PCB materials are stored at three locations: the Demolition Lot, Test Cells, and the New Tank Farm (see Figure 4-1). The Demolition Lot is a curbed, concrete, partially covered site that serves as a staging area for PCB wastes that originate from the construction of the new (and demolition of the old) heat transfer systems in D/26 and D/27. The facility is well-maintained, and there was no evidence of leaking containers or past spills.

One of the Test Cells (concrete vaults previously used by Pratt-Whitney to test aircraft engines and subsequently modified by KCP) are used to store both PCB wastes and PCB dielectric fluids used to "top-off" PCB transformers and switches. This Test Cell (No. 4) was inspected during the Environmental Survey. It was diked with a concrete floor and an adequate roof and walls to prevent rainwater from reaching stored items, and was properly marked with signs. No evidence of past spills was observed.

One of the above-ground tanks in the new tank farm is used to store bulk PCB liquids awaiting disposal. Waste Management personnel are required to test each container of waste liquid PCBs transported to the department. During this testing, drums of liquid wastes suspected of containing PCBs are stored at the Demolition Lot. After the results of testing are received, the individual containers are grouped according to PCB content (i.e., greater than 500 ppm versus less than 500 ppm) prior to transfer to the bulk storage tank. Since the bulk of the liquid wastes at KCP contain less than 500 ppm PCB, containers of waste liquids with a PCB content greater than 500 ppm are accumulated until there is a sufficient volume of the higher concentration waste to fill the bulk storage tanks and subsequently be disposed. Secondary containment has been constructed for the waste liquid PCB bulk storage tank.

No disposal of PCBs takes place at KCP. All disposal is through licensed disposal contractors at off-site locations. KCP has current contracts with Chemical Waste Management, Emelle, Alabama (for disposal of PCB capacitors by incineration); Envirosafe Services, Grandview, Idaho (for landfill disposal of PCB solids); and SCA Chemical Services, Chicago, Illinois (for incineration of PCB wastes). KCP has developed a formal procedure for qualifying disposal contractors, which, in brief, consists of financial background checks, a questionnaire, site visits, a visit to state agencies, telephone conversations with the appropriate EPA regional office personnel, and a final report. Once a disposal site has been approved, reviews are conducted annually. Shipments of PCB wastes to the disposal contractor is via an independent carrier. Signed manifests are returned to KCP and become part of a permanent file developed for all shipments. A master logbook of all PCB waste shipments is maintained in the Waste Management Department offices.

A detailed discussion of KCP waste management practices, including PCB wastes, is presented in Section 4.1 of this document. It should also be noted that the PCB regulations adopted by EPA under the Toxic Substances Control Act (40 CFR 761) specifically require that PCB wastes consigned for disposal be stored in areas located above the 100-year floodplain elevation. As discussed in the Waste Management section of this report (Section 4.1), most of the KCP (including the Demolition Lot, Test Cells and New Tank Farm) lies below the 100-year floodplain elevation.

It is well-documented that PCBs from the KCP electrical equipment and heat transfer systems have been released to the environment. Although records of spill incidents prior to 1969 are scanty, the Kansas City Area Office estimated that 73 gallons of Therminol FR-1 (highly concentrated PCB liquid) were lost to the environment before 1969 (Bulcock, 1976). In November of 1969, approximately 1,500 gallons of Therminol FR-1 were released to a gravel and soil area and an additional estimated 900 gallons of Therminol FR-1 were lost to Indian Creek via the storm sewer system leading to outfall 002. These releases occurred as a result of an expansion joint failure in the D/26 heat transfer system. A PCB transformer at Substation 18 (located north of Building 57) is also reported to have released PCBs to the storm sewer system sometime between 1959 and 1970 (Korte et al., 1986). In the early to mid-1970s, several spills from the D/26 and D/27 heat transfer systems resulted in additional releases of PCBs to the storm sewer systems totaling approximately 70 gallons (Korte et al., 1986, and KCP, 1961-86). During this same period, soils in these areas were also extensively contaminated with PCBs as the result of the release of more than 1,000 gallons of heat transfer fluids. By 1975 all three heat transfer systems (D/26, D/27, and resin pilot plant) had been drained at least once and refilled with Therminol 66 (non-PCB). Plant records indicate that in September 1975, 300-400 gallons of Therminol 66 (the particular system is not specified) were released when a seal on a cold-return-line pump leaked. Although these accounts do not specify the PCB content of the fluid that was spilled, the level of PCB contamination in the systems during this timeframe varied between 10,000 and 150,000 ppm. At least a portion of the 300-400 gallon spill was eventually discharged to the wastewater lagoons, but soils most likely were also affected (KCP, 1961-1986). By 1979, the PCB contamination in the heat transfer systems had been reduced to 40-90 ppm, when a 180 gallon spill from the D/26 system occurred in January 1979. Several other minor spills have taken place since 1979, the most recent recorded in December 1985.

PCB fluids were also released inside D/26 and D/27. These releases occurred during mold changes. When the molds were subsequently heated to operating temperature (up to 400°F), an oily fume was generated. The production of oily fume during mold heating continues at the present time and was observed during the Environmental Survey. Local exhaust recirculating units that contain charcoal filters are operated in each of the D/26 and D/27 work areas. Nevertheless, at least a portion of the oily fume generated by routine operations is (and was) carried into the ductwork and equipment of the roof-mounted heating, ventilation and air conditioning (HVAC) units for D/26 and D/27. Wipe samples collected from various locations in the D/26 and D/27 HVAC systems, including the D/27 return air plenum and the HVAC system fans and chiller coils, have revealed PCB surface contamination levels ranging from nondetectable to approximately 4,500 micrograms per 100 square centimeters ($\mu g/100\ cm^2$) of surface area (Vyhanek, 1987). Guidance recently published by EPA indicates that such surface contamination should not exceed 10-100 $\mu g/100\ cm^2$ (depending upon the type of surface) (EPA, 1987a). Consequently, the HVAC equipment that serves D/26 and D/27 is regarded by KCP as contaminated with PCBs.

PCBs present in the D/26 and D/27 HVAC systems as the result of the generation of oily fume may also have been released (and possibly currently are escaping) to the environment. Chiller coil condensate (the surface of the coils is known to be contaminated with PCBs) that was previously discharged to the roof drains (and eventually entered the storm sewer system) is now diverted to the industrial sewer and South Lagoon. In addition, the PCBs in the HVAC units may also have been released (and perhaps currently are being released, albeit in small quantities) to the air and building roof via the HVAC exhaust fans. Rainwater runoff from the roof could thus contribute to the PCB contamination currently known to be present in the South Lagoon effluent.

A fire occurred in a section of the HVAC ductwork located in the D/27 return air plenum on June 14, 1985. This fire started when a contractor attempted to use a torch to cut the bolts from the frame for the HVAC fan motor in order to effect repairs. Smoke from this fire, which lasted approximately 7 minutes, filled the D/27 return air plenum and also quickly spread to the production rooms in D/27 served by this particular section of ductwork (i.e., Rooms 10, 11, and 28).

Dioxins and dibenzofurans may be formed during combustion of PCBs. According to KCP fire department reports, an oily material on the interior surface of the ductwork caught fire. Since it has been documented that PCB surface contamination is present inside the HVAC systems, it is possible that dioxins and dibenzofurans may have been formed during this fire and carried throughout the return air plenum and rooms 10, 11, and 28 by the smoke from the fire. According to KCP personnel, the production rooms were subsequently washed at least once using a strong detergent. However, little cleaning was performed in the return air plenum, and no sampling and analysis of these areas for dioxins and dibenzofurans was conducted by KCP personnel prior to the Environmental Survey. As a result, it was possible that plant and contractor personnel who entered these areas to perform maintenance, inspection, or routine production tasks had the potential to come into contact with dioxins and dibenzofurans. Therefore, sampling and analysis of the D/27 air plenum and production areas for dioxins and dibenzofurans was proposed as part of the Environmental Survey. Subsequent to the on-site portion of the Environmental Survey, KCP did conduct sampling and analysis for dioxins and dibenzofurans in the D/27 air plenum and room 10 (Jennings, 1987). Samples were collected by KCP personnel and analyzed by Midwest Research Institute (Stanley, 1987). The data obtained were reviewed by a consultant at Kansas University Medical Center, who concluded that "an unacceptable toxic hazard" did not exist (Rozman, 1987). However, due to potential data quality assurance concerns, the Environmental Survey team determined that additional sampling and analysis of the D/27 and production areas for dioxins and dibenzofurans as part of the Environmental Survey would also be necessary (Gerlach, 1987). These samples were collected in September 1987; results were not available at the time this report was prepared.

The release of PCB and PCB-contaminated fluids from KCP electrical and heat transfer equipment and from other sources (e.g, rainwater) has resulted in widespread PCB contamination of the KCP site and releases of PCBs to the environment. PCB contamination has been detected in soils at various locations, in the storm sewer system and associated outfalls, in the industrial wastewater system (including the North and South Lagoons), and in the sanitary sewer system.

Interviews with former and current employees have been conducted to identify all known areas of PCB soil contamination. In addition to the spills in the D/26 and D/27 areas described above, these interviews have revealed that it was common practice in the past to dump rainwaters contaminated with PCBs in an area west of the lagoons. Spills of PCBs and hydraulic oils in an area east of the D/182 barrel lot were also reported. However, recent surface soils investigations in these areas yielded levels of PCB contamination well below 50 ppm (Korte, et al., 1986). In contrast, high levels (up to 7,000 ppm PCBs) have been detected in soils adjacent to D/26 (Korte et al., 1986) and D/27 (Fleischhauer et al., 1986). In the past, when the areas outside the KCP buildings were not paved to the extent currently seen at the plant, these soils contaminated with PCBs could be readily transported to the storm sewer system by rainwaters during storm events. Consequently, the amount of PCB-contaminated soils that currently enter the storm system as a result of storm-water runoff most likely is greatly reduced compared to discharges that occurred in the past. Nevertheless, it is a pathway that currently cannot be excluded. In addition to past, and perhaps ongoing contamination of the storm sewer system with PCBs from soils in storm water runoff, as noted above, direct releases of PCB fluids to the storm sewer system have been well documented. PCB contamination of the storm sewer system has resulted in the detection of PCB concentrations in the 001 and 002 outfalls (see Section 3.3.3). In 1986, the average PCB concentration detected at the 001 and 002 outfalls was 0.5 and 0.9 parts per billion, respectively.

PCBs have also been detected in the industrial wastewater sewer system. In the past, the industrial wastewaters, which consisted of rinsewater from various processes, flows from floor drains located in various operating areas and treated cooling waters were directed to the North Lagoon. Sampling and analysis of the sediments of the now inactive North Lagoon revealed PCB concentrations as high as 290 ppm (Fleischhauer et al., 1986). The South Lagoon was constructed in 1977 and is currently in service. The South Lagoon receives wastewaters previously discharged to the North Lagoon, as well as rainwaters that may be contaminated with PCBs. However, in contrast to the North Lagoon, when sampling of the South Lagoon sediments was recently conducted, the highest PCB concentration detected was 1 ppm (See Table 4-3 in Section 4.1.2.1), and the average PCB concentration detected in the South Lagoon effluent in 1986 was 0.6 parts per billion.

At KCP, the industrial and sanitary sewer systems combine prior to discharge to the Kansas City, Missouri, publicly owned treatment works (POTW). Although the source has not been identified, the average PCB concentration detected in the KCP sanitary sewer system during 1986 was an order of magnitude higher (7.8 ppb) than either the storm sewer system outfalls or the industrial sewer system (South Lagoon effluent). The presence of PCBs in the storm sewer system outfalls is an ongoing regulatory concern of the State of Missouri. As evidenced by the data shown in Table 4-11, about 90 percent of the PCBs currently being released from KCP are discharged to the POTW.

In summary, past and current plant operations have resulted in the release of PCBs both on-site and off-site. In the past, the PCB content of the fluid in the heat transfer systems was much greater, work practices and controls were not as restrictive, and concerns related to PCBs were not as prominent. As best as can be determined, releases of PCBs in the past were more frequent and of a greater magnitude. However, minute quantities of PCBs continue to be released off-site via 001 and 002 outfalls and the South Lagoon (and possibly the ambient air), with relatively higher releases occurring from the sanitary sewer system. These releases are the subject of on-going KCP investigation. Section 3.2 and Section 3.3 provide additional discussions of PCBs in soils and surface water, respectively. Section 4.5 includes discussions of inactive waste disposal sites and releases involving PCBs.

4.2.1.4 Pesticides

Pesticides are applied at KCP by both plant personnel and contractors. KCP personnel use herbicides for weed control, whereas contractors are responsible for application of pesticides to control pigeons, starlings, roaches, and spraying trees. No restricted-use pesticides are used by KCP, but one contractor applies Dursban (chlorpyrifos) to control roaches in the cafeteria. A listing of the pesticides that were approved for use by the KCP Environmental Services Department in FY1986 is shown in Table 4-12. The approved list is updated periodically to reflect changes in EPA regulations and/or the restricted-use status of particular pesticides.

KCP has developed a standard operating procedure for applying and disposing of non-restricted use pesticides (KCP, 1986b). This procedure includes requirements for notifying the KCP Environmental Services Department prior to applying pesticides, assuring that employees applying pesticides have received medical screening and training, the use of proper personal protective equipment and disposal of empty pesticide containers. The procedure is also consistent with the requirements of 40 CFR 165, "Recommended Procedures for the Disposal of Pesticide Containers and Residues."

Both contractor and KCP personnel who apply pesticides must complete Form KCD-2090 (Report of Pesticide Application) whenever an application is completed. These reports are tabulated at the end of the year to determine the total amount of pesticides applied at the site annually. Table 4-13 is a summary of pesticide usage at KCP during FY1986. This listing does not include any pesticides applied using spray cans available in retail stores.

TABLE 4-11

RELEASES OF PCBs
KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Sewer System	PCB Concentration(1)	Flow(2)
Storm		
001 Outfall	0.5	1.93
002 Outfall	0.9	5.68
Industrial		
South Lagoon Effluent	0.6	1.66
Sanitary(3)	7.8	6.46

Source: Environmental Survey team, 1987. Adapted from KCP sewer systems monitoring data.

(1) Average PCB concentration, in parts per billion, during CY 1986.
(2) Million liters per day.
(3) Sanitary sewer system data includes flow from south lagoon.

TABLE 4-12

PESTICIDES APPROVED FOR USE AT BKCD DURING 1986
KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Pesticide	EPA Regulation No.
Ammonium Sulfonate	1270-119-AA
Avitrol	11649-7
Baygon	3125-24-ZA/499-157-ZA
Diazinon 2D	100-445
Diazinon 4E	100-463-AA
Dursban(1)	464-476
Malathion	148-265
Orthene	239-2493-AA
Quell	3837-28-259
Simazine	100-436-2B
Trimec Broadleaf	2217-543
ULDBP 100 (pyrethrin)	11540-9
Vapona	6720-200-AA/499-182-ZA
Warfarin	5882-1
Weed-Wilt	259-6

Source: Environmental Survey team, 1987. Modified from Operating Procedure 835, "Control and Use of Pesticides."

(1) Dursban is a trade name for a pesticide known as chlorpyrifos, which is classified as a Restricted Use pesticide by EPA. Restricted Use pesticides must be applied by (or under the direction of) a qualified pesticide applicator and are not intended for use by the general public.

TABLE 4-13

PESTICIDE USAGE DURING 1986
KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Pesticide	Target Applications	No. of Applications	Dose Rate
Orthene	Roaches	91	1%
Dursban	Roaches	6	1%
Avitrol	Pigeons/Starlings	11	up to 10%
ULDBP 100	Roaches	3	0.5%
Quell	Weeds	1	9/1 dilution

Source: Environmental Survey team, 1987. Summarized from the Reports of Pesticide Applications (KCD-2090) filed for FY 1986.

All pesticides used at KCP are presently stored in locked cabinets in an area adjoining the barrel wash station in the Waste Management Department. However, future plans call for the relocation of the pesticide storage cabinets to an approved chemical storage location in the Chemical Stores Area (Heacock, 1987). The present storage location was inspected during the Environmental Survey, and no evidence of spills or leaking containers was observed.

Pesticides are mixed in the barrel wash area, where all drains lead to the industrial wastewater system and eventually the South Lagoon and the Kansas City, Missouri, publicy owned treatment works. According to KCP personnel, it is not necessary to dispose of pesticide container rinsewaters, since all water used for such purposes is used in mixing the pesticide for the application. Empty pesticide containers are disposed at the Envirosafe Services landfill in Grandview, Idaho, which is an EPA-approved, hazardous waste landfill.

4.2.1.5 Asbestos

The KCP Environmental Services Department oversees the management of asbestos-containing materials at KCP. The Facilities Engineering and Facilities Maintenance Departments also participate in this process, and a committee composed of the managers of these three departments is jointly responsible for all decisions regarding final disposition of asbestos-containing materials. This particular system has been in existence since the beginning of FY1986.

In general, the three departments are required to identify all sources of friable asbestos (deteriorating or damaged to the extent that asbestos fibers may be released to the environment) at KCP. In addition, they are expected to evaluate and prioritize the need for abatement (removal, encapsulation, or operations and maintenance planning), perform necessary abatement, and ensure the protection of KCP personnel during the abatement.

Facilities Engineering determines the procedures by which asbestos-containing materials are to be abated, and Facilities Maintenance personnel conduct the particular type of abatement required. Facilities Maintenance Internal Procedure No. 227 (KCP, 1986c) defines the work practices covering maintenance work where asbestos-containing materials may be encountered. Facilities Engineering Internal Procedure 9-5 (KCP, 1986d) addresses asbestos abatement activities performed by both contractor and Facilities Maintenance personnel, and establishes asbestos testing and reporting requirements.

An inventory of the location, condition, and amount of asbestos-containing materials at KCP has not been compiled. However, KCP personnel indicated that KCP is in the process of soliciting a contractor to perform such an inventory. It is known that, with the exception of Buildings 92, 96 and 97, asbestos-containing materials are present in all KCP buildings, a situation not uncommon to facilities constructed in the 1940s. Some of these asbestos-containing materials are in various states of deterioration and potentially friable; however, discussions with appropriate KCP personnel and review of available records indicate that KCP attempts to respond to such situations as soon as they are identified.

As stipulated by the National Emission Standard for Hazardous Air Pollutants (NESHAPs) for asbestos, the Facilities Engineering Department notifies the local agency responsible for enforcing the NESHAPs Asbestos Standard (the Air Quality Section of the Kansas City Health Department) prior to initiating any removal or demolition projects involving asbestos. A memo advising of such projects is sent to the Facilities Branch of the DOE-KCAO, which in turn is responsible for notifying the Health Department. Facilities Maintenance provides an annual summary of asbestos removal work performed in conjunction with small-scale renovation projects.

The receipt, storage, and disposal of waste asbestos materials is the responsibility of the KCP Waste Management Department. An internal procedure covering these activities (KCP, 1984b) has been adopted. All asbestos waste must be properly labeled and maintained in a wet state. The landfill is notified prior to each shipment of asbestos-containing waste.

No disposal of asbestos-containing wastes occurs at KCP. Presently, such wastes are sent to the Johnson County landfill, which has been used for this purpose by KCP since April 1984. Approximately 50 cubic yards of waste per month is disposed. KCP Waste Management personnel toured this facility in 1986 and found the operation (which is permitted to accept asbestos wastes) to be acceptable. Previously, asbestos wastes were disposed at Southeast Landfill, Kansas City, Missouri, (October 1983 to April 1984) and U.S. Pollution Control, Inc., landfill in Waynoka, Oklahoma (April 1981 to October 1983). Prior to 1981, the disposal of asbestos-containing wastes was not controlled. Asbestos wastes were not segregated from non-asbestos wastes, and these materials were disposed at the local landfill under contract at the time.

4.2.1.6 Chlorofluoroalkanes

The only chlorofluoroalkane used in appreciable quantities at KCP is dichlorodifluoromethane. The primary use of this material is as a refrigerant in air conditioning systems. KCP purchases dichlorodifluoromethane, primarily in 55-gallon drums that are stored until needed in Building 74, the New Chemical Storage Building. As discussed previously, this facility provides compatible storage conditions and adequate spill containment for all materials stored therein. As determined by observation of the storage facilities for chlorofluoroalkanes at KCP, interviews with appropriate KCP personnel and a review of the purchasing, disposal, and handling procedures utilized for toxic/hazardous materials, the storage, handling, use, and storage of chlorofluoroalkanes at KCP appear to be proper.

4.2.2 Environmental Monitoring Program

Sampling and analysis for PCBs in various media is performed regularly in conjunction with the NPDES and other compliance programs. There is no special environmental monitoring program in existence for other toxic chemicals at KCP; rather, such analyses are incorporated into the overall site environmental monitoring programs for air, surface water, groundwater, and soil described previously in Section 3.0.

4.2.3 Findings and Observations

4.2.3.1 Category I

None.

4.2.3.2 Category II

1. Potential Dioxin and Dibenzofuran Contamination of D/27 Air Plenum and Production Areas. The Department 27 air plenum and production areas may be contaminated with dioxins and dibenzofurans as a result of a June 1985 fire that occurred in a supply ventilation duct known to be contaminated with PCB oils on the interior surface.

   Dioxins and dibenzofurans may be formed during combustion of PCBs, and it is known that smoke from the fire spread throughout the D/27 air plenum and production areas, particularly Rooms 10, 11, and 28. Although the production areas were subsequently cleaned, KCP had not conducted sampling and analysis for dioxins and dibenzofurans in the air plenum or production areas prior to the Environmental Survey. However, after the on-site portion of the Environmental Survey, KCP did perform such sampling and analysis of the D/27 air plenum and Room 10. Nevertheless, due to concerns regarding the quality of the data obtained from these studies, the Environmental Survey team independently collected samples in these areas to determine whether or not personnel entering these areas have the potential to come into contact with dioxins and dibenzofurans.

