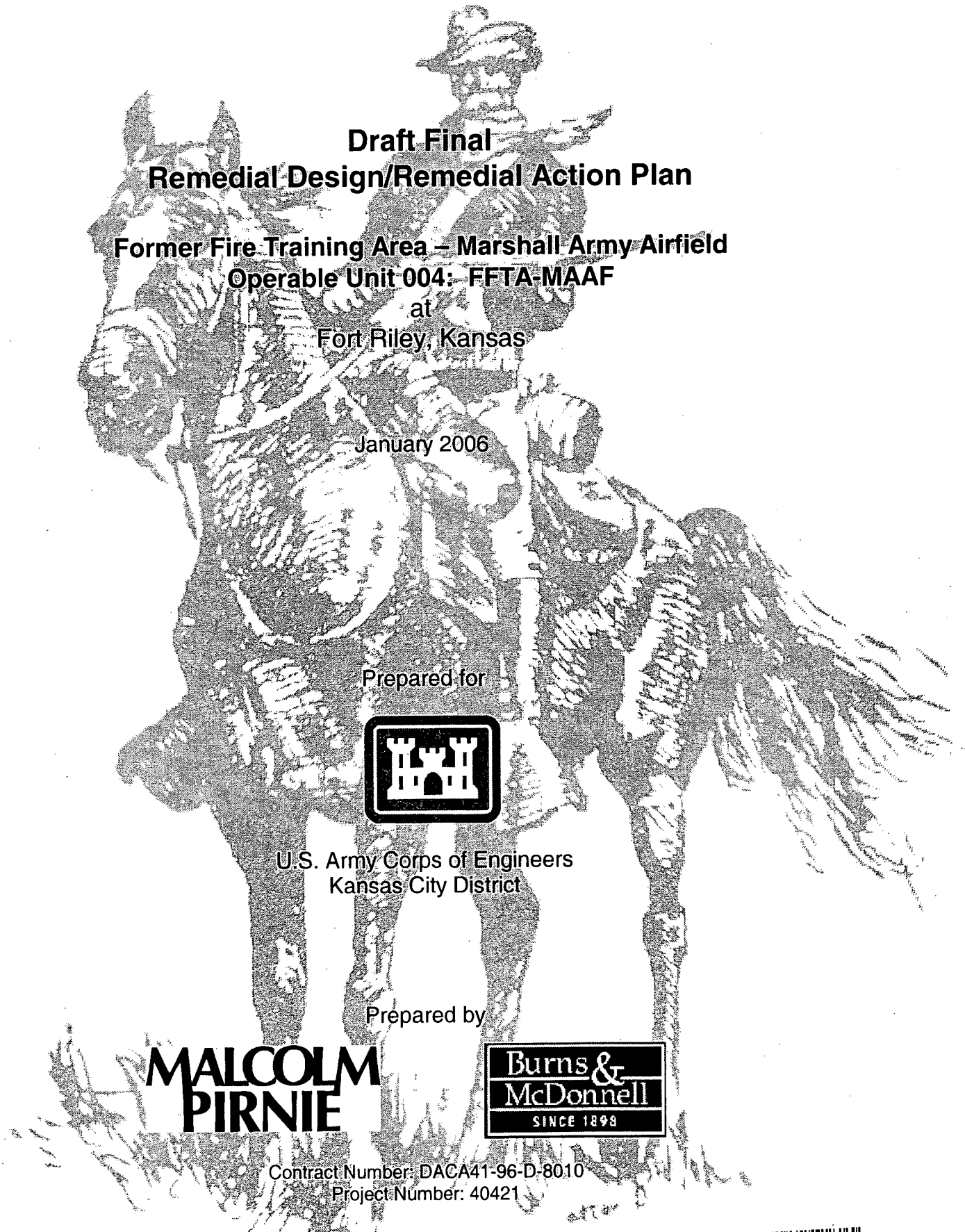

Draft Final
Remedial Design/Remedial Action Plan

Former Fire Training Area – Marshall Army Airfield
Operable Unit 004: FFTA-MAAF
at
Fort Riley, Kansas

January 2006

Prepared for

U.S. Army Corps of Engineers
Kansas City District

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List of Acronyms and Abbreviations

ARAR	Applicable or Relevant and Appropriate Requirement
bgs	Below Ground Surface
BLRA	Baseline Risk Assessment
BMcD	Burns & McDonnell Engineering Company, Inc.
CENWK	United States Army Corps of Engineers, Kansas City District
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Chemical of Concern
COPC	Chemical of Potential Concern
DA	Department of the Army
DCE	cis-1,2-Dichloroethene
DERA	Defense Environmental Restoration Account
EDG	Environmental Data Groupings
EE/CA	Engineering Evaluation/Cost Analysis
EUC	Environmental Use Control
Fe^{+2}	Ferrous Iron
FFA	Federal Facility Agreement
FFTA	Former Fire Training Area
FS	Feasibility Study
ft	Foot/feet
HRS	Hazard Ranking System
ISL	Identified Site List
IWSA	Installation-Wide Site Assessment
JP-4	Jet Fuel
KAR	Kansas Administrative Regulation
KDHE	Kansas Department of Health and Environment
LBA	Louis Berger & Associates
MAAF	Marshall Army Airfield
MCL	Maximum Contaminant Level
MNA	Monitored Natural Attenuation
MOGAS	Leaded Motor Gasoline
MP	Malcolm Pirnie
MPEO	Master Plan Environmental Overlay
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
OU	Operable Unit

List of Acronyms and Abbreviations

PCE	Tetrachloroethene (or Perchloroethene)
PWE	Directorate of Public Works – Environmental Division
QCSR	Quality Control Summary Report
RA	Remedial Action
RAB	Restoration Advisory Board
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
RPMP	Real Property Master Plan
SI	Site Investigation
Site	Former Fire Training Area – Marshall Army Airfield
SOP	Standard Operating Procedure
SVE	Soil Vapor Extraction
TCE	Trichloroethene
TCL	Target Compound List
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VOC	Volatile Organic Compound
µg/L	Micrograms per Liter

1.0 INTRODUCTION

1.1 PURPOSE

The purpose of this Remedial Design (RD)/Remedial Action (RA) Plan for the Former Fire Training Area (FFTA) – Marshall Army Airfield (MAAF) Site (Operating Unit [OU] 004) at Fort Riley, Kansas (hereinafter referred to as the Site) is to present the remedial actions necessary to restore the Site to a non-restricted use. The principal threat at this Site pertains to the hypothetical future use of site-impacted groundwater. This plan presents the procedures to implement monitored natural attenuation (MNA) with institutional controls in accordance with the Record of Decision (ROD) and Applicable or Relevant and Appropriate Requirements (ARARs).

1.2 BACKGROUND

The FFTA-MAAF Site (OU 004) is located at the north end of the MAAF in the southern region of the Fort Riley Military Installation and extends to the Kansas River. MAAF is in the southern region of Fort Riley, south of the Kansas River (Figure 1-1). The term Site is used in this report to refer to the general area extending from the FFTA north to the Kansas River.

The FFTA-MAAF Site (OU 004) is located on the alluvial floodplain of the Kansas River. The material beneath the FFTA-MAAF Site (OU 004) consists primarily of unconsolidated alluvial sand and gravel deposits (with minor discontinuous lenses of silt and clay) that tend to coarsen downward to the bedrock surface. The top of bedrock is at a depth of approximately 60 to 70 feet (ft) below ground surface (bgs), and is composed of limestone and shale units that dip gently (less than one degree) to the west-northwest (Burns & McDonnell Engineering Company, Inc. [BMcD], 2001).

The FFTA was operated from the mid-1960s through 1984 to conduct fire-training exercises. During these exercises, flammable liquids were poured into the FFTA, ignited, and then extinguished. The predominant fuels used for the fire training exercises were jet fuel (JP-4), diesel, and MOGAS (a generic term for leaded motor gasoline). In August 1982, reportedly 55 gallons of tetrachloroethene (or perchloroethene) (PCE) were inadvertently poured into a pit at the FFTA. The next day it was pumped out of the pit and into 55-gallon drums. Fire fighting training has not been conducted at the FFTA since 1984. Contaminants at the FFTA-MAAF Site (OU 004) are believed to have entered the environment through the FFTA and moved downward through the soil to the groundwater. Some of these contaminants have

migrated in the groundwater northward from the FFTA and currently exist under private property (BMcD, 2003a).

Environmental investigations and sampling events were performed at Fort Riley during the 1970s and 1980s. These investigations identified activities and facilities where hazardous substances had been released or had the potential to be released to the environment. Potential sources of contamination included landfills; printing, dry cleaning, and furniture shops; and pesticide storage facilities (BMcD, 2001).

Hazard Ranking System (HRS) ranking was performed in 1988 by the United States Environmental Protection Agency (USEPA) based on the aggregation of two individual sites, the Southwest Funston Landfill and the Pesticide Storage Facility. It was noted that other potentially contaminated areas exist at Fort Riley (e.g., burn pits, fire training areas, and dry cleaner operations). These sites received a comprehensive score of 33.79. As a result, on July 14, 1989, the USEPA proposed inclusion of Fort Riley on the National Priorities List (NPL) pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The USEPA formally listed Fort Riley on the NPL in August 1990 (BMcD, 2001). Effective June 1991, the Department of the Army (DA) entered into a Federal Facility Agreement (FFA) with the Kansas Department of Health and Environment (KDHE) and USEPA Region VII to address environmental pollution subject to the Resource Conservation and Recovery Act (RCRA) and/or CERCLA (USEPA, 1991). Pursuant to the FFA, Fort Riley conducted an Installation-Wide Site Assessment (IWSA) in 1992 (Louis Berger & Associates [LBA], 1992) to identify sites having the potential to release hazardous substances to the environment. The IWSA identified the FFTA-MAAF as one of the sites where releases of hazardous substances to the environment either have occurred or were likely to have occurred. Subsequent to the IWSA, in March 1994, a site investigation (SI) was conducted for the FFTA-MAAF. The SI results indicated that concentrations of organic compounds had been released to groundwater at concentrations exceeding federal and state drinking water standards. Also, similar contaminants were found in off-site private wells at levels above drinking water standards (LBA, 1994a). These results indicated that additional investigation and study at the FFTA-MAAF Site (OU 004) were necessary.

A source-removal, pilot-test study was performed at the FFTA from November 1994 through May 1995. This remediation effort was successful in removing from the soil an estimated 1,896 pounds of contaminants (primarily petroleum hydrocarbon compounds) from one area and an estimated 472 pounds

of contaminants (primarily PCE) from a second area (BMcD, 2004). Soil samples were collected following the pilot study to confirm source removal. A comparison between pre-pilot study analytical results and post-pilot study analytical results revealed an overall reduction in the number and levels of chemicals detected in soils near the treatment area. Post-pilot study results are described in the Remedial Investigation (RI) report (BMcD, 2001) and in the *Data Summary Report for Post-Pilot Study Expanded Soil Sampling for the Expanded Site Investigation, Former Fire Training Area, Marshall Army Airfield, Fort Riley, Kansas, and Nearby Off-Post Properties* (LBA, 1996).

From July 1994 through February 2004, monitoring wells associated with the FFTA-MAAF Site (OU 004) have been sampled. The results of these sampling events are provided in the Quality Control Summary Reports (QCSRs) for each event.

In 1996, the DA, Fort Riley, began an RI/feasibility study (FS), including a baseline risk assessment (BLRA) (human health and ecological), to identify the types, quantities, locations, and risk of the contaminants at the FFTA-MAAF Site (OU 004) and to develop a plan to address the contamination problem. The resulting *Exposure Control Action Engineering Evaluation/Cost Analysis for the Former Fire Training Area, Marshall Army Airfield, Fort Riley, Kansas and Nearby Off-Post Properties* (LBA, 1997) recommended the installation of two new supply wells within the aquifer in areas that have not been influenced by the groundwater plume. Two alternate water supply wells were installed in August 2002 after a lawsuit settlement to replace private wells impacted by the contaminant plume at the FFTA-MAAF Site (OU 004). The impacted private wells (M-1, R-1, and R-2) and two additional unimpacted wells (R-3 and R-4) were then abandoned. With the removal of these wells, there are no longer any private wells impacted by the contaminant plume at the FFTA-MAAF Site (OU 004) (BMcD, 2004).

Another engineering evaluation/cost analysis (EE/CA) was performed in 1997 to describe current conditions and to propose a groundwater removal action for remediating threats to human health and the environment associated with the FFTA-MAAF Site (OU 004). The results of the EE/CA are presented in the *Draft Groundwater Engineering Evaluation/Cost Analysis for the Former Fire Training Area at Marshall Army Airfield, Fort Riley, Kansas* (BMcD, 1998). The EE/CA was never finalized because the plume characterization activities defined a larger plume than anticipated and addressing hot-spot contamination was no longer applicable. It was agreed by Fort Riley, the United States Army Corps of Engineers, Kansas City District (CENWK), and the regulators to suspend the report and proceed with the RI report and the FS report (BMcD, 2003a).

Fifty-five (55) surface water samples were collected along five cross-sections of the Kansas River in July 1999 (BMcD, 1999) and twenty samples were collected along two cross-sections in March 2000 by the United States Geological Survey (USGS) (BMcD, 2000). These samples were collected both upstream and downstream of the point where the groundwater plume enters the river. The samples were analyzed for volatile organic compounds (VOCs), but no VOCs were detected in any of the samples.

The RI report provided the basis for the FS report which presents the alternatives available to address potential risk identified in the RI report. The USEPA and KDHE approved the RI and FS reports in 2001 and 2003, respectively (BMcD, 2004). In August 2004, permission was obtained to install two monitoring wells (FP-04-33b and FP-04-33c) on the north bank of the Kansas River adjacent to the Southwest Funston Landfill to provide additional monitoring points at KDHE's request as part of the 2001 approval of the RI report.

The *Proposed Plan, FFTA-MAAF at Fort Riley, Kansas* (BMcD, 2004), was issued as a supplement to the RI and FS reports to inform the public of Fort Riley's, USEPA's, and KDHE's preferred remedy based on information included in the Administrative Record and to solicit public comments pertaining to the remedial alternatives evaluated, including the preferred alternative. The Proposed Plan described the remedial alternatives considered for the FFTA-MAAF Site (OU 004) and identified the preferred remedial alternative with the rationale for this preference; no public comments were received. Submitted on May 12, 2004, the Draft Final Proposed Plan was accepted by KDHE and by USEPA with no comments. Having received no objections to the preferred remedy, the selected remedy for the Site was then documented in a ROD which was signed by the USEPA on August 10, 2005 (BMcD, 2005).

1.3 MONITORING WELL NETWORK

The monitoring wells which have been sampled to support the investigations at the FFTA-MAAF were installed under a number of different environmental programs (CERCLA, RCRA, and independent Army investigations). The same well has been referred to with a different designation in different documents. In order to document previous different designations used for specific monitoring wells, facilitate cross referencing and establish a baseline for future monitoring in support of FFTA-MAAF investigations, the designation to be used in the future are summarized in Tables 1-1 and 1-2. Generally, well designations include a site identifier, year installed, a sequential well number and a depth or stratigraphic identifier. Well construction information is provided in Table 1-3.

1.4 ANALYTICAL RESULTS

Details regarding the historical sampling events are provided in the RI report (BMcD, 2001) and QCSRs for each event.

1.5 ACTIONS TO ADDRESS MAJOR COMPONENTS OF THE SELECTED REMEDY

Fort Riley, as lead agency under the FFA, has established a course of action to accomplish each of the components of the selected remedy for the FFTA-MAAF. The following key elements of the selected remedy will be implemented:

- Removing the soil vapor extraction (SVE) shed and concrete slab,
- Plugging and abandoning all holes and removing all piping at the SVE shed area,
- Decommissioning all piezometers listed in Table 1-1,
- Decommissioning wells determined to be unnecessary for future sampling events, as listed in Table 1-1,
- Sampling wells semi-annually in the first year, then annually the next two years if none of the target analytes are detected above the MCLs in the first year in the zone of MNA as listed in Table 1-2,
- Sampling private wells M02-02 and R02-02 semi-annually in the first year, then annually the next two years if none of the target analytes are detected above the MCLs in the first year,
- Conducting annual inspections and periodic maintenance and repair of the monitoring wells listed in Table 1-2,
- Restricting site access and the installation and use of groundwater wells at and downgradient of the FFTA-MAAF Site (OU 004), as outlined in Section 3.0,
- Providing sampling results to the affected off-site landowners until groundwater quality has been restored, and
- Conducting a review in accordance with Section 121(c) of CERCLA no less often than every five years after initiation. The first five-year review of the selected remedy will include consideration of the following factors:
  - The performance of MNA in achieving clean-up levels (MCLs),
  - Property above the groundwater plume to ensure that groundwater with contamination above clean-up levels (MCLs) is not used, and
  - If no wells exceed groundwater clean-up levels (MCLs) for the chemicals of concern for

three consecutive years, a recommendation for discontinuing sampling and site close out will be made as part of the five-year review. Otherwise, sampling will continue as discussed in this RD/RA Plan.

1.6 BASIS FOR MNA WITH INSTITUTIONAL CONTROLS

The DA, USEPA, and KDHE have determined that MNA with institutional controls meets the requirements of CERCLA, and, to the extent practical, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This remedy was chosen over the other alternatives because it provides risk reduction through degradation of contaminants in the groundwater and provides measures to prevent future exposure to currently contaminated groundwater. Based on the information available at this time, the DA, USEPA, and KDHE believe the selected remedy will be protective of human health and the environment, will comply with ARARs, will be cost-effective, and will utilize permanent solutions to the maximum extent practicable (BMcD, 2004). Although MNA with institutional controls does not involve engineered treatment, it does rely on natural degradation processes already occurring at the FFTA-MAAF Site (OU 004) to further reduce contaminant concentrations to levels below the MCLs. Evidence of natural degradation processes at the Site, as per the USEPA MNA guidance document (USEPA, 1999) included 1) decreasing contaminant concentration trend, and 2) supporting geochemical data measurements. In addition, natural attenuation/degradation of the VOCs plume(s) is effectively reducing the contamination based on available data. The selection of MNA as the selected remedy is based upon current and reasonably projected land use and exposures. However, hazardous substances, pollutants, or contaminants may remain at the FFTA-MAAF Site (OU 004) above levels that would allow for unlimited use and unrestricted exposure. The rationale for choosing this remedy is based on the fact that no source materials (such as liquids, areas contaminated with high concentrations of toxic compounds, or highly mobile materials) constituting principal threat wastes likely exist at the FFTA-MAAF Site (OU 004) that require further treatment.

1.7 PLAN EVALUATION

This plan will be updated, if needed and appropriate, based upon evaluations of new chemical data and groundwater flow characteristics. On an annual basis, trends in constituent concentrations will be reviewed, groundwater flow patterns will be analyzed, and statistical analyses will be conducted to determine if the concentrations of constituents are increasing and moving toward potential receptor locations. Additionally, the site access and land use restrictions will be reviewed to ensure that the

institutional controls remain relevant and appropriate for site conditions. As a result of those evaluations, possible recommended adjustments to this RD/RA Plan might include:

- Addition or deletion of monitoring wells to be sampled.
- An increase or decrease in the frequency of sampling events.
- Changes in the specific chemical constituents to be analyzed and/or changes in the analytical method.
- Modifications in sampling, analysis, and evaluation methods.
- Additions to or deletions of institutional controls for site access and land use restrictions.

2.0 SITE PREPARATION AND WELL ABANDONMENT

2.1 SITE PREPARATION

The SVE shed, concrete slab, and associated piping will be removed and disposed in Campbell Construction Debris landfill. All existing holes in the SVE area will be plugged and abandoned in accordance with Kansas Administrative Regulation (KAR) Sections 28-30.

2.2 WELL AND PIEZOMETER ABANDONMENT

All piezometers at the FFTA-MAAF site (eight total) as listed on Table 1-1 will be abandoned in accordance with KAR Sections 28-30. In addition, the monitoring wells listed on Table 1-1 have been determined to be unnecessary for future sampling and will be abandoned in accordance with KAR Sections 28-30. Documentation supporting the abandonment of the wells listed in Table 1-1 is provided in Appendix A. The piezometers and monitoring wells selected for abandonment are shown on Figure 1-1.

3.0 INSTITUTIONAL CONTROLS

The inclusion of institutional controls, such as groundwater restrictions, will reduce the potential for human ingestion, inhalation, or dermal contact with contaminated groundwater at the FFTA-MAAF Site (OU 004). Because the contamination impacts both private and federal property, there are significant differences in the way institutional controls will be applied. Institutional controls for the FFTA-MAAF includes land use and site access.

3.1 PURPOSE

The purpose of institutional controls for the FFTA-MAAF Site (OU 004) is to present the procedures to implement the institutional controls in accordance with the ROD and ARARs. The principal threat at this Site pertains to the hypothetical future use of site-impacted groundwater.

3.2 OFF-POST INSTITUTIONAL CONTROLS

The primary control for the off-post portion of the FFTA-MAAF Site (OU 004) will be implementation of institutional controls for property with environmental contamination above unrestricted land-use standards. The institutional controls will restrict future use to agricultural, industrial, or commercial use and prohibit installation of drinking water wells within the impacted areas. These restrictions will limit the exposure at the FFTA-MAAF Site (OU 004) by:

- providing access for DA to continue monitoring,
- providing access for the USEPA and KDHE to conduct site inspections to confirm land and water use,
- prohibiting installation of groundwater wells within the impacted area, and
- ensuring future owners and tenants are aware of contamination at the FFTA-MAAF Site (OU 004).

These institutional controls will be in the form of proprietary controls to limit land and water use; however, the USEPA guidance on institutional controls suggests that controls should be "layered" to enhance the effectiveness and protectiveness of the remedy (USEPA, 2000). Layering refers to using different types of institutional controls together or in series to enhance their effectiveness on other institutional controls. Layering of institutional controls at the FFTA-MAAF Site (OU 004) will include the following:

- The KDHE Environmental Use Control (EUC) Program restricts future use to agricultural, industrial, or commercial use and prohibits installation of drinking water wells within the areas of the site with contaminant concentrations above the MCLs. The EUC program requires the impacted landowners to make application to the KDHE for approval of an EUC program for their property. The KDHE then provides oversight to ensure that the conditions imposed are followed. Although the Proposed Plan discussed the implementation of the KDHE EUC Program, the most recent groundwater sampling event results (March 2005) indicated contaminant levels are below the MCLs, therefore the EUC Program will not be utilized unless groundwater concentrations increase to levels greater than the MCLs.
- Lease Agreements are currently in place between Fort Riley and adjacent landowners whose land has been impacted by the contaminant plume. The agreements allow for groundwater monitoring, monitoring well maintenance, well installation, and access for Fort Riley and the regulators. The landowners are provided with results of monitoring and other information on the contaminants at the FFTA-MAAF Site (OU 004).
- The KDHE Identified Site List (ISL) is accessible through the Internet and provides basic information about the site, including site location, contaminants at the site, a narrative of activities, and a point of contact at the KDHE. The ISL database is not used for enforcement and does not place restrictions on site usage. The ISL database allows the public to conduct a web-based search to find contaminated sites within a specific community or area. State registries like this KDHE ISL are useful in providing information to the public.
- Deed Notices will be filed for impacted adjacent properties with landowner permission. Deed notices are non-enforceable, informational provisions that alert and inform anyone performing a title search that the property is located within an area impacted by a CERCLA site. Information in the notice will include types of contaminants and the risks they create.
- Zoning for the FFTA-MAAF Site (OU 004) is agricultural which allows construction of residential dwellings; however, the FFTA-MAAF Site (OU 004) is located in the floodplain where new construction is limited by a zoning ordinance. This zoning restriction will decrease the chance of a new drinking water well being installed.

Other controls, including alternate supply (replacement) wells, community awareness, and groundwater monitoring, are also components of this alternative. Two alternate water supply wells (M02-02 and R02-02) were installed in August 2002 to replace Private Wells R-1, R-2, R-3, R-4, and M-1. Groundwater

monitoring is intended to provide a level of protection to ensure that risk levels are adequate at the FFTA-MAAF Site (OU 004) during the remediation period.

3.3 ON-POST INSTITUTIONAL CONTROLS

The proprietary and governmental controls discussed above cannot be applied at active military bases. The federal ownership of an active military base limits the layering of other proprietary or government controls. The only additional controls that will be implemented at the FFTA-MAAF Site (OU 004) are informational controls (KDHE ISL and community awareness through the Restoration Advisory Board [RAB]). USEPA guidance for institutional controls states that the local authority for regulating and enforcing institutional controls at an active military base is the Commanding Officer and that the regulators should work through the installation personnel to incorporate restrictions (USEPA, 2000). The primary control for the on-post portion of the FFTA-MAAF Site (OU 004) will be to restrict land use through the environmental overlay of the Fort Riley Real Property Master Plan (RPMP).

The long-range component of the RPMP consists of narratives and supporting graphics that include a Master Plan Environmental Overlay (MPEO) to reflect operational and environmental constraints. Operational and environmental constraints are reflected in the MPEO and in the land-use analysis narrative. The purpose of the environmental overlay is to graphically depict the environmental data groupings (EDGs) which include:

- Surface/aerial limiting factors, for example, noise and flood plains,
- Underground hazards/limiters, for example, groundwater and Defense Environmental Restoration Account (DERA) issues, and
- Surface hazardous and toxic materials / waste issues.

The MPEO will illustrate FFTA-MAAF site features including:

- Site boundaries,
- Monitoring well locations, and
- Location of gates and signage.

The FFTA-MAAF Site (OU 004) will be designated as restricted land use in the RPMP. The category directs the RPMP user to the MPEO that subsequently identifies the restrictions. Restrictions will limit exposure at the FFTA-MAAF Site (OU 004) by:

- Restricting use to non-residential

- Limiting public access
- Prohibiting installation of drinking water wells and groundwater use in the area
- Involving Directorate of Public Works – Environmental Division (PWE) personnel in proposed future plans for the FFTA-MAAF Site (OU 004)

In addition, land use at the FFTA-MAAF is restricted because of its proximity to the floodplain (Executive Order 11988, Flood Plain Management Construction Criteria for Army Facilities).

Numerous federal laws and regulations control the transfer and sale of government property. These laws and regulations address the requirements for disposition of contaminated property. Should the FFTA-MAAF site be considered for transfer or sale, the provisions of these shall be followed. At a minimum, full disclosure of the Site conditions and specification of maintenance and land-use controls will be included in the provisions of the sale or transfer.

4.0 MONITORED NATURAL ATTENUATION PROGRAM

4.1 OBJECTIVES

The objectives of the MNA program are to:

- Monitor groundwater contaminant concentrations and reduce contaminant levels, to the extent practicable and appropriate, through natural attenuation processes, and
- Monitor geochemical parameters to determine if conditions favorable to MNA are present.