Wipe and/or bulk samples were collected in the D/27 air plenum and production areas. These will be analyzed for dioxins and dibenzofurans. Results obtained will be compared to the maximum surface contamination levels for these compounds recommended by EPA (EPA, 1987a and EPA, 1987b).

4.2.3.3 Category III

1. Release of PCBs to the Environment. Widespread contamination of the Kansas City Plant with polychlorinated biphenyls (PCBs) has resulted in the release of PCBs to the on-site and off-site environment. Such off-site releases may be attributed primarily to past operations and practices; however, on-site discharges of PCBs continue at the present time via the storm sewer, industrial wastewater, and sanitary sewer systems.

In the 1960s and 1970s, spills from the D/26 and D/27 heat transfer systems, which contained high concentrations of PCBs, directly contaminated the storm sewers, soils, and work locations in these areas. A PCB transformer located adjacent to the D/26 area is also known to have leaked to the storm sewer during this time period. In addition, storm water runoff contaminated with PCBs as a result of contact with PCB-contaminated soils and/or exterior building surfaces most likely also contributed to PCB contamination of the storm sewer system.

In the past, PCB-contaminated rainwaters and, on some occasions, spills of PCB fluids, were discharged to the North and South Lagoons. The North Lagoon has been closed and the sediments removed. However, the plant is currently discharging rainwaters potentially contaminated with PCBs to the South Lagoon, and PCBs have been detected in the South Lagoon effluent in the past year.

The South Lagoon effluent combines with the sanitary sewer system effluent prior to discharge to the Kansas City, Missouri, POTW. Sampling and analysis of the sanitary sewer system at points both prior to and after combination with the South Lagoon effluent have revealed that the average PCB contamination in the sanitary sewer system is an order of magnitude greater than the average concentration detected at the 001 or 002 outfalls or at the South Lagoon effluent (see Table 4-11). The source (or sources) of the PCB contamination detected in the sanitary sewer system is unknown at this time.

KCP has implemented policies and procedures designed to reduce the release of PCBs on-site. Heat transfer systems have been drained on several occasions, and when last tested

(April 1983), all systems contained less than 50 ppm PCB. In addition, waste management practices have been upgraded to comply with (and in some instances exceed) applicable regulations. Nevertheless, within the past year, on several occasions, PCBs have been detected in concentrations above the allowable limit (0 ppb) in storm sewer system outfalls 001 and 002. Furthermore, although the South Lagoon and sanitary sewer effluents are not currently regulated with respect to PCB discharges as stringently as the NPDES outfalls, the average PCB concentrations during the past year in the sanitary sewer effluent were 10-fold higher than the outfalls.

In summary, past and current plant operations have resulted in the release of PCBs off-site via 001 and 002 outfalls and the South Lagoon and sanitary sewer effluents. Although these releases are the subject of on-going investigation, final resolution is not expected in the near future. No sampling and analysis will be performed by the Environmental Survey team in connection with this finding.

2. Friable Asbestos-Containing Materials at KCP. Some asbestos-containing materials at KCP are friable and may be releasing asbestos fibers to the environment.

With the exception of Buildings 92, 96, and 97, asbestos-containing materials may be found throughout KCP. Some of these materials are friable (i.e., damaged or deteriorated to the extent that they could potentially be releasing asbestos fibers to the environment). Although this situation is not uncommon to buildings constructed in the 1940s, and KCP has an established program for dealing with asbestos-containing materials once identified, a formal inventory of friable and non-friable asbestos-containing materials has not been compiled.

4.2.3.4 Category IV

None.

4.3 Radiation

4.3.1 Background Information

The background radiation in the vicinity of KCP is a consequence of both natural and man-made sources. These sources include cosmic radiation, natural radioactive materials in the soil and building materials, fallout from past atmospheric weapons detonations, releases of radioactive materials from nuclear power plants and other facilities handling radioactive materials, and the intake of radioactive materials in food, drinking water, and air. The most significant exposure is that to the lungs from background levels of radon. The annual, average, effective dose equivalent for natural background in the United States is approximately 190 mrem/yr (FR, 1986); this dose is detailed in Table 4-14. About one-half of the dose equivalent is attributable to the inhalation of radon-222 and its decay products; the other half is direct exposure, primarily gamma radiation. The EPA reports the direct gamma radiation exposure rates for communities throughout the United States on a quarterly basis. During the period July-September 1986, EPA reported measured gamma exposure rates that were equivalent to annual doses of between a high of 160 ± 9 mrem (exposure rate of 18 microR/hr) in Montpelier, Vermont, and a low of 40 ± 4 mrem (exposure rate of 8 microR/hr) in Harrisburg, Pennsylvania (EPA, 1986). The EPA monitoring points nearest, the Kansas City Plant are in Oklahoma City, Oklahoma, and Chicago, Illinois. The exposure rates measured for the July-September 1986 period for the two cities, were equivalent to annual doses of 77 ± 2 mrem (exposure rate of 8.8 microR/hr) and 85 ± 2 millirem (exposure rate of 9.7 microR/hr), respectively. KCP does not process or machine any radioactive materials, nor handle any such materials except as sealed sources or activated (i.e., made radioactive by irradiation with high energy particles) components. Consequently, KCP is not likely to contribute measurably to the radiation levels in the Kansas City vicinity.

4.3.2 General Description of Pollution Sources/Controls

The KCP does not currently machine or process any radioactive materials, or handle any such materials other than as sealed radioactive sources, activated components, and spent electron tubes from X-ray machines. Consequently, there are no effluent or process streams at KCP that will contain radioactive materials. Small amounts of solid radioactive wastes are generated as KCP disposes of these items. The handling and disposal of radioactive wastes at KCP is discussed in Section 4.1. Neutron generators and high-energy x-ray units are used for the testing and inspection of electronic components and machined parts. Specific uses of radioactive sources and ionizing radiation equipment are discussed below in more greater detail.

<u>Low-level Radioactivity in Department 20, Inspection Area</u> - In the late 1950s and early 1960s, a section of the Heavy Machining Area [currently part of Department 20 (D/20] was used for the machining and inspection of depleted uranium parts. These activities resulted in fixed uranium contamination in excess of the criteria established by the Nuclear Regulatory Commission (NRC) and the American National Standards Institute (ANSI) (NRC Regulatory Guide 1.86, ANSI N13.12) for the

TABLE 4-14

AVERAGE U.S. ANNUAL EFFECTIVE DOSE EQUIVALENT TO HUMANS FROM NATURAL BACKGROUND RADIATION

Organ	Annual Effective Dose Equivalent (mrem)
Gonads	24
Breast	14
Lung (Total)	100
Red Bone Marrow	13
Bone Surfaces	6
Thyroid	3
Other	29
Total	189

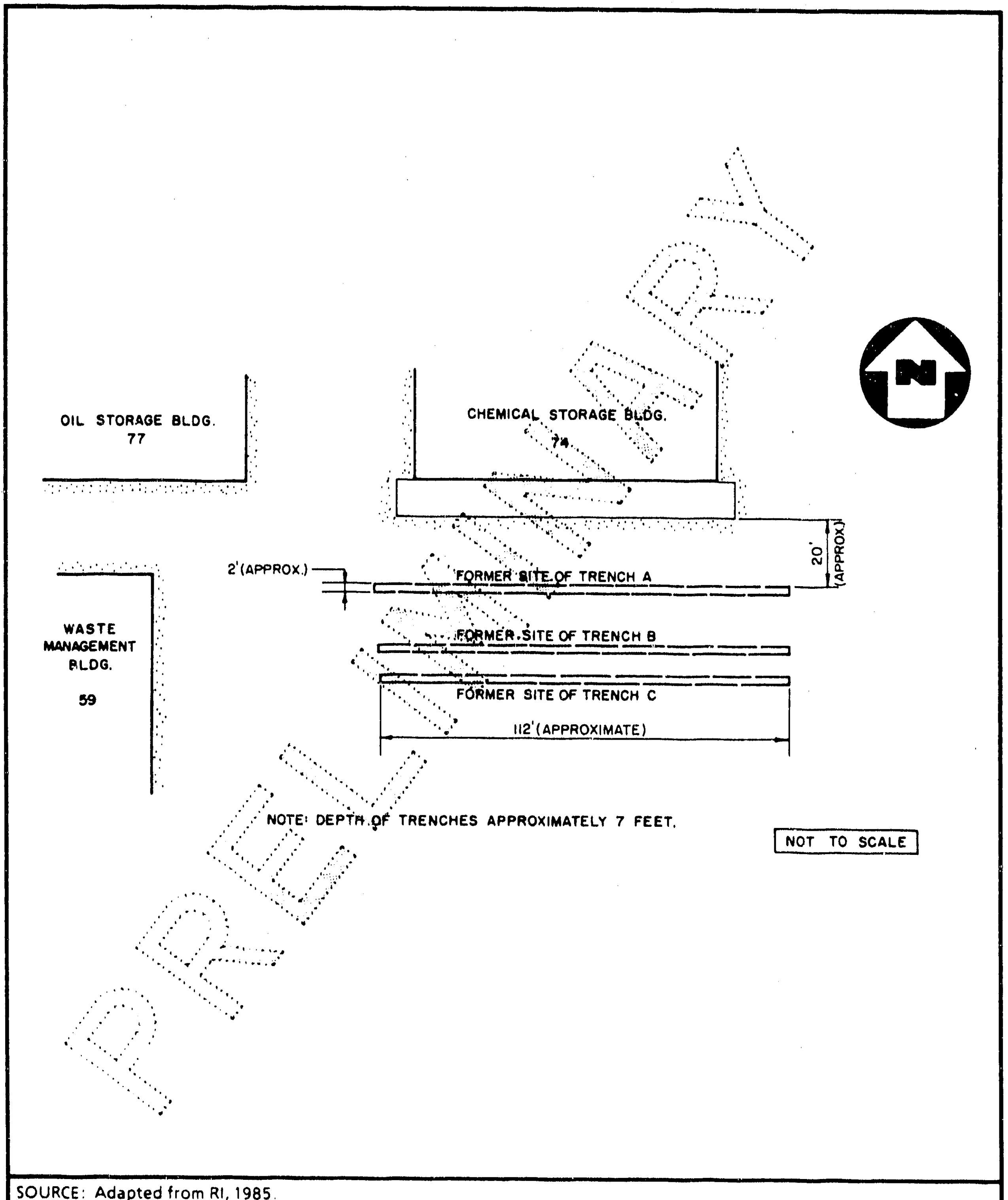
Source: 52 FR 34836, 1986.

unrestricted release of facilities or equipment. The significance of this contamination is that its removal would be necessary, should DOE choose to discontinue operations at KCP and release the facility for use without restrictions. In the early 1960s, material from these operations, possibly containing or contaminated with depleted uranium, was reported to have been buried in three classified burial trenches to the east side of the main manufacturing building (Figure 4-2).

In May of 1984, a project was initiated to remove radioactive materials from the trenches and the Heavy Machining Area (RI, 1985). The DOE Kansas City Area Office contacted the Rockwell International Rocky Flats Division for advice on approaches to remediation, and for implementation support, because of the latter's experience with radioactive materials and decontamination activities.

As part of the remediation project, a Phase I survey of the suspected trench site was conducted between May 29 and June 1, 1984. The purpose of the survey was to accurately locate the waste trenches and measure the levels of radioactive contamination in both the trenches and the manufacturing building. The trench locations were positively identified and contamination detected in the machining area. All of the contamination detected in the machining area was fixed in-place (i.e., not readily removable or dispersable), of very low levels, and considered to present no radiation risk to personnel (RI, 1985). Most fixed contamination lay in surface cracks, concrete inserts, flood drains that led to a sump, and an area surrounding a separator/sump. Levels of fixed contamination ranged from 300 to 600 disintegrations per minute per 100 square centimeters (d/m/100 cm^2) beta activity around cracks to 100,000 to 500,000 d/m/100 cm^2 beta activity around floor drains and the sump. The ANSI and NRC acceptance criteria for the unrestricted release of contaminated facilities or equipment are shown in Table 4-15. Also included in the table are administrative limits established by KCP. The maximum observed contamination levels were as high as two orders of magnitude greater than the NRC/ANSI limits.

Phase II of the project, to decontaminate the trenches and the machining area, was initiated August 7, 1984. The initial activity was the excavation of the buried materials from the trenches. Quantities of waste removed from the trenches included 696 55-gallon drums and one DOT 19A-type box. Both chemical and radiological testing were performed.



SOURCE: Adapted from RI, 1985.

FIGURE 4-2

LOCATION OF CLASSIFIED BURIAL TRENCHES
KANSAS CITY PLANT – KANSAS CITY, MISSOURI

TABLE 4-15

RADIOACTIVE CONTAMINATION ACCEPTANCE CRITERIA FOR UNRESTRICTED RELEASE
KANSAS CITY PLANT, KANSAS CITY, MISSOURI

fixed Contamination Parameter	KCP Criteria Value	ANSI N13.12 and NRC Reg Guide 1.86	
		Value	Unit
Average alpha activity on surfaces	10	5000	dpm/100 cm2
Average beta activity on surfaces	800	5000	dpm/100 cm2

Source: NRC Regulatory Guide 1.86 and ANSI N13.12.

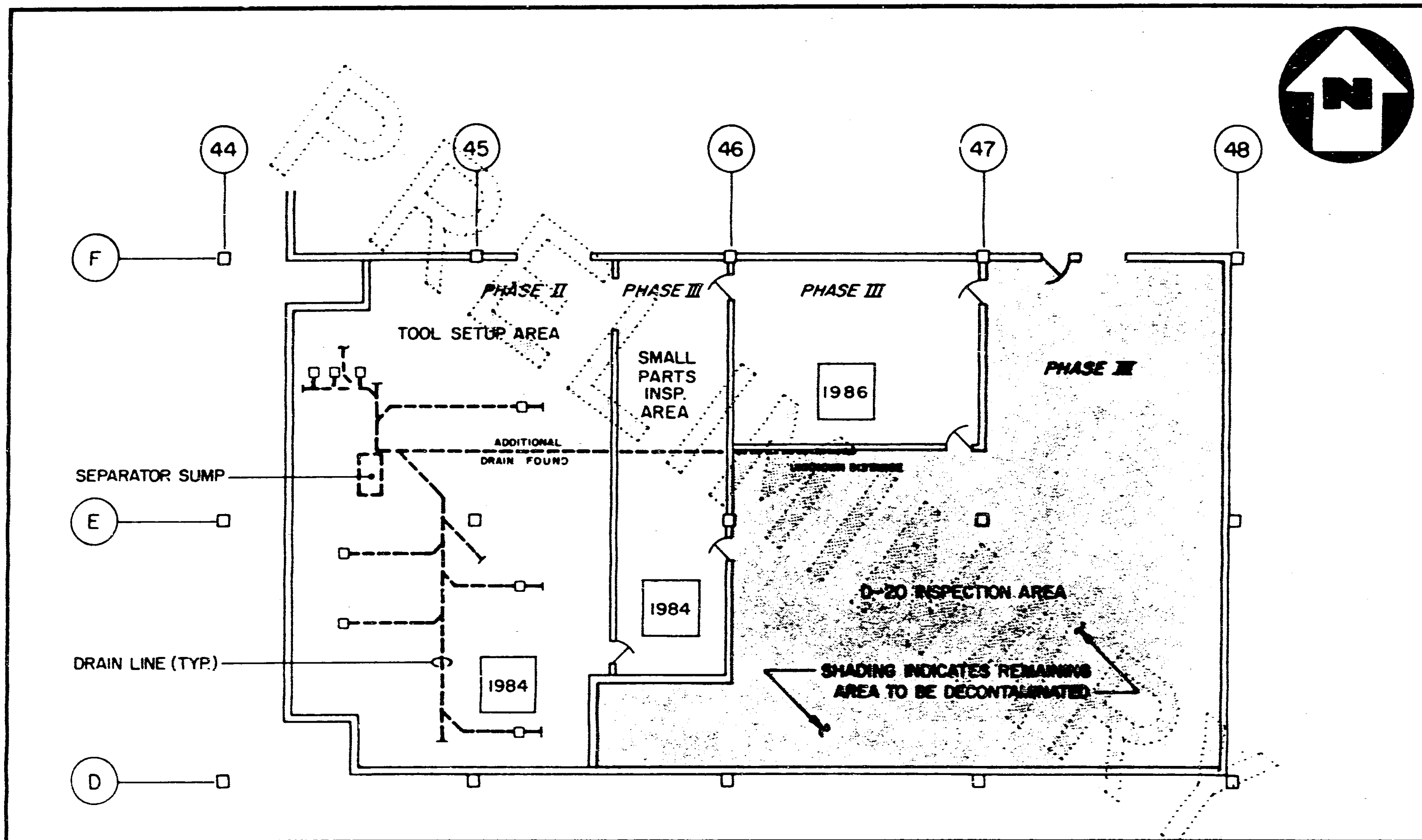
Chemical testing at the buried waste site consisted of hazardous waste identification in accordance with 40 CFR 261. In general, the waste contained a quantity of lead above the EP toxicity maximum. Four samples (out of seven) recorded lead in excess of regulations. No other contaminants exceeded EP toxicity maximum levels. Traces of toluene and trichloroethane were detected at levels reported as greater than 500 ppm and greater than 100 ppm, respectively. The backfill above the trenches and natural (in-situ) soil surrounding the waste had no contamination (RI, 1985)

To determine the background levels of radioactivity at the KCP, radiological surveys were conducted off-site and at portions of the plant site not expected to be contaminated. Based on these measurements, it was concluded that soil with a beta activity concentration of less than 19.4 pCi/g would be considered to be uncontaminated (i.e., did not contain any radioactive material in excess of background levels). During excavation of the trenches, newly exposed surfaces were scanned for radiation and samples were obtained for radiological analysis. The results of the surveys and analyses showed that the soils removed from the trenches had only background levels of radioactivity, and it was concluded that no radioactive materials had been present in the trenches.

Figure 4-3 shows schematically the KCP Machining Area. The tool setup area was selected for decontamination in 1984 as part of the Phase II activities. The small parts inspection area was originally to be decontaminated as part of Phase III, but the work was performed in 1984 during the Phase II effort. These areas, as well as the approximate locations of drain lines, are shown in Figure 4-3. During the decontamination activities, drain lines were removed and contamination removed from all surfaces. In 1986 a portion of the machining inspection area, in an enclosed room, was decontaminated as part of the Phase III activities. This effort was similar to the Phase II work.

All areas that were decontaminated were surveyed to verify that final radioactivity levels were below radiological acceptance criteria defined by the plant management (less than 2 standard deviations above natural background). These criteria are more restrictive than those accepted by either the U.S. Nuclear Regulatory Commission in Regulatory Guide 1.86 and American National Standards Institute in ANSI N13.12 for unrestricted use of a facility.

Radioactive contamination remains in the inspection area (shaded area shown in Figure 4-3) at levels between 200 and 3,000 counts per minute. Calibrations at KCP indicated that this would correspond to a range of between 600 and 9,000 disintegrations/minute/100 cm^2 of beta activity (Jeffries, 1987), if that count rate were constant over a large area. However, the contamination is confined to small spots of only a few square centimeters each. The contamination is fixed or in inaccessible locations. Surveys by Rockwell International personnel did not indicate that the contamination is resulting in radiation exposures to KCP personnel which would be considered a risk to health (Jeffries, 1987).



SOURCE: RI, 1985

FIGURE 4-3

RADIOACTIVELY CONTAMINATED MACHINING AREA
KANSAS CITY PLANT – KANSAS CITY, MISSOURI

Calibration, thickness gauge, and neutron generator sources - KCP uses a variety of radioactive sources for thickness gauges, as neutron generators, and for the calibration of inspection devices. These sources are sealed or fixed in such a maner that activity will not be released under normal circumstances.

A November 1986 source inventory of radioactive sources contained 78 entries. Many of these sources are of low activity (microcurie and millicurie levels) and not likely to present a hazard under any conditions, although there are several sources near one curie in activity and one cesium-137 source of 230 curies. These sources are not used in any process that would result in the environmental releases of radioactive materials and could present an environmental risk only if they are not properly handled or controlled.

The Survey team inspected source storage facilities and reviewed handling procedures, source radiological surveys, and source accountability records. There was no indication that the sources were being handled or stored in an unsafe manner. Sources are inventoried, and leak checked or surveyed as appropriate, on a semi-annual basis. The inspection and accountability procedures in place are consistent with accepted radiation protection practices.

Activated Components - The KCP receives, for testing, electronic components that have been irradiated with high-intensity neutron fluxes at the Sandia National Laboratory. The irradiation and subsequent testing is designed to examine the effects of neutron bombardment on the functioning of electronic weapons components. As a consequence of the irradiation, some materials in the components may become activated (i.e., made radioactive). As an example, the natural, nonradioactive chromium-50 isotope found in stainless steel may be converted to the radioactive isotope chromium-51. Since the activity is induced in the component rather than being a surface contamination, and since KCP does not machine or abrade the components, the activity is not subject to dispersal or release to the air or any liquid effluent. These component are stored after testing to allow the induced activity to decay, or they are disposed of as solid radioactive waste.

The Survey team reviewed the storage, handling, and disposal practices for the activated components. There was no indication that these activities were conducted in an unsafe manner. The safety and accountability practices related to these components are consistent with accepted radiation protection practices.