4.2 CHEMICALS OF POTENTIAL CONCERN

As part of the baseline risk assessment (BLRA), chemicals of potential concern (COPCs) were identified. However, the BLRA indicated that the estimated risks to human health and the environment were within or below the USEPA acceptable levels. Two site-related contaminants present off the site in the alluvial aquifer at levels exceeding drinking water standards (MCLs, identified as an ARAR) were selected as the chemicals of concern (COCs) for the Site. These two contaminants were identified in the FS (BMcD, 2003a). The MCL for trichloroethene (TCE) and cis-1,2-dichloroethene (DCE) are presented below:

COCs	MCL (micrograms per liter [ug/L])
TCE	5
DCE	70

4.3 GROUNDWATER MONITORING PROGRAM

4.3.1 Monitoring Well Sampling

The groundwater monitoring program for the site is based on over 10 years of groundwater sampling, evaluation, and trend analyses. The wells selected for long-term monitoring will be sampled semi-annually the first year, then annually the next two years if none of the target analytes are detected above the MCLS the first year. If a target analyte is detected above its respective MCL, that well with the MCL exceedence will be sampled semi-annually. The rationale for individual wells to be sampled is discussed below:

- Monitoring Wells FP-93-02, FP-93-04, FP-93-07, and FP-94-09 will be used to monitor the VOC concentrations in the shallow zone.
- Monitoring Wells FP-96-26b, FP-98-27b, FP-98-28b, FP-98-29b, FP-98-31b, and FP-99-32b will be used to monitor the VOC concentrations in the intermediate zone.

- Monitoring Wells FP-98-29c, FP-98-30c, FP-99-32c, and FP-04-33c will be used to monitor the VOC concentrations in the deep zone.
- Private Wells M02-02 and R02-02 will be used to monitor the VOC concentrations in the private wells.

Sampling will be conducted in accordance with the standard operating procedures (SOPs) in the *Installation-Wide Sampling and Analysis Plan for Environmental Investigations at Fort Riley, Kansas, Volume I – Field Sampling Plan* (Malcolm Pirnie [MP]-BMcD, 2004a). Annual inspections and periodic maintenance and repair will be conducted on the monitoring wells, which are depicted on Figure 1-1.

4.3.2 Chemical Analysis of Monitoring Well Samples

The COCs, TCE and cis-1,2-DCE, have been detected above MCLs, so they were included in the long-term monitoring program. Samples obtained from the monitoring wells outlined in Section 4.3.1 will be sampled for Target Compound List (TCL) VOCs, naphthalene, natural attenuation parameters (methane, ethane, ethene, alkalinity, total organic carbon, nitrate, sulfide, sulfate, dissolved oxygen, oxidation-reduction potential, and iron II [Fe^{+2}]), and general water quality parameters (temperature, pH, turbidity, and specific conductivity), as shown on Tables 4-1 and Table 4-2.

4.3.3 Groundwater Level Measurements

The water level in all monitoring wells will be measured and recorded during a 24-hour period immediately prior to the commencement of sampling operations as presented in Table 4-1. Water levels will again be measured immediately prior to and immediately after sampling each well. Water levels will be measured in accordance with the SOP in the *Installation-Wide Sampling and Analysis Plan for Environmental Investigations at Fort Riley, Kansas, Volume I – Field Sampling Plan* (MP-BMcD, 2004a).

5.0 DATA EVALUATION AND REPORTING

5.1 DATA EVALUATION

5.1.1 Adherence to Installation Basic Documents

All work conducted under this RD/RA Plan must adhere to the following basic documents (or updated versions if available at the time of the work):

- *Installation-Wide Sampling and Analysis Plan for Environmental Investigations at Fort Riley, Kansas, Volume I – Field Sampling Plan* (MP-BMcD, 2004a),
- *Installation-Wide Sampling and Analysis Plan for Environmental Investigations at Fort Riley, Kansas, Volume II – Quality Assurance Project Plan* (MP-BMcD, 2004b),
- *Installation-Wide Site Safety and Health Plan for Environmental Investigations at Fort Riley, Kansas* (MP-BMcD, 2004c), and
- *Installation-Wide Investigative Derived Waste Management Plan for Environmental Investigations at Fort Riley, Kansas* (BMcD, 2003c).

5.1.2 Hydrogeologic

The hydrogeologic system at the FFTA-MAAF involves the interaction of the alluvial aquifer and the Kansas River which is complex and constantly changing. The water level data acquired during each sampling event combined with stage data on the Kansas River will be used to develop potentiometric surface maps of the FFTA-MAAF area. The maps will provide valuable insight into groundwater flow directions as well as vertical and hydraulic gradients at the time the samples were taken.

5.1.3 Chemical Data Significance

The objectives of the MNA program are to monitor the reduction of groundwater contaminant concentrations to the extent practicable and appropriate through natural attenuation processes and monitor geochemical parameters to determine if conditions favorable to MNA are present.

5.2 REPORTS

5.2.1 Quality Control Summary Reports

A QCSR will be prepared within 30 days following the receipt of the laboratory data. The QCSR will include a summary of the data validation procedures conducted to evaluate the usability of the groundwater monitoring data. Data validation includes an evaluation of the following:

- field/sampling information,
- chain-of-custody,
- completion of requested analyses,
- holding times,
- sample preservation,
- method requirements,
- laboratory method blanks,
- trip blanks,
- surrogates,
- laboratory control samples,
- matrix spike/matrix spike duplicates
- field duplicates,
- reporting limits, and
- field and analytical completeness.

5.2.2 Annual Sampling Reports

An Annual Sampling Report will be prepared and submitted within 60 days following receipt of laboratory data from the Fall sampling event. The Annual Sampling Report will include a brief description of sampling activities, a summary of the data, a comparative evaluation of the data with the results from previous sampling events, evaluation of a groundwater potentiometric surface map developed from water level measurements taken during the sampling event, and presentation of quality control information. A summary of maintenance or repairs on the monitoring wells will also be included.

5.2.3 Reports to Affected Off-Post Landowners

Following the receipt and validation of the analytical data from the contracted laboratory, the affected off-post landowners will be provided the analytical results from the samples collected from their well until groundwater quality has been restored.

5.3 OVERALL DATA EVALUATION

Following the submittal of the Annual Sampling Report, the data will be evaluated to determine if further sampling is necessary. If no wells contain COCs exceeding groundwater cleanup levels (i.e., MCLs) for three consecutive years, a recommendation for discontinuing sampling until the next five-year review will

be made. Another round of groundwater sampling will be collected during the five-year review period, and if no wells contain COCs exceeding MCLs, a recommendation for site closeout will be made as part of the five-year review. Otherwise, sampling will continue as discussed in this RD/RA Plan.

5.4 DOCUMENT DISTRIBUTION

A distribution list is included as Table 5-1. The list will serve as a guide for the distribution of documents to be prepared in support of the requirements of this Plan. (The list will need to be updated if changes in key agencies and/or document distribution occur).

6.0 STATUTORY (FIVE-YEAR) REVIEWS

6.1 PURPOSE

Five-year reviews are performed to evaluate whether the response action remains protective of human health and the environment. The focus depends on the original goal of the response action. At FFTA-MAAF, protectiveness is assured through degradation by natural attenuation processes and exposure protection – MNA and institutional controls. Therefore, the five-year review at FFTA-MAAF will focus on whether monitoring indicates that natural attenuation is occurring and whether the controls remain in place to prevent exposure.

6.2 LEGAL AND REGULATORY REQUIREMENTS AND ADMINISTRATIVE GUIDANCE

When planning and performing a five-year review, the requirements and guidance in place at the time of the review shall be consulted and used, as appropriate for the FFTA-MAAF site. The following laws, regulations and administrative guidance documents contain requirements and guidance for the performing five-year reviews:

- Section 121(c) of the CERCLA, as amended, requires performance of "review ...no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented."
- Section 300.430(f)(4)(ii) of the NCP states "If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after initiation of the selected remedial action."
- Executive Order 12580 delegates responsibility for five-year reviews "...[to] the departments of ...Defense"
- EPA OSWER Directive 9355.7-03B-P, Structure and Components of Five-Year Reviews, June 2001 which "focuses primarily on the implementation of five-year reviews and issues associated with implementation."
- EPA OSWER Directive 9355.7-02A, Supplemental Five-Year Review Guidance, July 26, 1994, which "clarifies responsibility for conduct of five-year reviews at federal facilities"

6.3 GENERAL CHARACTERISTICS OF FIVE-YEAR REVIEWS

The following general characteristics are drawn from the above EPA OSWER guidance:

- The five-year review covers all OUs for which the RODs specify a five-year review.
- The five-year review is triggered by the first OU giving rise to a five-year review (i.e. at Fort Riley, it is the Southwest Funston Landfill). Discussions of subsequent remedies or OUs should be incorporated into the first five-year review conducted or in future reviews, as appropriate. The USEPA general requirements with respect to five-year reviews are applicable to all federal facilities on the NPL. See CERCLA section 120(a)(2).
- Federal agencies are responsible for the costs of all five-year reviews at their facilities.
- Federal agencies are responsible for annually reporting to Congress the reviews conducted at their own facilities, and actions recommended as a result of such reviews.

The following elements are included in a five-year review:

- Document Review
- Standards or ARAR Review
- Site Visit
- Report
- Public Notice

6.4 FFTA-MAAF FIVE-YEAR REVIEWS

Because this RA will result in hazardous substances, pollutants, or contaminants remaining at the FFTA-MAAF Site (OU 004) above levels that allow for unlimited use and unrestricted exposure, a review in accordance with the NCP will be conducted no less often than every five years after initiation of the remedial action to ensure that the action is, or will be, protective of human health and the environment. The five-year reviews of the selected remedy will include consideration of the following factors:

- the performance of MNA in achieving cleanup levels (MCLs),
- the continued absence of groundwater use on property above the plume to ensure that groundwater with contamination above cleanup levels (MCLs) is not used, and
- if no wells have contained COCs exceeding groundwater cleanup levels (MCLs) for three consecutive years, a recommendation for discontinuing sampling and for site closeout will be made. Otherwise, sampling will continue as discussed in this RD/RA Plan.

Five year reviews at the FFTA-MAAF site are initially planned for fiscal years 2007 and 2012. Performance of the reviews may be suspended or extended based upon the results of reviews. Generally, reviews are discontinued when levels of contaminants of concern are at levels that would allow unlimited use and unrestricted exposure.

7.0 REFERENCES

BMcD, 1998. *Draft Groundwater Engineering Evaluation/Cost Analysis for the Former Fire Training Area at Marshall Army Airfield, Fort Riley, Kansas.* April 30.

BMcD, 1999. Quality Control Summary Report for the July 1999 USGS River Sampling Event at *Fort Riley, Kansas. September 9.*

BMcD, 2000. *Quality Control Technical Memorandum for the March 20000 USGS River Sampling Event at Fort Riley, Kansas.* May 12.

BMcD, 2001. *Remedial Investigation Report for the Former Fire Training Area at Marshall Army Airfield, Fort Riley, Kansas.* March 26.

BMcD, 2003a. *Feasibility Study. Former Fire Training Area Marshall Army Airfield at Fort Riley, Kansas.* September 10.

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BMcD, 2004. *Proposed Plan, FFTA-MAAF at Fort Riley, Kansas.* May 12.

BMcD, 2005. *Record of Decision. July 2005. Former Fire Training Area Marshall Army Airfield at Fort Riley, Kansas.*

Louis Berger & Associates (LBA), 1992. *Installation-Wide Site Assessment for the Fort Riley, Kansas.* December 7.

LBA, 1994b. *Data Summary Report for Off-Post Soil and Groundwater Screening Samples.* December 7.

LBA, 1996. *Data Summary Report for Post-Pilot Study Expanded Soil Sampling for the Expanded Site Investigation, Former Fire Training Area, Marshall Army Airfield, Fort Riley, Kansas, and Nearby Off-Post Properties.* July 3.

LBA, 1997. *Exposure Control Engineering Evaluation/Cost Analysis for the Former Fire Training Area at Marshall Army Airfield, Fort Riley, Kansas.* December.

Malcolm Pirnie (MP) – BMcD, 2004a. *Installation-Wide Sampling and Analysis Plan for Environmental Investigations at Fort Riley, Kansas, Volume I – Field Sampling Plan.* February 17.

MP-BMcD, 2004b. *Installation-Wide Sampling and Analysis Plan for Environmental Investigations at Fort Riley, Kansas, Volume II – Quality Assurance Project Plan.* February 17.

MP-BMcD, 2004c. *Installation-Wide Site Safety and Health Plan for Environmental Investigations at Fort Riley, Kansas.* February 17.

United States Environmental Protection Agency (USEPA), 1991. *Interagency Agreement Between Fort Riley, Kansas, the State of Kansas, and EPA Region VII.* March.

USEPA, 1999. *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites.* Office of Solid Waste and Emergency Response. EPA 540-R-99-009. Directive 9200.4-17. April 21.

USEPA, 2000. *Institutional Controls: A Site Manager's Guide to Identifying, Evaluating and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups.* EPA 540-F-00-005, OSWER 9355.0-75FS-P. September.

* * * * *

TABLES

Table 1-1
Wells and Piezometers to Be Decommissioned
FFTA-MAAF Remedial Design/Remedial Action Plan
Fort Riley, Kansas

Wells/Piezometers			
FP-93-01	FP-94-12PZ	FP-96-23	FP-98-30
FP-96-02b	FP-96-13PZ	FP-96-23b	FP-98-30b
FP-96-02c	FP-96-14PZ	FP-96-23c	FP-98-31
FP-93-03	FP-96-15PZ	FP-96-24	FP-98-31c
FP-96-04b	FP-96-16PZ	FP-96-26	FP-99-32
FP-96-04c	FP-96-17PZ	FP-96-26c	FP04-33b
FP-93-05	FP-96-19	FP-98-27	FP-99-39PZ
FP-93-06	FP-96-20	FP-98-27c	FP-99-40PZ
FP-96-07c	FP-96-20b	FP-98-28	
FP-96-09b	FP-96-20c	FP-98-28c	
FP-96-09c	FP-96-22	FP-98-29	

Table 1-2
Wells to Be Sampled and Maintained
FFTA-MAAF Remedial Design/Remedial Action Plan
Fort Riley, Kansas

Wells			
FP-93-02	FP-96-26b	FP-98-29c	FP-99-32c
FP-93-04	FP-98-27b	FP-98-30c	FP-04-33c
FP-93-07	FP-98-28b	FP-98-31b	M02-02
FP-94-09	FP-98-29b	FP-99-32b	R02-02

Table 1-3
Well and Piezometer Construction Data and Groundwater Elevations
FFTA-MAAF Remedial Design/Remedial Action Plan
Fort Riley, Kansas

Well Number	Well Coordinates		Surface Elevation (feet)	Total Depth (feet)	Screened Interval (feet)	Top of Casing (feet)	Adjusted Groundwater Elevation (feet)
	Northing	Easting					
FP-93-01	268048.35	1665024.49	1056.05	29.3	1051.1-1031.1	1058.94	1035.95
FP-93-02	267934.69	1665356.34	1057.94	33.7	1051.9-1026.9	1060.15	1035.95
FP-96-02b	267936.71	1665363.85	1057.24	53.3	1017.7-1007.7	1060.03	1035.87
FP-96-02c	267940.35	1665351.97	1057.59	69.3	1000.7-990.7	1060.64	1035.86
FP-93-03	267859.06	1665660.92	1054.59	26.1	1050.6-1030.6	1057.38	1035.89
FP-93-04	267774.71	1665107.23	1056.03	34.4	1050.0-1025.0	1058.82	1036.14
FP-96-04b	267779.45	1665114.15	1056.05	49.8	1019.4-1009.4	1058.88	1036.03
FP-96-04c	267782.38	1665105.06	1056.01	69.9	1001.4-991.4	1058.76	1036.03
FP-93-05	267679.81	1665324.8	1056.05	34.2	1050.1-1025.1	1059.11	1036.04
FP-93-06	267625.27	1665545.88	1056.00	30.5	1051.0-1026.0	1058.50	1036.04
FP-93-07	267347.38	1665151.89	1056.62	28.1	1052.6-1032.6	1059.66	1036.32
FP-96-07c	267338.57	1665158.46	1056.63	67.7	1001.1-991.1	1058.91	1036.20
FP-94-09	268854.81	1665507.08	1060.22	29.1	1042.7-1032.7	1061.12	1035.36
FP-96-09b	268814.09	1665489.622	1060.40	54.2	1019.9-1009.9	1063.25	1035.42
FP-96-09c	268814.22	1665477.936	1060.50	72.2	1001.3-991.3	1063.37	1035.44
FP-94-12PZ	267949.83	1662895.36	1053.27	21.5	1043.5-1033.5	1054.70	1036.70
FP-96-13PZ	269001.76	1663850.77	1055.47	29.5	1038.0-1026.0	1056.51	NM
FP-96-14PZ	268415.38	1664596.75	1053.88	19.3	1037.9-1025.9	1055.77	Dry
FP-96-15PZ	268070.35	1663847.53	1055.74	31.7	1039.8-1027.8	1057.26	1036.44
FP-96-16PZ	267916.55	1664557.55	1058.27	30.4	1040.9-1028.9	1059.77	1036.10
FP-96-17PZ	267454.51	1664574.06	1057.26	30.6	1039.7-1027.7	1058.52	1036.31
FP-96-19	268313.74	1665622.16	1046.81	15.8	1041.8-1031.5	1046.58	1035.61
FP-96-20	268905.31	1665253.03	1059.97	33.8	1044.8-1029.2	1063.16	1035.44
FP-96-20b	268911.84	1665251.202	1060.30	19.8	1019.3-1009.3	1063.71	NM
FP-96-20c	268913.47	1665252.655	1060.30	72.8	1001.1-991.1	1063.72	1035.33
FP-96-22	269705.01	1665313.32	1058.89	32.3	1045.2-1029.3	1061.86	1034.94
FP-96-23	269576.51	1665690.97	1056.79	34.0	1041.7-1025.7	1060.01	1034.91
FP-96-23b	269589.39	1665692.495	1057.00	53.0	1017.6-1007.6	1060.05	1034.92
FP-96-23c	269600.88	1665692.211	1056.90	69.2	1001.1-991.1	1059.99	1034.93
FP-96-24	269416.88	1665988.69	1056.88	33.3	1042.0-1026.4	1059.96	1034.93
FP-96-26	268654.79	1665656.423	1059.60	25.0	1048.6-1033.6	1059.15	1035.49
FP-96-26b	268656.491	1665650.906	1059.50	46.5	1022.9-1012.9	1059.23	1035.51
FP-96-26c	268661.41	1665650.96	1059.50	70.0	999.9-989.9	1059.27	1035.51
FP-98-27	270367.92	1665965.11	1056.43	27.0	1047.6-1031.4	1059.02	1034.61
FP-98-27b	270381.05	1665964.01	1056.44	51.0	1017.9-1007.9	1059.01	1034.60
FP-98-27c	270391.809	1665963.12	1056.43	68.1	1001.5-991.5	1058.98	1034.59
FP-98-28	271305.226	1665837.52	1053.19	26.0	1043.4-1027.4	1055.69	1034.17
FP-98-28b	271317.845	1665837.8	1053.30	53.1	1013.1-1003.1	1055.74	1034.17
FP-98-28c	271328.61	1665838.1	1053.42	65.1	1001.0-991.0	1055.75	1034.18
FP-98-29	271301.81	1666443.625	1055.66	27.5	1047.0-1031.1	1058.40	1033.97
FP-98-29b	271313.91	1666443.75	1055.76	50.5	1017.7-1007.7	1058.24	1034.00
FP-98-29c	271327.312	1666444.375	1055.87	67.7	1000.8-990.8	1058.31	1033.99
FP-98-30	270931.178	1666783.76	1054.90	26.7	1047.2-1030.9	1057.48	1034.08
FP-98-30b	270944.978	1666783.07	1054.83	50.1	1017.8-1007.8	1057.30	1034.09
FP-98-30c	270959.16	1666782.56	1054.67	70.0	998.1-988.1	1057.24	1034.03
FP-98-31	271936.7	1666786.31	1058.52	30.2	1046.9-1030.8	1061.13	1033.53
FP-98-31b	271937.541	1666775.11	1058.56	52.0	1019.4-1009.4	1061.15	1033.54
FP-98-31c	271937.543	1666764.81	1058.64	73.0	999.0-989.0	1061.17	1033.57

Table 1-3 (continued)
Well and Piezometer Construction Data and Groundwater Elevations
FFTA-MAAF Remedial Design/Remedial Action Plan
Fort Riley, Kansas

Well Number	Well Coordinates		Surface Elevation (feet)	Total Depth (feet)	Screened Interval (feet)	Top of Casing (feet)	Adjusted Groundwater Elevation (feet)
	Northing	Easting					
FP-99-32	273528.61	1667837.37	NAv	29.5	1045.7-1029.1	1055.26	1031.56
FP-99-32b	273536.858	1667843.5	NAv	50.1	1017.7-1007.7	1055.32	1031.56
FP-99-32c	273544.797	1667849.8	NAv	69.3	997.1-987.1	1055.24	1031.54
FP-04-33b	275411.36	1669528.71	NAv	39.0	1012.9-1002.9	1044.38	1030.88
FP-04-33c	275411.79	1669522.95	NAv	56.0	985.6-996.6	1044.48	1030.88
FP-99-39PZ	271732.8	1664432.76	1055.88	28.8	1045.3-1029.4	1058.49	1034.76
FP-99-40PZ	271894.02	1669120.65	1055.50	29.5	1045.5-1027.1	1058.31	1032.66

Notes:
Groundwater levels measured on February 28, 2005.
NAv - Not Available
NM - Not Measured

Table 4-1
Monitored Natural Attenuation Program Sample Summary
FFTA-MAAF Remedial Design/Remedial Action Plan
Fort Riley, Kansas

		Analytical Laboratory										Field Measured			
	GW Level	TCL Volatiles	Naphthalene	Methane	Ethane	Ethene	Alkalinity	TOC	Nitrate	Sulfide	Sulfate	DO	ORP	Iron (II)	Temperature, pH, Turbidity, & Specific Conductance
Wells															
FP-93-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FP-93-04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FP-93-07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FP-94-09	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FP-96-26b	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FP-98-27b	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FP-98-28b	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FP-98-29b	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FP-98-29c	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FP-98-30c	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FP-98-31b	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FP-99-32b	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FP-99-32c	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FP-04-33c	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M02-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R02-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16

0 - Sample and/or measurement is planned.
DO - Dissolved oxygen
GW - Groundwater
ORP - Oxidation reduction potential
TCL - Target compound list
TOC - Total organic carbon

Table 4-2
Analytical Methods
FFTA-MAAF Remedial Design/Remedial Action Plan
Fort Riley, Kansas

Parameter	Analytical Method	Holding Time	
		Extraction	Analysis
Organics			
VOC w/ Naphthalene	SW-846 Method 8260B	NA	14 Days
Methane, Ethane, Ethene	SW-846 8015B (M)	NA	14 Days
Natural Attenuation Parameters			
Alkalinity	EPA 310.1	NA	14 Days
Nitrate as nitrogen	EPA Method 300.0	NA	48 Hours
Sulfide	EPA Method 376.2	NA	7 Days
Sulfate	EPA Method 300.0	NA	28 Days
Total Organic Carbon (TOC)	SW-846 Method 9060	NA	28 Days

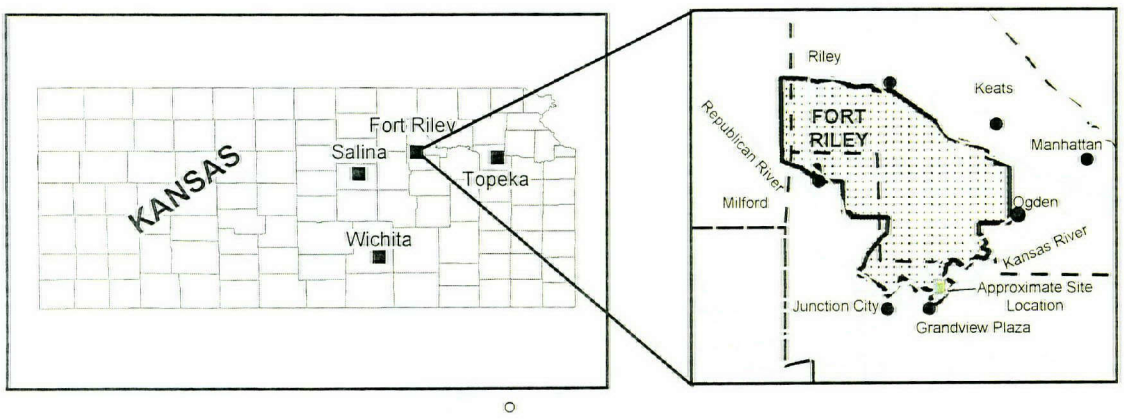
Notes:
EPA = United States Environmental Protection Agency
NA = Not Applicable
SW-846 = Test Method for Evaluating Solid Waste
VOC = Volatile Organic Compounds

Table 5-1
Document Distribution List
FFTA-MAAF Remedial Design/Remedial Action Plan
Fort Riley, Kansas

ADDRESSEE	NUMBER OF COPIES (1) DISTRIBUTION DESIGNATION							
	A - Working Draft Plan/Report	B - Draft Plan /Report	C - Draft Final Plan/Report	D - QCSR	E - Daily Quality Control Report	F - Working Draft Weeekly Report	G - Final Weekly Report	H - Electronic Copies of Data
Commander USACE, Kansas City District ATTN: CENWK-PM-ED (R. Van Saun) 601 East 12th Street Kansas City, Missouri 64106-2896	5	5	1/1	2	1	1	1	1
Directorate of Public Works ATTN: Dick Shields Building 407, Pershing Court Fort Riley, Kansas 66442-6016	2/1	2/1	2/2	2	1	1	1	1
Robin Paul, Remedial Project Manager U.S Environmental Protection Agency, Region VII SUPR/FFSE 901 North 5th Street Kansas City, Kansas 66101		2	2	2			1	
Jim Anstaett, Project Manager Curtis State Office Building 1000 SW Jackson Street, Suite 410 Topeka, Kansas 66612-1367		1	1	1			1	
Mr. Peter Rissell U.S. Army Environmental Center ATTN: SFIM-AEC-CDN Bldg E4480, Edgewood Area Aberdeen Proving Ground, MD 21010-5401		2	2	2			1	

(1) Hard Copy/PDF File on CD

FIGURE



KANSAS RIVER

FP-04-33b
FP-04-33c
SFL92-301
SFL92-302
SFL92-303

FP-99-32
FP-99-32b
FP-99-32c

FP-98-31
FP-98-31b
FP-98-31c

FP-99-40PZ

B-1

FP-99-39PZ

FP-98-28
FP-98-28b
FP-98-28c

FP-98-29
FP-98-29b
FP-98-29c

FP-98-30
FP-98-30b
FP-98-30c

FP-98-27
FP-98-27b
FP-98-27c

I-1

FORMER OXBOW LAKE
(WHISKEY LAKE)

FP-96-23
FP-96-23b
FP-96-23c

FP-96-22

FP-96-24

N-1

FP-96-20
FP-96-20b
FP-96-20c

FP-94-09
FP-96-09b
FP-96-09c

FP-96-13PZ

M02-02

FP-96-26
FP-96-26b
FP-96-26c

F-1

F-2

RESERVATION BOUNDARY

FP-96-14PZ

FP-93-02
FP-96-19
FP-96-02b
FP-96-02c

FFTA

FP-93-01

FP-96-15PZ

FP-96-16PZ

FP-93-03

FP-94-12PZ

FP-93-04
FP-96-04b
FP-96-04c

FP-93-05

FP-93-06

R02-02

FP-96-17PZ

FP-93-07
FP-96-07c

N

1,000 500 0 1,000 2,000

SCALE IN FEET

LEGEND

- Monitoring Well or Cluster
- Piezometer
- Private Well
- Reservation Boundary
- Property Line
- Roads

NOTES:

1. Subscripts b and c refer to intermediate and deep wells, respectively.
2. Wells SFL92-301, SFL92-301, and SFL92-303 will be sampled under the Southwest Funston Landfill groundwater monitoring program.
3. Wells in green will be sampled.
4. Wells and piezometers in red will be abandoned.
5. Wells in purple will remain, but will not be sampled.

Burns & McDonnell SINCE 1898

Figure 1-1

GENERAL SITE AND WELL LOCATIONS REMEDIAL DESIGN/ REMEDIAL ACTION PLAN

FFTA - MAAF

u:\armycorp\projects\maaf\arc\arcdocs\ra_rd plan\Figure 1-1 General Site and Well Locations.mxd 1:12000 tc mrb 01/24/05

APPENDIX A
SUPPLEMENTAL DATA FOR WELL ABANDONMENT

Table A-1
Rationale for Decommissioning Wells and Piezometers
FFTA-MAAF Remedial Design/Remedial Action Plan
Fort Riley, Kansas

Wells/Piezometers to Be Decommissioned	Rationale
FP-93-01	No COCs detected in last five sampling events for this well. This well was last sampled 8/26/1999.
FP-96-02b	No COCs detected in last two sampling events for this well. This well was last sampled 10/13/2004.
FP-96-02c	No COCs detected in any of the 17 sampling events for this well. This well was last sampled 2/20/2004.
FP-93-03	No COCs detected in any of the eight sampling events for this well. This well was last sampled 8/26/1999.
FP-96-04b	No COCs detected in last five sampling events for this well, and no COCs detected above MCLs in any of the 13 sampling events for this well. This well was last sampled 8/24/2000.
FP-96-04c	No COCs detected in any of the 13 sampling events for this well. This well was last sampled 8/24/2000.
FP-93-05	No COCs detected in any of the seven sampling events for this well. This well was last sampled 5/04/1999.
FP-93-06	No COCs detected in either of the two sampling events for this well. This well was last sampled 8/19/1997.
FP-96-07c	No COCs detected in any of the 10 sampling events for this well. This well was last sampled 8/21/2000.
FP-96-09b	No COCs detected above MCLs in last eight sampling events for this well. This well was last sampled 3/02/2005.
FP-96-09c	No COCs detected in last 10 sampling events for this well, and no COCs detected above MCLs in any of the 19 sampling events for this well. This well was last sampled 10/13/2004.
FP-94-12PZ	This piezometer was installed for the collection of groundwater levels to further define the potentiometric surface. As groundwater flow direction has been determined and does not fluctuate, this piezometer is no longer of use. No COCs detected in either of the two sampling events for this piezometer. This piezometer was last sampled 8/21/1997.
FP-96-13PZ	This piezometer was installed for the collection of groundwater levels to further define the potentiometric surface. As groundwater flow direction has been determined and does not fluctuate, this piezometer is no longer of use. This piezometer has not been sampled.
FP-96-14PZ	This piezometer was installed for the collection of groundwater levels to further define the potentiometric surface. As groundwater flow direction has been determined and does not fluctuate, this piezometer is no longer of use. This piezometer has not been sampled.

Table A-1
Rationale for Decommissioning Wells and Piezometers
FFTA-MAAF Remedial Design/Remedial Action Plan
Fort Riley, Kansas

FP-96-15PZ	This piezometer was installed for the collection of groundwater levels to further define the potentiometric surface. As groundwater flow direction has been determined and does not fluctuate, this piezometer is no longer of use. This piezometer has not been sampled.
FP-96-16PZ	This piezometer was installed for the collection of groundwater levels to further define the potentiometric surface. As groundwater flow direction has been determined and does not fluctuate, this piezometer is no longer of use. This piezometer has not been sampled.
FP-96-17PZ	This piezometer was installed for the collection of groundwater levels to further define the potentiometric surface. As groundwater flow direction has been determined and does not fluctuate, this piezometer is no longer of use. This piezometer has not been sampled.
FP-96-19	No COCs detected above MCLs in any of the 10 sampling events for this well. This well was last sampled 8/24/2000.
FP-96-20	A well obstruction was noted during the last sampling event. Prior to that, no COCs were detected in any of the 14 sampling events for this well. This well was last sampled 2/26/2004.
FP-96-20b	No COCs detected in last six sampling events for this well, and no COCs detected above MCLs in any of the 11 sampling events for this well. This well was last sampled 2/21/2001.
FP-96-20c	No COCs detected in any of the 14 sampling events for this well. This well was last sampled 2/25/2004.
FP-96-22	No COCs detected in any of the 10 sampling events for this well. This well was last sampled 8/25/2000.
FP-96-23	No COCs detected above MCLs in any of the 19 sampling events for this well. This well was last sampled 10/08/2004.
FP-96-23b	No COCs detected above MCLs in last seven sampling events for this well. This well was last sampled 10/08/2004.
FP-96-23c	No COCs detected in last four sampling events for this well, and no COCs detected above MCLs in last 11 sampling events for this well. This well was last sampled 10/08/2004.
FP-96-24	No COCs detected above MCLs in any of the 18 sampling events for this well. This well was last sampled 10/08/2004.
FP-96-26	No COCs detected above MCLs in last nine sampling events for this well. This well was last sampled 2/25/2004.
FP-96-26c	No COCs detected in last three sampling events for this well, and no COCs detected above MCLs in any of the 19 sampling events for this well. This well was last sampled 10/07/2004.
FP-98-27	No COCs detected in last four sampling events for this well, and no COCs detected above MCLs in any of the 15 sampling events for this well. This well was last sampled 10/13/2004.

Table A-1
Rationale for Decommissioning Wells and Piezometers
FFTA-MAAF Remedial Design/Remedial Action Plan
Fort Riley, Kansas

FP-98-27c	No COCs detected above MCLs in last seven sampling events for this well. This well was last sampled 10/13/2004.
FP-98-28	No COCs detected in any of the six sampling events for this well. This well was last sampled 8/22/2000.
FP-98-28c	No COCs detected in last seven sampling events for this well, and no COCs detected above MCLs in any of the 15 sampling events for this well. This well was last sampled 10/07/2004.
FP-98-29	No COCs detected in any of the eight sampling events for this well. This well was last sampled 2/23/2004.
FP-98-30	No COCs detected in any of the six sampling events for this well. This well was last sampled 8/23/2000.
FP-98-30b	No COCs detected in any of the 11 sampling events for this well. This well was last sampled 2/23/2004.
FP-98-31	No COCs detected in any of the four sampling events for this well. This well was last sampled 5/5/1999.
FP-98-31c	No COCs detected above MCLs in last five sampling events for this well. This well was last sampled 10/11/2004.
FP-99-32	No COCs detected in any of the 11 sampling events for this well. This well was last sampled 10/12/2004.
FP04-33b	No COCs detected in either of the two sampling event for this well. This well was last sampled 3/01/2005.
FP-99-39PZ	This piezometer was installed for the collection of groundwater levels to further define the potentiometric surface. As groundwater flow direction has been determined and does not fluctuate, this piezometer is no longer of use. This piezometer has not been sampled.
FP-99-40PZ	This piezometer was installed for the collection of groundwater levels to further define the potentiometric surface. As groundwater flow direction has been determined and does not fluctuate, this piezometer is no longer of use. This piezometer has not been sampled.

LEGEND

- Monitoring Well or Cluster
- Piezometer
- Supply Well
- Groundwater Screening Location
- Proposed Monitoring Well
- Reservation Boundary
- Property Line
- Roads
- FFTA / Former Access Road

600 0 600 Feet

N

NOTES:

1. Monitoring Wells FP-98-27, FP-98-28, FP-98-29, FP-98-30, and FP-98-31 were installed after the direct-push groundwater screening investigation.

2. Estimated extent of positive detections is based on groundwater screening results and May/June 1998 groundwater sampling results.

KANSAS RIVER

B10 B10a B10b

B9 B13 B13b B9a B11b B11a

B9b

B30 B1a B1b FP-98-31 B31 B11 B12b B12

FP-98-28 B21 B20 B17 FP-98-29 B18 B16 B19 B2 FP-98-30

B28 B27 B26 B22 B24 B23 B25 FP-98-27

I-1 B32

B14 FP-96-22 FP-96-23 B15 B29 FP-96-24

N-1

Reservation Boundary

FP-96-13PZ FP-96-20 FP-94-09 FP-96-21 FP-94-10 F-1 F-2

FP-94-08 M-1 R-1 FP-96-26

FP-96-14PZ FP-96-18 FP-94-11 R-2 FP-96-19 FP-96-25 R-3

FP-96-15PZ FP-93-01

FP-94-12PZ FP-96-16PZ FP-93-04 FP-93-02 FP-93-03 R-4

Former Fire Training Area

FP-93-05 FP-93-06

FP-96-17PZ FP-93-07

Levee

Racetrack Road

Former Oxbow Lake (Whiskey Lake)

u:\arc\usfmpw\aview\dsr0898b.apr\ShallowBoring Concentrations\11x17 one view layout CAG 09\26\00

Burns & McDonnell

Figure 4-1

Groundwater Screening Locations March and April, 1998

FFTA-MAAF RI

Table 4-2
Plume Characterization Groundwater Screening Results
FFTA-MAAF Remedial Investigation Report

Sample Location	FP-96-23b	I-1
Sample Identification	FP-96-23b	I-1
Date Sampled	2-Mar-98	2-Mar-98
Sample Depth (feet)	NAv (Intermediate)	NAv (Shallow)
Laboratory Number	FFTA-MAAF FP-96-23b	FFTA-MAAF I-1
Sample Parameters (ug/L)		
PCE	0.1 U	0.1 U
TCE	**5.7**	0.1 U
cis-1,2-DCE	**277**	0.1 U
Vinyl Chloride	0.1 U	0.1 U

Sample Location	B1			
Sample Identification	GW-1	GW-2	GW-2 D	GW-3
Date Sampled	3-Mar-98	3-Mar-98	3-Mar-98	3-Mar-98
Sample Depth (feet)	25	45	45	65
Laboratory Number	FFTA-MAAF GW-1	FFTA-MAAF GW-2	FFTA-MAAF GW-2D	FFTA-MAAF GW-3
Sample Parameters (ug/L)				
PCE	0.1 U	0.1 U	0.1 U	0.1 U
TCE	0.1 U	0.1 U	0.1 U	0.1 U
cis-1,2-DCE	0.1 U	**0.9**	**0.8**	**4.8**
Vinyl Chloride	0.1 U	0.1 U	0.1 U	0.1 U

Sample Location	B1a		
Sample Identification	GW-4	GW-5	GW-6
Date Sampled	3-Mar-98	3-Mar-98	3-Mar-98
Sample Depth (feet)	25	45	66
Laboratory Number	FFTA-MAAF GW-4	FFTA-MAAF GW-5	FFTA-MAAF GW-6
Sample Parameters (ug/L)			
PCE	0.1 U	0.1 U	0.1 U
TCE	0.1 U	0.1 U	0.1 U
cis-1,2-DCE	0.1 U	0.1 U	0.1 U
Vinyl Chloride	0.1 U	0.1 U	0.1 U

Table 4-2 (continued)
Plume Characterization Groundwater Screening Results
FFTA-MAAF Remedial Investigation Report

Sample Location	B1b		
Sample Identification	GW-7	GW-8	GW-9
Date Sampled	3-Mar-98	3-Mar-98	3-Mar-98
Sample Depth (feet)	25	45	65
Laboratory Number	FFTA-MAAF GW-7	FFTA-MAAF GW-8	FFTA-MAAF GW-9
Sample Parameters (ug/L)			
PCE	0.1 U	0.1 U	0.1 U
TCE	0.1 U	0.1 U	0.1 U
cis-1,2-DCE	0.1 U	0.1 U	0.1 U
Vinyl Chloride	0.1 U	0.1 U	0.1 U

Sample Location	B9			
Sample Identification	GW-10	GW-11	GW-12	GW-12 D
Date Sampled	4-Mar-98	4-Mar-98	2-Mar-98	2-Mar-98
Sample Depth (feet)	25	45	65	65
Laboratory Number	FFTA-MAAF GW-10	FFTA-MAAF GW-11	FFTA-MAAF GW-12	FFTA-MAAF GW-12D
Sample Parameters (ug/L)				
PCE	0.1 U	0.1 U	0.1 U	0.1 U
TCE	0.1 U	0.1 U	0.1 U	0.1 U
cis-1,2-DCE	0.1 U	0.1 U	0.1 U	0.1 U
Vinyl Chloride	0.1 U	0.1 U	0.1 U	0.1 U

Sample Location	B9b		
Sample Identification	GW-13	GW-14	GW-15
Date Sampled	3-Mar-98	3-Mar-98	3-Mar-98
Sample Depth (feet)	25	45	64
Laboratory Number	FFTA-MAAF GW-13	FFTA-MAAF GW-14	FFTA-MAAF GW-15
Sample Parameters (ug/L)			
PCE	0.1 U	0.1 U	0.1 U
TCE	0.1 U	0.1 U	0.1 U
cis-1,2-DCE	0.1 U	0.1 U	0.1 U
Vinyl Chloride	0.1 U	0.1 U	0.1 U

Table 4-2 (continued)
Plume Characterization Groundwater Screening Results
FFTA-MAAF Remedial Investigation Report

Sample Location	B11		
Sample Identification	GW-16	GW-17	GW-18
Date Sampled	3-Mar-98	3-Mar-98	4-Mar-98
Sample Depth (feet)	25	45	65
Laboratory Number	FFTA-MAAF GW-16	FFTA-MAAF GW-17	FFTA-MAAF GW-18
Sample Parameters (ug/L)			
PCE	0.1 U	0.1 U	**2.3**
TCE	0.1 U	**2.9**	**1.2**
cis-1,2-DCE	0.1 U	**2.0**	**3.7**
Vinyl Chloride	0.1 U	0.1 U	0.1 U

Sample Location	B12			
Sample Identification	GW-19	GW-20	GW-21	GW-21 D
Date Sampled	5-Mar-98	5-Mar-98	5-Mar-98	5-Mar-98
Sample Depth (feet)	25	45	65	65
Laboratory Number	FFTA-MAAF GW-19	FFTA-MAAF GW-20	FFTA-MAAF GW-21	FFTA-MAAF GW-21D
Sample Parameters (ug/L)				
PCE	0.1 U	0.1 U	0.1 U	0.1 U
TCE	0.1 U	0.1 U	0.1 U	0.1 U
cis-1,2-DCE	0.1 U	0.1 U	0.1 U	0.1 U
Vinyl Chloride	0.1 U	0.1 U	0.1 U	0.1 U

Sample Location	B12b		
Sample Identification	GW-22	GW-23	GW-24
Date Sampled	5-Mar-98	5-Mar-98	5-Mar-98
Sample Depth (feet)	25	45	65
Laboratory Number	FFTA-MAAF GW-22	FFTA-MAAF GW-23	FFTA-MAAF GW-24
Sample Parameters (ug/L)			
PCE	0.1 U	0.1 U	0.1 U
TCE	0.1 U	0.1 U	0.1 U
cis-1,2-DCE	0.1 U	0.1 U	0.1 U
Vinyl Chloride	0.1 U	0.1 U	0.1 U

Table 4-2 (continued)
Plume Characterization Groundwater Screening Results
FFTA-MAAF Remedial Investigation Report

Sample Location	B9a		
Sample Identification	GW-25	GW-26	GW-27
Date Sampled	5-Mar-98	5-Mar-98	5-Mar-98
Sample Depth (feet)	25	45	65
Laboratory Number	FFTA-MAAF GW-25	FFTA-MAAF GW-26	FFTA-MAAF GW-27
Sample Parameters (ug/L)			
PCE	0.1 U	**2.0**	**2.3**
TCE	0.1 U	**5.7**	**3.5**
cis-1,2-DCE	0.1 U	**14.2**	**33.4**
Vinyl Chloride	0.1 U	0.1 U	0.1 U

Sample Location	B10			
Sample Identification	GW-28	GW-29	GW-30	GW-30 D
Date Sampled	6-Mar-98	6-Mar-98	6-Mar-98	2-Mar-98
Sample Depth (feet)	25	45	64	64
Laboratory Number	FFTA-MAAF GW-28	FFTA-MAAF GW-29	FFTA-MAAF GW-30	FFTA-MAAF GW-30D
Sample Parameters (ug/L)				
PCE	0.1 U	0.1 U	0.1 U	0.1 U
TCE	0.1 U	0.1 U	0.1 U	0.1 U
cis-1,2-DCE	**0.2**	0.1 U	0.1 U	0.1 U
Vinyl Chloride	0.1 U	0.1 U	0.1 U	0.1 U

Sample Location	B11a		
Sample Identification	GW-31	GW-32	GW-33
Date Sampled	2-Mar-98	3-Mar-98	3-Mar-98
Sample Depth (feet)	25	45	63
Laboratory Number	FFTA-MAAF GW-31	FFTA-MAAF GW-32	FFTA-MAAF GW-33
Sample Parameters (ug/L)			
PCE	0.1 U	0.1 U	0.1 U
TCE	0.1 U	0.1 U	0.1 U
cis-1,2-DCE	0.1 U	0.1 U	0.1 U
Vinyl Chloride	0.1 U	0.1 U	0.1 U

Table 4-2 (continued)
Plume Characterization Groundwater Screening Results
FFTA-MAAF Remedial Investigation Report

Sample Location	B11b		
Sample Identification	GW-34	GW-35	GW-36
Date Sampled	3-Mar-98	3-Mar-98	3-Mar-98
Sample Depth (feet)	25	45	63
Laboratory Number	FFTA-MAAF GW-34	FFTA-MAAF GW-35	FFTA-MAAF GW-36
Sample Parameters (ug/L)			
PCE	0.1 U	0.1 U	**0.4**
TCE	0.1 U	**0.2**	**1.1**
cis-1,2-DCE	0.1 U	0.1 U	**0.9**
Vinyl Chloride	0.1 U	0.1 U	0.1 U

Sample Location	B10a		
Sample Identification	GW-37	GW-38	GW-39
Date Sampled	6-Mar-98	6-Mar-98	6-Mar-98
Sample Depth (feet)	25	45	63
Laboratory Number	FFTA-MAAF GW-37	FFTA-MAAF GW-38	FFTA-MAAF GW-39
Sample Parameters (ug/L)			
PCE	0.1 U	**4.1**	**4.0**
TCE	0.1 U	**4.6**	**3.5**
cis-1,2-DCE	0.1 U	**13.8**	**5.3**
Vinyl Chloride	0.1 U	0.1 U	0.1 U

Sample Location	B10b			
Sample Identification	GW-40	GW-41	GW-42	GW-42 D
Date Sampled	7-Mar-98	7-Mar-98	7-Mar-98	7-Mar-98
Sample Depth (feet)	25	45	60	60
Laboratory Number	FFTA-MAAF GW-40	FFTA-MAAF GW-41	FFTA-MAAF GW-42	FFTA-MAAF GW-42D
Sample Parameters (ug/L)				
PCE	0.1 U	0.1 U	0.1 U	0.1 U
TCE	0.1 U	0.1 U	0.1 U	0.1 U
cis-1,2-DCE	0.1 U	0.1 U	0.1 U	0.1 U
Vinyl Chloride	0.1 U	0.1 U	0.1 U	0.1 U

Table 4-2 (continued)
Plume Characterization Groundwater Screening Results
FFTA-MAAF Remedial Investigation Report

Sample Location	B13		
Sample Identification	GW-43	GW-44	GW-45
Date Sampled	7-Mar-98	7-Mar-98	7-Mar-98
Sample Depth (feet)	25	45	65
Laboratory Number	FFTA-MAAF GW-43	FFTA-MAAF GW-44	FFTA-MAAF GW-45
Sample Parameters (ug/L)			
PCE	0.1 U	0.1 U	0.1 U
TCE	0.1 U	0.1 U	0.1 U
cis-1,2-DCE	0.1 U	0.1 U	0.1 U
Vinyl Chloride	0.1 U	0.1 U	0.1 U

Sample Location	B13b		
Sample Identification	GW-46	GW-47	GW-48
Date Sampled	7-Mar-98	7-Mar-98	7-Mar-98
Sample Depth (feet)	25	45	65
Laboratory Number	FFTA-MAAF GW-46	FFTA-MAAF GW-47	FFTA-MAAF GW-48
Sample Parameters (ug/L)			
PCE	0.1 U	0.1 U	0.1 U
TCE	0.1 U	0.1 U	0.1 U
cis-1,2-DCE	0.1 U	**0.7**	**0.9**
Vinyl Chloride	0.1 U	0.1 U	0.1 U

Sample Location	B2		
Sample Identification	GW-49	GW-50	GW-51
Date Sampled	7-Mar-98	7-Mar-98	7-Mar-98
Sample Depth (feet)	25	45	62
Laboratory Number	FFTA-MAAF GW-49	FFTA-MAAF GW-50	FFTA-MAAF GW-51
Sample Parameters (ug/L)			
PCE	0.1 U	**2.2**	**3.5**
TCE	0.1 U	**3.1**	**6.8**
cis-1,2-DCE	0.1 U	**36**	**54.8**
Vinyl Chloride	0.1 U	0.1 U	0.1 U

Table 4-2 (continued)
Plume Characterization Groundwater Screening Results
FFTA-MAAF Remedial Investigation Report

Sample Location	B14	
Sample Identification	GW-52	GW-53
Date Sampled	13-Apr-98	13-Apr-98
Sample Depth (feet)	45	65
Laboratory Number	FFTA-MAAF GW-52	FFTA-MAAF GW-53
Sample Parameters (ug/L)		
PCE	0.2 U	0.2 U
TCE	0.2 U	0.2 U
cis-1,2-DCE	0.2 U	0.2 U
Vinyl Chloride	0.2 U	0.2 U

Sample Location	B15	
Sample Identification	GW-54	GW-55
Date Sampled	13-Apr-98	13-Apr-98
Sample Depth (feet)	45	65
Laboratory Number	FFTA-MAAF GW-54	FFTA-MAAF GW-55
Sample Parameters (ug/L)		
PCE	**0.3**	0.2 U
TCE	**1.4**	0.2 U
cis-1,2-DCE	**0.5**	0.2 U
Vinyl Chloride	0.2 U	0.2 U

Sample Location	B16			
Sample Identification	GW-56	GW-57	GW-58	GW-58 D
Date Sampled	13-Apr-98	13-Apr-98	13-Apr-98	13-Apr-98
Sample Depth (feet)	25	45	65	65
Laboratory Number	FFTA-MAAF GW-56	FFTA-MAAF GW-57	FFTA-MAAF GW-58	FFTA-MAAF GW-58D
Sample Parameters (ug/L)				
PCE	0.2 U	**1.5**	0.2 U	0.2 U
TCE	0.2 U	**2.0**	**0.6**	**0.3**
cis-1,2-DCE	0.2 U	**2.0**	**0.3**	0.2 U
Vinyl Chloride	0.2 U	0.2 U	0.2 U	0.2 U

Table 4-2 (continued)
Plume Characterization Groundwater Screening Results
FFTA-MAAF Remedial Investigation Report

Sample Location	B17		
Sample Identification	GW-59	GW-60	GW-61
Date Sampled	13-Apr-98	13-Apr-98	13-Apr-98
Sample Depth (feet)	25	45	63
Laboratory Number	FFTA-MAAF GW-59	FFTA-MAAF GW-60	FFTA-MAAF GW-61
Sample Parameters (ug/L)			
PCE	0.2 U	**1.4**	**1.4**
TCE	0.2 U	**2.3**	**3.3**
cis-1,2-DCE	0.2 U	**29.7**	**33.6**
Vinyl Chloride	0.2 U	0.2 U	0.2 U

Sample Location	B18			
Sample Identification	GW-62	GW-63	GW-64	GW-64 D
Date Sampled	13-Apr-98	13-Apr-98	14-Apr-98	14-Apr-98
Sample Depth (feet)	25	45	64	64
Laboratory Number	FFTA-MAAF GW-62	FFTA-MAAF GW-63	FFTA-MAAF GW-64	FFTA-MAAF GW-64D
Sample Parameters (ug/L)				
PCE	0.2 U	**4.0**	**7.5**	**5.3**
TCE	0.2 U	**2.1**	**4.0**	**3.0**
cis-1,2-DCE	0.2 U	**11.7**	**22.6**	**16.0**
Vinyl Chloride	0.2 U	0.2 U	0.2 U	0.2 U

Sample Location	B19		
Sample Identification	GW-65	GW-66	GW-67
Date Sampled	14-Apr-98	14-Apr-98	14-Apr-98
Sample Depth (feet)	25	45	65
Laboratory Number	FFTA-MAAF GW-65	FFTA-MAAF GW-66	FFTA-MAAF GW-67
Sample Parameters (ug/L)			
PCE	0.2 U	0.2 U	0.2 U
TCE	0.2 U	0.2 U	0.2 U
cis-1,2-DCE	0.2 U	0.2 U	0.2 U
Vinyl Chloride	0.2 U	0.2 U	0.2 U

Table 4-2 (continued)
Plume Characterization Groundwater Screening Results
FFTA-MAAF Remedial Investigation Report

Sample Location	B20			
Sample Identification	GW-68	GW-69	GW-69 D	GW-70
Date Sampled	14-Apr-98	14-Apr-98	14-Apr-98	14-Apr-98
Sample Depth (feet)	25	45	45	62
Laboratory Number	FFTA-MAAF GW-68	FFTA-MAAF GW-69	FFTA-MAAF GW-69D	FFTA-MAAF GW-70
Sample Parameters (ug/L)				
PCE	0.2 U	0.2 U	0.2 U	0.2 U
TCE	0.2 U	0.2 U	0.2 U	0.2 U
cis-1,2-DCE	0.2 U	**0.8**	**0.7**	**1.9**
Vinyl Chloride	0.2 U	0.2 U	0.2 U	0.2 U

Sample Location	B21		
Sample Identification	GW-71	GW-72	GW-73
Date Sampled	14-Apr-98	14-Apr-98	14-Apr-98
Sample Depth (feet)	25	45	61
Laboratory Number	FFTA-MAAF GW-71	FFTA-MAAF GW-72	FFTA-MAAF GW-73
Sample Parameters (ug/L)			
PCE	0.2 U	**0.3**	0.2 U
TCE	0.2 U	**1.4**	0.2 U
cis-1,2-DCE	0.2 U	**0.5**	0.2 U
Vinyl Chloride	0.2 U	0.2 U	0.2 U

Sample Location	B22		
Sample Identification	GW-74	GW-75	GW-76
Date Sampled	14-Apr-98	14-Apr-98	14-Apr-98
Sample Depth (feet)	25	45	65
Laboratory Number	FFTA-MAAF GW-74	FFTA-MAAF GW-75	FFTA-MAAF GW-76
Sample Parameters (ug/L)			
PCE	0.2 U	**4.5**	**0.9**
TCE	0.2 U	**7.0**	**1.3**
cis-1,2-DCE	0.2 U	**57.1**	**25.6**
Vinyl Chloride	0.2 U	0.2 U	0.2 U

Table 4-2 (continued)
Plume Characterization Groundwater Screening Results
FFTA-MAAF Remedial Investigation Report

Sample Location	B23		
Sample Identification	GW-77	GW-78	GW-79
Date Sampled	15-Apr-98	15-Apr-98	15-Apr-98
Sample Depth (feet)	25	45	60
Laboratory Number	FFTA-MAAF GW-77	FFTA-MAAF GW-78	FFTA-MAAF GW-79
Sample Parameters (ug/L)			
PCE	0.2 U	**0.3**	0.2 U
TCE	0.2 U	**0.7**	**0.3**
cis-1,2-DCE	0.2 U	**0.5**	0.2 U
Vinyl Chloride	0.2 U	0.2 U	0.2 U