Ionizing radiation equipment - KCP uses numerous instruments that produce ionizing radiation, such as x-ray units, neutron generators, and electron beam welders. In general, these instruments will not produce radiation of sufficient energy to create an environmental hazard, since low-energy radiation is not strongly penetrating. Radiation protection practices and monitoring designed to protect plant personnel will also prevent elevated off-site radiation levels. The Survey team reviewed the monitoring records and inspected the monitoring provisions associated with equipment capable of generating ionizing radiation. A March 15, 1987, inventory of ionizing radiation generating equipment had 47 entries. The equipment is surveyed on an annual basis to verify that interlocks and radiation shielding are functioning properly. The records reviewed did not indicate any radiation levels outside of controlled areas that were in excess of any health based radiation standards.

Radioactive Waste Generation and Handling - Radioactive wastes generated at the KCP consist of the decontamination debris from the heavy machining area, as discussed above, and the disposal of excessed sealed sources, spent electron tubes, and activated electronic components. The heavy machining area decontamination generated a total of forty-two 55-gallon drums and two DOT 19A-type boxes of low-level radioactive wastes consisting primarily of contaminated soils and concrete in the drums, and contaminated drain pipes and a separator/sump trap in the boxes. In a typical year, KCP generates less than 15 cubic feet of solid low-level radioactive wastes from sources other than the decontamination programs.

The Survey team inspected the waste storage areas and radioactive-waste handling practices and found no indication of unsafe practices. The generation and handling of radioactive wastes at KCP is discussed in further detail in Section 4.1

4.3.3 Environmental Monitoring Program

The Kansas City Plant does not process or handle any radioactive materials in such a way that radioactive effluents would be generated and does not conduct any radiological environmental monitoring.

4.3.4 Findings and Observations

4.3.4.1 Category I

None.

4.3.4.2 Category II

None.

4.3.4.3 Category III

1. Depleted Uranium Contamination in Department 20 Inspection Area. Depleted uranium contamination, at levels exceeding the ANSI N13.12 and NRC Regulatory Guide 1.86 guidance for the release of equipment and facilities for unrestricted use, has been detected in the Department 20 Inspection Area (see Figure 4-3).

Radioactive contamination is present in the inspection area at levels between 200 and 3,000 counts per minute. This would reportedly correspond to a range of between 600 and 9,000 disintegrations/minute/100 cm^2 of beta activity (Jeffries, 1987), if that count rate were constant over a large area. However, the contamination is confined to small spots of only a few square centimeters each. The contamination is fixed or in inaccessible locations. Surveys by Rockwell International personnel did not indicate that the contamination is resulting in radiation exposures to KCP personnel that would be considered a risk to health (Jeffries, 1987).

4.3.4.2 Category IV

None.

4.4 Quality Assurance

4.4.1 General Description of Data-Handling Procedures

The Kansas City Plant does not use in-house personnel or laboratories to administer its environmental monitoring program and has contracted with outside laboratories to provide this service. KCP currently utilizes four laboratories in support of both environmental sampling and analysis: (1) Langston Laboratories, Inc. (LLI), (2) Midwest Research Institute (MRI), (3) Cambridge Analytical, and (4) DOE's Grand Junction Project Office (GJPO).

4.4.1.1 Langston Laboratories, Inc. (LLI)

LLI is under contract to KCP to provide sampling and analyses in support of the plant's NPDES permit, analyses for PCBs in oils, and analyses of wastes for hazardous constituents. The survey team visited LLI, toured the laboratory facilities, reviewed records and laboratory notebooks, and observed the sample check-in process.

LLI is certified by the State of Kansas for analysis of drinking water, wastewater, and hazardous materials. Kansas conducts on-site audits of the laboratory's operations and submits performance samples on a semi-annual basis. The Survey team was unable to obtain copies of state audit reports or evaluations of state-submitted performance samples during the on-site portion of the survey. Missouri does not support any laboratory accreditation program.

LLI hired a staff member in 1987 to serve as the laboratory QA manager and sample custodian. This person has responsibility for QA aspects of both sampling and analysis, sample receipt, and intralaboratory transfer and tracking of samples.

Sampling and analytical procedures have been developed and assembled in loose-leaf binders as laboratory procedure manuals and are available in the laboratory for use by all personnel. A representative of LLI stated that the procedures are reviewed on an annual basis (Kerschen, 1986); although there is no written documentation available to verify that reviews have been conducted according to this schedule. When procedures are revised, one person is assigned to replace obsolete procedures in all copies of the procedures manual; this is intended to ensure that all manuals are maintained and up-to-date. In addition to the sampling and analytical procedures manual, LLI has also developed a manual of standard operating procedures (SOP). The SOPs detail specific laboratory practices, including the QA program and manual, sample handling, safety, calibrations, instrument maintenance, and data packages.

LLI has assembled a manual for the KCP NPDES sampling. This manual includes copies of procedures to be used in the collection and analysis of KCP samples, and information specific to KCP, such as sampling locations, sample preservation, and frequency of collection replicates. While this manual is quite detailed, much of sampling guidance is generic in nature, covering multiple sampling techniques. The manual does not provide KCP-specific techniques nor any guidance pertaining to which techniques are to be used at KCP. Consequently, there is the potential for the analyst to select an inappropriate technique.

The Survey team observed the collection of several NPDES samples. The procedures were appropriate to the media being sampled and were adequately followed by the personnel, although some deficiencies were noted. Sample lines were allowed to come into contact with the soil during sampler set-up and were not decontaminated prior to sampling. A break in the chain-of-custody was observed during the sampling at the Blue River downstream location. While the continuous sampler was being installed and grab samples collected, samples from previous locations were left unattended, unsecured, and out of view of the sampler. During this period, the samples were in a cooler in the bed of a pick-up truck. The cooler was not lockable or fitted with a tamper-evident closure.

During sampling, the samplers carried a loose-leaf notebook containing sampling information forms, and sample chain-of-custody forms. Portions of the forms had been completed at LLI prior to receipt by the sampler to provide necessary information. The remainder of the form is completed by the sampler as each sample is collected. At the completion of a sampling excursion, the sampler transfers the samples to the sample custodian with a copy of the completed sample chain-of-custody record. Upon the custody transfer the sampler signs the form, the sample custodian verifies that all samples are present and signs the form to acknowledge receipt. Samples are logged into the computer, assigned unique identification numbers, and labeled. Samples are then retained in a locked area or delivered directly to the laboratory for analysis. The chain-of-custody form follows the samples throughout the laboratory.

Each analyst is assigned a laboratory notebook. Written procedures on the use of the notebooks are included in the manual of standard operating procedures. Notebooks are to be used to record data, document any irregularities, detail any necessary deviations from written procedures, note any unusual observations, and record sample calculations. The notebooks are reviewed on a periodic basis (typically, a 1-week period between reviews) by either the laboratory director or laboratory manager.

Training for laboratory personnel appears to be well designed. Experienced analysts are videotaped performing an analysis while a narrator explains the techniques. These tapes are used for initial training, re-training, and cross-training of analysts. To be considered qualified, an analyst must obtain results in accordance with expected precision on quality control samples of known concentration and a sample previously analyzed by an experienced analyst. For the first 3 months after initial qualification, new analysts are required to analyze more quality control samples than other analysts. There is no formal re-qualification program, although analysts undergo re-training if their performance on routine quality control samples does not conform to the expected precision of the techniques.

LLI's internal quality assurance procedures require that quality control samples be analyzed on a routine basis. A standard and a blank are analyzed with each set of samples. In addition, a minimum of 5 percent of all samples are matrix spikes containing known quantities of analytes, and 10 percent are duplicates. For the KCP NPDES samples, 3 samples are collected in the field as duplicates; one of these is submitted to the laboratory analysts as blind (i.e., the analyst is unaware that the sample is a duplicate), and the other two are identified as duplicates. Matrix spikes are not used for KCP analyses. LLI participates in the USEPA water intercomparison program. As a part of its internal quality control, LLI purchases quality control samples from Environmental Resource Associates (ERA). The latter samples contain known quantities of analytes such as nitrates, sulfates, and metals that are used by the laboratory to evaluate analyst performance. LLI receives and analyzes samples from ERA on a quarterly basis.

As a part of its laboratory selection process, KCP submitted performance standards to the analytical contract bidders for analysis. These standards required analysis for 26 water-quality parameters (e.g., total dissolved solids, conductivity, alkalinity, hardness), 23 trace metals (e.g., aluminum, arsenic, beryllium, cadmium, zinc), and PCBs (Aroclor-1242). Three laboratories were evaluated, including the successful bidder, LLI. For each analytical parameter, an acceptance range was defined on the basis of the expected precision of the analysis. For each parameter, a laboratory was assigned a numerical score, based upon the accuracy of its result. The laboratory which had results closest to the known value received three points and the laboratory with the poorest results received one point. Any result outside of the acceptance range received no points. LLI received the highest overall score for the three laboratories. None of the LLI results were outside of the acceptance ranges (Ramirez, 1985).

On a quarterly basis, KCP submits performance standards to LLI. These samples are clearly identifiable as performance standards and may therefore receive special care by the analysts. The results of these analyses are evaluated by KCP personnel. If any results fail to conform to the expected precision of the technique, LLI is notified and requested to determine the cause of unsatisfactory results. The Environmental Survey team reviewed the results of the quarterly performance standards for the last quarter of 1985 and the first three quarters of 1986. For this period, all results were within acceptable ranges with the exception of two PCB samples, one submitted in the first quarter of 1986, and one submitted in the second quarter of 1986. For both of these samples, the PCB concentrations were low (0.64 ppb and 0.52 ppb respectively) and the acceptance ranges very narrow. In a response letter concerning the second quarter analysis, LLI submitted the acceptable ranges used by EPA in evaluating performance evaluation samples (Kerschen, 1986). The performance of LLI on the samples in question would have been acceptable, had the EPA ranges been used. The contract between LLI and KCP requires that LLI maintain records of performance on KCP duplicate samples. The contract also requires that KCP have access to LLI QA records. An LLI representative stated that KCP has never requested these records for review (Kerschen, 1986). KCP does not receive any supporting QA data with LLI analytical reports. KCP has sponsored only one audit of LLI activities . This audit, conducted in July 1986, considered only the NPDES sampling (Wagner and Korte, 1986). Several deficiencies were noted in the audit report. KCP personnel reported that these deficiencies have been corrected by LLI (Korte, 1987a).

4.4.1.2 DOE Grand Junction Project Office

DOE's Grand Junction Project Office (GJPO), Grand Junction, Colorado, conducts the groundwater sampling and the analysis of groundwater samples for inorganic constituents. The GJPO QA program is described in two documents: "Quality Assurance Manual" (BFEC, 1986b) and "Administrative Plan and Quality Control Methods for the Bendix/GJPO Analytical Laboratories" (BFEC, 1985). The program is designed to conform to the applicable requirements of ANSI/ASME NQA-1, Quality Assurance Program Requirements for Nuclear Power Plants. Detailed written procedures for sampling and analysis are documented in "Handbook of Analytical and Sample Preparation Methods" (BFEC, 1986c). The sampling and analysis details specific to KCP are documented in "Detailed Technical Plan for Inorganic Analyses of Water for the Kansas City Site Characterization Project" (BFEC, undated b) and "Detailed Technical Plan for Organic Analyses for the Kansas City Site Characterization Project,." (BFEC, undated c). The documents were prepared for a project to characterize the groundwater quality at the KCP. This characterization program is described in Section 3.4.3.

The field sampling teams collect 10 percent of all samples in duplicate and spike 5 percent of the samples with known quantities of analytes. These field duplicates and spikes are submitted to the laboratories "blind," that is, the laboratory personnel cannot identify them as quality control samples. The performance of the laboratory may be monitored through the use of these samples. In the past, GJPO reviewed the data from these samples; however, no tabulations of the data or evaluations of the GJPO analytical performance have been received by KCP since July 1986. At the time of the Survey, the analytical reports from GJPO did not contain any supporting quality assurance data.

4.4.1.3 Cambridge Analytical

Cambridge Analytical (CA), Cambridge, Massachusetts, performs the organic analyses on KCP groundwater samples. The contract with CA is administered by GJPO. KCP has available, but has not reviewed, documents detailing the laboratory's quality assurance program or analytical procedures. KCP has relied upon the evaluations of the laboratory by GJPO. GJPO has reviewed this documentation and made an inspection of the laboratory, although its scope did not include conducting a quality assurance audit (Korte, 1987a). CA participates in EPA's Contractor Laboratory Program (CLP); acceptance into the CLP requires that the laboratory pass an EPA quality assurance audit. The contract with CA requires that CLP protocols be used for all KCP analyses.

CA receives both blind duplicate and blind spike samples prepared by the GJPO groundwater sampling teams. These data are used by GJPO as external quality-control samples to monitor CA's performance. No tabulations of these data or any evaluation of CA's analytical performance have been received by KCP since July 1986.

In January 1987, KCP began collecting field duplicates of 10 percent of all groundwater samples to be analyzed at the laboratory at DOE's K-25 Plant, Oak Ridge, Tennessee. The K-25 laboratory is an EPA referee laboratory. Referee laboratories are used by the EPA as a part of its CLP to resolve conflicting analyses from multiple laboratories. The K-25 analyses serve as an external quality assurance check on the groundwater organic analyses performed by CA. These data had not been reviewed by KCP at the time of the Environmental Survey.

The data packages received from CA by KCP include quality assurance data generated as a part of CA's internal quality assurance program. The survey team did not identify any documented review of these data by KCP personnel.

4.4.1.4 Midwest Research Institute

Midwest Research Institute (MRI) performs PCB analyses in complex sample matrices (i.e., sample matrices that would limit the accuracy of standard PCB analysis techniques or present difficulties in performing an analysis) and for special programs requiring PCB analyses in soils, lagoon sludges, and stream sediments. MRI is accepted by the USEPA as a special analytical services laboratory. MRI's contract with KCP requires full CLP treatment for all samples.

The contract with MRI is administered by GJPO. KCP does not have available and has not reviewed laboratory procedures manuals or QA program documentation for MRI. KCP has relied upon evaluation of the laboratory by GJPO, although KCP has not requested or received any written evaluations of MRI performance. KCP does not provide MRI with any external quality control samples, nor are any samples split and sent to other laboratories for confirmation analyses.

4.4.2 Findings and Observations

4.4.2.1 Category I

None.

4.4.2.2 Category II

None.

4.4.2.3 Category III

None.

4.4.2.4 Category IV

1. Sampling Practices for the NPDES Monitoring Program. Existing sampling practices are not adequate to ensure accurate/representative samples.

   - Sample lines are not flushed with sample prior to collection. This may lead to contamination of the sample by any residual liquids in the line from previous sampling.

   - Sampling lines are allowed to come into direct contact with soil, the sampling contractor's pick-up truck bed, other sample lines, and sampling equipment. Sample lines are not carried in separate bags to maintain cleanliness nor placed on clean ground coverings during sampler setup. When sample lines were obviously soiled, they were cleansed by the sampler with a wipe of his bare hand. These practices may lead to contamination of the sample.

   - A break in the sample chain-of-custody was observed. During sample collection, samples from previous sample points are left in the sample track unattended, unsecured, and without tamper-evident seals. For at least one sample point (Blue River, downstream), the truck and samples are not within sight of the sampler. There is potential for tampering with the samples during this period.

- There are no site-specific sampling procedures to cover the KCP sampling. Site-specific procedures are generally considered part of a good sampling program to ensure the use of consistent and compete sampling practices.

2. Laboratory QA Practices for NPDES samples. The existing quality assurance controls being applied to the analysis of NPDES and waste samples may not be sufficient to provide verification of data accuracy and precision.

   - A reagent shelf-life program exists, but undated reagents were observed in the laboratory.

   - External quality-control samples submitted to Langston Laboratories, Inc., are not blind; that is, the analysts may easily identify the samples as performance standards. This may result in the analyst's giving more care to these samples than to routine analyses and may thereby eliminate the effectiveness of the performance measure.

   - The laboratory does not routinely use matrix spikes during the analysis of KCP water samples. The use of matrix spikes is typically included as a part of a laboratory QA program as a measure of analytical accuracy. A representative of LLI stated that for waste samples, spikes are used at the discretion of the laboratory supervisor, although the survey team did not identify any documentation that would define the use of waste sample spikes.

   - Of the three duplicate samples analyzed with each sample set, only one is submitted to the analyst as a blind. Blind duplicates are considered the best measure of analytical precision. Laboratory QA programs typically include 10 percent of all analyses as blind duplicates. QA samples not submitted blind may receive preferential care.

   - The laboratory procedure-control program is not sufficient to document that all procedures in use are the most current available and have been appropriately approved.

   - The Laboratory, in accordance with its contract with KCP, maintains a record of analytical performance on duplicates. However, according to the laboratory manager, KCP has never requested copies of, or reviewed, the data.

3. External Quality Assurance. The external quality assurance does not provide adequate monitoring of the performance of the laboratories conducting sampling and analysis of groundwater. It is a generally accepted practice that users of analytical data independently evaluate the adequacy of the data, regardless of the laboratory's internal QA program or oversight by other organizations such as the EPA.

- Blind spikes and duplicates have been provided by to the laboratories performing the analyses of the groundwater, but no tabulations of the external QA data have been received by KCP since July 1986. In addition, there is no documentation to verify that any evaluations of the data have been conducted. An effective external QA program requires timely evaluation of the data and appropriate documentation.

- KCP does not receive any of the supporting QA data from the laboratory performing inorganic analyses of the groundwater. Such data is essential to verify the adequacy of the data.

- KCP does not have copies of the QA program or procedures being used by the laboratory performing organic analyses. Consequently, KCP cannot evaluate the adequacy of the analyses for KCP's needs. KCP is relying upon evaluations by the Grand Junction Project Office.

4. Asbestos Analyses. There are no quality assurance controls applied to the analyses of bulk samples for asbestos. Without documented controls, there is no verification of the accuracy of negative results (i.e., conclusions that asbestos is not present). The consequence of this is that KCP may not be able to adequately demonstrate that materials determined to contain no asbestos and consequently handled as such were appropriately characterized.

4.5 Inactive Waste Sites and Releases

4.5.1 Background

This section provides an overview of past releases of hazardous substances into the environment as a result of inactive waste sites and of spills and leaks at the DOE KCP Plant. Information on these inactive waste sites and releases is provided in several documents, including

- Hydrogeologic Site Characterization of the Department of Energy Kansas City Facility, Interim Report, April 1985.

- Hydrogeologic Site Characterization of the Department of Energy Kansas City Facility, Second Interim Report, January 1986.

- Historical Survey; Department of Energy Kansas City Facility, Second Edition, August 1986.

- Hydrogeologic Site Characterization of the Department of Energy Kansas City Facility, February 1987.

- Comprehensive Environmental Assessment and Response Program (CEARP) Phase 1: Installation Assessment Kansas City, Draft, April 1986.

Although the CEARP Phase 1 draft report initially identified 39 inactive waste disposal and release sites, this number likely will be reduced to less than 20 as a result of several factors, including recently completed U.S. Environmental Protection Agency CERCLA preremedial activities (e.g., Federal Facilities Site Discovery and Identification Findings, Preliminary Assessments, Site Inspections) and a determination that some sites will be investigated under RCRA and not CERCLA (i.e., and therefore will be eliminated from further CEARP studies). It has also been recognized that some sites were multiple-listed in the initial list of 39 sites. The number of CEARP sites likely will be reduced further when similar yet distinct sites are aggregated into a single generic listing (e.g., underground storage tanks) and when field sampling and analyses verifies that past cleanup actions have been completed satisfactorily at several spill and inactive waste sites.

Based on information available to the Survey team, there are 14 inactive waste sites and areas of releases (known and potential) for KCP. Several of these sites are representative of smaller yet distinct inactive waste sites (e.g., multiple spills and releases in the Northeast area of the plant site). Eleven of the 14 sites already have been identified in published reports (e.g., CEARP Phase 1). The Survey team determined that three additional sites should be considered as potential environmental problems as a result of the on-site Survey. Information on the 14 sites is presented in Section 4.5.2.

4.5.2 General Description of Pollution Sources/Controls

The KCP has many sites that are existing or possible sources for environmental contamination. These sites are known or believed to contain hazardous substances as a result of past waste disposal practices and plant operations. The sites identified to be of concern are the

- North Lagoon
- IRS Landfill (General Services Administration Property)
- Underground Tank Farm
- West Boiler House
- Old Railroad Dock Area
- Heat Exchange Systems
- Underground Storage Tanks - Removed and Inactive
- General Northeast Area, Including Former Ponds and Liberty Drive Oil Sludge
- Southeast Parking Lot
- Classified Burial Trenches
- Chip Collection/Reclamation Building
- Sales Building
- Sanitary Sewer Lift Station at the Northeast Area
- Off-site Hazardous Waste Disposal Companies

Three of the above-listed sites have not been identified by previously published reports (e.g., CEARP Phase 1). These sites are the chip collection/reclamation building, sales building, and sanitary sewer lift station.

The selection of the above 14 sites was based in part on known wastes that were buried and/or released at these areas, and the possibility for wastes (undocumented) to have been disposed at these sites. Also, a preliminary review of existing hydrogeologic and geophysical data indicates that some of these sites are already sources of contaminant releases to the soil and groundwater.(see Section 3.2.2, Soil and Section 3.4.2, Groundwater.).

4.5.2.1 North Lagoon

The North Lagoon was built in 1962 and operated until 1985, when it was decommissioned. The unlined lagoon received wastewater that was discharged from the KCP industrial wastewater system. The wastewater included rinse water and drain discharges from various process operations, as well as treated cooling waters. The North Lagoon is approximately 2.6 acres in area (see Figure 2-2).

The North Lagoon was designed and operated to adjust the pH of the influent wastewater. To a lesser extent, the lagoon was used for the removal of suspended solids. Over the years of operation, sludge accumulated in the North Lagoon to the point where only limited retention capacity remained. Also in the later years, vegetation began to grow inside the lagoon.

The North Lagoon originally discharged directly to the Blue River. In 1967, however, the Missouri Department of Natural Resources began to regulate direct wastewater discharges and thereby prohibited the discharge of the North Lagoon effluent to the Blue River. The lagoon effluent was subsequently rerouted and discharged to the Kansas City (Missouri) municipal sanitary sewer system. In 1975, compliance actions under the National Pollutant Discharge Elimination System (NPDES) prohibited other water discharges to the Blue River (e.g. potentially contaminated stormwater and chemically treated cooling water). To accommodate these additional flows, the South Lagoon was constructed in 1975. The North Lagoon was later taken out of service in 1985 and is currently in the process of being closed under a RCRA Closure Plan (see Section 4.1.2, Waste Management). The South Lagoon remains active but is scheduled for RCRA closure in 1988 (see Section 4.1.2, Waste Management).

The North Lagoon does not appear to have been a source of groundwater contamination (see Section 3.4.2.4, Groundwater).

The North Lagoon sediment and subsurface soil were determined to be nonhazardous as defined by RCRA characteristics. PCBs were notably present in the sediments (up to 290 ppm PCB) but significantly less in the subsurface soil (less than 3 ppm, see Section 3.2.3.2, Soil).

The contaminated sediment and subsurface soil have been removed from the North Lagoon under a RCRA closure plan. Also removed were wastes (e.g., construction debris, cafeteria waste), from a trench that was discovered in the subsurface soil. Final RCRA closure has been delayed as the result of the discovery of several buried concrete pipes. The history of these pipes is unknown. KCP has scheduled a site assessment of these buried pipes during the summer of 1987. Depending on the findings of this assessment, KCP plans to remove the pipes and complete the North Lagoon closure during 1987.

4.5.2.2 IRS Landfill

The IRS Landfill, which is under the jurisdiction of the General Services Administration, is located at the east side of KCP, south of 95th Street and east of the Missouri Pacific Railroad tracks. The landfill is approximately 5 acres in area (see Figure 3-6). The landfill is referred to as the IRS Landfill because of its proximity to the Internal Revenue Service (IRS) center, which is located north of the landfill. From the 1940s to 1964, this landfill was used by occupants of the facility for the deposition of plant wastes. There are no records to indicate the types and quantities of these wastes.

The DOE KCP was only one of several contributors to the landfill. Pratt-Whitney first used this area as a landfill in the early 1940s, and Westinghouse later used it during its operations. When Westinghouse terminated its operations in 1961, it buried all of its waste in the landfill (Meininger and Madril, 1987a).

It is believed that general plant refuse was the bulk of waste buried at the landfill, as well as metals or alloys which contain boron, beryllium, and uranium (Meininger and Madril, 1987a). As part of the general trash disposed of, there were various liquid wastes which included plating wastes (e.g., acids and cyanides), and painting wastes (e.g., paint and thinners). Wooden block flooring, which possibly contained mercury and solvents from spills during plant operations, are buried in the landfill . There is also a possibility that liquid wastes were directly dumped in a pond on the landfill, as shown by a 1960 aerial photograph.

In 1970 and 1971, several changes occurred at the IRS Landfill area. The IRS parking lot was constructed; Bannister Road was constructed south of the landfill; and the U.S. Army Corps of Engineers, Kansas City District, constructed a flood dike near the landfill site. The IRS Landfill now consists of a parking lot and open vegetated area.

Data obtained from monitoring wells indicate that the landfill may be a source of groundwater contamination. Monitoring wells downgradient of the landfill show organic solvents in the groundwater at concentrations up to 366 ppb, but the data show no indication that metals have leached into the groundwater (see Section 3.4.3.5, Groundwater). Metals and other contaminants are present in the landfill soil (see Section 3.2.3.3, Soil).

4.5.2.3 Underground Tank Farm

During 1943 and 1944, the Underground Tank Farm was constructed at the east side of KCP. The Tank Farm provided liquid product storage (and later some liquid waste storage) in support of operations at KCP. The Tank Farm has been inactive since 1979. There are 28 steel and concrete tanks which, when in service, held a variety of materials, including gasoline, kerosene, diesel fuel, No. 6 fuel oil, lubricants, coolants, and solvents. One of the solvents was Varsol. The tanks also contained products under the trade names Triad, Perm-A-Chlor, Sunicut, and Dural. Triad and Perm-A-Chlor are believed to have been trichloroethene-based solvents. Sunicut was a series of non-emulsifiable cutting oils, and Dural may have been a detergent. Four tanks were later converted to storage for liquid wastes, including waste kerosene and waste solvents. Figure 4-4 illustrates the layout of the 28 tanks that comprised the Underground Tank Farm.

In 1983, an inspection of the underground tanks revealed that the tanks were in poor condition. Severe scaling and pitting were noted, as well as severe corrosion. Soil characteristics at the site suggest that the tanks could have maintained their integrity for 20 to 30 years after installation, which occurred from 1943 to 1944; therefore, under the best circumstances, the tanks probably leaked as early as 10 to 15 years ago. However, the integrity of the tanks always has been suspect. When the tanks were inspected, welds on one underground tank were noted to be of poor quality.

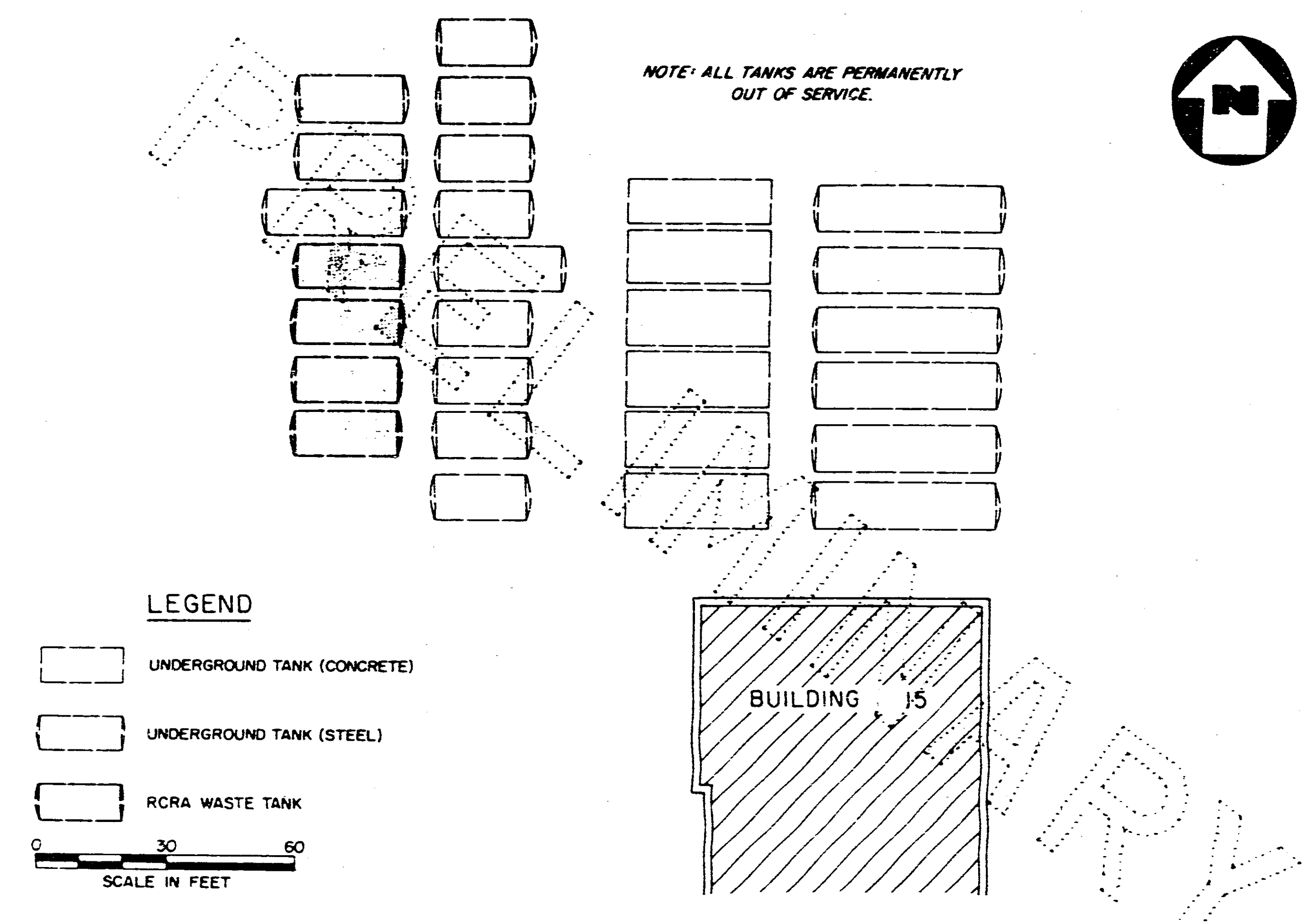
Recent environmental data confirm that tanks in the Tank Farm did leak. Petroleum fuels are the most significant contaminant in the subsurface soil (see Section 3.2.3.4, Soil) The identity of several groundwater contaminants can be traced directly to past inventories of the tanks; other constituents probably have resulted from biodegradation of certain of these known contaminants. Monitoring wells installed near the Tank Farm reveal parts per million of trichloroethene, methylene chloride, and 1,1,1-trichloroethane in the groundwater (see Section 3.4.3.1, Groundwater).

The Underground Tank Farm is currently undergoing site remediation in accordance with a RCRA Closure Plan (see Section 4.1.2, Waste Management).

4.5.2.4 West Boiler House

The West Boiler House is located at the west end of the facility. The boiler house provides steam and chilled water for KCP and other areas of the Federal complex. There is evidence that subsurface contamination exists at this site due to leaking underground tanks and past spills (see Figure 3-7).

Two steel underground tanks were recently removed from the west side of the West Boiler House. Both tanks were installed in 1943 and removed in 1985. One tank was 10,000-gallon capacity and was used to store diesel fuel. The other tank was 1,000-gallon capacity and stored waste oil generated at KCP. Until the mid-1970s waste oil was burned in the boiler burners as a fuel supplement. This practice was terminated when the burners became fouled from metal chips, which



SOURCE: Bendix, 1986.

FIGURE 4-4

TANK LOCATIONS – UNDERGROUND TANK FARM AREA
KANSAS CITY PLANT – KANSAS CITY, MISSOURI

apparently were present in the waste oil. The waste oil also contained PCBs, which probably came from the PCB-contaminated heat transfer systems (i.e., Departments 26 and 27) and other sources.

Recent soil analyses at this site indicate the soil is contaminated. Subsurface soil samples taken at this site indicate oil and grease concentrations up to 2,430 ppm and PCB concentrations up to 8.8 ppm (see Section 3.2.3.5, Soil).

Two other underground storage tanks are located at the south side of the West Boiler House. These concrete tanks are each 250,000-gallon capacity and are used to store No. 6 fuel oil (although the east tank is currently empty). These tanks were installed in 1943 and, over the years, have been periodically cleaned and inspected for cracks. A 1984 internal inspection of the empty tank revealed the presence of cracks in the concrete walls. These cracks have not been repaired.

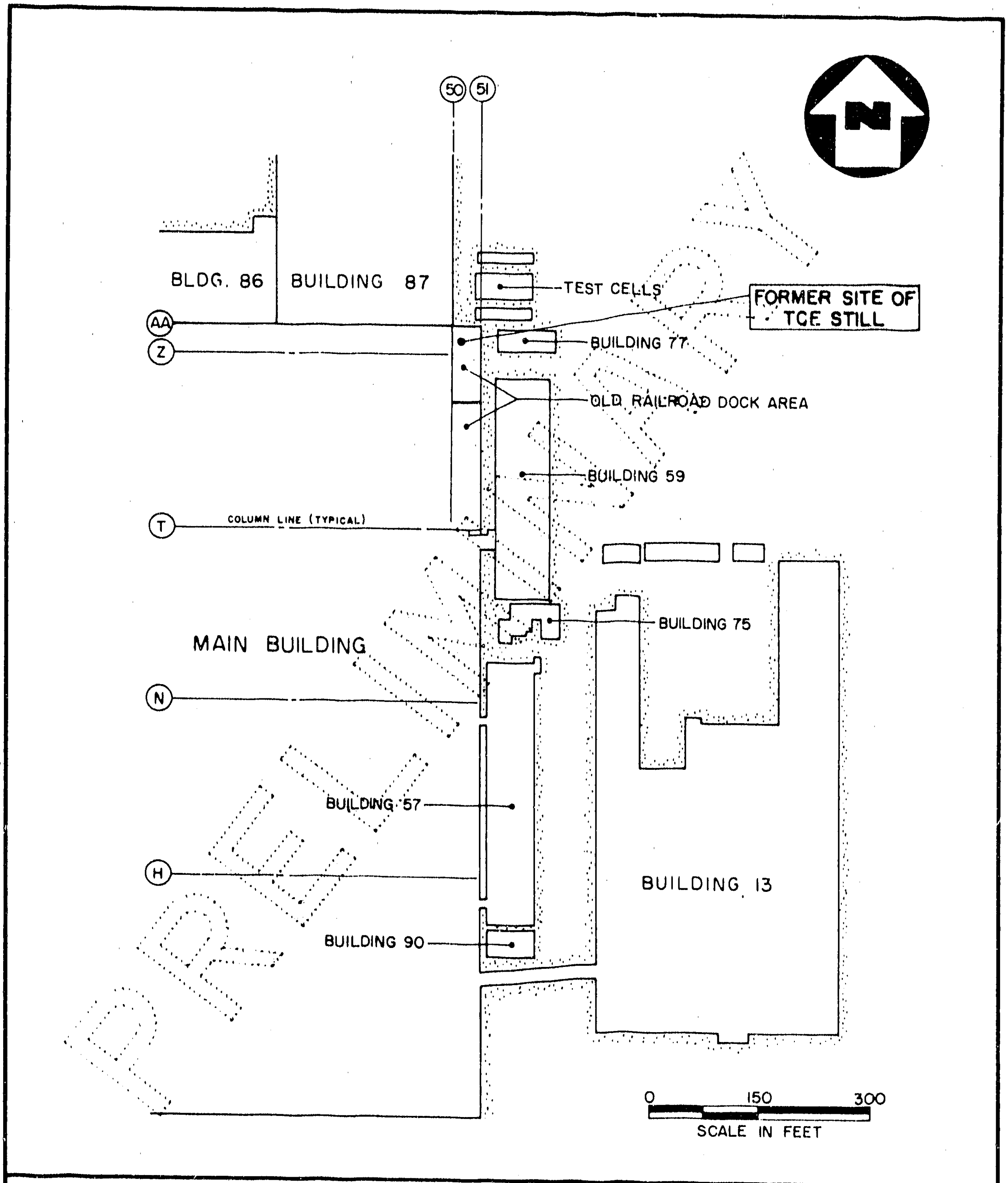
This area has also experienced several spills. In 1967, a large spill occurred west of the West Boiler House. Between 500 and 5,000 gallons of No. 6 fuel oil were discharged onto the ground when a fill hose from a tanker truck became disconnected. Oil was also released to a drainage ditch, which flows to Indian Creek. The oil was dammed and burned in an effort to keep it from reaching Indian Creek. There have also been smaller spills in this area as a result of fuel transfer operations.

Soil in this area is also known to be contaminated. Oil and grease have been measured up to 1,920 ppm in the subsurface soil (see Section 3.2.3.5, Soil).

4.5.2.5 Old Railroad Dock Area

The Old Railroad Dock is located inside of the main building near the north end of Building 59. About 1950 to 1952, a solvent-recovery still operated on a raised platform adjacent to an unpaved railroad siding (see Figure 4-5). The still was used to reclaim spent solvents, principally trichloroethene (TCE). Employee interviews (DOE, 1986a, and Korte et al., 1986) indicate that numerous spills (quantities unknown) occurred at this site as a result of the still operation, as well as the handling and storage of materials around the still area. Any chemical spill likely would have been released to the railroad tracks and percolated into the soil. Since the operation of the still, the railroad tracks have been removed and the soil covered with a concrete floor. The Old Railroad Dock is now used for material storage.

The subsurface soil at the dock area is known to be contaminated (see Section 3.2.3.6, Soil). Recent soil studies (Fleischhauer et al., 1987) show the presence of trichloroethene up to 290 ppm in the subsoil. The presence of 1,2-trans-dichloroethene was detected at lower concentrations (about



SOURCE: DOE Environmental Survey team, 1987.

FIGURE 4-5

FORMER SITE OF TCE STILL AT THE OLD RAILROAD DOCK AREA
KANSAS CITY PLANT – KANSAS CITY, MISSOURI

5 ppm). The soil data indicates that the upper 10 feet of soil has retained significant concentrations of solvents. The solvents have also migrated downward near the contact of the alluvium and the Knobstone Sandstone (approximately 40 feet below ground surface). PCBs were also detected in subsurface soil samples but at concentrations less than 0.5 ppm.

The groundwater at the Old Railroad Dock area is contaminated with trichloroethene at concentrations up to 5 ppm (see Section 3.4.3, Groundwater).

4.5.2.6 Heat Exchange Systems

There are two heat exchange systems that historically have used fluids containing high concentrations of PCBs. One system is located outside and north of Department 27. The other is located outside and east of Department 26. Both systems currently use a non-PCB heat exchange fluid, although residual PCB contamination remains in each system (see Section 4.2.2, Toxic and Chemical Materials). During the next several years, each system will be replaced with a new heat exchange system that will be PCB-free.

Department 27

The heat exchange system for Department 27 has been a source of many PCB leaks from expansion tanks and of spills from failures of expansion joints, pumps, and the heat exchangers. In addition, there is evidence that two underground tanks, one a storage tank and the other an interceptor tank, may have leaked. The 10,000-gallon-capacity, steel, storage tank contained Therminol FR-1 oil, a PCB oil. The interceptor tank (unknown capacity and construction material) was used to collect surface runoff around the heat-exchange system. The runoff was frequently contaminated with Therminol oil (i.e., PCBs). Both tanks were removed in 1985 (see Figure 3-8).

The soil in the vicinity of Department 27 is known to be contaminated with PCBs. The highest concentrations have been found in the surface soil (up to 7,400 ppm PCB), although significant levels (up to 460 ppm PCB) were observed in the subsurface soil at the base of the 10,000-gallon, Therminol oil storage tank. Although the ground surface around the Department 27 heat transfer system is now paved, it is reasonable to assume that the PCB-contaminated soil is widely distributed.

The heat exchange system for Department 26 has experienced leaks and releases similar to the Department 27 heat exchange system. It also has a history of using Therminol FR-1, a PCB oil. Pipes containing this oil were located between Building 57 and the Main Building. A major spill involving some 1,500 gallons of Therminol occurred in November 1969 at the north end of Building 57.

Approximately 900 gallons of the Therminol drained into the 002 storm sewer system and ultimately into Indian Creek. The remainder soaked into the soil. This area has since been paved, and curbing has been added to prevent the release future spills from the site (see Figure 3-9).

The soil in the vicinity of Department 26 is contaminated with PCBs (see Sections 3.2.3.8, and 3.2.3.9, Soil). There is significant PCB contamination between Building 57 and the Main Building. This contamination ranges from several thousand parts per million at the surface to several hundreds parts per million (and less) in the subsoil. Sumps around the heat transfer system also are contaminated with PCBs. Concentration ranges up to 43,000 ppm. The ground surface area around the heat exchange system is now paved.

4.5.2.7 Underground Storage Tanks - Removed and Inactive

There are a number of underground storage tanks (USTs) that have been removed or are inactive (permanently out-of-service). Following is a discussion of these tanks.

USTs - Removed

Table 4-16 lists 10 underground storage tanks (USTs) that have been removed from KCP and the off-site SECOM property.[1] All of these tanks were removed during the period 1983-1986. Following is a brief overview of each tank.

Tank 2 was used to store potable water at the Emergency Operations Center (EOC). The steel tank was removed in 1986 when the EOC was taken out of service. Other than potable water, this tank was never used to store a product or waste material (Mast, 1987c).

Tanks 25 and 26 were formerly located at the west side of the West Boiler House. Tank 25 was used to store diesel fuel. Tank 26 was used to store waste oil, which was used until the mid-1970s as a fuel supplement in the boiler burners. Both steel tanks were removed in 1985. When the tanks were removed from the ground, there was reportedly no visible sign of soil contamination around the tanks (Ramirez, 1987c). However, recent soil data indicate that there are PCB and oil contaminants in the soil (see Section 3.2.3.5, Soil).

Tanks 29 and 30 were used in association with the Department 27 heat transfer system. Tank 29 was a gasoline storage tank and Tank 30 was a Therminol storage tank. Therminol is a heat exchange

[1] The Survey team visited the SECOM (Secure Communication) site, which is located about 20 miles south of KCP. The DOE operates a communication network at this 123-acre site.

TABLE 4-16

UNDERGROUND STORAGE TANKS -- REMOVED
KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Tank	Location	Status	Installed/ Removed	Capacity (gallons)	Contents When Removed	Tank Material	Last Use
2	EOC	Removed	1966/1986	2,000	Empty	Steel	Potable Water
25	West Boiler House	Removed	1943/1985	10,000		Steel	Diesel
26	West Boiler House	Removed	1943/1985	1,000		Steel	Waste Oil
29	D-27	Removed	/1985	500		Steel	Gasoline
30	D-27	Removed	1970/1985	10,000		Steel	Therminol
31	ERC	Removed	1966/1986	1,000	Empty	Steel	Diesel
38	Near South Lagoon	Removed	1981/1983	5,000	(1)	Fiberglass	(1)
39	Near South Lagoon	Removed	1981/1983	5,000	(1)	Fiberglass	(1)
A	SECOM	Removed	/1986			Steel	Diesel
B	SECOM	Removed	/1986			Steel	Diesel

Source: DOE Environmental Survey team, 1987. Adapted from Kansas City Plant inventory of process and storage tanks.