Sample Location	FP-96-22	FP-96-24
Sample Identification	GW-80	GW-81
Date Sampled	15-Apr-98	15-Apr-98
Sample Depth (feet)	NAv (Shallow)	NAv (Shallow)
Laboratory Number	FP-96-22 GW-80	FP-96-24 GW-81
Sample Parameters (ug/L)		
PCE	0.2 U	0.2 U
TCE	0.2 U	**2.1**
cis-1,2-DCE	0.2 U	**3.3**
Vinyl Chloride	0.2 U	0.2 U

Sample Location	B24			
Sample Identification	GW-82	GW-83	GW-84	GW-84 D
Date Sampled	15-Apr-98	15-Apr-98	15-Apr-98	15-Apr-98
Sample Depth (feet)	25	45	65	65
Laboratory Number	FFTA-MAAF GW-82	FFTA-MAAF GW-83	FFTA-MAAF GW-84	FFTA-MAAF GW-84D
Sample Parameters (ug/L)				
PCE	0.2 U	**6.6**	**2.5**	**3.2**
TCE	0.2 U	**4.3**	**2.4**	**3.3**
cis-1,2-DCE	0.2 U	**26.2**	**10.2**	**10.8**
Vinyl Chloride	0.2 U	0.2 U	0.2 U	0.2 U

Table 4-2 (continued)
Plume Characterization Groundwater Screening Results
FFTA-MAAF Remedial Investigation Report

Sample Location	B25		
Sample Identification	GW-85	GW-86	GW-87
Date Sampled	15-Apr-98	15-Apr-98	15-Apr-98
Sample Depth (feet)	25	45	65
Laboratory Number	FFTA-MAAF GW-85	FFTA-MAAF GW-86	FFTA-MAAF GW-87
Sample Parameters (ug/L)			
PCE	0.2 U	0.2 U	0.2 U
TCE	0.2 U	0.2 U	0.2 U
cis-1,2-DCE	0.2 U	0.2 U	0.2 U
Vinyl Chloride	0.2 U	0.2 U	0.2 U

Sample Location	B26		
Sample Identification	GW-88	GW-89	GW-90
Date Sampled	15-Apr-98	15-Apr-98	15-Apr-98
Sample Depth (feet)	25	45	65
Laboratory Number	FFTA-MAAF GW-88	FFTA-MAAF GW-89	FFTA-MAAF GW-90
Sample Parameters (ug/L)			
PCE	0.2 U	**0.9**	**0.3**
TCE	0.2 U	**1.7**	**0.7**
cis-1,2-DCE	0.2 U	**54.2**	**33.6**
Vinyl Chloride	0.2 U	0.2 U	0.2 U

Sample Location	B27		
Sample Identification	GW-91	GW-92	GW-93
Date Sampled	15-Apr-98	15-Apr-98	15-Apr-98
Sample Depth (feet)	25	45	65
Laboratory Number	FFTA-MAAF GW-91	FFTA-MAAF GW-92	FFTA-MAAF GW-93
Sample Parameters (ug/L)			
PCE	0.2 U	0.2 U	0.2 U
TCE	0.2 U	0.2 U	0.2 U
cis-1,2-DCE	0.2 U	**11.3**	**0.4**
Vinyl Chloride	0.2 U	0.2 U	0.2 U

Table 4-2 (continued)
Plume Characterization Groundwater Screening Results
FFTA-MAAF Remedial Investigation Report

Sample Location	B28		
Sample Identification	GW-94	GW-95	GW-96
Date Sampled	16-Apr-98	16-Apr-98	16-Apr-98
Sample Depth (feet)	25	45	65
Laboratory Number	FFTA-MAAF GW-94	FFTA-MAAF GW-95	FFTA-MAAF GW-96
Sample Parameters (ug/L)			
PCE	0.2 U	0.2 U	0.2 U
TCE	0.2 U	0.2 U	0.2 U
cis-1,2-DCE	0.2 U	0.2 U	0.2 U
Vinyl Chloride	0.2 U	0.2 U	0.2 U

Sample Location	B29	
Sample Identification	GW-97	GW-98
Date Sampled	16-Apr-98	16-Apr-98
Sample Depth (feet)	25	45
Laboratory Number	FFTA-MAAF GW-97	FFTA-MAAF GW-98
Sample Parameters (ug/L)		
PCE	0.2 U	0.2 U
TCE	0.2 U	0.2 U
cis-1,2-DCE	0.2 U	0.2 U
Vinyl Chloride	0.2 U	0.2 U

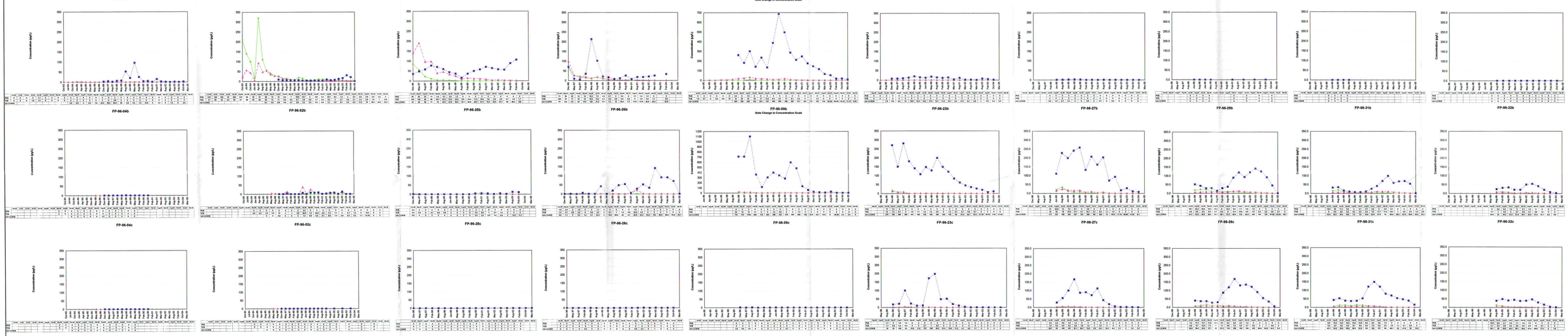
Sample Location	B30		
Sample Identification	GW-99	GW-100	GW-101
Date Sampled	16-Apr-98	16-Apr-98	16-Apr-98
Sample Depth (feet)	25	45	64
Laboratory Number	FFTA-MAAF GW-99	FFTA-MAAF GW-100	FFTA-MAAF GW-101
Sample Parameters (ug/L)			
PCE	0.2 U	0.2 U	0.2 U
TCE	0.2 U	0.2 U	0.2 U
cis-1,2-DCE	0.2 U	0.2 U	0.2 U
Vinyl Chloride	0.2 U	0.2 U	0.2 U

Table 4-2 (continued)
Plume Characterization Groundwater Screening Results
FFTA-MAAF Remedial Investigation Report

Sample Location	B31			
Sample Identification	GW-102	GW-103	GW-104	GW-104 D
Date Sampled	16-Apr-98	16-Apr-98	16-Apr-98	16-Apr-98
Sample Depth (feet)	25	45	65	65
Laboratory Number	FFTA-MAAF GW-102	FFTA-MAAF GW-103	FFTA-MAAF GW-104	FFTA-MAAF GW-104D
Sample Parameters (ug/L)				
PCE	0.2 U	**7.0**	**4.3**	**3.6**
TCE	0.2 U	**3.0**	**2.1**	**2.0**
cis-1,2-DCE	**0.3**	**26.3**	**41.7**	**42.1**
Vinyl Chloride	0.2 U	0.2 U	0.2 U	0.2 U

Sample Location	B32		
Sample Identification	GW-105	GW-106	GW-107
Date Sampled	16-Apr-98	16-Apr-98	16-Apr-98
Sample Depth (feet)	25	45	65
Laboratory Number	FFTA-MAAF GW-105	FFTA-MAAF GW-106	FFTA-MAAF GW-107
Sample Parameters (ug/L)			
PCE	0.2 U	0.2 U	0.2 U
TCE	0.2 U	0.2 U	0.2 U
cis-1,2-DCE	0.2 U	**0.8**	0.2 U
Vinyl Chloride	0.2 U	0.2 U	0.2 U

Source:
May/June 1998 DSR (BMcD, 1998j)
Notes:
D = Duplicate sample
U = Qualified as undetected by the laboratory
NAv = Not Available
ND = Not Detected
µg/L = micrograms per liter
DCE = Dichloroethene
PCE = Tetrachloroethene
TCE = Trichloroethene
BOLD text indicates positive detections
Shaded values indicate detections exceding MCL



Notes:

750 ft = Distance between wells along centerline of the plume.

Zero entries on the data table indicate non-detects, and blank entries represent Not Sampled (NS). See Data Summary Reports (DSRs) for analytical reporting limits.

Burns & McDonnell SINCE 1898

Figure A-1
Chlorinated Solvents Trend Chart
TFTA/SSAAP

KANSAS RIVER

RESERVATION BOUNDARY

FORMER OXBOW LAKE
(WHISKEY LAKE)

SFL92-301
1029.19

FP-99-32
1031.56

FP-99-40PZ
1032.66

FP-98-31
1033.59

FP-99-39PZ
1034.76

FP-98-28
1034.17

FP-98-29
1033.97

FP-98-30
1034.08

FP-98-27
1034.61

FP-96-22
1034.94

FP-96-23
1034.91

FP-96-24
1034.93

FP-96-20
1035.44

FP-94-09
1035.36

FP-96-26
1035.49

FP-96-14PZ
NM

FP-96-15PZ
1036.44

FP-94-12PZ
1036.7

FP-96-16PZ
1036.1

FP-96-17PZ
1036.31

FP-93-02
1035.95

FP-96-19
1035.61

FP-93-03
1035.89

FP-93-04
1036.14

FP-93-06
1036.04

FP-93-07
1036.32

FP-93-01
1035.95

FP-93-05
1036.04

1032.0
1032.5
1033.0
1033.5
1034.0
1034.5
1035.0
1035.5
1036.0
1036.5

0 455 910 1,820
SCALE IN FEET

NORTH

LEGEND

- Monitoring Well or Cluster
- Piezometer
- Private Well
- Groundwater Flow Direction
- Reservation Boundary
- Property Line
- Roads

NOTE:

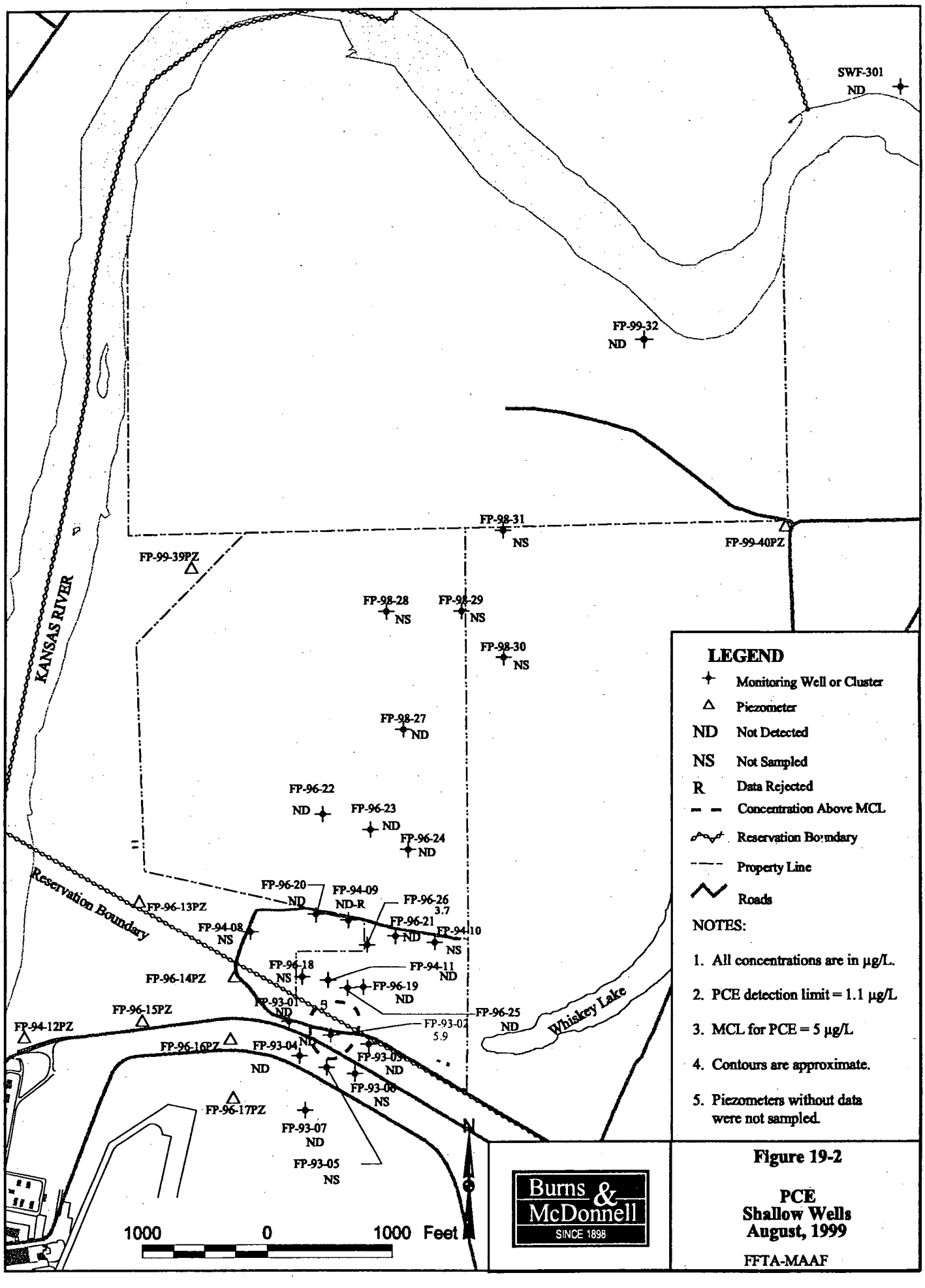
1. NM = Not Measured.

Burns & McDonnell
SINCE 1898

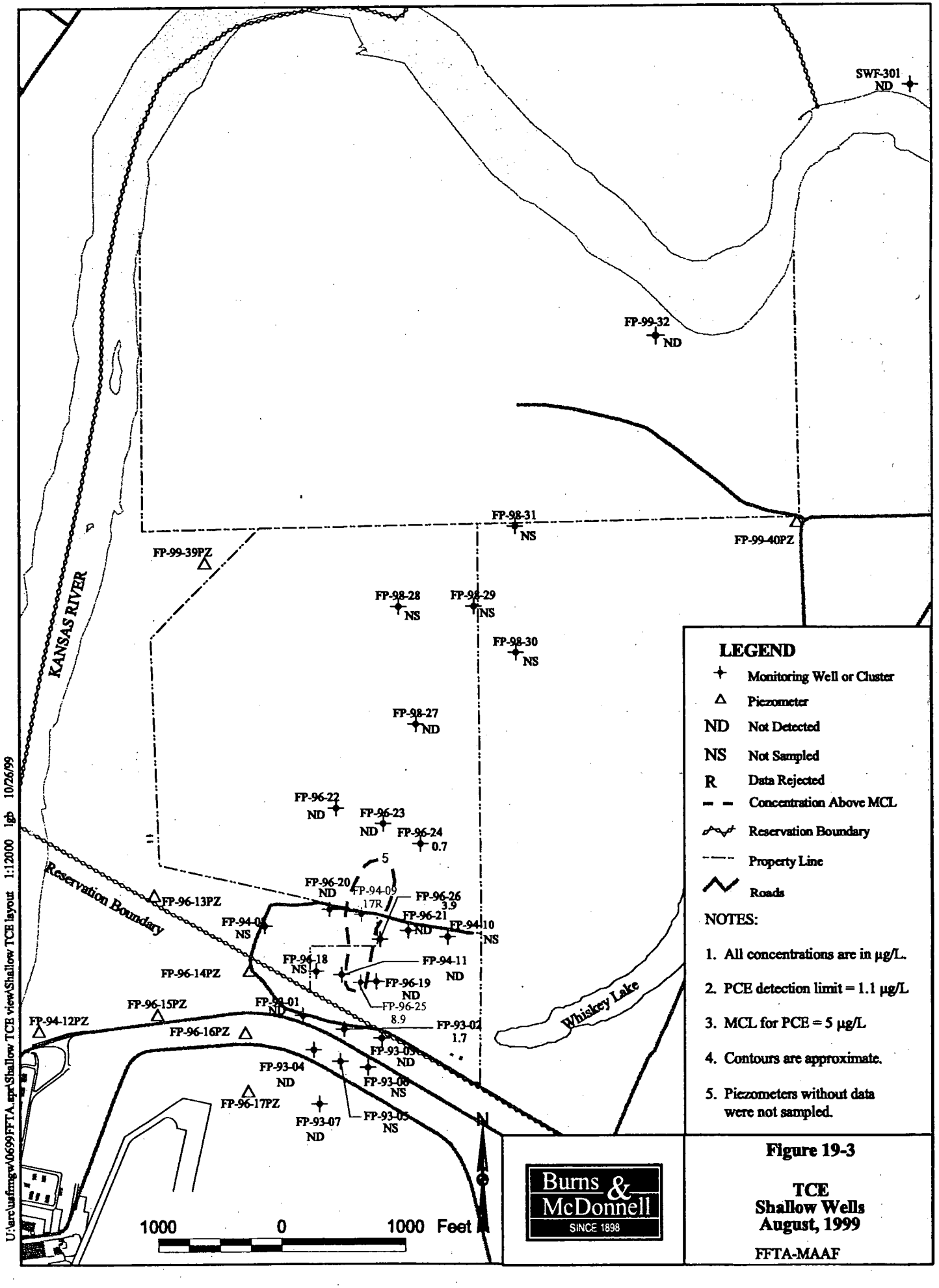
Figure 30-7
GROUNDWATER ELEVATIONS
SHALLOW WELLS
MARCH 2005

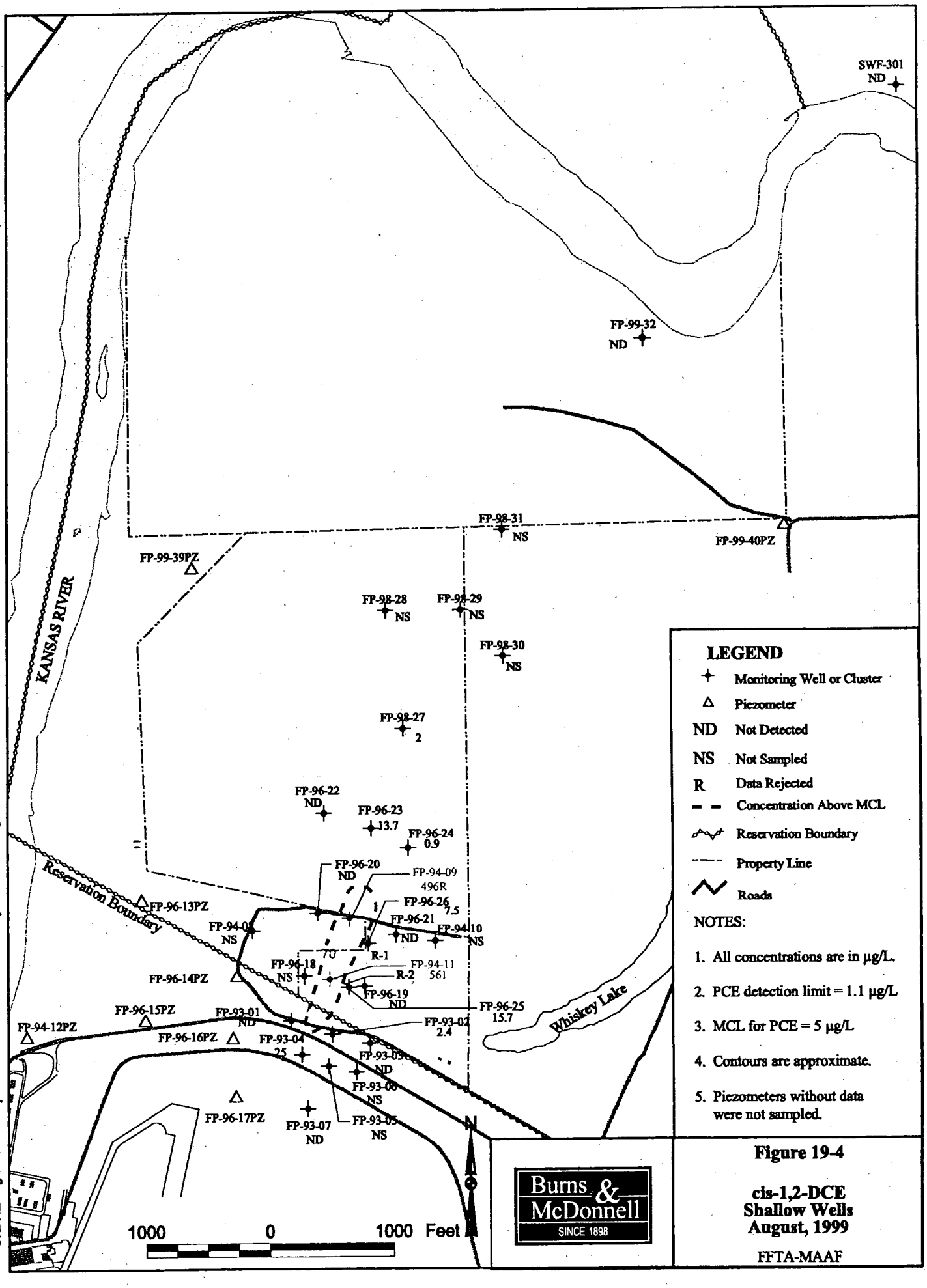
FFTA - MAAF

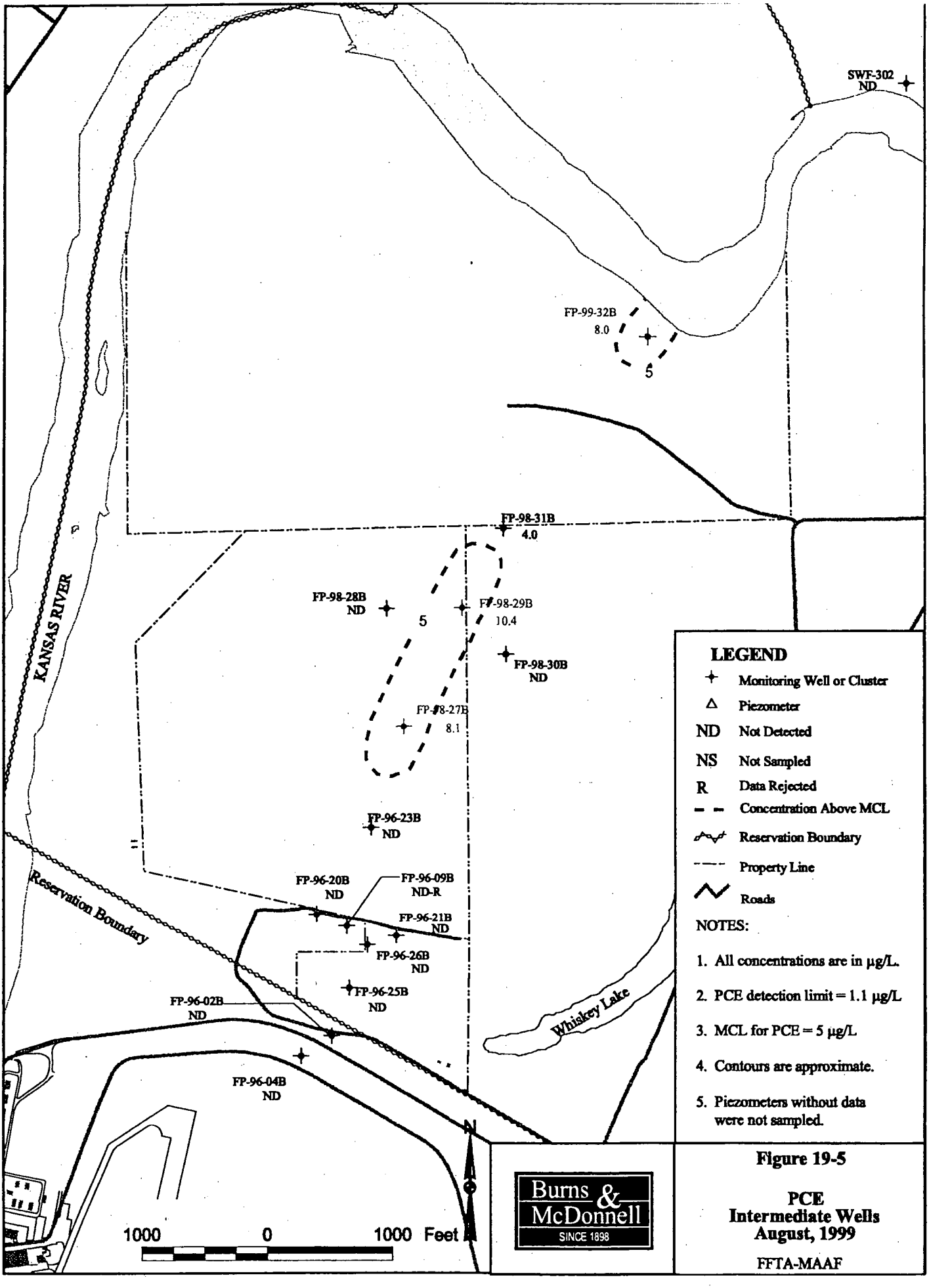
\\Gissrv\Projects\armvcorp\Projects\maaf\ARC\ArcDocs\DSR 0305\Figure 30-7 shallow gwcont.mxd 1:12000 mrb el 04/26/05



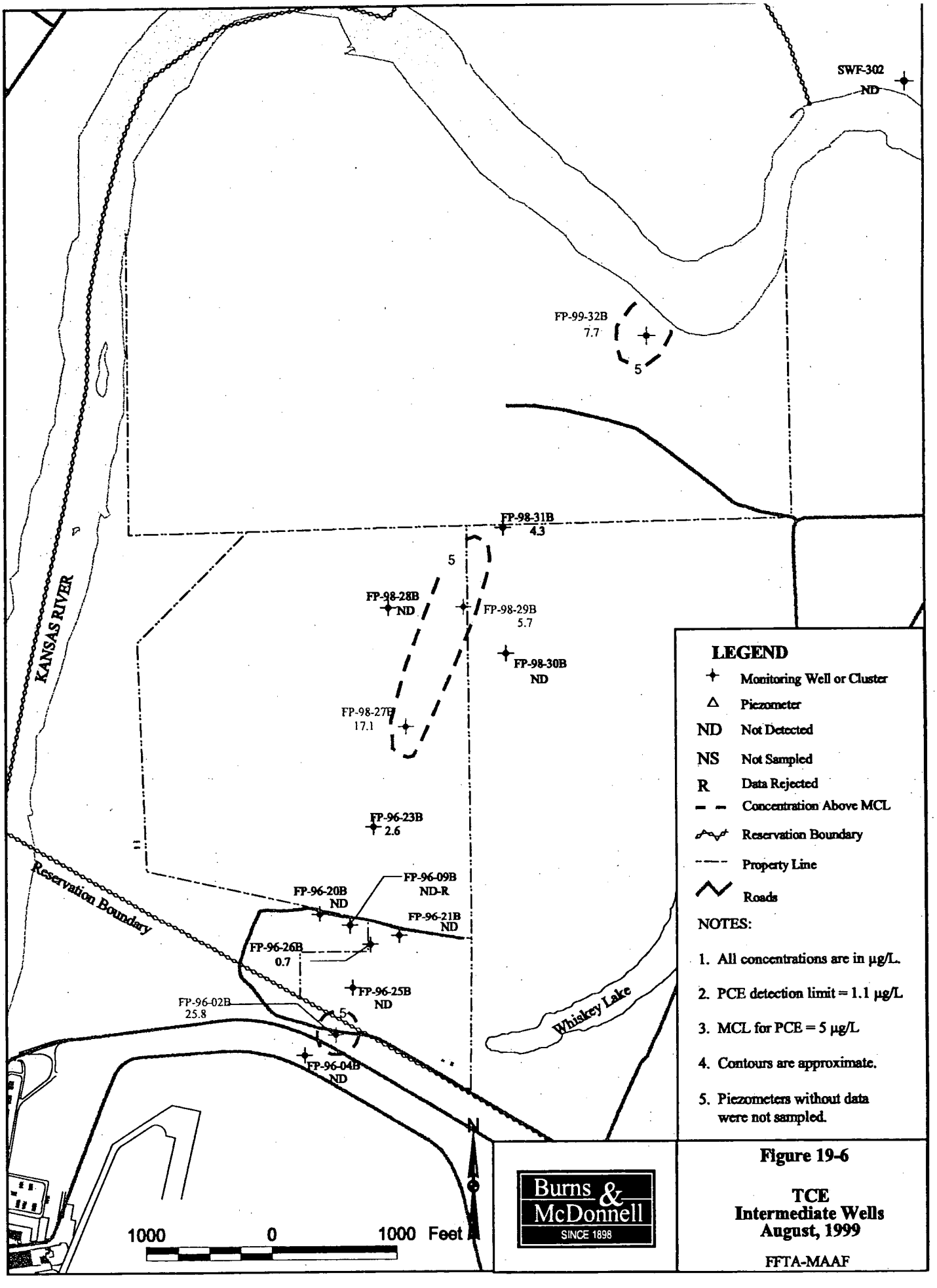
U:\arc\usfrngw\0999FFTA.apr\Shallow PCE view\Shallow PCE layout - 1:12000 lgb 10/26/99


SWF-301
ND
FP-99-32
ND
FP-98-31
NS
FP-99-40PZ
FP-99-39PZ
KANSAS RIVER
FP-98-28
NS
FP-98-29
NS
FP-98-30
NS
FP-98-27
ND
FP-96-22
ND
FP-96-23
ND
FP-96-24
0.7
5
FP-96-20
ND
FP-94-09
17R
FP-96-26
3.9
FP-96-21
ND
FP-94-10
NS
Reservation Boundary
FP-96-13PZ
FP-94-08
NS
FP-96-18
NS
FP-94-11
ND
FP-96-14PZ
FP-96-19
ND
FP-96-25
8.9
FP-96-15PZ
FP-93-01
ND
FP-94-12PZ
FP-96-16PZ
FP-93-02
1.7
Whiskey Lake
FP-93-04
ND
FP-93-06
NS
FP-96-17PZ
FP-93-07
ND
FP-93-05
NS
1000 0 1000 Feet
N
LEGEND
Monitoring Well or Cluster
Piezometer
ND Not Detected
NS Not Sampled
R Data Rejected
Concentration Above MCL
Reservation Boundary
Property Line
Roads
NOTES:
1. All concentrations are in µg/L.
2. PCE detection limit = 1.1 µg/L
3. MCL for PCE = 5 µg/L
4. Contours are approximate.
5. Piezometers without data were not sampled.
Burns & McDonnell
SINCE 1898
Figure 19-3
TCE
Shallow Wells
August, 1999
FFTA-MAAF
U:\arc\usafmgw\0699FFTA.apr\Shallow TCE view\Shallow TCE layout 1:12000 lgb 10/26/99

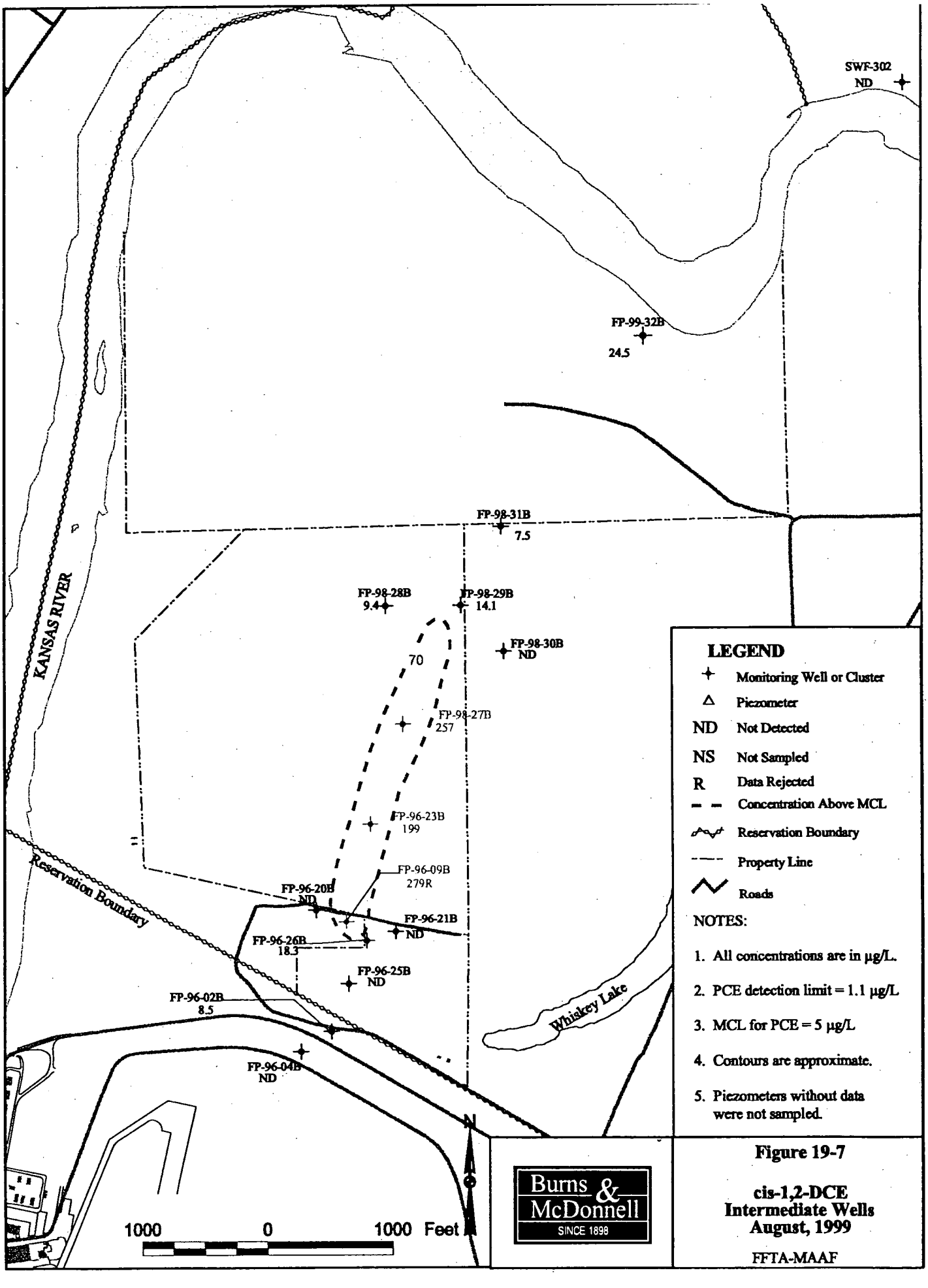

SWF-301
ND
FP-99-32
ND
FP-98-31
NS
FP-99-40PZ
FP-99-39PZ
KANSAS RIVER
FP-98-28
NS
FP-98-29
NS
FP-98-30
NS
FP-98-27
2
FP-96-22
ND
FP-96-23
13.7
FP-96-24
0.9
FP-96-20
ND
FP-94-09
496R
FP-96-26
7.5
FP-96-21
ND
FP-94-10
NS
Reservation Boundary
FP-96-13PZ
FP-94-08
NS
70
R-1
FP-96-18
NS
FP-94-11
561
R-2
FP-96-14PZ
FP-96-19
ND
FP-96-25
15.7
Whiskey Lake
FP-96-15PZ
FP-93-01
ND
FP-93-02
2.4
FP-94-12PZ
FP-96-16PZ
FP-93-04
25
FP-93-05
ND
FP-93-06
NS
FP-96-17PZ
FP-93-07
ND
FP-93-05
NS
N
1000 0 1000 Feet
LEGEND
Monitoring Well or Cluster
Piezometer
ND Not Detected
NS Not Sampled
R Data Rejected
Concentration Above MCL
Reservation Boundary
Property Line
Roads
NOTES:
1. All concentrations are in µg/L.
2. PCE detection limit = 1.1 µg/L
3. MCL for PCE = 5 µg/L
4. Contours are approximate.
5. Piezometers without data were not sampled.
Burns & McDonnell
SINCE 1898
Figure 19-4
cis-1,2-DCE
Shallow Wells
August, 1999
FFTA-MAAF
U:\arc\us\fmgw\0699FFTA.apr\Shallow DCE view\Shallow DCE layout 1:12000 lgb 10/26/99



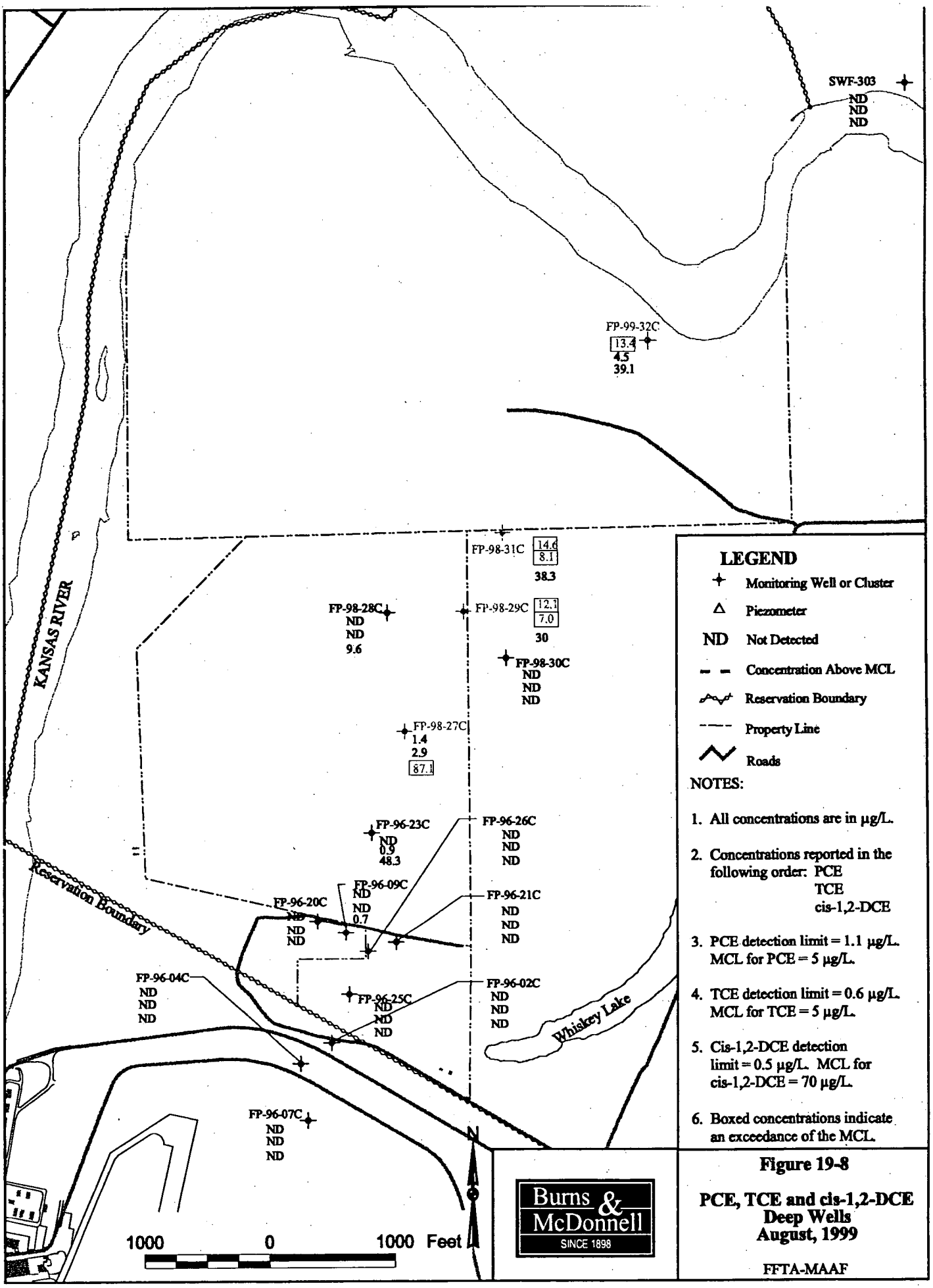
U:\src\usfrmgw\0699FFTA.apr\Intermediate PCE view\Intermediate PCE layout 1:12000 lgb 10/26/99



U:\arc\usafmgw\06699FFTA.apr\Intermediate TCE view\Intermediate TCE layout 1:12000 lgb 10/26/99



U:\arc\usafmgw\06599FFTA.apr\Intermediate DCE view\Intermediate DCE layout 1:12000 lgb 10/26/99


SWF-303
ND
ND
ND
FP-99-32C
13.4
4.5
39.1
FP-98-31C
14.6
8.1
38.3
FP-98-28C
ND
ND
9.6
FP-98-29C
12.1
7.0
30
FP-98-30C
ND
ND
ND
FP-98-27C
1.4
2.9
87.1
FP-96-23C
ND
0.9
48.3
FP-96-26C
ND
ND
ND
FP-96-09C
ND
ND
0.7
FP-96-20C
ND
ND
ND
FP-96-21C
ND
ND
ND
FP-96-04C
ND
ND
ND
FP-96-25C
ND
ND
ND
FP-96-02C
ND
ND
ND
FP-96-07C
ND
ND
ND
KANSAS RIVER
Reservation Boundary
Whiskey Lake
1000 0 1000 Feet
N
LEGEND
Monitoring Well or Cluster
Piezometer
ND Not Detected
Concentration Above MCL
Reservation Boundary
Property Line
Roads
NOTES:
1. All concentrations are in µg/L.
2. Concentrations reported in the following order: PCE
TCE
cis-1,2-DCE
3. PCE detection limit = 1.1 µg/L. MCL for PCE = 5 µg/L.
4. TCE detection limit = 0.6 µg/L. MCL for TCE = 5 µg/L.
5. Cis-1,2-DCE detection limit = 0.5 µg/L. MCL for cis-1,2-DCE = 70 µg/L.
6. Boxed concentrations indicate an exceedance of the MCL.
Burns & McDonnell
SINCE 1898
Figure 19-8
PCE, TCE and cis-1,2-DCE
Deep Wells
August, 1999
FFTA-MAAF
U:\arc\usfrmgw\09999FFTA.apr\Deep Well Results view\Deep DCE, PCE, TCE layout 1:12000 lgb 10/27/99

KANSAS RIVER

RESERVATION BOUNDARY

SFL92-301
ND

FP-99-32
ND

FP-98-31
NS

FP-99-40PZ
NS

FP-99-39PZ
NS

FP-98-28
NS

FP-98-29
NS

FP-98-30
NS

FORMER OXBOW LAKE
(WHISKEY LAKE)

FP-98-27
ND

FP-96-22
NS

FP-96-23
ND

FP-96-24
3.8

FP-94-09
ND

FP-96-20
NS

FP-96-26
NS

FP-96-19
NS

FP-94-12PZ
NS

FP-96-14PZ
NS

FP-96-15PZ
NS

FP-93-01
NS

FP-93-02
2.4

FP-93-03
NS

FP-96-16PZ
NS

FP-93-04
ND

FP-93-06
NS

FP-96-17PZ
NS

FP-93-07
NS

FP-93-05
NS

1,000 0 1,000 Feet

NORTH

LEGEND

- Monitoring Well or Cluster
- Piezometer
- Reservation Boundary
- Property Line
- Roads

NOTES:

1. All concentrations are in ug/L.
2. PCE detection limit = 1.1 ug/L.
3. MCL for PCE = 5 ug/L.
4. ND = Not Detected.
5. NS = Not Sampled.
6. J = Estimated.

Burns & McDonnell
SINCE 1898

Figure 29-2
PCE
SHALLOW WELLS
OCTOBER 2004

FFTA - MAAF

u:\armycorp\projects\maaf\arc\arcdocs\dsr 1004\Fig29-2 shallow pce 1:12000 mrb el 12/20/04

Trichloroethylene (ug/L)						
Sample Point	Mar-02	Aug-02	Mar-03	Aug-03	Feb-04	Oct-04
FP-93-02	***2.6***	***2.1***	***3.4***	***2.8***	***1.5***	***1.0***
FP-94-04	0.6 U	0.6 U	0.6 U	0.6 U	0.6 UJ	0.6 U
FP-94-09	***1.2***	0.6 U	0.6 U	0.6 U	0.6 UJ	0.6 U
FP-96-20	0.6 U	NS	0.6 U	NS	0.6 U	NS
FP-96-23	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
FP-96-24	***1.6***	***2***	***1.2***	***1.5***	***2.3 J***	***3.6***
FP-96-26	***1.6***	***0.9***	***1.1***	NS	***0.8***	NS
FP-98-27	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
FP-98-29	0.6 U	NS	0.6 U	NS	0.6 U	NS
FP-99-32	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
SFL92-301	0.6 U	0.6 U	0.6 U	0.6 UJ	0.6 U	0.6 U

KANSAS RIVER

SFL92-301
ND

FP-99-32
ND

FP-98-31
NS

FP-99-40PZ
NS

FP-99-39PZ
NS

FP-98-28
NS

FP-98-29
NS

FP-98-30
NS

FORMER OXBOW LAKE
(WHISKEY LAKE)

FP-98-27
ND

FP-96-22
NS

FP-96-23
ND

FP-96-24
3.6

RESERVATION BOUNDARY

FP-94-09
ND

FP-96-20
NS

FP-96-26
NS

FP-94-12PZ
NS

FP-96-14PZ
NS

FP-96-19
NS

FP-96-15PZ
NS

FP-93-01
NS

FP-93-02
1.0

FP-93-03
NS

FP-96-16PZ
NS

FP-93-04
ND

FP-93-06
NS

FP-96-17PZ
NS

FP-93-07
NS

FP-93-05
NS

1,000 0 1,000 Feet

NORTH

LEGEND

- Monitoring Well or Cluster
- Piezometer
- Reservation Boundary
- Property Line
- Roads

NOTES:

1. All concentrations are in ug/L.
2. TCE detection limit = 0.6 ug/L.
3. MCL for TCE = 5 ug/L.
4. ND = Not Detected.
5. NS = Not Sampled.
6. J = Estimated.

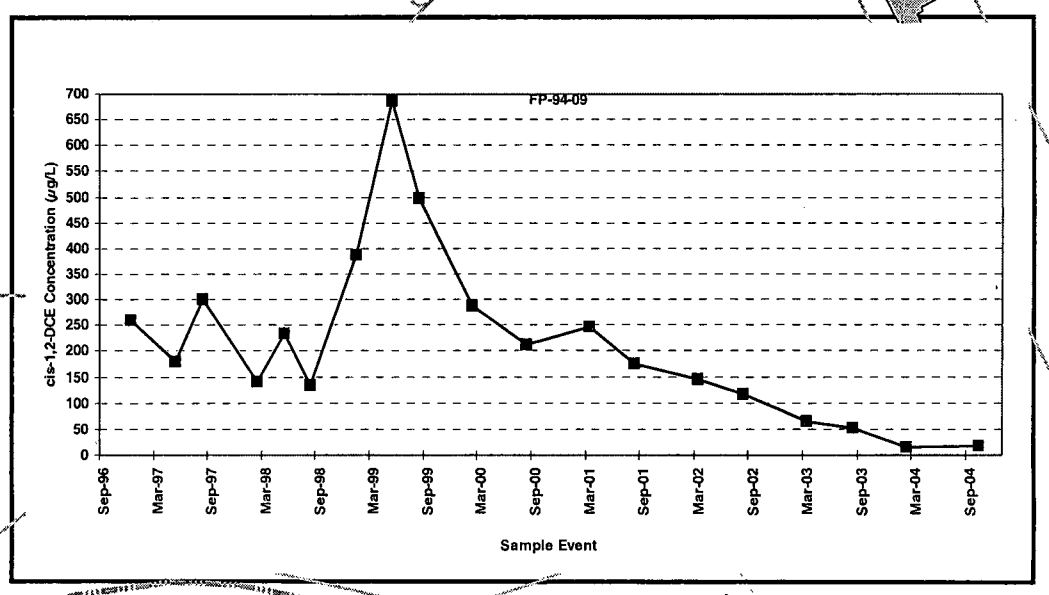
Burns & McDonnell
SINCE 1898

Figure 29-3
TCE
SHALLOW WELLS
OCTOBER 2004

FFTA - MAAF

u:\armycorp\projects\maaf\arc\arcdocs\dsr_1004\Fig29-3_shallow_tce_1:12000_mrb_el_12/21/04

cis-1,2-Dichloroethylene (ug/L)						
Sample Point:	Mar-02	Aug-02	Mar-03	Aug-03	Feb-04	Oct-04
FP-93-02	***5.3***	***6.9***	***11.5***	***16***	***30.1***	***20.3***
FP-94-04	***3.7***	***1.4***	0.5 U	***1.2***	***0.5 J***	***2.4***
FP-94-09	***145***	***116***	***64.9***	***52.5***	***16.1 J***	***17.7***
FP-96-20	0.5 U	NS	0.5 U	NS	0.5 U	NS
FP-96-23	***2.3***	***2.8***	***1***	***7.6***	***5.3***	***2.3***
FP-96-24	***2.1***	***3.6***	***1.7***	***4.4***	***8.1 J***	***14.2***
FP-96-26	***17.8***	***20.8***	***25.4***	NS	***32.8***	NS
FP-98-27	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
FP-98-29	0.5 U	NS	0.5 U	NS	0.5 U	NS
FP-99-32	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
SFL92-301	***0.5***	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U



KANSAS RIVER

SFL92-301
ND

FP-99-32
ND

FP-98-31
NS

FP-99-40PZ
NS

FP-99-39PZ
NS

FP-98-28
NS

FP-98-29
NS

FP-98-30
NS

FORMER OXBOW LAKE
(WHISKEY LAKE)

FP-98-27
ND

FP-96-22
NS

FP-96-23
2.3

FP-96-24
14.2

FP-94-09
17.7

RESERVATION BOUNDARY

FP-96-20
NS

FP-96-26
NS

FP-96-19
NS

FP-94-12PZ
NS

FP-96-14PZ
NS

FP-96-15PZ
NS

FP-93-01
NS

FP-93-02
20.3

FP-93-03
NS

FP-96-16PZ
NS

FP-94-04
2.4

FP-93-06
NS

FP-96-17PZ
NS

FP-93-07
NS

FP-93-05
NS

1,000 0 1,000 Feet

NORTH

LEGEND

- Monitoring Well or Cluster
- Piezometer
- Concentration above MCL
- Reservation Boundary
- Property Line
- Roads

NOTES:

1. All concentrations are in ug/L.
2. cis-1,2-DCE detection limit = 0.5 ug/L.
3. MCL for cis-1,2-DCE = 70 ug/L.
4. ND = Not Detected.
5. NS = Not Sampled.
6. J = Estimated.

Burns & McDonnell SINCE 1898

Figure 29-4
cis-1,2-DCE
SHALLOW WELLS
OCTOBER 2004

FFTA - MAAF

u:\armycorp\projects\maaf\arc\arcdocs\dsr 1004\Fig29-4 shallow dce 1:12000 mrb el 12/21/04

KANSAS RIVER

RESERVATION BOUNDARY

FP-04-33b
ND

SFL92-302
ND

FP-99-32b
ND

FP-98-31b
ND

FP-98-29b
ND

FP-98-28b
ND

FP-98-30b
NS

FORMER OXBOW LAKE
(WHISKEY LAKE)

FP-98-27b
ND

FP-96-23b
ND

FP-96-09b
ND

FP-96-20b
NS

FP-96-26b
ND

FP-96-02b
ND

FP-96-04b
NS

1,000 0 1,000 Feet

NORTH

LEGEND

- Monitoring Well or Cluster
- Reservation Boundary
- Property Line
- Roads

NOTES:

1. All concentrations are in ug/L.
2. PCE detection limit = 1.1 ug/L.
3. MCL for PCE = 5 ug/L.
4. ND = Not Detected.
5. NS = Not Sampled.
6. Subscript b refers to intermediate wells.

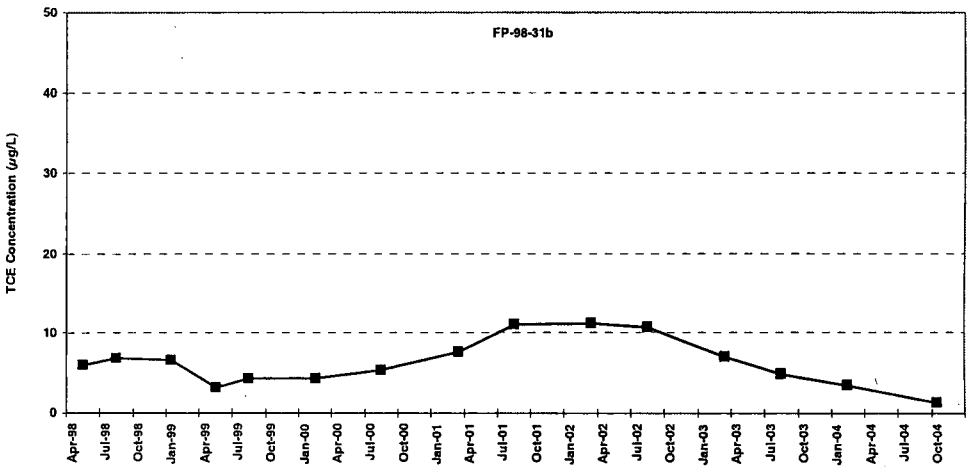
Burns & McDonnell
SINCE 1898

Figure 29-5
PCE
INTERMEDIATE WELLS
OCTOBER 2004

FFTA - MAAF

u:\armycorp\projects\maaf\arc\arcdocs\dsr_1004\Fig29-5 intermed pce 1:12000 mrb el 12/21/04

Trichloroethylene (ug/L)						
Sample Point	Mar-02	Aug-02	Mar-03	Aug-03	Feb-04	Oct-04
FP-96-02b	***5.7***	***7.5***	0.6 U	***10.5***	0.6 U	0.6 U
FP-96-09b	0.6 U	0.6 U	0.6 U	0.6 U	0.6 UJ	0.6 U
FP-96-23b	***0.6***	***0.7***	0.6 U	0.6 U	0.6 U	0.6 U
FP-96-26b	***2.6***	0.6 U	0.6 U	0.6 U	1 UJ	0.6 U
FP-98-27b	***1.1***	***1.2***	0.6 U	0.6 U	0.6 UJ	0.6 U
FP-98-28b	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
FP-98-29b	***9.8***	***7.6***	***6.4***	***3.9***	***2.6***	***0.7***
FP-98-30b	0.6 U	NS	0.6 U	NS	0.6 U	NS
FP-98-31b	***11.2***	***10.7***	***7***	***4.8***	***3.4***	***1.3***
FP-99-32b	***4.8***	***4.7***	***2.9***	***1.2***	0.6 U	0.6 U
FP-04-33b	NS	NS	NS	NS	NS	0.6 U
SFL92-302	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U



KANSAS RIVER

RESERVATION BOUNDARY

FP-04-33b ND

SFL92-302 ND

FP-99-32b ND

FP-98-31b 1.3

FP-98-29b 0.7

FP-98-28b ND

FP-98-30b NS

FP-98-27b ND

FP-96-23b ND

FP-96-20b NS

FP-96-09b ND

FP-96-26b ND

FP-96-02b ND

FP-96-04b NS

FORMER OXBOW LAKE (WHISKEY LAKE)

1,000 0 1,000 Feet

NORTH

LEGEND

- Monitoring Well or Cluster
- Concentration aboce MCL
- Reservation Boundary
- Property Line
- Roads

NOTES:

1. All concentrations are in ug/L.
2. TCE detection limit = 0.6 ug/L.
3. MCL for TCE = 5 ug/L.
4. ND = Not Detected.
5. NS = Not Sampled.
6. Subscript b refers to intermediate wells.