(1) Tanks 38 and 39 were never put into service.
Note: Blank indicates information not available.

fluid that when used at KCP contained high concentrations of PCBs. In 1985, both steel tanks were removed. Soil data indicate this area to be contaminated with PCBs (see Section 3.2.3.7, Soil).

Tank 31 was another underground tank located at the EOC. This steel tank was used to store diesel fuel for an emergency power generator. The tank was removed in 1986. During tank removal, plant personnel reported no visible soil contamination or conspicuous odors. No soil sampling was conducted.

Tanks 38 and 39 were originally intended for spill control, although neither tank was ever put into service. These fiberglass tanks were removed in 1983.

Tanks A and B (lettered for purposes of this report) were used to store heating oil at the SECOM site. The date(s) of installation is unknown. This site was formerly used by the U.S. Air Force. Information about the history of these tanks is incomplete. The tanks were emptied and taken out of service, probably in the 1970s, and later removed in 1986. At the time of removal, there was some evidence of soil contamination. A small amount of oil (quantity unknown) was found inside the excavated pit. The oil was believed to have come from one of the waste oil tanks, which cracked as it was lifted from the ground. Ten 55-gallon drums of contaminated soil were removed from the excavation site (Eggers, 1986). No soil sampling was conducted.

USTs - Inactive

Table 4-17 lists 43 USTs that are inactive and known to be permanently out of service (POOS). Following is a brief overview of each tank.

Tank 09 is located west of the polymer building (Building 15) and was intended to store dimethylformamide rinsewater. The tank reportedly has been used only once (Mast, 1987c). The tank has cathodic protection and passed a tank leak test in 1985.

Tanks 10 through 13 are the only tanks at the Tank Farm reportedly to have contained hazardous wastes (i.e., waste oil, waste coolants, and waste solvents). These steel tanks were taken out of service and emptied in 1983.

Tanks 32 and 33 were used to store No. 6 fuel oil for the East Boiler House. These steel tanks were emptied in 1985, when the boilers were taken out of service.

TABLE 4-17

UNDERGROUND STORAGE TANKS - PERMANENTLY TAKEN OUT OF SERVICE
KANSAS CITY PLANT, KANSAS CITY, MISSOURI

Tank	Location	Status	Installed/ Taken Out of Service	Capacity (Gallons)	Contents When Removed	Tank Material	Last Use
09	Building 15		1982/	5,000	Rinse Water	Steel STI-P3	
10	Tank Farm	POOS	1943/1983	10,000	Empty	Steel	Waste Oil
11	Tank Farm	POOS	1943/1983	10,000	Empty	Steel	Waste Coolants
12	Tank Farm	POOS	1943/1983	10,000	Empty	Steel	Waste Solvents
13	Tank Farm	POOS	1943/1983	10,000	Empty	Steel	Waste Solvents
14	Tank Farm	POOS	1943/1983	20,000	Empty	Steel	Diesel Fuel
15	Tank Farm	POOS	1943/1983	20,000	Empty	Steel	Diesel Fuel
32	East Boiler House	POOS	1959/1985	15,000	Empty	Steel	No. 6 Fuel Oil
33	East Boiler House	POOS	1959/1985	15,000	Empty	Steel	No 6 Fuel Oil
34	Building 57	POOS	1943/1950	26,000	Sand	Concrete	Waste Oil
35	Test Cells	POOS	1943/1950	10,000	Sand	Steel	Waste Oil
36	Test Cells	POOS	1943/1950	10,000	Sand	Steel	Waste Oil
37	Test Cells	POOS	1943/1950	1,000	Sand	Steel	Waste Oil
43	Tank Farm	POOS	1943/1950	10,800	Empty	Steel	Kerosene
44	Tank Farm	POOS	1943/1950	9,000	Empty	Steel	Waste Kerosene
45	Tank Farm	POOS	1943/1950	5,000	Empty	Steel	Waste Kerosene
46	Tank Farm	POOS	1943/1983	11,400	Empty	Steel	No. 6 Fuel Oil
47	Tank Farm	POOS	1943/1983	11,400	Empty	Steel	No. 6 Fuel Oil
48	Tank Farm	POOS	1943/1983	11,400	Empty	Steel	No. 6 Fuel Oil
49	Tank Farm	POOS	1943/1983	12,500	Empty	Steel	No 6 Fuel Oil
50	Tank Farm	POOS	1943/1983	15,600	Empty	Steel	No. 6 Fuel Oil
51	Tank Farm	POOS	1943/1983	12,500	Empty	Steel	No. 6 Fuel Oil
52	Tank Farm	POOS	1943/1983	12,500	Empty	Steel	No 6 Fuel Oil
53	Tank Farm	POOS	1943/1950	11,400	Empty	Steel	Paraffin
54	Tank Farm	POOS	1943/1950	12,500	Empty	Steel	Hydraulic Oil
55	Tank Farm	POOS	1943/1979	20,700	Sand	Concrete	Gasoline

TABLE 4-17
UNDERGROUND STORAGE TANKS - PERMANENTLY TAKEN OUT OF SERVICE
KANSAS CITY PLANT, KANSAS CITY, MISSOURI
PAGE TWO

Tank	Location	Status	Installed/ Taken Out of Service	Capacity (Gallons)	Contents When Removed	Tank Material	Last Use
56	Tank Farm	POOS	1943/1979	20,700	Sand	Concrete	Gasoline
57	Tank Farm	POOS	1943/1979	20,700	Sand	Concrete	Gasoline
58	Tank Farm	POOS	1943/1979	20,700	Sand	Concrete	Gasoline
59	Tank Farm	POOS	1943/1979	20,700	Sand	Concrete	Gasoline
60	Tank Farm	POOS	1943/1979	20,700	Sand	Concrete	Gasoline
61	Tank Farm	POOS	1943/	20,000	Water	Steel	Water
62	Tank Farm	POOS	1943/	20,000	Water	Steel	Water
63	Tank Farm	POOS	1943/	20,000	Water	Steel	Water
64	Tank Farm	POOS	1943/	20,000	Water	Steel	Water
65	Tank Cells	POOS	1943/	20,000	Water	Steel	Water
66	Test Cells	POOS	1943/	1,000	Sand	Steel	Kerosene
67	FY-12	POOS	1943/	1,880	Sand	Steel	Waste Oil
68	FY-12	POOS	1943/	2,130	Sand	Steel	Waste Oil
69	FY-12	POOS	1943/	2,130	Sand	Steel	Waste Oil

Source: DOE Environmental Survey team, 1987. Adapted from Kansas City Plant inventory of process and storage tanks.

POOS: Permanently out of service.
Note: Blank indicates information not available.

Tank 34 was originally used to store heat exchange oil (Therminol-Aroclor 1242) for the Department 26 heat transfer system. The concrete tank was later used to store waste oil. It was taken out of service in 1950 and filled with sand. It is not known whether this tank ever leaked. The soil around the tank is known to be PCB-contaminated (see Section 3.2.2.8, Soil)

Tanks 35, 36, and 37 are located beneath a concrete floor inside the Test Cells. The tanks were used to store waste oil in the 1940s. The steel tanks were taken out of service in 1950. They were emptied and filled with sand. It is not known whether these tanks ever leaked.

Tanks 14, 15, and 43 through 64 are out-of-service and located at the Underground Tank Farm. These tanks contained a variety of materials: gasoline, diesel fuel, fuel oil, kerosene, paraffin, hydraulic oil, water, and waste kerosene. The tank materials are concrete and steel. All tanks were installed in 1943. Underground tanks at the Tank Farm are known to have leaked and have contaminated the soil and the groundwater (see Section 3.2.3.4, Soil and Section 3.4.3.1, Groundwater). The Tank Farm is scheduled for remediation under a RCRA closure (see Section 4.1.2, Waste Management). The remedial work is scheduled to begin during the summer of 1987 (Ramirez, 1987d).

Tank 65 is under a concrete floor inside Building 814. The tank is made of concrete and was part of a closed-loop water cooling facility. The facility is no longer used, but the tank still contains cooling water. It is not known whether the residual water has been chemically treated.

Tank 66 was used to store kerosene. The steel tank was later emptied and filled with sand when it was taken out of service (date unknown). It is not known whether this tank ever leaked.

Tanks 67, 68, and 69 are located inside the main building and under a concrete floor. This area was acquired in 1986 by the DOE from the General Services Administration. The tanks were reportedly used to store used cutting oil from the Pratt-Whitney aircraft machining operations of the 1940s. All three tanks were filled with sand when taken out of service (date unknown). It is not known whether these tanks ever leaked.

4.5.2.8 General Northeast Area, Including Former Ponds and Liberty Drive Oil Sludge

The general northeast area is located approximately north and west of the North Lagoon, east of the two large aboveground oil storage tanks, and south of the Santa Fe Train Road. This site has historically served as an occasional disposal area for relatively small (unknown) quantities of diluted waste acids and caustics, as well as drainwater collected from sumps (some containing

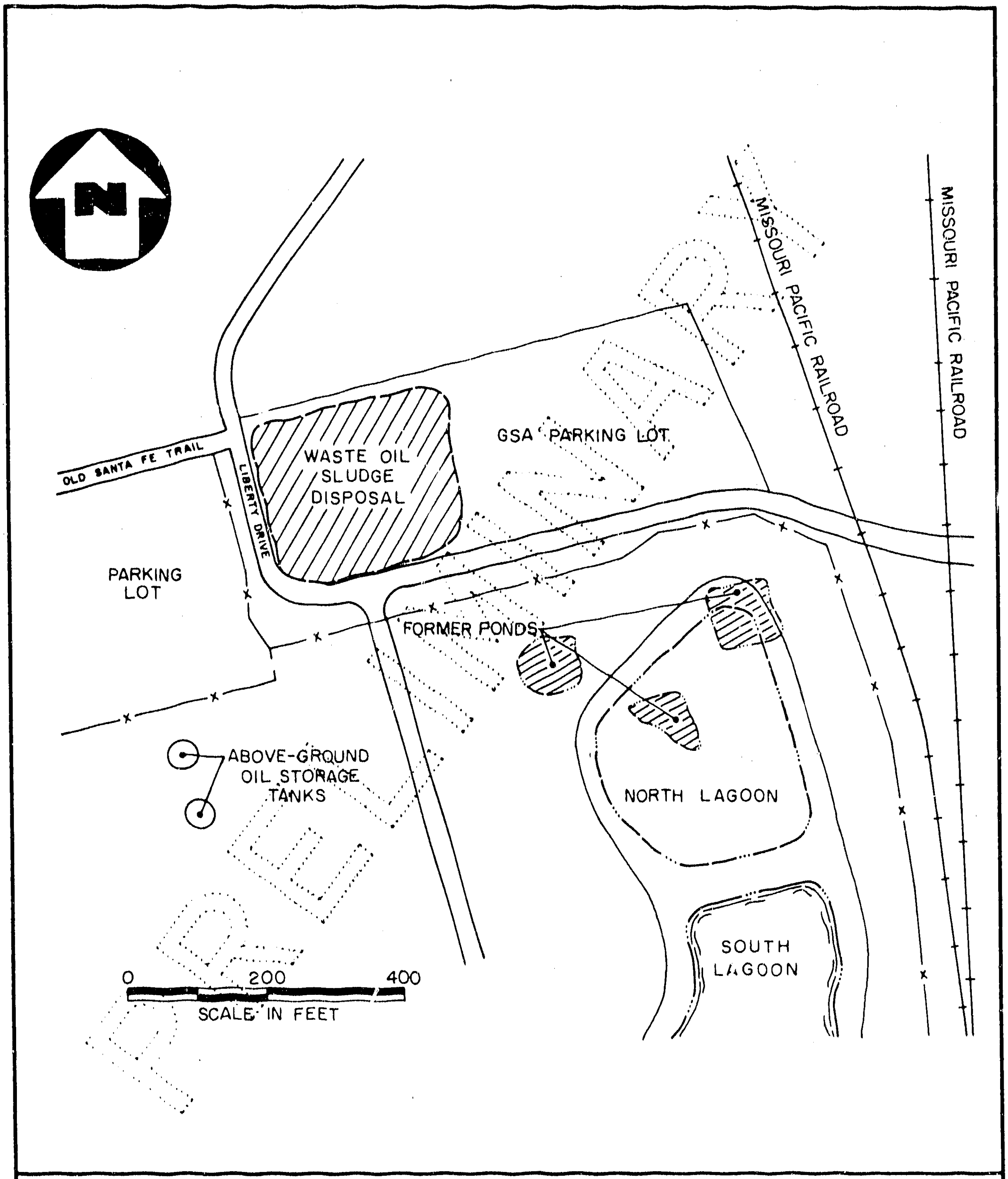
PCB-contaminated oil). Other wastes could have been disposed of here. The practice of dumping wastes was discontinued in the 1970s. Disposed wastes probably have been dissipated by rainwater and soil buffering. Available environmental data taken from this area indicate the PCB concentration in the upper 12 inches of soil to be less than 1 ppm (Korte, 1987b). Groundwater in the northeast area is contaminated with trichloroethene and other chlorinated solvents (see Section 3.4.3, Groundwater).

In addition to past liquid waste disposal in the northeast area, there is also evidence that ponds (no longer in existence) were constructed and used for some unknown purpose during the late 1950s and possibly the early 1960s. Unclassified aerial photographs (P134545/1955 and P22196/1960) indicate the location of several (at least three can be identified) former ponds located in the general area of the north section of the North Lagoon. Each pond appears to have been several acres in size. Figure 4-6 illustrates the approximate location of the ponds with respect to the North Lagoon. An aerial photograph taken in 1963 shows no evidence of the ponds; presumably the ponds were discontinued and removed before or during 1963. There are no records known to be available that suggest how these ponds were used, nor were any plant employees aware of the existence of these ponds. The history of these ponds remains a mystery. As indicated by the photographs, roads did lead to the ponds. This would suggest that the ponds could have been used by trucks to offload waste materials, perhaps liquids. It is unclear whether these ponds have contributed to the general groundwater contamination found in the northeast area (see Section 3.4.3, Groundwater).

There is also a report that sludge was disposed of at the Northeast Area. One employee reported (DOE, 1986a) that in 1973, waste oil sludge was disposed of along the east side of Liberty Drive (now believed to be the site of a paved parking lot). Figure 4-6 illustrates the approximate location of this area. Liberty Drive runs in a general north-south direction east of the General Services Administration parking lot. The sludge allegedly came from the No. 6 fuel oil underground storage tank located at the West Boiler House. This fuel oil tank was cleaned in 1973 (Mast, 1987d).

4.5.2.9 Southeast Parking Lot

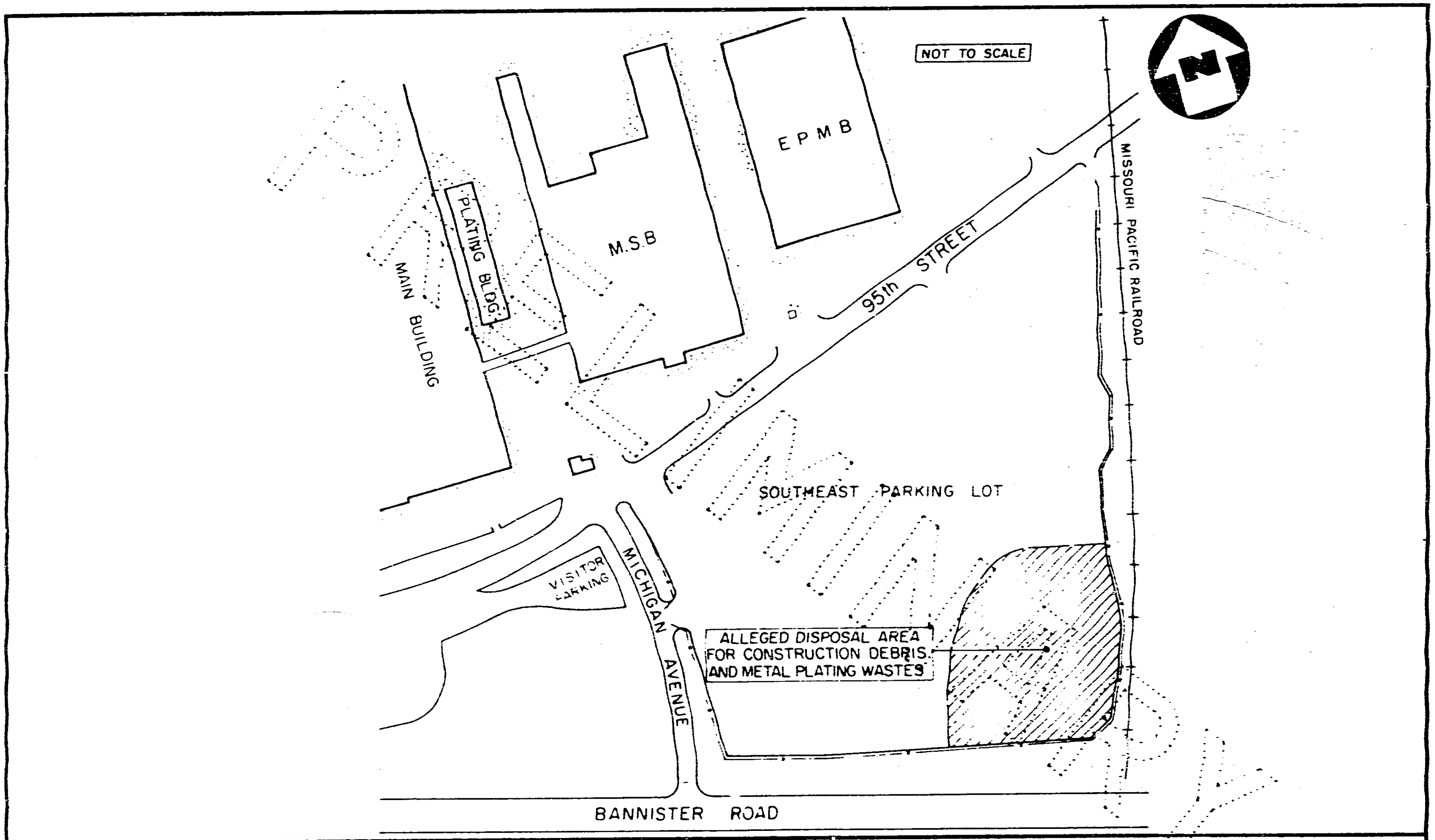
This site is located at the southeast side of KCP, between Bannister Road and 95th Street, and west of the Missouri Pacific Railroad tracks. Figure 4-7 illustrates the location of this site. Based on employee interviews (DOE, 1986a), construction debris and plating wastes allegedly were disposed of in an area now under the southeast corner of the Southeast Parking Lot. The period of deposition was reportedly around 1962 to 1966. There are no records regarding the quantity of wastes disposed of here.



SOURCE: Adapted from Meininger and Madril, 1987b

FIGURE 4-6

FORMER PONDS AND AREA OF OIL SLUDGE DISPOSAL
KANSAS CITY PLANT – KANSAS CITY, MISSOURI



SOURCE: DOE, 1986a

FIGURE 4-7

ILLUSTRATION OF ALLEGED DISPOSAL AREA AT SOUTHEAST PARKING LOT
KANSAS CITY PLANT – KANSAS CITY, MISSOURI

The groundwater in this area has exhibited elevated concentrations of manganese. Manganese levels have been measured consistently nigh (22.1 ppm) in wells near the Southeast Parking Lot (see Section 3.4.3, Groundwater).

4.5.2.10 Classified Burial Trenches

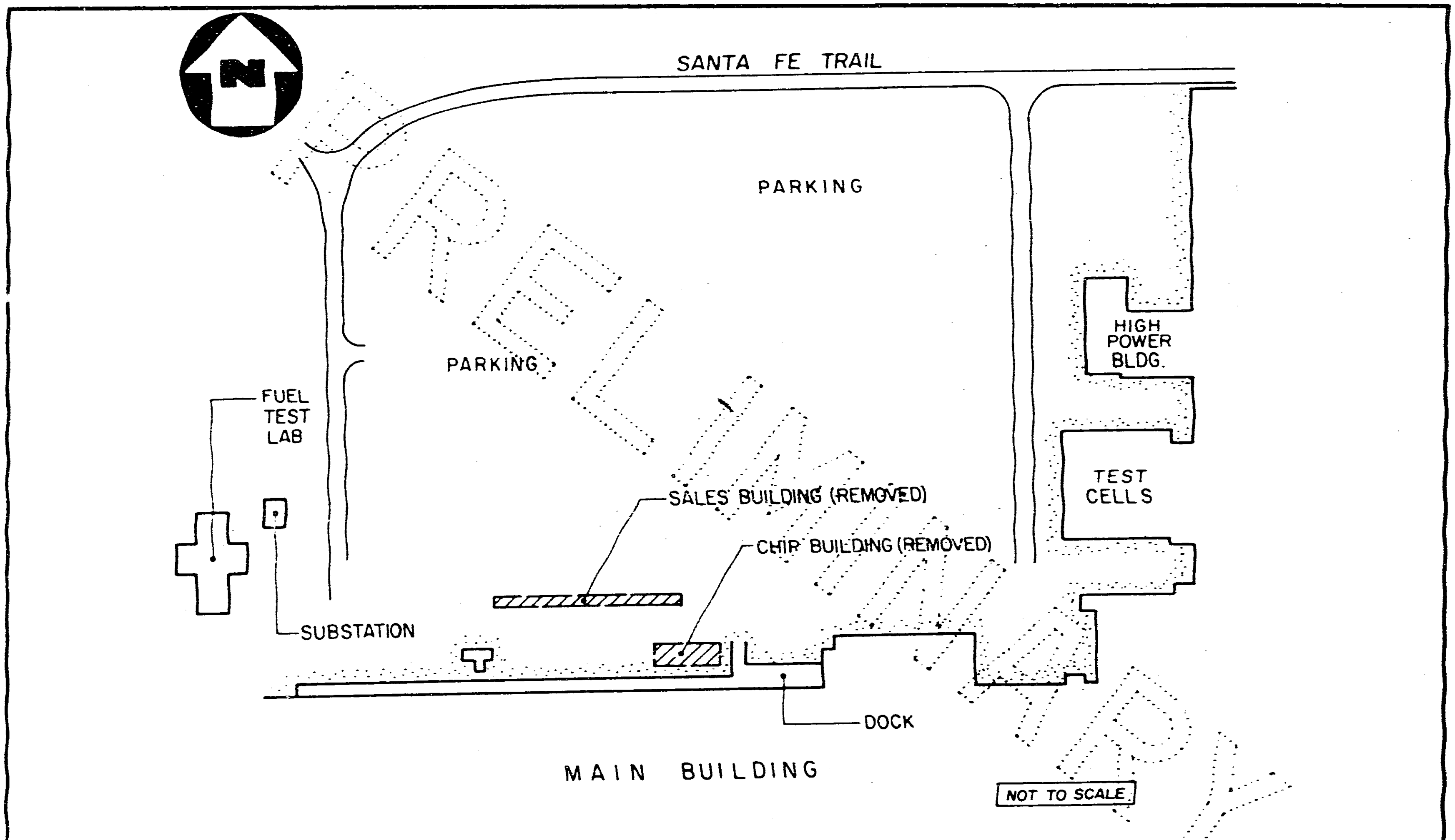
In the late 1950s and early 1960s, a section of Department 20 was used for the machining and inspection of depleted uranium. In the early 1960s, material from this operation was buried in three earthen trenches. Figure 4-2 illustrates the location of these trenches. Among the materials buried were lead oxide and classified shapes. Existing records are unclear as to whether the uranium was actually buried at this site or instead was shipped off-site for disposal. In 1984, Rockwell International exhumed the buried materials and surrounding soil.

The buried wastes were determined to be hazardous because lead was measured (using the EP Toxicity Test) at concentrations greater than the EP toxicity limit of 5 mg/l. Lead concentrations ranged up to 72.3 ppm. No uranium was detected in the wastes. The virgin soil beneath the trenches was found to be nonhazardous (i.e., according to RCRA characteristics for hazardous wastes), although total lead concentrations were measured as high as 400 ppm. (There is no EP toxicity limit for total lead.) It was determined that the backfill material around the wastes was not contaminated.

Unclassified trench wastes and excavated soil were sent off-site and disposed of at the Nevada Test Site. Classified trench wastes were placed in containers and are stored on-site (inside an unused Test Cell).

4.5.2.11 Chip Collection/Reclamation Building

A Chip Collection/Reclamation Building was operated by Pratt-Whitney during the 1940s. The four-story building was used for the collection and segregation of metal chips from aircraft machining operations (Holm, 1987). The chips were placed in drums and taken to a nearby loading dock, where off-site contractors picked up the chips for recycling. When Pratt-Whitney terminated its operations in the mid-1940s, the "Chip Building" became inactive and remained vacant. The building was later removed in 1974. There is now a paved parking lot at this site. Aerial photographs (e.g., P134545/1946 and P37356/1964) identify the building location to have been north of the main building and west of Buildings 47 and 80. Figure 4-8 illustrates the location of this former building and the location of the dock, which is still used today.



SOURCE: Holm, 1987

FIGURE 4-8

APPROXIMATE LOCATION OF CHIP BUILDING AND SALES BUILDING
KANSAS CITY PLANT – KANSAS CITY, MISSOURI

The metal chips collected at this building likely contained waste oil and coolants. There is currently no environmental data to suggest whether the Chip Building area or the loading dock area are contaminated.

The Chip Building was not identified in the CEARP draft Phase 1 report.

4.5.2.12 Sales Building

The Sales Building was formerly located north of the former Chip Collection/Reclamation Building at the north side of KCP. Figure 4-8 illustrates the former location of this building. This one-story building was used for the storage of surplus material and equipment (e.g., paint, used machinery), which were later sold at a public auction (Holm, 1987). There are no records to indicate what items were actually stored in this building.

The building was active from the mid-40s to 1972. Later, it was occasionally used for the storage of U.S. Marine Corps boats and other items (unknown). The building was removed in 1981. There is now a paved parking lot at this site.

Liquid contaminants could have been stored inside the building and possibly released to the area around the building. There is no environmental data to suggest whether this area is contaminated.

The Sales Building was not identified in the CEARP draft Phase 1 report.

4.5.2.13 Sanitary Sewer Lift Station at the Northeast Area

Sanitary sewage from the KCP flows to the Kansas City, Missouri, sewer collection system. A lift station, located in the northeast area of KCP, pumps the KCP wastewater to a 24-inch sewer pipe, which discharges to the city sewer system. A 14-inch piezometer tube on the 24-inch gravity line contains level sensors that operate control valves used to control flow to the wetwell of the lift station. This piezometer tube is open at the top and is used as an access point for sampling the sanitary sewage. In the past, sewage has overflowed onto the ground through this opening when the city sewers became backed up and were hydraulically unable to carry the full flow from KCP. About 5 years ago, the city sewer (adjacent to the KCP area) was increased from 42 inches to 84 inches in diameter to increaser the hydraulic capacity. It is not known whether sewage overflows at the lift station still occur (Mast, 1987e). The Lift Station was not identified in the CEARP draft Phase 1 report.

4.5.2.14 Off-Site Hazardous Waste Disposal Sites

In 1984, KCP conducted a records search to identify off-site hazardous waste disposal sites that received hazardous wastes from KCP. The records review included purchase orders, debit memoranda, shipping documents, invoices, and manifests. The record search identified 22 off-site waste disposal sites, although there may have been others (Long, 1987). Records for off-site shipment of hazardous materials date back only to the 1960s. For the 22 sites identified, information is available pertaining to when these companies were used for waste disposal, the description of the hazardous material, the approximate quantity of waste sent off-site, and the waste disposal method (e.g., landfill, incineration).

There is one hazardous waste disposal site which was formerly used by KCP and is known to have groundwater contamination. The commercial landfill is located at Kansas City, Missouri, and is owned and operated by the Conservation Chemical Company (CCC). The CCC site is a proposed NPL site. KCP used this site from 1961 to 1977 for the disposal of solid wastes and liquid wastes, including acids, solvents, and coolants. Approximately one million gallons of liquid wastes from KCP were disposed of at the CCC site. In 1986, responsible parties agreed to provide funds to remediate the site. KCP, although not identified as a responsible party, did provide funds for the site cleanup. The remediation effort to clean up the groundwater apparently did not succeed, and the Conservation Chemical Company recently has become involved in new litigation (Long, 1987). It is unclear what implications this will have on KCP.

4.5.3 Findings and Observations

4.5.3.1 Category I

None.

4.5.3.2 Category II

None.

4.5.3.3 Category III

1. Underground Tank Farm. There is a Category III finding for this site in Section 4.1.3.3, Waste Management.

2. West Boiler House. Buried underground storage tanks at the West Boiler House are sources for soil contamination. The boiler house provides steam and chilled water for KCP and other areas at the Federal complex.

Two steel underground tanks were recently removed at the west side of the West Boiler House. Both tanks were installed in 1943 and removed in 1985. One tank was 10,000-gallon capacity and was used to store diesel fuel. The other tank was 1,000-gallon capacity and stored waste oil. The waste oil also contained PCBs, which probably came from the PCB-contaminated heat transfer systems (Departments 26 and 27) and other sources.

Recent soil analyses at this site indicate that the subsurface soil is contaminated with oil and grease (up to 2,430 ppm) and PCBs (up to 8.8 ppm, see Section 3.2.3.5, Soil). Two other underground storage tanks are located at the south side of the West Boiler House. These concrete tanks are each 250,000-gallon capacity and are used to store No. 6 fuel oil (although the east tank is currently empty). These tanks were installed in 1943 and over the years, have been periodically cleaned and inspected for cracks. A 1984 internal inspection of the empty tank revealed the presence of cracks in the concrete walls. These cracks have not been repaired.

This area has also experienced several spills. In 1967, a large spill occurred west of the West Boiler House. Between 500 and 5,000 gallons of No. 6 fuel oil were discharged onto the ground when a fill hose from a tanker truck became disconnected. Oil was also released to a drainage ditch which flows to Indian Creek. The oil was dammed and burned in an effort to keep it from reaching Indian Creek. There have also been smaller spills in this area as a result of fuel transfer operations.

Recent soil analyses in this area indicate the subsurface soil is contaminated with oil and grease (up to 1,920 ppm, see Section 3.2.3.5, Soil).

3. Old Railroad Dock. At the Old Railroad Dock, past operations of a former still operation have contaminated the soil and the groundwater.

Around 1950 to 1952, a solvent recovery still operated on a raised platform adjacent to an unpaved railroad siding. The still reclaimed spent solvents, principally trichloroethene (TCE). Numerous spills (quantities unknown) occurred at this site. Any chemical spills likely would have been released to the railroad tracks and percolated into the soil. Since the termination and removal of the still, the railroad tracks have been removed and the soil covered with a concrete floor. The Old Railroad Dock is now used for material storage.

The subsurface soil at the dock area is contaminated with TCE at concentrations up to 290 ppm. Also detected was 1,2-trans-dichloroethene but at lower concentrations (about 5 ppm). PCBs were measured at concentrations less than 0.5 ppm (see Section 3.2.3.6, Soil).

The groundwater at the Old Railroad Dock area is also contaminated with TCE at concentrations up to 0.5 ppm (see Section 3.4.3, Groundwater).

4. <u>Heat Exchange System</u>. The heat exchange systems, located outside of Departments 27 and 26, are known to be sources for soil contamination. Both systems historically have used Therminol FR-1, which is a PCB-oil used as a heat transfer fluid. Currently, both systems use a non PCB-heat transfer fluid, although residual PCB contamination remains in the systems.

Both systems have released PCB-oils. Releases have occurred as the result of spills from expansion tanks and as the result of leaks from failures of expansion joints, pumps, and the heat exchangers.

High concentrations of PCBs were found in the soil outside the Department 27 area. The higher concentrations were generally found in the surface soil (up to 7,400 ppm PCB), although significant levels were observed near the base of a PCB Therminol storage tank (460 ppm PCB) that was removed in 1985. Excavation of the contaminated fill and soil around the removed underground storage tank has reduced residual concentrations to low levels (<2 ppm PCB). It is reasonable to assume that PCB-contaminated soil remains below the pavement elsewhere in this general area.

Similarly, PCBs remain in the soil outside of Department 26. Between Building 57 and the main building, PCB contamination ranges from several thousand parts per million at the surface to several hundreds parts per million (and less) to a depth of 3 feet. Sumps around the heat transfer system remain contaminated up to 43,000 ppm PCB.

Areas around both heat exchange systems have been paved. This preventive measure has minimized the exposure to PCB-contaminated soil and has prevented surface runoff from infiltrating the contaminated subsurface soil.

5. Underground Storage Tanks (USTs). There is a Category III finding for this site in Section 4.1.3.3, Waste Management.

6. General Northeast Area. There is a Category III finding for this site in Section 3.4.4.3, Groundwater. Survey-related sampling is planned for this site (i.e., the sites of the former ponds).

7. Southeast Parking Lot. There is a Category III finding in Section 3.4.4.3, Groundwater, which includes this site.

8. Classified Burial Trenches - The site of the former classified burial trenches may be a source of soil contamination.

   In the late 1950s and early 1960s, a section of Department 20 was used for the machining and inspection of depleted uranium. In the early 1960s, material from this operation (excluding uranium) was buried in three earthen trenches. Among the materials buried were lead oxide and classified shapes. In 1984, Rockwell International exhumed the buried materials and surrounding soil (excluding the virgin soil beneath the trenches).

   The virgin soil beneath the trench wastes was not found to be hazardous (i.e., according to RCRA characteristics for hazardous wastes). However, total lead concentrations in the soil ranged up to 400 ppm (there is no EP toxicity limit for total lead). This lead-contaminated soil was not removed when the site was cleaned up. It remains buried beneath approximately 10 feet of clean overburden.

9. Chip Collection/Reclamation Building. The site of the former Chip Collection/Reclamation Building may be a possible source of soil contamination.

   This building was operated by Pratt-Whitney during the 1940s. The four-story building was used for the collection and segregation of metal chips from aircraft machining operations. The chips were later taken to a nearby loading dock, where off-site contractors picked up the chips for recycling. When Pratt-Whitney terminated its operation in the mid-1940s, the "Chip Building" became inactive and remained vacant. The building was later removed in 1974.

There is now a paved parking lot at this site. The building was located north of the main building and west of Buildings 47 and 80.

The metal chips collected at this building likely contained waste oil and coolants, which could have leaked on the building floors. Accumulated waste liquids also could have been released (e.g., spilled) on the area surrounding the building. There also could have been releases at the loading dock area. There is currently no environmental data to suggest whether this area is contaminated.

Survey-related sampling is planned for this site.

10. Sales Building. The site of the former Sales Building may be a possible source of soil contamination. The one-story building was used for the storage of surplus material and equipment (e.g., paint, used machinery), which were later sold at public auction. There are no records to indicate what items were actually stored in this building.

The building was active from the mid-40s to 1972. Later, it was occasionally used for the storage of U.S. Marine Corps boats and reportedly other (unknown) items . The building was removed in 1981. A paved parking lot now occupies this site.

Liquid contaminants could have been released from stored equipment and materials inside the building. The soil around the building could have become contaminated. There is no environmental data to suggest whether this area is contaminated.

Survey-related sampling is planned for this site.

11. Sanitary Sewer Lift Station at the Northeast Area. The sanitary sewer lift station northeast of the plant is a source of soil contamination.

The lift station has backed up and released wastewater contaminants (unknown characteristics) to the surrounding soil. This has occurred several times in the last few years as a result of the inadequate hydraulic capacity in the Kansas City sewer system. The city has recently increased the capacity of the sewer system near KCP and likely has eliminated hydraulic backups at the lift station. Approximately 25 square feet of ground surface area is stained from the lift station overflows.

Survey-related sampling is planned for this site.

4.5.3.4 Category IV

1. CERCLA 103(c) Notification. Under Section 103(c) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), KCP is required, among other things, to notify the Environmental Protection Agency (EPA) of the existence of hazardous substances that have been disposed of at the facility.

   No documentation could be found in the files to verify that KCP has formally notified EPA of the existence of these sites.

2. Accidental Spills of Hazardous Substances. If accidental spills of hazardous substances were to occur at any of the five following locations, they would not be adequately contained and could present an environmental problem (e.g., hazardous substances could percolate to the groundwater or run off to surface water). The locations of concern are described below. (See Section 4.1.2, Waste Management, for background discussion.)

   - Transfer operations to fill the diesel underground storage tank (Tank No. 1) at the West Boiler House occur in an undiked area. A significant spill would flow directly to a nearby storm drain located just east of the transfer area.

   - Much of the surface area under the network of above ground fuel transfer pipes is unpaved. These transfer pipes are used to fill two large oil storage tanks that are located west of the North Lagoon. Also, there is no containment structure(s) to collect a spill that might occur if a pipe were to leak or rupture.

   - The solvent distillation unit in Building 59 (Department 87) is not located within a diked area. A spill would flow to floor drains which are located in the adjacent corridor.

   - The liquid waste loading area at the Aboveground Tank Farm may not be able to contain a large spill. Spilled liquid is intended to flow into a 1-inch gap, that separates the platform scale from the service drive. The spilled liquid flows down and beneath the scale and collects in a sump. However, in the event of a large spill, it is unlikely that all of the liquid would be captured. It is more likely that at least some liquid would flow beyond the gap and likely flow into a storm drain located nearby.

- The area just east of the Building 77 chemical storage area is used to unload and temporarily store liquid hazardous substances (e.g., solvents). These materials are later taken to various KCP buildings. This area is not diked and is located near a storm drain. Any spill that would occur during transfer or temporary storage would flow to the storm drain.

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APPENDIX A

SURVEY PARTICIPANTS

KANSAS CITY PLANT SURVEY PARTICIPANTS
MARCH 23 THROUGH APRIL 3, 1987

<u>DOE</u>

Team Leader:	T. T. Traceski
Assistant Team Leader:	H. Carwell
Operations Office Representative:	P. Hoopes

<u>NUS</u>

Coordinator/Surface Water:	R. E. Tarbert
Toxic Materials:	R. C. Gerlach
Air:	T. F. Eckle
Assistant Coordinator/Radiation/QA:	J. D. Yesso
Hydrogeology:	M. S. Robison

<u>ICF</u>

Waste Management:	G. M. Kelly
Inactive Waste Sites:	R. L. Scullin

APPENDIX B
SURVEY PLAN

ENVIRONMENTAL SURVEY PLAN

KANSAS CITY PLANT

MARCH 23 - APRIL 3, 1987

KANSAS CITY, MISSOURI

1.0 INTRODUCTION

The Kansas City Plant (KCP) environmental survey is part of the larger Department of Energy (DOE)-wide Environmental Survey effort announced by Secretary John S. Herrington on September 18, 1985. The purpose of this effort is to identify, via "no fault" baseline surveys, existing environmental problems and areas of environmental risk at DOE facilities, and to rank them on a DOE-wide basis. This ranking will enable DOE to more effectively establish priorities for addressing environmental problems and allocate the resources necessary to correct these problems. Because the survey is "no fault" and is not an "audit", it is not designed to identify specific isolated incidents of noncompliance, or to analyze environmental management practices. Such incidents and/or management practices will, however, be used in the survey as a means of identifying existing and potential environmental problems.

The KCP survey will be conducted in accordance with the protocols and procedures contained in the May 16, 1986, draft Environmental Survey Manual.

2.0 SURVEY IMPLEMENTATION

The Environmental Survey of the Kansas City Plant (KCP) will be managed by the DOE Team Leader, Thomas Traceski and the Assistant Team Leader, David Caughey. John Cochran will serve as the Albuquerque Operations Office (ALO) representative on the Environmental Survey Team. Technical support is provided by NUS Corporation and ICF Corporation personnel as follows:

Richard Tarbert	NUS Coordinator/Surface Water
David Yesso	Assistant NUS Coordinator/Radiation/QA
Richard Gerlach	TSCA (Toxic Materials)
Tom Eckle	Air
Gerard Kelly	RCRA/Solid Waste
Ronald Scullin	CERCLA (Inactive Sites)
Mary Robison	Hydrogeology/Soil

2.1 Pre-survey Activities

Pre-survey activities began in December, 1986, when the DOE Team Leader and Assistant Team Leader initiated reviews of KCP environmental documents that were available at the DOE Office of Environmental Audit (OEA). This review was followed by a December 24, 1986, memorandum from OEA to the Albuquerque Operations Office (ALO) and the Kansas City Plant (KCP) announcing a pre-survey site visit and requesting additional survey-related information. The technical specialists began their review of the documents available at OEA in early February 1987. The purpose of the review of that material was to allow the survey team members to gain familiarity with KCP and prepare themselves for the pre-survey site visit.

The nine members of the survey team, accompanied by Mr. Elmer Burd (NUS Health and Safety Advisor) conducted the pre-survey site visit on February 10 and 11, 1987. The visit was scheduled to allow team members an opportunity to gain initial familiarity with the site, identify potential areas of environmental concern, explain the objectives and methodology of the survey, collect the documents requested in the December 24, 1986 memorandum, and coordinate plans for the upcoming survey with DOE/ALO, DOE/Kansas City Area Office (KCAO), and Allied/Bendix Kansas City Plant personnel. The visit allowed the NUS Health and Safety Advisor to gather the information required to prepare the Health and Safety Plan to be used by the survey team during the performance of the on-site portion of the survey. Mr. Kevin Flynn, Argonne National Laboratory, who will coordinate the sampling and analysis phase of the survey, also attended the pre-survey site visit.

During the pre-survey site visit, team members were provided with detailed briefings by KCP and DOE/KCAO personnel on the KCP organization, operations, and activities; environmental issues; plant security; safety; industrial hygiene; and the plant environmental programs. Of particular value to the team were tours of the waste management facilities, outside sites, and production facilities. Following the tours, team members had an opportunity to review the environmental documents that had been assembled by KCP personnel. Based upon this review, the briefings and tour, additional documents were identified and requested by team members. Arrangements were made to have the collected materials shipped to the NUS offices in Pittsburgh. All of the documents that were requested in the memorandum of December 24, 1986 and during the pre-survey site visit have been received. This survey plan is based upon material received by the survey team through the end of February 1987.

During the pre-survey site visit, Messrs. Traceski and Caughey met with representatives of DOE/ALO; Allied/Bendix; and officials of the U.S. EPA, Region VII; Missouri Department of Natural Resources; and the City of Kansas City, Missouri. This meeting was scheduled to explain the purposes of the survey to the Federal, state, and local personnel and to allow them to express their concerns over the environmental condition of KCP.

The survey was provided with a detailed site plot-plan which was used in the preparation of this survey plan. The plot plan is reproduced here as Figure 2-1.

2.2 On-Site Activities and Reports

The on-site portion of the Environmental Survey will be conducted over a two (2) week period from March 23, 1987 through April 3, 1987. A brief (about 30 minutes) introductory meeting will be held on the first day between the survey team, the KCAO Manager and the KCP Manager to introduce the team members and review the objectives and methodology of the survey. The survey will include all facilities and areas associated with the Kansas City Plant operations. A tentative agenda is as shown in Table 2-1. As members of the survey team continue reviewing the documents prior to the survey, and during the actual site visit, it is expected that modifications will be made by DOE as appropriate to minimize disruption of site activities, to enhance survey efficiency and effectiveness. All modifications to the agenda will be coordinated with the site officials designated as survey contacts. A summary of the survey agenda is shown in Table 2-2.