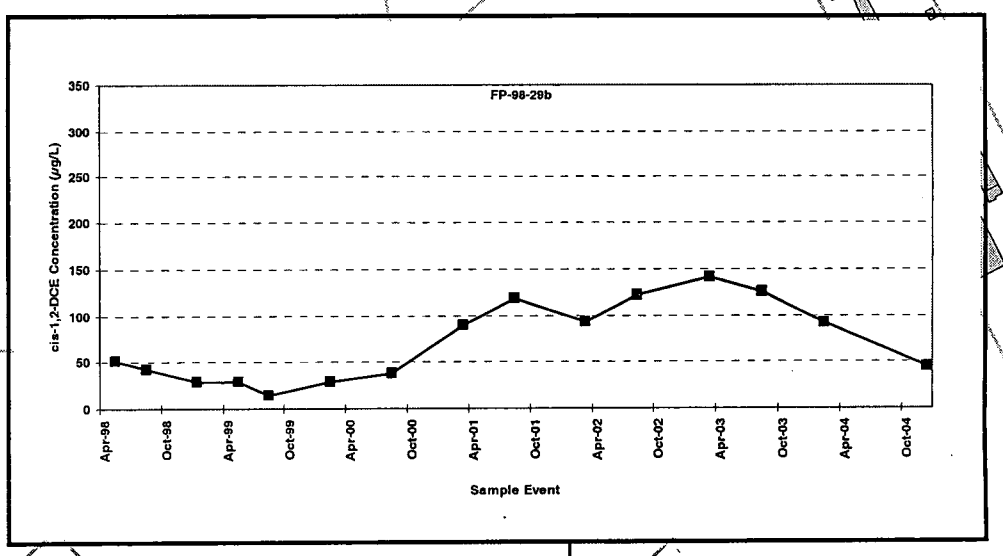
Burns & McDonnell SINCE 1890

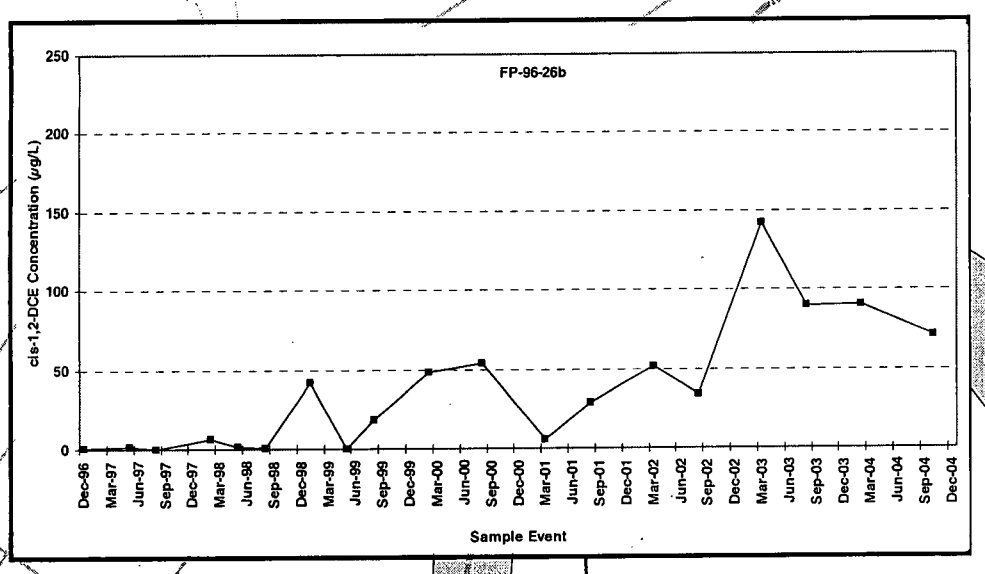
Figure 29-6
TCE
INTERMEDIATE WELLS
OCTOBER 2004

FFTA - MAAF

u:\armycorp\projects\maaf\arc\arcdocs\dsr 1004\Fig29-6 intermed tce 1:12000 mrb el 21/21/04

cis-1,2-Dichloroethylene (ug/L)						
Sample Point	Mar-02	Aug-02	Mar-03	Aug-03	Feb-04	Oct-04
FP-96-02b	***6.3***	***8.4***	***1.1***	***13.2***	0.5 U	0.5 U
FP-96-09b	***28.8***	***13.6***	***6***	***23.8***	***2.3 J***	***2.4***
FP-96-23b	***45.7***	***35.4***	***27.2***	***19.7***	***7.4***	***11.4***
FP-96-26b	***52.2***	***33.8***	***142***	***56.2***	***90.5***	***70.9***
FP-98-27b	***72***	***92.9***	***17.1***	***28.9***	***10.9***	***8.1***
FP-98-28b	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
FP-98-29b	***92.8***	***120***	***141***	***125***	***91.8***	***45.2***
FP-98-30b	0.5 U	NS	0.5 U	NS	0.5 U	NS
FP-98-31b	***70***	***98.9***	***59.4***	***67.8***	***69.9***	***54.4***
FP-99-32b	***50.1***	***54.5***	***41.4***	***20.5***	***8.2***	***2.9***
FP-04-33b	NS	NS	NS	NS	NS	0.5 U
SFL92-302	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U





KANSAS RIVER

RESERVATION BOUNDARY

FP-04-33b
ND

SFL92-302
ND

FP-99-32b
2.9

FP-98-31b
54.4

FP-98-29b
45.2

FP-98-28b
ND

FP-98-30b
NS

FORMER OXBOW LAKE
(WHISKEY LAKE)

FP-98-27b
8.1

FP-96-23b
11.4

FP-96-09b
2.4

FP-96-20b
NS

FP-96-26b
70
70.9

FP-96-02b
ND

FP-96-04b
NS

1,000 0 1,000 Feet

NORTH

LEGEND

- Monitoring Well or Cluster
- Concentration above MCL
- Reservation Boundary
- Property Line
- Roads

NOTES:

1. All concentrations are in ug/L.
2. cis-1,2-DCE detection limit = 0.5 ug/L.
3. MCL for cis-1,2-DCE = 70 ug/L.
4. Contours are approximate.
5. ND = Not Detected.
6. NS = Not Sampled.
7. J = Estimated.
8. Subscript b refers to intermediate wells.

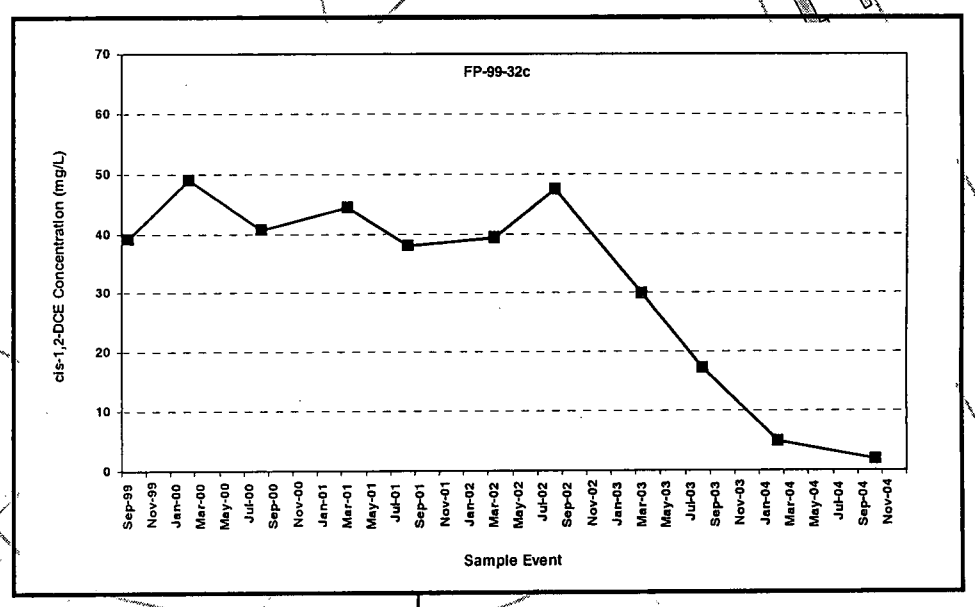
Burns & McDonnell SINCE 1898

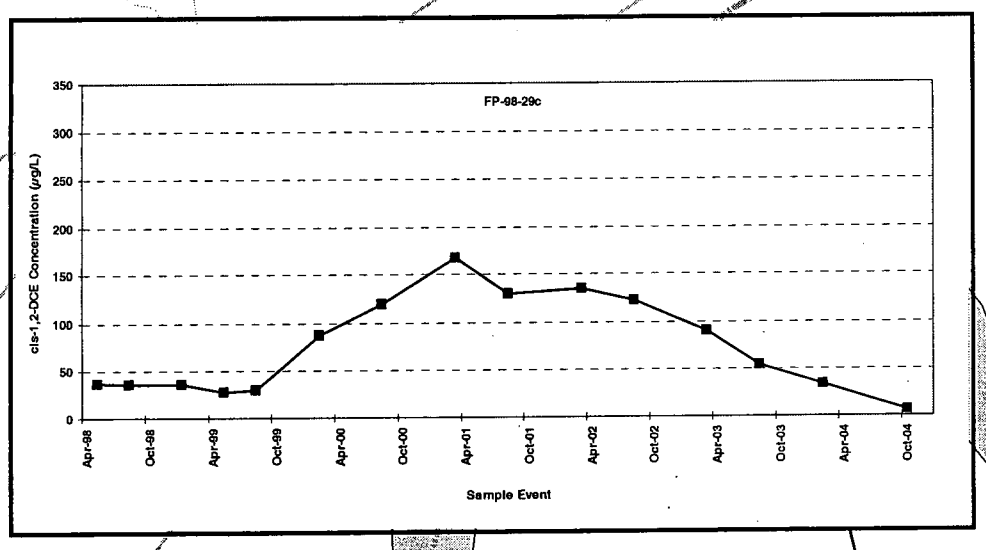
Figure 29-7
cis-1,2-DCE
INTERMEDIATE WELLS
OCTOBER 2004

FFTA - MAAF

u:\armycorp\projects\maaf\arc\arcdocs\dsr 1004\Fig29-7 intermed dce 1:12000 mrb el 12/21/04

cis-1,2-Dichloroethylene (ug/L)						
Sample Point	Mar-02	Aug-02	Mar-03	Aug-03	Feb-04	Oct-04
FP-96-02c	0.5 U	N S	0.5 U	NS	0.5 U	NS
FP-96-09c	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 U
FP-96-20c	0.5 U	NS	0.5 U	NS	0.5 U	NS
FP-96-23c	***0.6***	***1.1***	0.5 U	0.5 U	0.5 U	0.5 U
FP-96-26c	***2.2***	0.5 U	***1***	0.5 U	0.5 U	0.5 U
FP-98-27c	***19.2***	***6.4***	***2.1***	***2***	***1.6***	***0.7***
FP-98-28c	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
FP-98-29c	***135***	***122***	***90.9***	***54.9***	***34.2***	***6.3***
FP-98-30c	0.5 U	NS	***1.6***	NS	***5.8***	NS
FP-98-31c	***80***	***69.1***	***54***	***47.8***	***39***	***15.9***
FP-99-32c	***39.4***	***47.4***	***29.8***	***17.2***	***5 J***	***1.8***
FP-04-33c	NS	NS	NS	NS	NS	0.5 U
SFL92-303	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U





Trichloroethylene (ug/L)						
Sample Point	Mar-02	Aug-02	Mar-03	Aug-03	Feb-04	Oct-04
FP-96-02c	0.6 U	NS	0.6 U	NS	0.6 U	NS
FP-96-09c	0.6 U	0.6 U	0.6 U	0.6 U	0.6 UJ	0.6 U
FP-96-20c	0.6 U	NS	0.6 U	NS	0.6 U	NS
FP-96-23c	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
FP-96-26c	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
FP-98-27c	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
FP-98-28c	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
FP-98-29c	***4.7***	***2.9***	***2***	***1***	***0.6***	0.6 U
FP-98-30c	0.6 U	NS	***0.7***	NS	***1.1***	NS
FP-98-31c	***2.3***	***1.5***	***1.1***	***0.7 J***	***0.6***	0.6 U
FP-99-32c	***2.5***	***2.6***	***1.5***	***0.7***	0.6 UJ	0.6 U
FP-04-33c	NS	NS	NS	NS	NS	0.6 U
SFL92-303	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U

FP-04-33c
ND
ND
ND

SFL92-303
ND
ND
ND

KANSAS RIVER

FP-99-32c
ND
ND
1.8 J

FP-98-31c
ND
ND
15.9

FP-98-29c
ND
ND
6.3

FP-98-28c
ND
ND
ND

FP-98-30c
NS
NS
NS

FORMER OXBOW LAKE
(WHISKEY LAKE)

FP-98-27c
ND
ND
0.7

FP-96-23c
ND
ND
ND

FP-96-09c
ND
ND
ND

FP-96-20c
NS
NS
NS

FP-96-26c
ND
ND
ND

RESERVATION BOUNDARY

FP-96-02c
NS
NS
NS

FP-96-04c
NS
NS
NS

FP-96-07c
NS
NS
NS

1,000 0 1,000 Feet

NORTH

LEGEND

- Monitoring Well or Cluster
- Reservation Boundary
- Property Line
- Roads

NOTES:

1. All concentrations are in ug/L.
2. Concentrations reported in the following order:
   PCE
   TCE
   cis-1,2-DCE
3. PCE detection limit = 1.1 ug/L.
   MCL for PCE = 5 ug/L.
4. TCE detection limit = 0.6 ug/L.
   MCL for TCE = 5 ug/L.
5. cis-1,2-DCE detection limit = 0.5 ug/L.
   MCL for cis-1,2-DCE = 70 ug/L.
6. J = Estimated.
7. ND = Not Detected.
8. NS = Not Sampled.
9. Concentration and time scales vary on graphs.
10. Subscript c refers to deep wells.

Burns & McDonnell SINCE 1898

Figure 29-8
PCE, TCE, and cis-1,2-DCE
DEEP WELLS
OCTOBER 2004

FFTA - MAAF

u:\armycorp\projects\maaf\arc\arcdocs\dsr 1004\Fig29-8 deep pce tce dce 1:12000 mrb el 12/21/04

KANSAS RIVER

RESERVATION BOUNDARY

B-1
NS
NS
NS

I-1
NS
NS
NS

N-1
NS
NS
NS

M02-02
ND
ND
ND

F-1
NS
NS
NS

F-2
NS
NS
NS

R02-02
NS
NS
NS

1,000 0 1,000 Feet

NORTH

LEGEND

- Private Well (Sampled)
- Private Well (Not Sampled)
- Abandoned Well
- Reservation Boundary
- Property Line
- Roads

NOTES:

1. All concentrations are in micrograms per liter (ug/L).
2. Concentrations reported in the following order:
   PCE
   TCE
   cis-1,2-DCE
3. PCE detection limit = 1.1 ug/L. MCL for PCE = 5 ug/L.
4. TCE detection limit = 0.6 ug/L. MCL for TCE = 5 ug/L.
5. cis-1,2-DCE detection limit = 0.5 ug/L. MCL for cis-1,2-DCE = 70 ug/L.
6. ND = Not Detected.
7. NS = Not Sampled.

Burns & McDonnell SINCE 1898

Figure 30-5
PCE, TCE, cis-1,2-DCE
PRIVATE WELLS
MARCH 2005

FFTA - MAAF

u:\armycorp\projects\maaf\arc\arcdocs\dsr_0305\Fig30-5_private_pce_tce_dce_1:12000_mrb_el_04/25-05

Rec'd 1/27/06 RMS

Burns & McDonnell
SINCE 1898

January 26, 2006

Directorate of Public Works
Environmental Division
ATTN: IMNW-RLY-PWE (D. Shields)
407 Pershing Court
Fort Riley, KS 66442-6016

Draft Final Remedial Design/Remedial Action Plan
Former Fire Training Area – Marshall Army Airfield, Fort Riley, Kansas
BMCD Project No. 40421
Contract No. DACW41-02-D-003

Dear Mr. Shields:

Enclosed are two electronic copies and two hard copies of the Draft Final Remedial Design/Remedial Action Plan for the above referenced site. Copies of the distribution list and responses to comments are also enclosed.

If you have any questions, please call me at (816) 822-3369.

Sincerely,

Tracy Cooley
Project Manager

Enclosures

9400 Ward Parkway
Kansas City, Missouri 64114-3319
Tel: 816 333-9400
Fax: 816 333-3690
www.burnsmcd.com

DISTRIBUTION LIST

Commander U. S. Army Engineer District, Kansas City ATTN: CENWK-PM-E (R Van Saun) 601 E 12th Street Kansas City, MO 64106-2896	1 copy of Draft Final Remedial Design/ Remedial Action Plan, 1 CD, Responses to Comments, and Distribution List
Directorate of Public Works Environmental Division ATTN: IMNW-RLY-PWE .(D Shields) 407 Pershing Court Fort Riley, KS 66442-6016	2 copies of Draft Final Remedial Design/ Remedial Action Plan, 2 CDs, Responses to Comments, and Distribution List
Robin Paul Remedial Project Manager USEPA Region VII SUPR/FFSE 901 North 5th Street Kansas City, KS 66101	2 copies of Draft Final Remedial Design/ Remedial Action Plan, Responses to Comments
Jim Anstaett Project Manager Kansas Department of Health and Environment Curtis State Office Building 1000 SW Jackson Street, Suite 410 Topeka, KS 66612-1367	1 copy of Draft Final Remedial Design/ Remedial Action Plan, Responses to Comments
Peter Rissell U.S. Army Environmental Center ATTN: SFIM-AEC-CDN Bldg E4480, Edgewood Area Aberdeen Proving Ground, MD 21010-5410	2 copies of Draft Final Remedial Design/ Remedial Action Plan, Responses to Comments

RESPONSE TO EPACOMMENTS E-MAILED DECEMBER 12, 2005 TO THE DRAFT REMEDIAL DESIGN/REMEDIAL ACTION PLAN, FORMER FIRE TRAINING AREA – MARSHALL ARMY AIRFIELD, OPERABLE UNIT 004: FFTA-MAAF AT FORT RILEY, KANSAS, DATED NOVEMBER, 2005

General Comments

1. Decommissioning of piezometers and groundwater monitoring wells - The Agency concurs with the proposal set forth in the subject document to decommission the piezometers associated with the FFTA-MAAF site as shown on Figure 1-1. However, the Agency requests the following information regarding decommissioning of the groundwater wells as proposed.

1. The rationale for the abandonment of selected monitoring wells
2. Recent potentiometric surface maps
3. Groundwater plume maps, if applicable
4. The direction of groundwater flow

The reason for this request is to ensure that the source area, nearby residences, and downgradient detections are adequately monitored and documented. To facilitate the review, the above referenced wells and subsequent rationale should be placed in tabular format. Maps should be attached as necessary. The Agency may propose an alternate step-wise reduction of monitoring wells that occurs as contaminant trends are documented to decline over the monitoring period through the next five-year review.

Response: Concur. Information requested will be submitted as Appendix A in the RDP. The rationale for the abandonment of the selected monitoring wells is provided as Table A-1. The site has been monitored since 1993 and the plume characterization was completed in 1998. The plume characterization used direct-push groundwater sampling techniques at shallow, intermediate, and deep intervals within the aquifer to thoroughly delineate the groundwater plume in the cross-gradient and down gradient directions (see attached Figure 4-1 and Table 4-2). The plume characterization results were used to place permanent monitoring wells in the plume, as well as outside (cross-gradient) of the plume to monitor for changes in contaminant migration. Since 1998, 17 groundwater sampling events have been conducted as follows.

- ***Three Times Per Year - 1998 and 1999***
- ***Semi-Annual - 2000, 2001, 2002, 2003, and 2004***
- ***Annual - 2005***

The data from these events were evaluated and presented in Data Summary Reports (DSRs) after each event. Figure A-1 presents the data from these events for the wells down the centerline of the plume. Results of the events have indicated the following.

- ***Little change occurs in the potentiometric surface between events or intervals***
- ***Groundwater flow is consistently to the N-NE (see Figure 30-7)***

- *No seasonal influence on contaminants exists*
- *Contaminant plume consistently follows a path from the former fire training area to the N-NE to Monitoring Well Cluster FP-99-32 (see Figures 19-2 through 19-8)*
- *Cross-gradient wells have not been impacted*
- *Monitoring Well Cluster FP-04-33 across the Kansas River is not impacted*
- *Monitored natural attenuation is occurring at the site based on evaluation parameters, presence of daughter products and decreasing contaminant levels*
- *Cross-gradient private wells have not been impacted based on plume characterization and groundwater sampling results*
- *Groundwater levels have been decreasing and have decreased to below MCLs for the contaminants of concern as of October 2004 (see Figures 29-2 through 29-8)*

Based on the 8 years of monitoring since the plume characterization and the results of that sampling, Fort Riley believes that the wells proposed for sampling are sufficient to monitor the groundwater plume and that an alternate step-wise reduction is not warranted. This approach should be adequate based on the declining contaminant trends and positive MNA parameters observed over the last 8 years of monitoring.

The reduction in the wells sampled will also reduce the cost of the groundwater monitoring program, not only from a labor and analytical perspective, but also due to the reduced costs associated leasing monitoring well access from private landowners that ranges from $90 to $1,000 per well on an annual basis.

2. Frequency of Compliance Monitoring – Annual sampling within the zone of monitored natural attenuation (MNA) may not be appropriate at this time. The Agency proposes that sampling be conducted semi-annually within the first year. If declining trends are observed for constituents in the target compound list and increasing trends are observed for methane, ethane, and ethane, a proposal to reduce the frequency of sampling to an annual event will be considered.

Response: Concur. Fort Riley proposes to conduct semi-annual monitoring the first year, then annual monitoring the next two years if none of the target analytes are detected above the MCLs in the first year. If a target analyte is detected above its respective MCL, that well with the MCL exceedence will be sampled semi-annually. This approach should be adequate based on the declining contaminant trends and positive MNA parameters observed over the last 8 years of monitoring and the summary of site conditions presented in the response to General Comment #1.

Specific Comments

1. Section 1.5, Actions to Address Major Components of the Selected Remedy, Page 1-5 – Please change "annually" to "semi-annually" in bullets 5 and 6.

Response: Concur, see General Comment #2

2. Section 2.2, Well and Piezometer Abandonment, Page 2-1 – Please see General Comment 1 above.

Response: Concur, see General Comment #1

3. Section 3.2, Off-Post Institutional Controls, Page 3-1 – Please review the use of the word "proprietary" in the last paragraph on this page.

Response: Noted, Proprietary Controls represent a category of institutional controls referenced by EPA guidance – Institutional Controls: A Site Managers Guide to Identifying, Evaluating, and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups (EPA, 2000). They take the form of easements or covenant (servitudes).

4. Section 3.3, On-Post Institutional Controls, Page 3-3 – Please review the use of the word "proprietary" in the first paragraph in this section.

Response: Noted, Proprietary Controls represent a category of institutional controls referenced by EPA guidance – Institutional Controls: A Site Managers Guide to Identifying, Evaluating, and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups (EPA, 2000). They take the form of easements or covenant (servitudes).

5. Section 4.2, Chemicals of Potential Concern, Page 4-1 – Please define "BLRA" in the first sentence in this section. Also, the last sentence in the first paragraph is in error. The MCL for TCE and DCE is presented, not the "range of concentrations at which they were detected." Please correct this inconsistency.

Response: Concur, will define BLRA and the reference to the MCLs will be corrected as requested..

6. Section 4.3.1, Monitoring Well Sampling, Page 4-1 – Please change "annual" to "semi-annual" in the first paragraph of this section.

Response: Concur, see General Comment #2.

The wells discussed in this section do not add up to the wells in Figure 1-1, nor do they add up to the wells on Table 4-1. Please correct these discrepancies.

Response: Concur, the rationale in the bullets at the bottom of page 4-1, Section 4.3.1 were expanded to include all of the wells proposed for sampling in the monitoring program.

The Agency believes it would be prudent to have more than one monitoring well recording the VOC concentrations in the deep zone. Please propose an additional deep zone monitoring well.

Response: Based on the 8 years of monitoring since the plume characterization and the results of that sampling, Fort Riley believes that the three deep wells proposed for sampling south of the river and one well north of the river are sufficient to monitor the groundwater

plume and that additional wells are not needed. This approach should be adequate based on the declining contaminant trends and results of the groundwater sampling in the deep zone.

Finally, we believe there is value in monitoring private wells I-1, B-1, F-1, and F-2 during at least the first year of remedy implementation, and providing the results to the land owners. Please include these wells in the groundwater monitoring program.

Response: The referenced wells were sampled during previous groundwater sampling events and results indicated that the wells were not impacted (see Figure 30-5 for private well locations). Based on this data, the extensive plume characterization study and 8 years of monitoring at the site, Fort Riley believes the private wells do not need to be sampled as part of this monitoring program.

7. Section 5.2.2, Annual Sampling Reports, Page 5-2 – Please change the first sentence in this section to read "An Annual Sampling Report will be prepared and submitted within 60 days following receipt of laboratory data from the Fall sampling event." Thereinafter, the "annual report" will in reality be the results of the annual groundwater sampling event, depending on the results of the first year's semi-annual sampling events.

Response: Concur, see General Comment #2.

Burns & McDonnell
SINCE 1898

January 17, 2006

Public Works, Environmental Division
Directorate of ~~Environment & Safety~~
ATTN: ~~AFZN-ES-OM~~ (D Shields) IMNW-RLY-PWE
407 Pershing Court
Fort Riley, KS 66442-6016

Responses to EPA's Comments on Draft Remedial Design/Remedial Action Plan Response
Former Fire Training Area – Marshall Army Airfield, Fort Riley, Kansas
BMCD Project No. 40421
Contract No. DACW41-02-D-003

Dear Dr. Shields:

Enclosed are two hard copies of the responses to EPA's comments on the Draft Remedial Design/Remedial Action Plan for the above referenced site.

If you have any questions, please call me at (816) 822-3369.

Sincerely,

Tracy L Cooley

Tracy Cooley
Project Manager

Enclosures

9400 Ward Parkway
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SINCE 1898

January 18, 2006

Directorate of Environment & Safety
ATTN: AFZN-ES-OM (D Shields)
407 Pershing Court
Fort Riley, KS 66442-6016

Responses to EPA's Comments on Draft Remedial Design/Remedial Action Plan Respon
Former Fire Training Area – Marshall Army Airfield, Fort Riley, Kansas
BMCD Project No. 40421
Contract No. DACW41-02-D-003

Dear Mr. Shields:

Enclosed are two copies of the revised Figure A-1 that supports the responses to EPA's comments on the Draft Remedial Design/Remedial Action Plan for the above referenced site.

If you have any questions, please call me at (816) 822-3369.

Sincerely,

Tracy Cooley
Project Manager

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RESPONSE TO EPACOMMENTS E-MAILED DECEMBER 12, 2005 TO THE DRAFT REMEDIAL DESIGN/REMEDIAL ACTION PLAN, FORMER FIRE TRAINING AREA – MARSHALL ARMY AIRFIELD, OPERABLE UNIT 004: FFTA-MAAF AT FORT RILEY, KANSAS, DATED NOVEMBER, 2005

General Comments

1. Decommissioning of piezometers and groundwater monitoring wells - The Agency concurs with the proposal set forth in the subject document to decommission the piezometers associated with the FFTA-MAAF site as shown on Figure 1-1. However, the Agency requests the following information regarding decommissioning of the groundwater wells as proposed.

1. The rationale for the abandonment of selected monitoring wells
2. Recent potentiometric surface maps
3. Groundwater plume maps, if applicable
4. The direction of groundwater flow

The reason for this request is to ensure that the source area, nearby residences, and downgradient detections are adequately monitored and documented. To facilitate the review, the above referenced wells and subsequent rationale should be placed in tabular format. Maps should be attached as necessary. The Agency may propose an alternate step-wise reduction of monitoring wells that occurs as contaminant trends are documented to decline over the monitoring period through the next five-year review.

Response: Concur. Information requested will be submitted as Appendix A in the RDP. The rationale for the abandonment of the selected monitoring wells is provided as Table A-1. The site has been monitored since 1993 and the plume characterization was completed in 1998. The plume characterization used direct-push groundwater sampling techniques at shallow, intermediate, and deep intervals within the aquifer to thoroughly delineate the groundwater plume in the cross-gradient and down gradient directions (see attached Figure 4-1 and Table 4-2). The plume characterization results were used to place permanent monitoring wells in the plume, as well as outside (cross-gradient) of the plume to monitor for changes in contaminant migration. Since 1998, 17 groundwater sampling events have been conducted as follows.

- ***Three Times Per Year - 1998 and 1999***
- ***Semi-Annual - 2000, 2001, 2002, 2003, and 2004***
- ***Annual - 2005***

The data from these events were evaluated and presented in Data Summary Reports (DSRs) after each event. Figure A-1 presents the data from these events for the wells down the centerline of the plume. Results of the events have indicated the following.

- ***Little change occurs in the potentiometric surface between events or intervals***
- ***Groundwater flow is consistently to the N-NE (see Figure 30-7)***

- *No seasonal influence on contaminants exists*
- *Contaminant plume consistently follows a path from the former fire training area to the N-NE to Monitoring Well Cluster FP-99-32 (see Figures 19-2 through 19-8)*
- *Cross-gradient wells have not been impacted*
- *Monitoring Well Cluster FP-04-33 across the Kansas River is not impacted*
- *Monitored natural attenuation is occurring at the site based on evaluation parameters, presence of daughter products and decreasing contaminant levels*
- *Cross-gradient private wells have not been impacted based on plume characterization and groundwater sampling results*
- *Groundwater levels have been decreasing and have decreased to below MCLs for the contaminants of concern as of October 2004 (see Figures 29-2 through 29-8)*

Based on the 8 years of monitoring since the plume characterization and the results of that sampling, Fort Riley believes that the wells proposed for sampling are sufficient to monitor the groundwater plume and that an alternate step-wise reduction is not warranted. This approach should be adequate based on the declining contaminant trends and positive MNA parameters observed over the last 8 years of monitoring.

The reduction in the wells sampled will also reduce the cost of the groundwater monitoring program, not only from a labor and analytical perspective, but also due to the reduced costs associated leasing monitoring well access from private landowners that ranges from $90 to $1,000 per well on an annual basis.

2. Frequency of Compliance Monitoring – Annual sampling within the zone of monitored natural attenuation (MNA) may not be appropriate at this time. The Agency proposes that sampling be conducted semi-annually within the first year. If declining trends are observed for constituents in the target compound list and increasing trends are observed for methane, ethane, and ethane, a proposal to reduce the frequency of sampling to an annual event will be considered.

Response: Concur. Fort Riley proposes to conduct semi-annual monitoring the first year, then annual monitoring the next two years if none of the target analytes are detected above the MCLs in the first year. If a target analyte is detected above its respective MCL, that well with the MCL exceedence will be sampled semi-annually. This approach should be adequate based on the declining contaminant trends and positive MNA parameters observed over the last 8 years of monitoring and the summary of site conditions presented in the response to General Comment #1.

Specific Comments

1. Section 1.5, Actions to Address Major Components of the Selected Remedy, Page 1-5 – Please change "annually" to "semi-annually" in bullets 5 and 6.

Response: Concur, see General Comment #2

2. Section 2.2, Well and Piezometer Abandonment, Page 2-1 – Please see General Comment 1 above.

Response: Concur, see General Comment #1

3. Section 3.2, Off-Post Institutional Controls, Page 3-1 – Please review the use of the word "proprietary" in the last paragraph on this page.

Response: Noted, Proprietary Controls represent a category of institutional controls referenced by EPA guidance – Institutional Controls: A Site Managers Guide to Identifying, Evaluating, and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups (EPA, 2000). They take the form of easements or covenant (servitudes).

4. Section 3.3, On-Post Institutional Controls, Page 3-3 – Please review the use of the word "proprietary" in the first paragraph in this section.

Response: Noted, Proprietary Controls represent a category of institutional controls referenced by EPA guidance – Institutional Controls: A Site Managers Guide to Identifying, Evaluating, and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups (EPA, 2000). They take the form of easements or covenant (servitudes).

5. Section 4.2, Chemicals of Potential Concern, Page 4-1 – Please define "BLRA" in the first sentence in this section. Also, the last sentence in the first paragraph is in error. The MCL for TCE and DCE is presented, not the "range of concentrations at which they were detected." Please correct this inconsistency.

Response: Concur, will define BLRA and the reference to the MCLs will be corrected as requested..

6. Section 4.3.1, Monitoring Well Sampling, Page 4-1 – Please change "annual" to "semi-annual" in the first paragraph of this section.

Response: Concur, see General Comment #2.

The wells discussed in this section do not add up to the wells in Figure 1-1, nor do they add up to the wells on Table 4-1. Please correct these discrepancies.

Response: Concur, the rationale in the bullets at the bottom of page 4-1, Section 4.3.1 were expanded to include all of the wells proposed for sampling in the monitoring program.

The Agency believes it would be prudent to have more than one monitoring well recording the VOC concentrations in the deep zone. Please propose an additional deep zone monitoring well.

Response: Based on the 8 years of monitoring since the plume characterization and the results of that sampling, Fort Riley believes that the three deep wells proposed for sampling south of the river and one well north of the river are sufficient to monitor the groundwater

plume and that additional wells are not needed. This approach should be adequate based on the declining contaminant trends and results of the groundwater sampling in the deep zone.

Finally, we believe there is value in monitoring private wells I-1, B-1, F-1, and F-2 during at least the first year of remedy implementation, and providing the results to the land owners. Please include these wells in the groundwater monitoring program.

Response: The referenced wells were sampled during previous groundwater sampling events and results indicated that the wells were not impacted (see Figure 30-5 for private well locations). Based on this data, the extensive plume characterization study and 8 years of monitoring at the site, Fort Riley believes the private wells do not need to be sampled as part of this monitoring program.

7. Section 5.2.2, Annual Sampling Reports, Page 5-2 – Please change the first sentence in this section to read "An Annual Sampling Report will be prepared and submitted within 60 days following receipt of laboratory data from the Fall sampling event." Thereinafter, the "annual report" will in reality be the results of the annual groundwater sampling event, depending on the results of the first year's semi-annual sampling events.

Response: Concur, see General Comment #2.

LEGEND

- Monitoring Well or Cluster
- Piezometer
- Supply Well
- Groundwater Screening Location
- Proposed Monitoring Well
- Reservation Boundary
- Property Line
- Roads
- FFTA / Former Access Road

600 0 600 Feet

N

NOTES:

1. Monitoring Wells FP-98-27, FP-98-28, FP-98-29, FP-98-30, and FP-98-31 were installed after the direct-push groundwater screening investigation.
2. Estimated extent of positive detections is based on groundwater screening results and May/June 1998 groundwater sampling results.

KANSAS RIVER

B10 B10a B10b B9 B13 B13b B9a B11b B11a B9b FP-98-31 B30 B1a B1b B31 B11 B12b B12 FP-98-28 B21 FP-98-29 B20 B17 B16 B18 B19 B2 FP-98-30 B28 B27 B26 B22 B24 B23 B25 FP-98-27 I-1 B32 B14 FP-96-22 FP-96-23 B15 B29 FP-96-24 N-1 Reservation Boundary FP-96-13PZ FP-96-20 FP-94-09 FP-96-21 FP-94-10 F-1 F-2 FP-94-08 M-1 R-1 FP-96-26 FP-96-14PZ FP-96-18 FP-94-11 R-2 FP-96-19 FP-96-25 R-3 FP-96-15PZ FP-93-01 FP-94-12PZ FP-96-16PZ FP-93-04 FP-93-02 FP-93-03 R-4 Former Fire Training Area FP-93-05 FP-93-06 Levee Racetrack Road FP-96-17PZ FP-93-07 Former Oxbow Lake (Whiskey Lake)

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Burns & McDonnell

Figure 4-1

Groundwater Screening Locations March and April, 1998

FFTA-MAAF RI

Table 4-2
Plume Characterization Groundwater Screening Results
FFTA-MAAF Remedial Investigation Report

Sample Location	FP-96-23b	I-1
Sample Identification	FP-96-23b	I-1
Date Sampled	2-Mar-98	2-Mar-98
Sample Depth (feet)	NAv (Intermediate)	NAv (Shallow)
Laboratory Number	FFTA-MAAF FP-96-23b	FFTA-MAAF I-1
Sample Parameters (ug/L)		
PCE	0.1 U	0.1 U
TCE	5.7	0.1 U
cis-1,2-DCE	277	0.1 U
Vinyl Chloride	0.1 U	0.1 U

Sample Location	B1			
Sample Identification	GW-1	GW-2	GW-2 D	GW-3
Date Sampled	3-Mar-98	3-Mar-98	3-Mar-98	3-Mar-98
Sample Depth (feet)	25	45	45	65
Laboratory Number	FFTA-MAAF GW-1	FFTA-MAAF GW-2	FFTA-MAAF GW-2D	FFTA-MAAF GW-3
Sample Parameters (ug/L)				
PCE	0.1 U	0.1 U	0.1 U	0.1 U
TCE	0.1 U	0.1 U	0.1 U	0.1 U
cis-1,2-DCE	0.1 U	**0.9**	**0.8**	**4.8**
Vinyl Chloride	0.1 U	0.1 U	0.1 U	0.1 U

Sample Location	B1a		
Sample Identification	GW-4	GW-5	GW-6
Date Sampled	3-Mar-98	3-Mar-98	3-Mar-98
Sample Depth (feet)	25	45	66
Laboratory Number	FFTA-MAAF GW-4	FFTA-MAAF GW-5	FFTA-MAAF GW-6
Sample Parameters (ug/L)			
PCE	0.1 U	0.1 U	0.1 U
TCE	0.1 U	0.1 U	0.1 U
cis-1,2-DCE	0.1 U	0.1 U	0.1 U
Vinyl Chloride	0.1 U	0.1 U	0.1 U

Table 4-2 (continued)
Plume Characterization Groundwater Screening Results
FFTA-MAAF Remedial Investigation Report

Sample Location	B1b		
Sample Identification	GW-7	GW-8	GW-9
Date Sampled	3-Mar-98	3-Mar-98	3-Mar-98
Sample Depth (feet)	25	45	65
Laboratory Number	FFTA-MAAF GW-7	FFTA-MAAF GW-8	FFTA-MAAF GW-9
Sample Parameters (ug/L)			
PCE	0.1 U	0.1 U	0.1 U
TCE	0.1 U	0.1 U	0.1 U
cis-1,2-DCE	0.1 U	0.1 U	0.1 U
Vinyl Chloride	0.1 U	0.1 U	0.1 U

Sample Location	B9			
Sample Identification	GW-10	GW-11	GW-12	GW-12 D
Date Sampled	4-Mar-98	4-Mar-98	2-Mar-98	2-Mar-98
Sample Depth (feet)	25	45	65	65
Laboratory Number	FFTA-MAAF GW-10	FFTA-MAAF GW-11	FFTA-MAAF GW-12	FFTA-MAAF GW-12D
Sample Parameters (ug/L)				
PCE	0.1 U	0.1 U	0.1 U	0.1 U
TCE	0.1 U	0.1 U	0.1 U	0.1 U
cis-1,2-DCE	0.1 U	0.1 U	0.1 U	0.1 U
Vinyl Chloride	0.1 U	0.1 U	0.1 U	0.1 U

Sample Location	B9b		
Sample Identification	GW-13	GW-14	GW-15
Date Sampled	3-Mar-98	3-Mar-98	3-Mar-98
Sample Depth (feet)	25	45	64
Laboratory Number	FFTA-MAAF GW-13	FFTA-MAAF GW-14	FFTA-MAAF GW-15
Sample Parameters (ug/L)			
PCE	0.1 U	0.1 U	0.1 U
TCE	0.1 U	0.1 U	0.1 U
cis-1,2-DCE	0.1 U	0.1 U	0.1 U
Vinyl Chloride	0.1 U	0.1 U	0.1 U

Table 4-2 (continued)
Plume Characterization Groundwater Screening Results
FFTA-MAAF Remedial Investigation Report

Sample Location	B11		
Sample Identification	GW-16	GW-17	GW-18
Date Sampled	3-Mar-98	3-Mar-98	4-Mar-98
Sample Depth (feet)	25	45	65
Laboratory Number	FFTA-MAAF GW-16	FFTA-MAAF GW-17	FFTA-MAAF GW-18
Sample Parameters (ug/L)			
PCE	0.1 U	0.1 U	**2.3**
TCE	0.1 U	**2.9**	**1.2**
cis-1,2-DCE	0.1 U	**2.0**	**3.7**
Vinyl Chloride	0.1 U	0.1 U	0.1 U

Sample Location	B12			
Sample Identification	GW-19	GW-20	GW-21	GW-21 D
Date Sampled	5-Mar-98	5-Mar-98	5-Mar-98	5-Mar-98
Sample Depth (feet)	25	45	65	65
Laboratory Number	FFTA-MAAF GW-19	FFTA-MAAF GW-20	FFTA-MAAF GW-21	FFTA-MAAF GW-21D
Sample Parameters (ug/L)				
PCE	0.1 U	0.1 U	0.1 U	0.1 U
TCE	0.1 U	0.1 U	0.1 U	0.1 U
cis-1,2-DCE	0.1 U	0.1 U	0.1 U	0.1 U
Vinyl Chloride	0.1 U	0.1 U	0.1 U	0.1 U

Sample Location	B12b		
Sample Identification	GW-22	GW-23	GW-24
Date Sampled	5-Mar-98	5-Mar-98	5-Mar-98
Sample Depth (feet)	25	45	65
Laboratory Number	FFTA-MAAF GW-22	FFTA-MAAF GW-23	FFTA-MAAF GW-24
Sample Parameters (ug/L)			
PCE	0.1 U	0.1 U	0.1 U
TCE	0.1 U	0.1 U	0.1 U
cis-1,2-DCE	0.1 U	0.1 U	0.1 U
Vinyl Chloride	0.1 U	0.1 U	0.1 U

Table 4-2 (continued)
Plume Characterization Groundwater Screening Results
FFTA-MAAF Remedial Investigation Report

Sample Location	B9a		
Sample Identification	GW-25	GW-26	GW-27
Date Sampled	5-Mar-98	5-Mar-98	5-Mar-98
Sample Depth (feet)	25	45	65
Laboratory Number	FFTA-MAAF GW-25	FFTA-MAAF GW-26	FFTA-MAAF GW-27
Sample Parameters (ug/L)			
PCE	0.1 U	**2.0**	**2.3**
TCE	0.1 U	**5.7**	**3.5**
cis-1,2-DCE	0.1 U	**14.2**	**33.4**
Vinyl Chloride	0.1 U	0.1 U	0.1 U

Sample Location	B10			
Sample Identification	GW-28	GW-29	GW-30	GW-30 D
Date Sampled	6-Mar-98	6-Mar-98	6-Mar-98	2-Mar-98
Sample Depth (feet)	25	45	64	64
Laboratory Number	FFTA-MAAF GW-28	FFTA-MAAF GW-29	FFTA-MAAF GW-30	FFTA-MAAF GW-30D
Sample Parameters (ug/L)				
PCE	0.1 U	0.1 U	0.1 U	0.1 U
TCE	0.1 U	0.1 U	0.1 U	0.1 U
cis-1,2-DCE	**0.2**	0.1 U	0.1 U	0.1 U
Vinyl Chloride	0.1 U	0.1 U	0.1 U	0.1 U

Sample Location	B11a		
Sample Identification	GW-31	GW-32	GW-33
Date Sampled	2-Mar-98	3-Mar-98	3-Mar-98
Sample Depth (feet)	25	45	63
Laboratory Number	FFTA-MAAF GW-31	FFTA-MAAF GW-32	FFTA-MAAF GW-33
Sample Parameters (ug/L)			
PCE	0.1 U	0.1 U	0.1 U
TCE	0.1 U	0.1 U	0.1 U
cis-1,2-DCE	0.1 U	0.1 U	0.1 U
Vinyl Chloride	0.1 U	0.1 U	0.1 U

Table 4-2 (continued)
Plume Characterization Groundwater Screening Results
FFTA-MAAF Remedial Investigation Report

Sample Location	B11b		
Sample Identification	GW-34	GW-35	GW-36
Date Sampled	3-Mar-98	3-Mar-98	3-Mar-98
Sample Depth (feet)	25	45	63
Laboratory Number	FFTA-MAAF GW-34	FFTA-MAAF GW-35	FFTA-MAAF GW-36
Sample Parameters (ug/L)			
PCE	0.1 U	0.1 U	**0.4**
TCE	0.1 U	**0.2**	**1.1**
cis-1,2-DCE	0.1 U	0.1 U	**0.9**
Vinyl Chloride	0.1 U	0.1 U	0.1 U

Sample Location	B10a		
Sample Identification	GW-37	GW-38	GW-39
Date Sampled	6-Mar-98	6-Mar-98	6-Mar-98
Sample Depth (feet)	25	45	63
Laboratory Number	FFTA-MAAF GW-37	FFTA-MAAF GW-38	FFTA-MAAF GW-39
Sample Parameters (ug/L)			
PCE	0.1 U	**4.1**	**4.0**
TCE	0.1 U	**4.6**	**3.5**
cis-1,2-DCE	0.1 U	**13.8**	**5.3**
Vinyl Chloride	0.1 U	0.1 U	0.1 U

Sample Location	B10b			
Sample Identification	GW-40	GW-41	GW-42	GW-42 D
Date Sampled	7-Mar-98	7-Mar-98	7-Mar-98	7-Mar-98
Sample Depth (feet)	25	45	60	60
Laboratory Number	FFTA-MAAF GW-40	FFTA-MAAF GW-41	FFTA-MAAF GW-42	FFTA-MAAF GW-42D
Sample Parameters (ug/L)				
PCE	0.1 U	0.1 U	0.1 U	0.1 U
TCE	0.1 U	0.1 U	0.1 U	0.1 U
cis-1,2-DCE	0.1 U	0.1 U	0.1 U	0.1 U
Vinyl Chloride	0.1 U	0.1 U	0.1 U	0.1 U

Table 4-2 (continued)
Plume Characterization Groundwater Screening Results
FFTA-MAAF Remedial Investigation Report

Sample Location	B13		
Sample Identification	GW-43	GW-44	GW-45
Date Sampled	7-Mar-98	7-Mar-98	7-Mar-98
Sample Depth (feet)	25	45	65
Laboratory Number	FFTA-MAAF GW-43	FFTA-MAAF GW-44	FFTA-MAAF GW-45
Sample Parameters (ug/L)			
PCE	0.1 U	0.1 U	0.1 U
TCE	0.1 U	0.1 U	0.1 U
cis-1,2-DCE	0.1 U	0.1 U	0.1 U
Vinyl Chloride	0.1 U	0.1 U	0.1 U

Sample Location	B13b		
Sample Identification	GW-46	GW-47	GW-48
Date Sampled	7-Mar-98	7-Mar-98	7-Mar-98
Sample Depth (feet)	25	45	65
Laboratory Number	FFTA-MAAF GW-46	FFTA-MAAF GW-47	FFTA-MAAF GW-48
Sample Parameters (ug/L)			
PCE	0.1 U	0.1 U	0.1 U
TCE	0.1 U	0.1 U	0.1 U
cis-1,2-DCE	0.1 U	**0.7**	**0.9**
Vinyl Chloride	0.1 U	0.1 U	0.1 U

Sample Location	B2		
Sample Identification	GW-49	GW-50	GW-51
Date Sampled	7-Mar-98	7-Mar-98	7-Mar-98
Sample Depth (feet)	25	45	62
Laboratory Number	FFTA-MAAF GW-49	FFTA-MAAF GW-50	FFTA-MAAF GW-51
Sample Parameters (ug/L)			
PCE	0.1 U	**2.2**	**3.5**
TCE	0.1 U	**3.1**	**6.8**
cis-1,2-DCE	0.1 U	**36**	**54.8**
Vinyl Chloride	0.1 U	0.1 U	0.1 U

Table 4-2 (continued)
Plume Characterization Groundwater Screening Results
FFTA-MAAF Remedial Investigation Report

Sample Location	B14	
Sample Identification	GW-52	GW-53
Date Sampled	13-Apr-98	13-Apr-98
Sample Depth (feet)	45	65
Laboratory Number	FFTA-MAAF GW-52	FFTA-MAAF GW-53
Sample Parameters (ug/L)		
PCE	0.2 U	0.2 U
TCE	0.2 U	0.2 U
cis-1,2-DCE	0.2 U	0.2 U
Vinyl Chloride	0.2 U	0.2 U

Sample Location	B15	
Sample Identification	GW-54	GW-55
Date Sampled	13-Apr-98	13-Apr-98
Sample Depth (feet)	45	65
Laboratory Number	FFTA-MAAF GW-54	FFTA-MAAF GW-55
Sample Parameters (ug/L)		
PCE	**0.3**	0.2 U
TCE	**1.4**	0.2 U
cis-1,2-DCE	**0.5**	0.2 U
Vinyl Chloride	0.2 U	0.2 U

Sample Location	B16			
Sample Identification	GW-56	GW-57	GW-58	GW-58 D
Date Sampled	13-Apr-98	13-Apr-98	13-Apr-98	13-Apr-98
Sample Depth (feet)	25	45	65	65
Laboratory Number	FFTA-MAAF GW-56	FFTA-MAAF GW-57	FFTA-MAAF GW-58	FFTA-MAAF GW-58D
Sample Parameters (ug/L)				
PCE	0.2 U	**1.5**	0.2 U	0.2 U
TCE	0.2 U	**2.0**	**0.6**	**0.3**
cis-1,2-DCE	0.2 U	**2.0**	**0.3**	0.2 U
Vinyl Chloride	0.2 U	0.2 U	0.2 U	0.2 U

Table 4-2 (continued)
Plume Characterization Groundwater Screening Results
FFTA-MAAF Remedial Investigation Report

Sample Location	B17		
Sample Identification	GW-59	GW-60	GW-61
Date Sampled	13-Apr-98	13-Apr-98	13-Apr-98
Sample Depth (feet)	25	45	63
Laboratory Number	FFTA-MAAF GW-59	FFTA-MAAF GW-60	FFTA-MAAF GW-61
Sample Parameters (ug/L)			
PCE	0.2 U	**1.4**	**1.4**
TCE	0.2 U	**2.3**	**3.3**
cis-1,2-DCE	0.2 U	**29.7**	**33.6**
Vinyl Chloride	0.2 U	0.2 U	0.2 U

Sample Location	B18			
Sample Identification	GW-62	GW-63	GW-64	GW-64 D
Date Sampled	13-Apr-98	13-Apr-98	14-Apr-98	14-Apr-98
Sample Depth (feet)	25	45	64	64
Laboratory Number	FFTA-MAAF GW-62	FFTA-MAAF GW-63	FFTA-MAAF GW-64	FFTA-MAAF GW-64D
Sample Parameters (ug/L)				
PCE	0.2 U	**4.0**	**7.5**	**5.3**
TCE	0.2 U	**2.1**	**4.0**	**3.0**
cis-1,2-DCE	0.2 U	**11.7**	**22.6**	**16.0**
Vinyl Chloride	0.2 U	0.2 U	0.2 U	0.2 U

Sample Location	B19		
Sample Identification	GW-65	GW-66	GW-67
Date Sampled	14-Apr-98	14-Apr-98	14-Apr-98
Sample Depth (feet)	25	45	65
Laboratory Number	FFTA-MAAF GW-65	FFTA-MAAF GW-66	FFTA-MAAF GW-67
Sample Parameters (ug/L)			
PCE	0.2 U	0.2 U	0.2 U
TCE	0.2 U	0.2 U	0.2 U
cis-1,2-DCE	0.2 U	0.2 U	0.2 U
Vinyl Chloride	0.2 U	0.2 U	0.2 U

Table 4-2 (continued)
Plume Characterization Groundwater Screening Results
FFTA-MAAF Remedial Investigation Report

Sample Location	B20			
Sample Identification	GW-68	GW-69	GW-69 D	GW-70
Date Sampled	14-Apr-98	14-Apr-98	14-Apr-98	14-Apr-98
Sample Depth (feet)	25	45	45	62
Laboratory Number	FFTA-MAAF GW-68	FFTA-MAAF GW-69	FFTA-MAAF GW-69D	FFTA-MAAF GW-70
Sample Parameters (ug/L)				
PCE	0.2 U	0.2 U	0.2 U	0.2 U
TCE	0.2 U	0.2 U	0.2 U	0.2 U
cis-1,2-DCE	0.2 U	**0.8**	**0.7**	**1.9**
Vinyl Chloride	0.2 U	0.2 U	0.2 U	0.2 U

Sample Location	B21		
Sample Identification	GW-71	GW-72	GW-73
Date Sampled	14-Apr-98	14-Apr-98	14-Apr-98
Sample Depth (feet)	25	45	61
Laboratory Number	FFTA-MAAF GW-71	FFTA-MAAF GW-72	FFTA-MAAF GW-73
Sample Parameters (ug/L)			
PCE	0.2 U	**0.3**	0.2 U
TCE	0.2 U	**1.4**	0.2 U
cis-1,2-DCE	0.2 U	**0.5**	0.2 U
Vinyl Chloride	0.2 U	0.2 U	0.2 U