The on-site activities of the survey team will consist of interviews and consultations with, among others, environmental, industrial hygiene, safety, operations, waste management, purchasing, and warehousing personnel; a review of files and documents (including classified documents) unavailable prior to the on-site portion of the survey; and process-specific and area-specific tours of the facility.

A closeout briefing will be conducted on Friday, April 3, 1987 to describe preliminary findings of the on-site activities. A preliminary report of the survey will be prepared within 8 to 10 weeks from the conclusion of the survey. Subsequently, an interim report will be prepared by the survey team within 6 to 8 weeks of the completion of sample analysis. The interim report will incorporate technical comments to the Preliminary Report and the data from the sample analyses.

The Interim Report will be made available to the public, upon request. At the completion of the overall environmental survey effort, a final report will be prepared that will contain a DOE-wide list of environmental problems. The report will be used as an information base for the ranking of DOE's environmental problems.

2.3 Sampling and Analysis

Based on available site environmental information and the results of the survey activities on site, the KCP survey team will identify any survey-related sampling needs. Preparation for the sampling and analysis (S&A) phase of the survey process will begin approximately 2-4 weeks after the completion of the site visit, with the development of the sampling request package. The S&A effort will be conducted by Argonne National Laboratories (ANL). Kevin Flynn and Don McCown will be the ANL Team Leaders for the sampling and analysis phase of the Environmental Survey. The Argonne sampling and analysis team will draft a sampling and analysis plan based upon the needs identified by the survey team. The Assistant Team Leader will coordinate the review of this sampling and analysis plan with the Albuquerque Operations Office and EPA's Laboratory at Las Vegas (Environmental Monitoring Systems Laboratory) which has quality assurance responsibility for the survey's sampling and analysis efforts. The actual on-site sampling at KCP is projected to start during the summer (tentatively July) of 1987. The sampling is expected to take between 2 and 4 weeks to complete. Analysis of the samples will be conducted by Argonne following protocols provided in the Survey Manual, supplemented by the KCP Sampling and Analysis Plan. Results of the sampling and analysis will be transmitted to the survey team leader for incorporation into the interim report.

3.0 AIR

The air-related survey will involve an assessment of activities at the Kansas City Plant (KCP) that emit or have a potential to emit one or more air-contaminant materials, the administrative and emission controls applied to the sources, and plans for ambient-air monitoring. The emphasis of the survey will be placed on those air contaminants for which air-quality standards (criteria pollutants) or emission standards have been established by the United States Environmental Protection Agency, the Missouri Air Conservation Commission, or the Health Department of the City of Kansas City, Missouri. Also to be reviewed are substances being considered for listing as hazardous air pollutants. The primary contact for the air specialist will be D.M. Eggers, with other contacts as appropriate in production areas indicated in Table 2-1.

3.1 Issue Identification

As a result of the pre-survey site visit, it is apparent that KCP has relatively few sources of criteria pollutants or substances regulated by National (or State) Emission Standards for Hazardous Air Pollutants (NESHAP). However, about 1600 exhaust vents exist, many of which are probable sources of volatile organic compounds that may be toxic and/or potentially contribute to the local ozone problem. The emission of volatile organic compounds, which react photochemically to produce ozone, is a developing concern at KCP. As discussed by a representative of the U.S. Environmental Protection Agency, Region VII, during the pre-survey site visit, the State of Missouri is being required to revise its ozone implementation plan. This revision is required because the ozone air-quality standard has not been attained in parts of Missouri (specifically, the Metropolitan Kansas City Interstate Air Quality Control Region). The new plan could place severe restrictions on volatile organic compound emissions from KCP.

The general approach to the survey will include of a review of existing air permits, pending applications, and standard operating procedures. Processes and control equipment will be inspected, with special emphasis on solvent metal cleaning operations and other solvent uses. The survey will evaluate the adequacy of devices or techniques used to minimize the emissions of air-contaminant materials to the atmosphere, and assess the need for additional monitoring to characterize the air-contaminant emissions. In addition, the potential for emissions of windblown fugitive dust particles from plant roads, parking lots, and from remediation activities at the lagoons and underground tank farm will be assessed.

During the pre-survey site visit, D.M. Eggers discussed requests for proposals that were being prepared to obtain contractors: (1) to perform stack tests for emissions determinations at the West Boiler House and at three of the exhaust vents on the main building, and (2) to equip and operate three ambient-air monitoring stations on the Kansas City Plant property. As part of the survey, any proposals received will be reviewed to assess the adequacy of the sampling and monitoring programs.

Several areas of specific interest have been identified as a result of the pre-survey site visit and a preliminary review of available documents:

- The major air-related issue at the Kansas City Plant is the emission to the atmosphere of volatile organic compounds from solvent metal cleaning, surface coating, and other activities involving organic solvents.

- Emission testing at steam plant stacks has not been performed since 1978.

- Potential exists for emission of NESHAP pollutants (e.g., beryllium and mercury) and prospective NESHAP pollutants (e.g., trichloroethylene and perchloroethylene).

- Ambient-air monitoring program for criteria pollutants has been inactive for over one year.

- Proposed new sources for VOC emissions to the atmosphere include:

  - Air stripping of wastewater prior to discharge to Publicly Owned Treatment Works (POTW).

  - Air stripping of groundwater as a backup to ozonation prior to discharge to sewage system.

Throughout the survey, emphasis will be placed on assessing available data and any future data generated by the site to characterize the overall environmental impact of plant operations. Where data gaps exist, recommendations for additional sampling and analysis may be developed for follow-up by the sampling and analysis team.

3.2 Records Required

Additional documents will be reviewed as part of the survey, including documents not yet received (e.g., classified documents, individual files, documents not yet identified). Specific documents and files requested for review while on site include but will not be limited to, the following:

- Most recent computerized listing of exhaust hood locations, materials used, and results of face-velocity tests. The relation between exhaust hood and roof vent is also desirable.

- Detailed inventory of roof exhaust vents including information on location, source served, potential pollutant emission, etc.

- Fuel-consumption data for steam production for most recent year (monthly data per boiler), including data on heating value of fuels and sulfur and ash contents.

- Contractor proposals for air-emissions sampling and ambient-air monitoring activities.

- Standard Operating Procedures
  - Use of Waste Acid Storage Tank
  - Use of Waste Solvent Storage Tank
  - Solvent Recovery Still

4.0 SURFACE WATER

The surface water-related portion of the Kansas City Plant Environmental Survey will be concerned with discharges to adjacent streams and Publicly Owned Treatment Works (POTWs). The plant's potable water system will be addressed in this part of the survey.

4.1 Issue Identification

The preliminary review of the documents supplied by the Albuquerque Operations Office and the Kansas City Plant and briefings by the Bendix Staff during the pre-survey site visit helped to focus on the following issues.

PCB contamination of soils and sediments, from leaks and spills while these materials were used in the past, continue to present a problem for the surface water medium. The NPDES permit prohibits the discharge of measureable amounts of PCBs. The plant discontinued the use of PCBs (except those in transformers and capacitors) in 1979 but they began to be consistently detected again in outfalls 001 and 002 in June 1982. An abatement Order was issued on December 3, 1984 that required the plant to reduce discharges to one microgram per liter (1 ug/l) on a monthly average by July 31, 1985. The plant was able to do this for outfall 001 but the average for outfall 002 continues to be in the range of 1-2 ug/l.

The plant is situated in the flood plain of the Blue River. A flood wall and dike were partially completed in 1972 which gives protection for up to a once-in-seventy-year flood. The Federal Emergency Management Agency does not show the plant as being in either the 100-year or 500-year flood plain on its Flood Boundry and Floodways Map (Community Panel No. 290173-0115). This may affect the plant's handling of PCBs covered under TSCA and hazardous wastes covered under RCRA since both these acts prohibit the storage of materials in a 100-year flood plain.

Another surface water concern driven by an act other than the Clean Water Act (CWA) is the project to construct an Industrial Waste Pretreatment Facility. This project was initiated to treat the industrial wastewater effluent to the POTW to meet the pretreatment standards for both the metals finishing and elecroplating industries when the South Lagoon is closed under RCRA in 1988. The limit actually imposed on the plant is an alternate limit as determined by the combined waste stream formula in 40 CFR 403.6(e). This approach is used because there are flows in the waste stream that serve to dilute the concentration of contaminants present in the effluent.

The monitoring program at KCP includes analyses of the Blue River and Indian Creek both upstream and downstream of the plant, the discharges through the four NPDES permitted storm water outfalls, the discharge to the POTW and the water supplied by the Kansas City Water Department to the plant. The stream monitoring has shown no significant impact on the receiving streams due to the plant's operations. The NPDES parameter, other than PCBs, most frequently exceeded is the total dissolved solids. This parameter is limited to 10% above the concentration detected in incoming water. Most exceedences are only slightly above this value.

The survey will include identification of potential discharges to surface waters, or the local sanitary authority, which may not be addressed in operating permits or other documents from KCP. Measures taken at KCP to prevent back-flow of process wastewater or sanitary sewer flows into the drinking water piping systems will be reviewed. A walk-through of plant facilities will be made to observe normal routines, including maintenance activities which generate wastewaters. Various discharge and monitoring points will be reviewed, and actual sampling procedures will be observed. Emphasis will be placed on the major contributors to wastewater generation, for example the plating operations in Departments 94 and 97. Minor sources (in terms of total volume) will also be examined because of the nature of the contaminants and commensurate potential environmental impacts. The wastewater collection, holding and treatment systems will be evaluated, as will the final effluent monitoring and sampling stations. The impact of changes resulting from construction of the new wastewater treatment facilities will also be evaluated.

The primary contacts for the surface water specialist will be John Ramirez and Nic Korte. Interface with the production people in the departments indicated in Table 2-1 will be required during tours of their areas to look at sources of liquids that eventually discharge to the surface waters.

4.2 Records Required

During the pre-survey review of documents supplied by KCP, the following additional data and documents were identified as being of interest to the surface water specialist.

- Waste Management Internal Procedure 737 - Operating Procedures for the Oilmaster Oil/Water Separator

- Waste Management Internal Procedure 738 - Operation of the DCI DYNA1 Solvent Distillation System

- Data used for preparing recent Industrial Waste Discharge Reports and NPDES Monitoring Reports

- Sampling protocols and logbooks

- Records of drinking water quality

- Internal memos or correspondence relating to surface water/drinking water problems, e.g., back-flow prevention measures

5.0 GROUNDWATER AND SOIL

One of the major environmental issues at the plant is the release of contaminants to the groundwater and subsurface. A review of the documentation for the hydrogeological site characterization performed to date, as well as the information presented during the pre-survey site visit, indicates that the major groundwater problem at the Kansas City Plant is the presence of organic solvent contamination, particularly trichloroethene. The major soil problem is PCB contamination, although solvent and non-PCB oil contamination is also present. Transport of contaminated soil by surface runoff or through leaky sewers can result in surface-water contamination.

The survey effort will involve the evaluation of recent studies of site hydrogeology, determination of the status of on-going studies, assessment of the adequacy of the environmental monitoring program, and the review of plans for further investigations and remedial actions.

5.1 Issue Identification

Several areas of specific interest have been identified through the pre-survey site visit briefings and review of the data received thus far. These issues are discussed below.

The Tank Farm consists of 28 underground tanks, which were installed in 1943 to store fuels, coolants, and solvents. None of the tanks are in current use, although at least three were used until 1983. Six were filled with water, some of which may have leaked out, six are filled with sand, and 16 have been drained and cleaned with high-pressure soap and water.

Monitoring wells installed in 1982 to meet RCRA requirements revealed (parts per million) ppm levels of trichloroethene, methylene chloride, and 1,1,1-trichloroethane in groundwater. An expanded well network is in place and quarterly sampling and analysis is being conducted. The plume is migrating southward toward Indian Creek at a rate of 0.05 foot per day. Eventual discharge of contaminated groundwater to the creek could degrade surface-water quality.

Corrective action is required under RCRA. Remedial action alternatives have been evaluated and the project is now in the engineering design phase.

The <u>Old Railroad Dock Area</u> was the location of a solvent reclamation still that operated during the early 1950's. Trichloroethene contamination is found to depths of 40 feet in the soil, and a contaminant plume is present in groundwater downgradient of the area. The environmental problem is again the potential for degradation of surface water through discharge of contaminated groundwater. Restoration of groundwater quality by removal and treatment is reportedly scheduled for FY88.

The <u>Northeast Area</u> also contains ppm levels of trichloroethene and other chlorinated solvents in groundwater. Several separate sources seem to be required to explain the depth and location of contaminants. One of these sources may be a debris-filled trench which existed prior to construction of the North Lagoon. The environmental problem is potential discharge of contaminated groundwater to the Blue River. Further well installation will be done prior to the on-site survey, as part of the characterization of this area.

The IRS Landfill may be the source of volatile organic compounds found in downgradient monitoring wells near the Blue River. Low levels of these organic compounds were found in a few samples taken from borings in the landfill. The samples showed high concentrations of trace metals which do not appear in groundwater. This is consistent with the fact that the samples were not leached significantly in the EP Toxicity Test. The apparent mismatch between source and plume is analogous to that in the Tank Farm area, where the soil is contaminated with oil but not with organic solvents, while the groundwater is contaminated with solvents but not oil.

Underground storage tanks at the West Boiler House have leaked fuel oil to the surrounding soil. Spills have occurred during fuel transfer; one large spill was blocked from Indian Creek by damming a drainage ditch and burning the fuel behind the dam. Oil and grease contamination have been found in soil borings. Recent sampling shows higher levels than earlier sampling, and oil is found in soil at depths below the water table, although oil spills would be expected to float. Two waste oil tanks have been removed, and removal of both active and abandoned underground tanks at this site is planned (FY88 and FY90 funding). Further site characterization may be needed, although additional study could be performed in conjunction with tank removal.

PCB-contaminated soil at the 002 Raceway, the abandoned outfall south of the Visitor Parking Area, and spill sites within the plant area can be transported by surface runoff, thus contributing to surface water pollution. Contaminated soil may also be transported in leaky sewer pipes.

The primary contact for the groundwater and soil specialist will be N.E. Korte.

5.2 Records Required

Files will be reviewed as part of the survey including documents not yet reviewed or received (e.g., classified documents, individual files, documents not yet identified). Specific documents and files to be reviewed as part of the survey include, but will not be limited to, the following:

- Recent analytical data from groundwater monitoring.
- Well locations and construction diagrams from new well installation.
- Latest report in hydrogeologic site characterization series (sediment analysis and groundwater modeling).
- Backup analytical data from hydrogeologic site characterization project files.
- Report on remedial options for IRS Landfill, if available.
- Work plans for current and proposed investigations.
- Sampling procedures and analytical protocol.

6.0 HAZARDOUS/RADIOACTIVE/SOLID WASTE

The hazardous/radioactive/solid waste element of the environmental survey will identify all wastes generated at KCP; document waste treatment, storage, recycling and disposal practices; and identify any related problems that could result in the contamination of environmental media. The procedure and facility-specific activities to accomplish these survey objectives are presented below.

The pre-survey visit provided an important basis for the procedures and activities outlined. It afforded an overview of waste management facilities and practices, as well as an on-site perspective of plant operations and waste volumes generated. Wastes and waste management practices were described, waste management facilities were visited, responsible plant personnel were met, and pertinent documents were identified. The knowledge and perspective gained also enhanced the review and analysis of material provided by KCP regarding waste generation and management.

6.1 Issue Identification

The survey procedure to identify waste-related environmental problems incorporates four types of activities: 1) inspection of waste generating processes and waste management facilities; 2) interviews with waste management plant personnel; 3) review of relevant records and documents; and 4) comparison of on-site observations with KCP reports and procedures. Each of these activities will be conducted daily as various KCP areas are assessed.

Emphasis will be placed on tracking waste streams through the plant that have been identified in KCP's RCRA Part A permit application, KCP's Waste Management Site Plan, and the Federal facility waste inventory. These wastes include:

- Acidic wastes
- Caustic wastes
- Plating wastes
- Cyanide salts
- Solvents
- Oils and coolants
- Precious metal wastes
- Laboratory wastes
- Radioactive wastes
- Lead/acid batteries
- Scrap metal/grindings
- Rubber compounds
- Foams and resins
- Phenols
- Toluene diisocyanate
- Adhesives
- Paints and thinners
- Spent chemicals
- Plant refuse/trash
- Construction debris
- Lagoon sediment

A significant amount of time will be devoted to inspection of production areas, waste handling areas, and waste storage areas, including all facilities listed in the KCP RCRA Part B permit application. Both active and inactive solid waste management units will be assessed, including:

- Waste storage rooms (4)
- Cyanide crib
- South Lagoon
- North Lagoon
- Solvent distillation unit

- Thermal emulsion breaker
- Oil/water separator
- Waste mixing room
- Demo lot
- Waste staging area

In addition, above ground and underground tanks, in service and abandoned, will be inspected (including the old underground tank farm and its ancillary facilities). Underground storage tank inspection will focus on tank material, corrosion protection, age, content, and leak detection capabilities. Special attention will be given to tank spill control and containment measures. The degree of flood protection will also be studied. In addition, the status of closure plans will be evaluated. All wastes and waste handling facilities not previously documented will be highlighted.

Waste management activities that could result in or avoid releases of contaminants to the environment will also be observed. Such activities at KCP include:

- Waste minimization and recycling.
- Waste analysis, segregation and tracking.
- Waste mixing.
- Solvent recovery.
- Coolant dewatering.
- Oil dewatering.
- Waste storage.
- Waste curing.

- o Waste packaging, staging and shipping.
- o Other waste management practices, including training, waste inventory control, recordkeeping, inspection protocol and contingency planning.

Metal machining operations and equipment lubrication will be inspected to verify that these activities are non-hazardous, and associated documentation will be reviewed. Controls to prevent co-mingling of non-hazardous wastes with hazardous wastes will be assessed. Adherence to established KCP waste management procedures, referenced in the Quality Program Plan, will be evaluated. Findings of previous audits and inspections will be studied.

Discussions will be held with individuals knowledgeable of current and past waste management practices. This will be accomplished during production and facility tours and in the process of reviewing records and documentation. The objective is to develop an understanding of past and existing waste mangement activities that may serve as the basis for problem identification by the survey team. Discussions will be held with personnel from the following groups.

- o **Waste Management**

  Al Levine and Ken Gentry - Waste inventories, waste management activities and procedures, permitting, waste minimization, training.

- o Environmental Services

  B.D. Heacock - Underground storage tanks

  D.E. Brown - Facility closure

  D.M. Eggers - Solvent management

6.2 Records Required

Records on waste generation and waste management activities will be reviewed to verify and update documented information. Records include:

- o Notices of deficiencies related to RCRA Part B permit application.
- o Hazardous waste processing forms
- o On-site RCRA facility inspection forms.
- o Waste stream analysis records (see Section 6.1 waste listing)
- o Waste stream inventories (see Section 6.1 waste listing)
- o Waste manifests
- o Off-site facilities inspection records
- o Files on UST testing
- o Files on waste oil and beryllium oxide
- o Files on South Lagoon sediments
- o Quality records
- o Files on actions to correct adverse quality conditions
- o Training records
- o Internal and external audit files (e.g., state, local and Federal inspection records)

7.0 TOXIC/HAZARDOUS SUBSTANCES

The toxic substances survey will address raw materials and process-related chemicals used at KCP as well as the handling, storage and disposal of specific chemicals regulated under the Toxic Substances Control Act such as polychlorinated biphenyls (PCBs), asbestos and pesticides/herbicides/biocides. The condition and environmental monitoring of underground and above ground storage tanks used for bulk chemical substances other than wastes will also be examined. Through interviews with key KCP personnel and tours of relevant facilities, the tracking, control and management of toxic/hazardous substances will be reviewed. This information and records of usage will be evaluated to determine whether or not the systems, equipment and programs established by KCP for the management of toxic/hazardous substances are adequate to minimize, to the extent feasible, potential environmental problems.

7.1 Issue Identification

PCB contamination of soil has been documented or is suspected in many areas of the KCP. For example, the KCP storm sewer system is known to contain PCBs (Annual Site Environmental Report for Calendar Year 1985, April 1986). This particular situation has been under investigation by KCP for several years, nevertheless, the cause of this contamination has not yet been identified.

Several dump or spill sites are also contaminated with PCBs (Historical Survey: Department of Energy, Kansas City Facility, August 1986). These include Department 26 in Building 57, the area surrounding a transformer in substation 18, and an abandoned, sand-filled tank located between Buildings 9 and 57. During the on-site portion of the environmental survey, additional information regarding these and other PCB spill areas, as well as tours of the affected locations, will be conducted. The PCB-containing pipeline which was recently discovered in the North Lagoon/Northeast area will be among the conditions which will be further investigated.

The 1985 PCB Annual Report for the KCP will provide the basis for a thorough review of plant programs for in-service equipment which contains PCBs. Those locations which serve as PCB storage or disposal and reuse areas will also be evaluated. The latter areas include the outside test cells and the tank farm. A representative portion of the in-service PCB equipment will be inspected for the purpose of observing the general condition of the equipment, and accordingly, the potential for environmental PCB contamination. Obsolete, stored or used PCB equipment will be checked for proper containment and protection. Plant storage records for PCBs will be reviewed. Disposal methods and practices will also be addressed. Soil sampling and analysis for PCBs will be requested, as necessary, to determine if contamination exists at PCB spill locations not previously identified and/or evaluated by KCP environmental staff.

According to KCP personnel, all buildings at the site (with the exception of Buildings 92, 96 and 97) contain asbestos. More specific information, regarding the quantity, type and condition of the asbestos-containing materials in these buildings, and the procedures used by the KCP to maintain, repair, renovate or remove such materials, is necessary to determine if the potential exists for an environmental problem involving asbestos. Such information will be requested during the on-site survey. Records relating to the handling and disposal of asbestos-containing materials will be reviewed. If possible, asbestos removal projects ongoing during the survey and/or disposal of asbestos-containing materials at the three off-site landfills utilized by the plant will be observed directly. A tour of the boiler houses will also be requested for the purpose of evaluating the condition of any asbestos-containing materials in these buildings.

The documents which have been provided to the survey team by KCP indicate that both KCP and contractor personnel handle, mix, apply and dispose of pesticides. The KCP Operating Procedure - Control and Use of Pesticides contains extensive requirements for KCP personnel, however, no documentation of the contractor procedures for these activities have been made available for review by the survey team. Several other KCP documents ("Report of Pesticide Application, Precautions in Using Pesticides, and Personal Protection in the Handling of Pesticides") are referenced in the KCP Operating Procedure, and these will be obtained and reviewed.

During the environmental survey, the procedures used by contractors for pesticides will be assessed. In addition, the areas used to mix and store the pesticides which are applied by KCP personnel will be evaluated. Pesticide purchase, usage, and application records will be reviewed. The training program and associated records for KCP employees and contractor personnel will also be of interest to the team. Environmental Services personnel will be interviewed regarding the handling, storage, and disposal of pesticides at KCP.

Toxic/hazardous chemicals are stored and used in both bulk and smaller quantities at KCP. In addition, the plant produces products (e.g., various resins, coatings, and solvents) which contain toxic/hazardous components. Material Safety Data Sheets (MSDS) on all toxic/hazardous materials purchased by KCP have been provided in microfiche format. Similarly, the team has copies of the MSDS for all KCP products. According to KCP personnel, the Hazardous Materials Identification System (HMIS) is used to convey the potential hazards of these materials to the user.

Areas where large quantities of toxic/hazardous materials (e.g., chlorofluoroalkanes, acids) are used and/or stored will be visited during the survey. Notable in this category are the Production Stores area (Building 25) and the tank farm. In addition, locations where highly toxic substances (e.g., carcinogens) are handled will also be evaluated to determine the potential for environmental contamination. Discussions will be held with those individuals knowledgeable of toxic/hazardous substances in order to develop an understanding of current and past practices. This will include the KCP personnel responsible for rating toxic/hazardous substances using the HMIS.

7.2 Records Required

Specific documents and files to be reviewed during the environmental survey include:

o PCB transformer inspection records and forms.

- Storage and disposal records for PCB equipment and fluids.

- Correspondence with the KCP Fire Department regarding PCB electrical equipment, in particular any records of fires involving PCB equipment.

- For spills involving PCBs, records which demonstrate that affected areas (building surfaces, soil, etc.) have been adequately decontaminated.

- Procedures established by KCP for asbestos removal work performed by KCP employees and/or subcontractor personnel.

- Records of NESHAPs notifications for recent asbestos removal projects.

- Asbestos disposal records and permits.

- Requirements imposed by KCP on contractors who apply pesticides in the plant.

- The following documents related to handling, use and disposal of pesticides:

  - "Report of Pesticide Application"
  - "Precautions in Using Pesticides"
  - "Personal Protection in the Handling of Pesticides"
  - Training records

- Criteria used to rate products purchased by KCP which contain toxic/hazardous substances using the Hazardous Materials Identification System (HMIS).

- Procedures which address the handling, storage, use and disposal of chlorofluoroalkanes (e.g., freons).

- Environmental monitoring reports and procedures for underground storage tanks (1981-present).

- Internal or external audits of any of the above programs.

8.0 RADIOLOGICAL

The Kansas City Plant does not currently process or machine any radioactive materials, however, there are aspects of past and present plant activities that will be investigated with regard to their radiological impact on the environment.

8.1 Issue Identification

Specific issues to be investigated are:

1. Low-level radioactive contamination of an area currently identified as Department 20. - In the late 1950's and early 1960's, a section of the manufacturing area [currently known as Department 20 (D/20)] was used for the machining and inspection of depleted uranium parts. These activities resulted in fixed radioactivity in excess of the criteria established by the NRC and ANSI for the unrestricted use of facilities or equipment. In the early 1960's, material from these operations was allegedly buried in three trenches to the east side of the main manufacturing building.

   A project to remove radioactive materials from the waste disposal site and the manufacturing building was initiated in May of 1984. The trenches were excavated and surveyed to verify that radioactivity levels were below radiological acceptance criteria defined by the plant management (less than 2 standard deviations above the natural background). These criteria are more restrictive than those accepted by the NRC and ANSI. On the basis of a preliminary review of the "Waste Trenches and Machining Area Decontamination Final Report, RI/RD85-265", the survey team accepts the conclusion of the report that this area is free of radioactive materials.

Most of the D/20 area has been decontaminated to below the KCP radiological acceptance criteria; however, low-level contamination remains in some locations. The large-parts inspection area has contamination levels reportedly ranging from 200 to 700 counts per minutes. Fixed contamination was also found on the horizontal I-beam and utility surfaces in the mezzanine area located over the southwest corner of the large-parts inspection area. During the on-site portion of the survey, the contamination of this area will be investigated. The investigation will consist of a brief inspection of the area, review of radiological survey data, and discussions with J. Jeffries, who was identified to the survey team as being the most knowledgeable about the D/20 contamination. It should be recognized that none of the data currently available to the survey team indicates that the types and levels of contamination constitute an environmental risk.

2. <u>Calibration, thickness gauge, and neutron generator sources.</u> - KCP uses a variety of radioactive sources for thickness gauges, as neutron generators, and for the calibration of inspection devices. These sources are sealed or fixed such that activity will not be released under normal circumstances.

A March 1986 source inventory of radioactive sources contained 78 entries. Many of these sources are of low activity and not likely to present a hazard under any conditions, although there are several sources near one curie in activity and one cesium-137 source of 230 curies. These sources are not used in any process that would result in the environmental release of radioactive materials and could present an environmental risk only if they are not properly handled or controlled. The survey team will inspect source storage facilities, review source radiological survey records, review source accountability/control practices and records, and observe the handling of sources by KCP personnel, if possible. The plant radiation safety officer (RSO) should be available to discuss the plant's radioactive protection program. Either the RSO or a radiation protection professional should provide a tour of source storage and use areas.

3. <u>Neutron activation products.</u> - Neutron irradiation is used as a part of the KCP inspection and testing program. The neutron intensities expected for the irradiators are not sufficiently high to constitute an environmental hazard. However, some materials are readily activated (converted to radioactive nuclides) by neutron irradiation. Proper controls must be placed on activated materials until such time as any radioactive constituents have decayed to acceptable levels. The survey team has reviewed KCP procedures for the handling and monitoring of irradiated components; these procedures should be adequate for the safe handling and storage of these components. During the on-site portion of the survey, the survey team will inspect neutron irradiation facilities,

storage areas for irradiated materials, and monitoring records. It would be desirable to observe KCP staff while they are irradiating materials and handling irradiated components. The tour of the facilities should be conducted by the plant RSO or a radiation protection professional.

4. Ionizing radiation equipment. - KCP uses numerous instruments that produce ionizing radiation, such as x-ray units and electron beam welders. In general, these instruments will not produce radiation of sufficient energy to create an environmental hazard, since low-energy radiation is not strongly penetrating. There is however a 2.5 MV x-ray unit which can produce a highly-penetrating photon and, if not properly shielded, can emit significant levels of radiation. Radiation protection practices and monitoring designed to protect plant personnel will also prevent elevated off-site radiation levels. The survey team will review the monitoring records and inspect the monitoring provisions associated with high-energy x-ray units.

5. Radioactive waste storage and handling. - KCP generates less than 0.3 cubic meters of low-level radioactive waste per year. These wastes are primarily sealed sources and electron-gap tubes. During the on-site portion of the survey, the radioactive waste storage area will be inspected and radwaste documentation reviewed. The survey team has identified J.J. Meunier as the most likely contact for this issue.

8.2 Records Required

Additional records that are requested for on-site review include the following:

- Most recent radiological surveys of D/20 area.
- Leak check and other radiological survey data for radioactive sources.
- Source accountability/control logbooks.
- Irradiated materials monitoring data.
- Monitoring records for ionizing radiation equipment.
- Radioactive waste storage/disposal records.

9.0 QUALITY ASSURANCE

The quality assurance survey activities will consist of an examination of the methods used to assure that the collection and analysis of environmental samples at KCP result in the generation of valid data.

9.1 Issue Identification

The Kansas City Plant conducts routine monitoring of liquid effluents for compliance with NPDES limitations. The sampling and analysis are performed by an outside contractor laboratory. For 1986, Langston Laboratories, Inc. (LLI), Leawood, Kansas has the contract to provide this service. According to information received during the pre-survey site visit, LLI has received certification from the state of Missouri for conducting drinking water analyses. During the on-site survey, this certification will be verified and the certification criteria examined. Copies of the laboratory's procedures manual and quality assurance manual are currently being reviewed by the Environmental Survey Team. Also being reviewed are the results of quality assurance performance samples submitted to LLI by KCP.

Sample collection and analysis of groundwater and soils are provided by DOE's K-25 facility, DOE's Grand Junction Project Office, Midwest Research Institute and Cambridge Laboratories. These laboratories all reportedly have certification under EPA's Contractor Laboratory Program (CLP). Verification of the certification will be made during the on-site survey. Proposals and contract documents will be reviewed to determine procedures and quality assurance practices being used for the KCP samples. Procedure manuals, the quality assurance manual, and the results of any available external performance evaluation samples will be reviewed to assess the adequacy of the quality assurance protocols being applied to the KCP samples.

The primary contacts for the evaluation of environmental sampling and anlysis quality assurance at KCP will be personnel from the Environmental Services Department.

9.2 Records Required

The following additional records or documents are requested to be available for review during the on-site portion of the survey:

- Contract documents for outside laboratory sampling and analysis services.

- Procedure manuals and quality assurance manuals supporting the sampling and analysis aspects of KCP environmental monitoring.

- Results of performance evaluation samples supplied to contractor laboratories by KCP.

- Quality assurance audits by KCP of contractor laboratories.

- Summaries of the results of interlaboratory cross-check analyses provided by contractor laboratories.

- Summaries of results of QA sample analyses on external performance evaluation samples, such as those from DOE's Environmental Measurements Laboratory (EML) and from the EPA.

10.0 INACTIVE WASTE SITES/RELEASES

The pre-survey visit to the DOE Kansas City Plant (KCP) provided an opportunity to become familar with the plant operations and the general layout of the site, and allowed for an overview as well as a general inspection of areas known to have, or possibly have, environmental contamination. The on-site survey will attempt to identify environmental problems and potential risks associated with the historical handling, storage, and disposal of hazardous substances at KCP. This aspect of the survey will be coordinated with the RCRA and hydrogeology team members, and will focus on current and future risks related to the following:

- past disposal practices
- past spills/releases from tanks, pipes, ponds, lagoons, trenches; and
- potential for future spills/releases.

10.1 Issue Identification

Facilities that have handled or are currently handling hazardous substances will be reviewed, inspected and assessed. These facilities include the Solvent Recovery Facility, TCE Still, Tank Farm, Reclamation Area, L-lot, Red-X lot, Barrel lot, possible sludge disposal site along Liberty Drive, IRS Landfill, Northeast Area/North Lagoon, South Lagoon, D-26 Area, Stored Classified Wastes, Active and Abandoned Outfalls, and the Heat Transfer System. Other sites will also be investigated that are identified in the documents: Historical Survey: Department of Energy Kansas City Facility, Bendix Field Engineering Corporation, 2nd ed., August 1986; and the Comprehensive Environmental Assessment and Response Program (CEARP), DOE Albuquerque Operations Office; Phase I - draft, April 1986. Due to past waste management and disposal practices, these facilities will be reviewed in terms of the materials that are/were contained; the integrity of the facilities; past and potential releases of hazardous substances; environmental monitoring and sampling data; and existing and potential regulatory concerns.

Sites that have undergone some type of remediation will be addressed (e.g., D2O/classified waste trenches, and the West Boilerhouse Waste Oil Tank). Records and analytical data in support of the site cleanup will be obtained for review. Sites of inactive tanks (47) and former tanks (8) that may have contained hazardous substances will be inspected and assessed. Former storage areas and staging areas will be included in this effort. Each of these sites will be evaluated in terms of a potential risk to the environment.

The Survey Team will review available material pertaining to the CEARP draft Phase I report (e.g., personnel interview files). Also, there is a need to review available engineering drawings of the facility (to identify abandoned sumps and drains, outfalls, vaults, etc.) and aerial photographs that show the historical development of the site.

The Environmental Survey Team will also want to review environmental records pertaining to the past management, disposal and cleanup regarding hazardous substances. Of particular interest will be a review of records pertaining to wastes disposed offsite (e.g., Cleveland dump). The team will review regulatory compliance records pertaining to the County, State and Federal Government.

Primary contacts for this portion of the survey will include personnel from Environmental Services, Facilities Engineering and Facilities Maintenance.

10.2 **Records Required**

The following records, among others, are requested to be made available for review at the site:

- SOPs regarding management of hazardous substances, disposal areas and storage areas.
- Hazardous substances inventories.
- Historical files on past operations and processes, substances used, and methods of handling and disposal.
- Records of facility expansion and building rubble disposal.
- Records of regulatory notification pertaining to inactive waste sites and potential areas of contamination.
- Records of regulatory compliance.

- Description of former waste management facilities, including buried tanks and structures.

- "Interview files" for the draft Phase I Installation Assessment report.

- Engineering drawings of the facility.

- Documents pertaining to potential off-site contamination associated with the KCP.

- Documents pertaining to past remedial actions at KCP.

- Environmental records pertaining to past facility responses to hazardous substance spills and releases.

- Documents pertaining to the "Petrex Survey".

APPENDIX C

SITE-SPECIFIC SURVEY ACTIVITIES

C.1 Pre-Survey Preparation

The DOE Office of Environmental Audit and Compliance, Assistant Secretary for Environment, Safety, and Health selected a team to conduct an Environmental Survey at the Kansas City Plant (KCP) in Kansas City, Missouri, which is operated for DOE by Allied/Signal Bendix Kansas City Division. Mr. Thomas Traceski was designated DOE Team Leader, and Ms. Hattie Carwell, the Assistant Team Leader. Other team members included technical specialists from NUS Corporation and ICF Corporation. Argonne National Laboratory (ANL) was designated to provide a sampling team for the KCP Survey and to perform the laboratory analytical services.

A pre-Survey site visit was conducted on February 10 and 11, 1987, by the Team Leaders, the NUS and ICF technical specialists, and representatives from the ANL sampling and analysis team. Following introductions, KCP personnel presented an overview of activities at the facility and discussed environmental issues of concern to them. The logistics of the upcoming Survey were discussed and a plant tour was provided. In addition, a meeting was held with personnel of EPA Region VII, the Missouri Department of Natural Resources, and the Kansas City, Missouri, Departments of Health and Water Pollution Control to inform them of Survey activities and to hear their concerns with regard to KCP.

Subsequently, NUS and ICF technical specialists intensively reviewed the environmental documents and reports that were provided by KCP. Based on that review, a Survey plan for the KCP site was prepared, which discussed the specific approach to the Survey for each of the technical disciplines and included a proposed schedule of activities for on-site activities. The Survey plan was transmitted to the Albuquerque Operations Office, the Kansas City Area Office, and Bendix during the week of March 6, 1987.

C.2 On-site Activities

The on-site portion of the Survey was conducted at the KCP during the period of March 23 through April 3, 1987. The opening meeting held on March 23, 1987, was attended by representatives from DOE Headquarters, the Albuquerque Operations Office, the Kansas City Area Office, Bendix Kansas City Division, NUS Corporation, and ICF Corporation. Discussions during this meeting centered on the purpose of the Survey, logistics at the KCP, and an introduction of the personnel involved.

During the on-site portion of the Survey, team members reviewed additional file materials including permits and applications, background studies, engineering drawings, unusual occurrence reports, and operating logbooks. The production process was thoroughly analyzed to identify existing and potential pollutants. Site operations and monitoring procedures were observed. Extensive interviews were conducted with plant personnel regarding environmental controls, operations, monitoring and analysis, past operations, regulatory permits, and waste management.

Meetings of the Survey team members were held to report observations and compare findings. The team also coordinated daily with KCP personnel to arrange for specific site personnel and facilities to be available, as needed, on the following day. The sampling and analysis requirements identified by the Survey team members were discussed as they developed with Argonne personnel.

A site closeout briefing was held on April 3, 1987, at which the DOE Team Leader presented the preliminary observations of the Survey team. These observations were classified as preliminary, because additional research and, in some cases, additional field sampling were required to positively confirm the observations.

C.3 Sampling and Analysis

Argonne National Laboratory (ANL) is evaluating the sampling requests made by the Survey team and is determining sampling and analysis logistics, costs, and schedules. The sampling plan being prepared by ANL will include a quality assurance plan and a health and safety plan.

C.4 Report Preparation

A draft preliminary Survey report for the KCP was prepared to summarize the findings from the on-site Survey effort. This report will be provided to the Albuquerque Operations Office, the Kansas City Area Office, and the KCP contractor for review. The findings presented in the draft report are considered preliminary until comments are received and S&A results are available. At that time, the comments and S&A results will be evaluated and an Interim Report will be prepared.

APPENDIX D

CHEMICAL SYMBOLS, ABBREVIATIONS, AND ACRONYMS

ALO	-	Albuquerque Operations Office
ANL	-	Argonne National Laboratory
ANSI	-	American National Standards Institute
AQCR	-	Air Quality Control Region
BFEC	-	Bendix Field Engineering Corporation
BKC	-	Bendix Kansas City
BKCD	-	Bendix Kansas City Division
BOD	-	Biological Oxygen Demand
Btu	-	British thermal unit
CAMPS	-	Computer-Assisted Materials Purchasing System
Cd	-	Cadmium
CA	-	Cambridge Analytical
CCC	-	Conservation Chemical Company
°C	-	Degree Celcius
CEARP	-	Comprehensive Environmental Assessment and Response Program
CERCLA	-	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	-	Code of Federal Regulations
cfs	-	cubic feet per second
CLP	-	Contractor Laboratory Program
cm/sec	-	centimeter per second
Col/100ml	-	Colonies per 100 milliliters
CO_2	-	Carbon dioxide
Cr	-	Chromium
CSR	-	Code of State Regulations
Cu	-	Copper
CY	-	Calendar Year
d/m/100cm^2	-	Disintegrations per minute per 100 square centimeters
DCE	-	1,2-trans-Dichloroethylene
DMF	-	Dimethylformamide
DOE	-	Department of Energy
DOT	-	Department of Transportation
EOC	-	Emergency Operations Center
EOX	-	Extractable Organic Halogen
EP	-	Extraction Procedure
EP-TOX	-	EP Toxicity Method
°F	-	Degree Fahrenheit
FR	-	Federal Register
Ft^3	-	cubic foot(feet)
ft/d	-	feet per day
FY	-	Fiscal Year

gpm	gallon per minute
GC/MS	Gas Chromatography/Mass Spectrometry
GJPO	Grand Junction Project Office
GSA	General Services Administration
H_2O	Water
HEPA	High-Efficiency Particulate Air
HMIS	Hazardous Materials Information System
HVAC	Heating, Ventilating, and Air Conditioning
ICRP	International Commission for Radiation Protection
IRS	Internal Revenue Service
KCAO	Kansas City Area Office
KCP	Kansas City Plant
LLI	Langston Laboratories, Inc.
mg/kg	milligram per kilogram
mg/l	milligram per liter
ml	milliliter
mrem	millirem
MOCA	4-4' methylene-bis(2-chloroaniline)
MRI	Midwest Research Institute
MSB	Manufacturing Support Building
MSDS	Material Safety Data Sheet
μg/g	microgram per gram
μg/l	microgram per liter
$\mu g/m^3$	microgram per cubic meter
$\mu g/100\ cm^2$	microgram per 100 square centimeters
μS/cm	micro Seimens per centimeter
NA	Not Analyzed
NAAQS	National Ambient Air Quality Standards
ND	Not Detected
NESHAP	National Emission Standards for Hazardous Air Pollutants
NH^3	Ammonia
Ni	Nickel
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRC	Nuclear Regulatory Commission
NTU	Natural Turbidity Unit

OW	-	Observation Well
PAH	-	Polynuclear Aromatic Hydrocarbons
Pb	-	Lead
PCB	-	Polychlorinated Biphenyl
PCE	-	Perchloroethylene (tetrachloroethylene or tetrachloroethene)
POOS	-	Permanently Out of Service
POX	-	Purgeable Organic Halogen
POTW	-	Publically Owned Treatment Works
ppb	-	part per billion
ppm	-	part per million
QA	-	Quality Assurance
RCRA	-	Resource Conservation and Recovery Act
RI	-	Rockwell International
S&A	-	Sampling and Analysis
SECOM	-	Secure Communication Site
SOP	-	Standard Operating Procedure
SU	-	Standard Units
TCA	-	1,1,1-trichloroethane
TCE	-	trichloroethylene (trichloroethene)
TEB	-	Thermal Emulsion Breaker
TSCA	-	Toxic Substances Control Act
TTO	-	Total Toxic Organics
UOR	-	Unusual Occurrence Report
USBC	-	U.S. Bureau of Census
USEPA	-	U.S. Environmental Protection Agency
USGS	-	U.S. Geological Survey
UST	-	Underground Storage Tank
UV	-	Ultraviolet
VOC	-	Volatile Organic Compound
Zn	-	Zinc

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