Sample Location	B22		
Sample Identification	GW-74	GW-75	GW-76
Date Sampled	14-Apr-98	14-Apr-98	14-Apr-98
Sample Depth (feet)	25	45	65
Laboratory Number	FFTA-MAAF GW-74	FFTA-MAAF GW-75	FFTA-MAAF GW-76
Sample Parameters (ug/L)			
PCE	0.2 U	**4.5**	**0.9**
TCE	0.2 U	**7.0**	**1.3**
cis-1,2-DCE	0.2 U	**57.1**	**25.6**
Vinyl Chloride	0.2 U	0.2 U	0.2 U

Table 4-2 (continued)
Plume Characterization Groundwater Screening Results
FFTA-MAAF Remedial Investigation Report

Sample Location	B23		
Sample Identification	GW-77	GW-78	GW-79
Date Sampled	15-Apr-98	15-Apr-98	15-Apr-98
Sample Depth (feet)	25	45	60
Laboratory Number	FFTA-MAAF GW-77	FFTA-MAAF GW-78	FFTA-MAAF GW-79
Sample Parameters (ug/L)			
PCE	0.2 U	**0.3**	0.2 U
TCE	0.2 U	**0.7**	**0.3**
cis-1,2-DCE	0.2 U	**0.5**	0.2 U
Vinyl Chloride	0.2 U	0.2 U	0.2 U

Sample Location	FP-96-22	FP-96-24
Sample Identification	GW-80	GW-81
Date Sampled	15-Apr-98	15-Apr-98
Sample Depth (feet)	NAv (Shallow)	NAv (Shallow)
Laboratory Number	FP-96-22 GW-80	FP-96-24 GW-81
Sample Parameters (ug/L)		
PCE	0.2 U	0.2 U
TCE	0.2 U	**2.1**
cis-1,2-DCE	0.2 U	**3.3**
Vinyl Chloride	0.2 U	0.2 U

Sample Location	B24			
Sample Identification	GW-82	GW-83	GW-84	GW-84 D
Date Sampled	15-Apr-98	15-Apr-98	15-Apr-98	15-Apr-98
Sample Depth (feet)	25	45	65	65
Laboratory Number	FFTA-MAAF GW-82	FFTA-MAAF GW-83	FFTA-MAAF GW-84	FFTA-MAAF GW-84D
Sample Parameters (ug/L)				
PCE	0.2 U	**6.6**	**2.5**	**3.2**
TCE	0.2 U	**4.3**	**2.4**	**3.3**
cis-1,2-DCE	0.2 U	**26.2**	**10.2**	**10.8**
Vinyl Chloride	0.2 U	0.2 U	0.2 U	0.2 U

Table 4-2 (continued)
Plume Characterization Groundwater Screening Results
FFTA-MAAF Remedial Investigation Report

Sample Location	B25		
Sample Identification	GW-85	GW-86	GW-87
Date Sampled	15-Apr-98	15-Apr-98	15-Apr-98
Sample Depth (feet)	25	45	65
Laboratory Number	FFTA-MAAF GW-85	FFTA-MAAF GW-86	FFTA-MAAF GW-87
Sample Parameters (ug/L)			
PCE	0.2 U	0.2 U	0.2 U
TCE	0.2 U	0.2 U	0.2 U
cis-1,2-DCE	0.2 U	0.2 U	0.2 U
Vinyl Chloride	0.2 U	0.2 U	0.2 U

Sample Location	B26		
Sample Identification	GW-88	GW-89	GW-90
Date Sampled	15-Apr-98	15-Apr-98	15-Apr-98
Sample Depth (feet)	25	45	65
Laboratory Number	FFTA-MAAF GW-88	FFTA-MAAF GW-89	FFTA-MAAF GW-90
Sample Parameters (ug/L)			
PCE	0.2 U	**0.9**	**0.3**
TCE	0.2 U	**1.7**	**0.7**
cis-1,2-DCE	0.2 U	**54.2**	**33.6**
Vinyl Chloride	0.2 U	0.2 U	0.2 U

Sample Location	B27		
Sample Identification	GW-91	GW-92	GW-93
Date Sampled	15-Apr-98	15-Apr-98	15-Apr-98
Sample Depth (feet)	25	45	65
Laboratory Number	FFTA-MAAF GW-91	FFTA-MAAF GW-92	FFTA-MAAF GW-93
Sample Parameters (ug/L)			
PCE	0.2 U	0.2 U	0.2 U
TCE	0.2 U	0.2 U	0.2 U
cis-1,2-DCE	0.2 U	**11.3**	**0.4**
Vinyl Chloride	0.2 U	0.2 U	0.2 U

Table 4-2 (continued)
Plume Characterization Groundwater Screening Results
FFTA-MAAF Remedial Investigation Report

Sample Location	B28		
Sample Identification	GW-94	GW-95	GW-96
Date Sampled	16-Apr-98	16-Apr-98	16-Apr-98
Sample Depth (feet)	25	45	65
Laboratory Number	FFTA-MAAF GW-94	FFTA-MAAF GW-95	FFTA-MAAF GW-96
Sample Parameters (ug/L)			
PCE	0.2 U	0.2 U	0.2 U
TCE	0.2 U	0.2 U	0.2 U
cis-1,2-DCE	0.2 U	0.2 U	0.2 U
Vinyl Chloride	0.2 U	0.2 U	0.2 U

Sample Location	B29	
Sample Identification	GW-97	GW-98
Date Sampled	16-Apr-98	16-Apr-98
Sample Depth (feet)	25	45
Laboratory Number	FFTA-MAAF GW-97	FFTA-MAAF GW-98
Sample Parameters (ug/L)		
PCE	0.2 U	0.2 U
TCE	0.2 U	0.2 U
cis-1,2-DCE	0.2 U	0.2 U
Vinyl Chloride	0.2 U	0.2 U

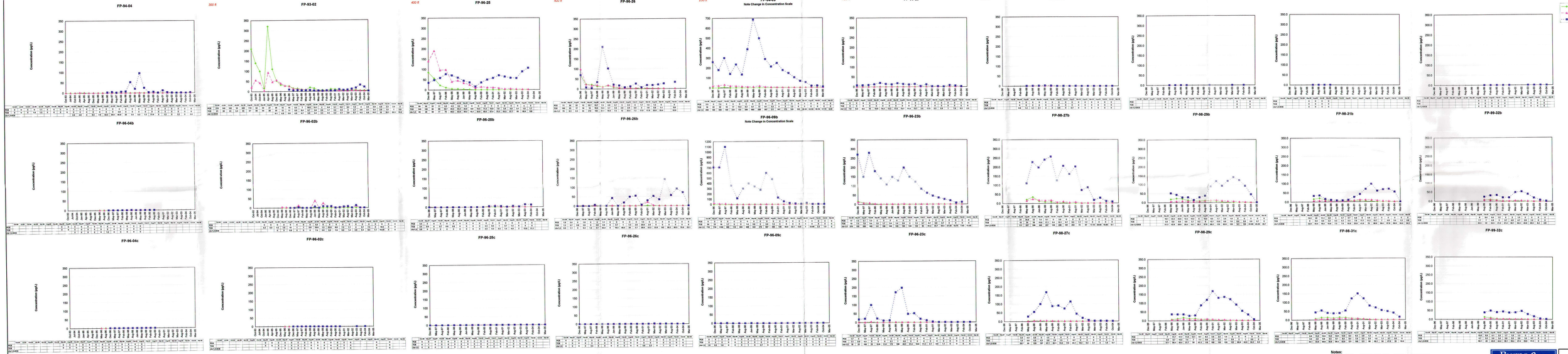
Sample Location	B30		
Sample Identification	GW-99	GW-100	GW-101
Date Sampled	16-Apr-98	16-Apr-98	16-Apr-98
Sample Depth (feet)	25	45	64
Laboratory Number	FFTA-MAAF GW-99	FFTA-MAAF GW-100	FFTA-MAAF GW-101
Sample Parameters (ug/L)			
PCE	0.2 U	0.2 U	0.2 U
TCE	0.2 U	0.2 U	0.2 U
cis-1,2-DCE	0.2 U	0.2 U	0.2 U
Vinyl Chloride	0.2 U	0.2 U	0.2 U

Table 4-2 (continued)
Plume Characterization Groundwater Screening Results
FFTA-MAAF Remedial Investigation Report

Sample Location	B31			
Sample Identification	GW-102	GW-103	GW-104	GW-104 D
Date Sampled	16-Apr-98	16-Apr-98	16-Apr-98	16-Apr-98
Sample Depth (feet)	25	45	65	65
Laboratory Number	FFTA-MAAF GW-102	FFTA-MAAF GW-103	FFTA-MAAF GW-104	FFTA-MAAF GW-104D
Sample Parameters (ug/L)				
PCE	0.2 U	**7.0**	**4.3**	**3.6**
TCE	0.2 U	**3.0**	**2.1**	**2.0**
cis-1,2-DCE	**0.3**	**26.3**	**41.7**	**42.1**
Vinyl Chloride	0.2 U	0.2 U	0.2 U	0.2 U

Sample Location	B32		
Sample Identification	GW-105	GW-106	GW-107
Date Sampled	16-Apr-98	16-Apr-98	16-Apr-98
Sample Depth (feet)	25	45	65
Laboratory Number	FFTA-MAAF GW-105	FFTA-MAAF GW-106	FFTA-MAAF GW-107
Sample Parameters (ug/L)			
PCE	0.2 U	0.2 U	0.2 U
TCE	0.2 U	0.2 U	0.2 U
cis-1,2-DCE	0.2 U	**0.8**	0.2 U
Vinyl Chloride	0.2 U	0.2 U	0.2 U

Source:
May/June 1998 DSR (BMcD, 1998j)
Notes:
D = Duplicate sample
U = Qualified as undetected by the laboratory
NAv = Not Available
ND = Not Detected
µg/L = micrograms per liter
DCE = Dichloroethene
PCE = Tetrachloroethene
TCE = Trichloroethene
BOLD text indicates positive detections
Shaded values indicate detections exceding MCL



Notes:

750 ft = Distance between wells along centerline of the plume.

Zero entries on the data table indicate non-detects, and blank entries represent Not Sampled (NS). See Data Summary Reports (DSRs) for analytical reporting limits.

Burns & McDonnell SINCE 1898

Figure A-1
Chlorinated Solvents Trend Chart
FFTA-NAAAF

KANSAS RIVER

RESERVATION BOUNDARY

SFL92-301
1029.19

FP-99-32
1031.56

FP-99-40PZ
1032.66

FP-99-39PZ
1034.76

FP-98-31
1033.58

FP-98-28
1034.17

FP-98-29
1033.97

FP-98-30
1034.08

FP-98-27
1034.61

FP-96-22
1034.94

FP-96-23
1034.91

FP-96-24
1034.93

FP-96-20
1035.44

FP-94-09
1035.36

FP-96-26
1035.49

FP-96-14PZ
NM

FP-96-15PZ
1036.44

FP-94-12PZ
1036.7

FP-96-16PZ
1036.1

FP-93-02
1035.95

FP-96-19
1035.61

FP-93-03
1035.89

FP-93-04
1036.14

FP-93-06
1036.04

FP-96-17PZ
1036.31

FP-93-07
1036.32

FP-93-01
1035.95

FP-93-05
1036.04

1032.0
1032.5
1033.0
1033.5
1034.0
1034.5
1035.0
1035.5
1036.0
1036.5

FORMER OXBOW LAKE
(WHISKEY LAKE)

0 455 910 1,820
SCALE IN FEET

NORTH

LEGEND

- Monitoring Well or Cluster
- Piezometer
- Private Well
- Groundwater Flow Direction
- Reservation Boundary
- Property Line
- Roads

NOTE:

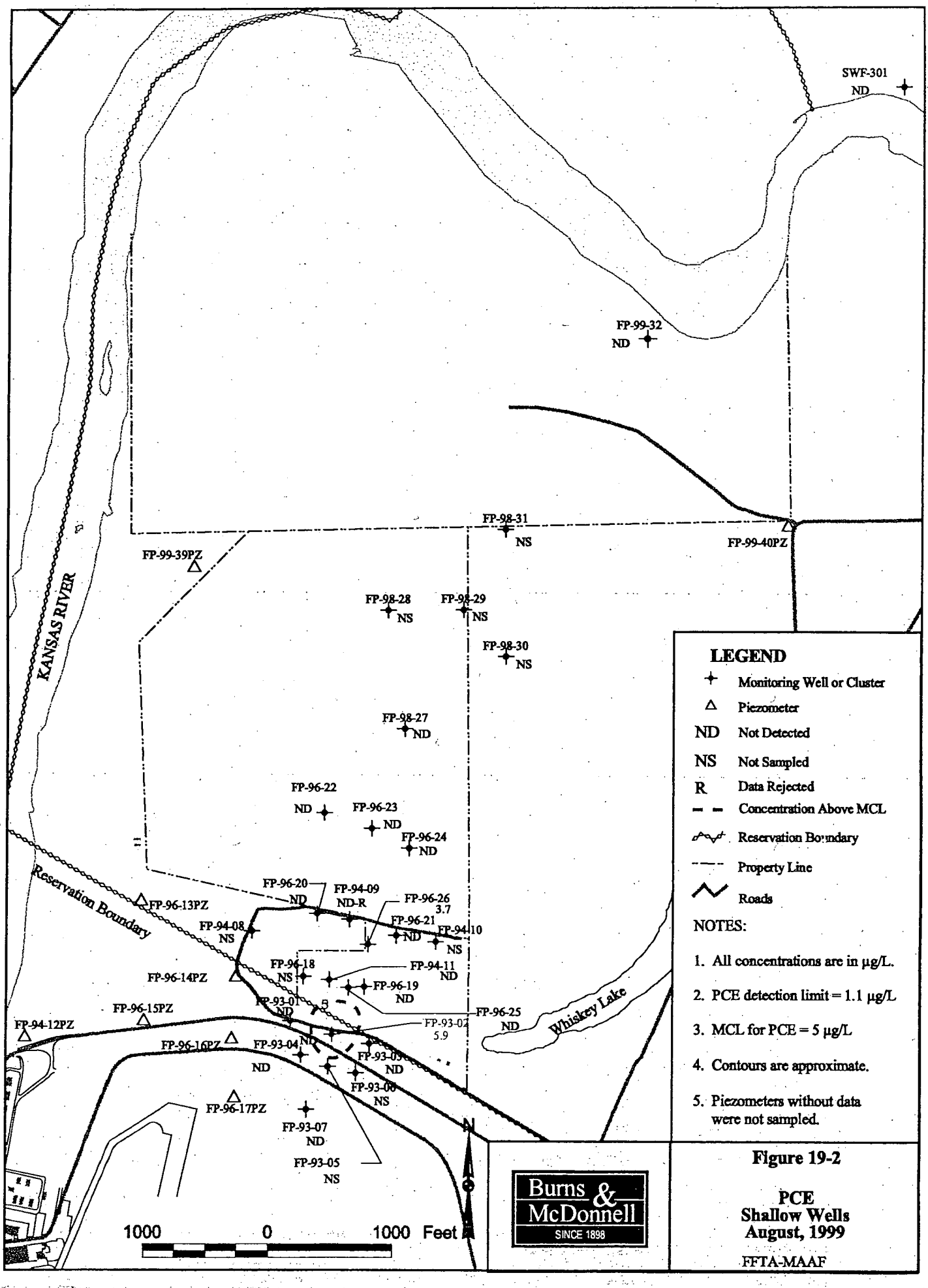
1. NM = Not Measured.

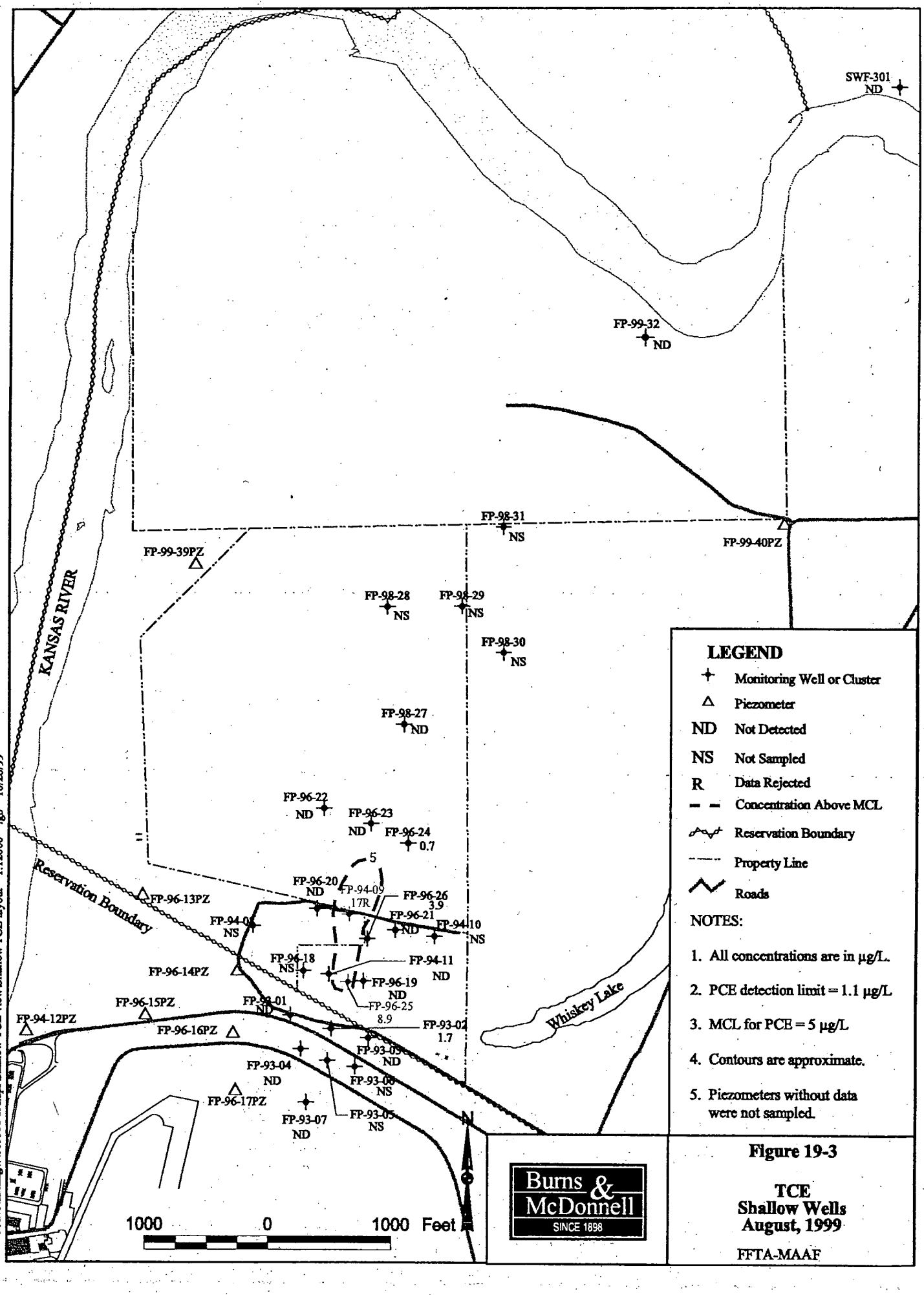
Burns & McDonnell
SINCE 1898

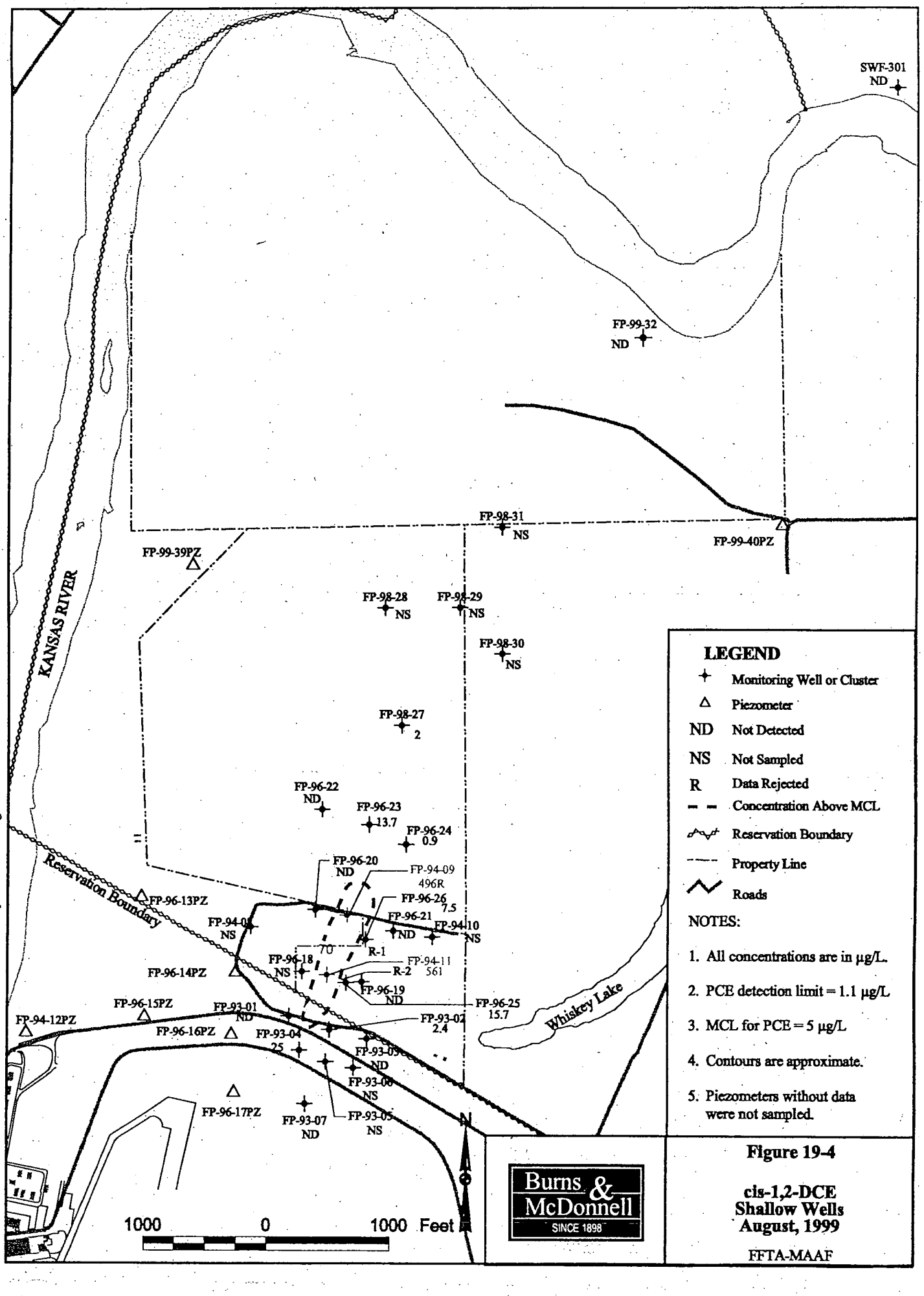
Figure 30-7
GROUNDWATER ELEVATIONS
SHALLOW WELLS
MARCH 2005

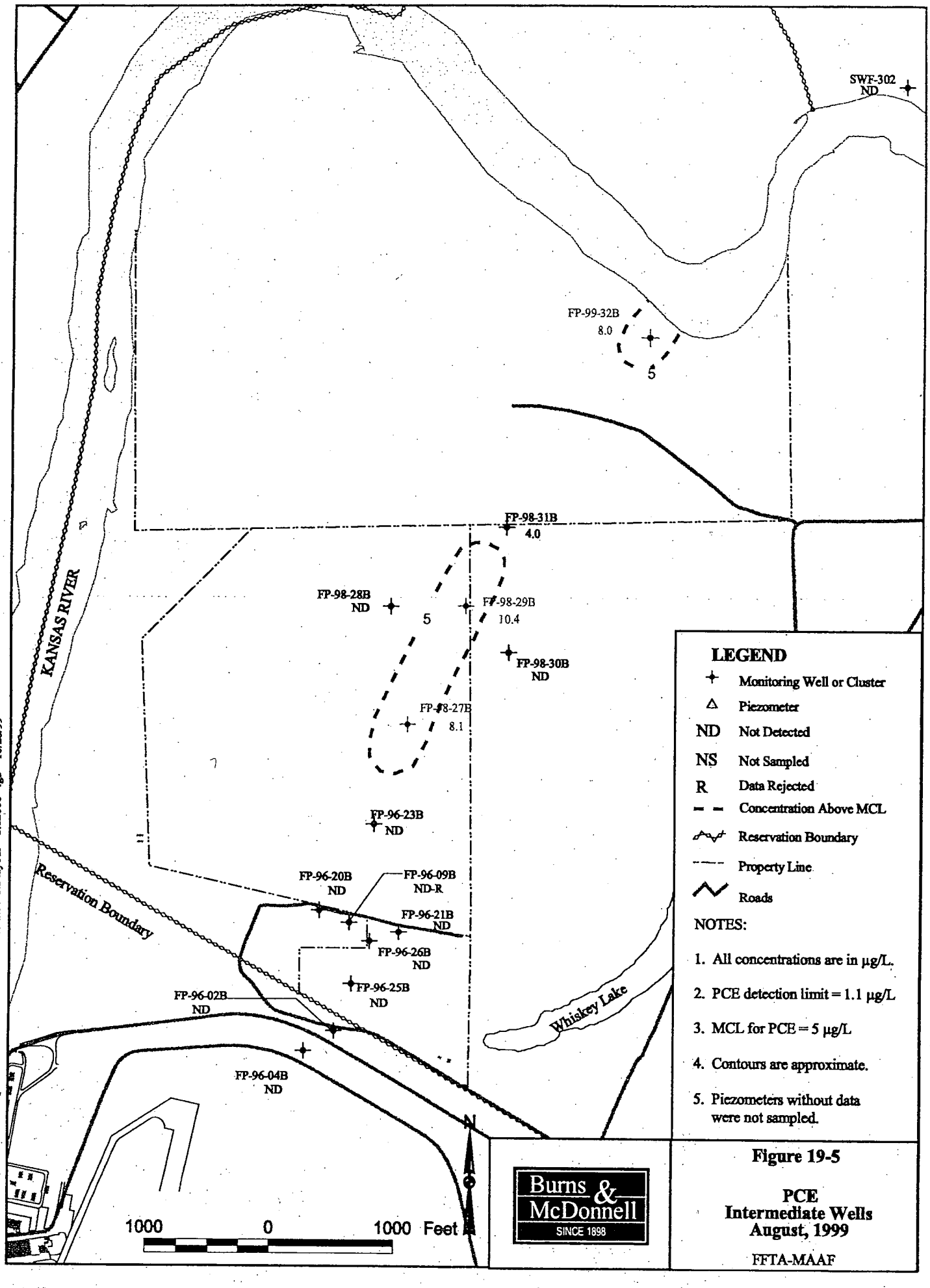
FFTA - MAAF

\\Gissrv\Projects\armycorp\Projects\maaf\ARC\ArcDocs\DSR_0305\Figure 30-7_shallow_gwcont.mxd 1:12000 mrb el 04/26/05

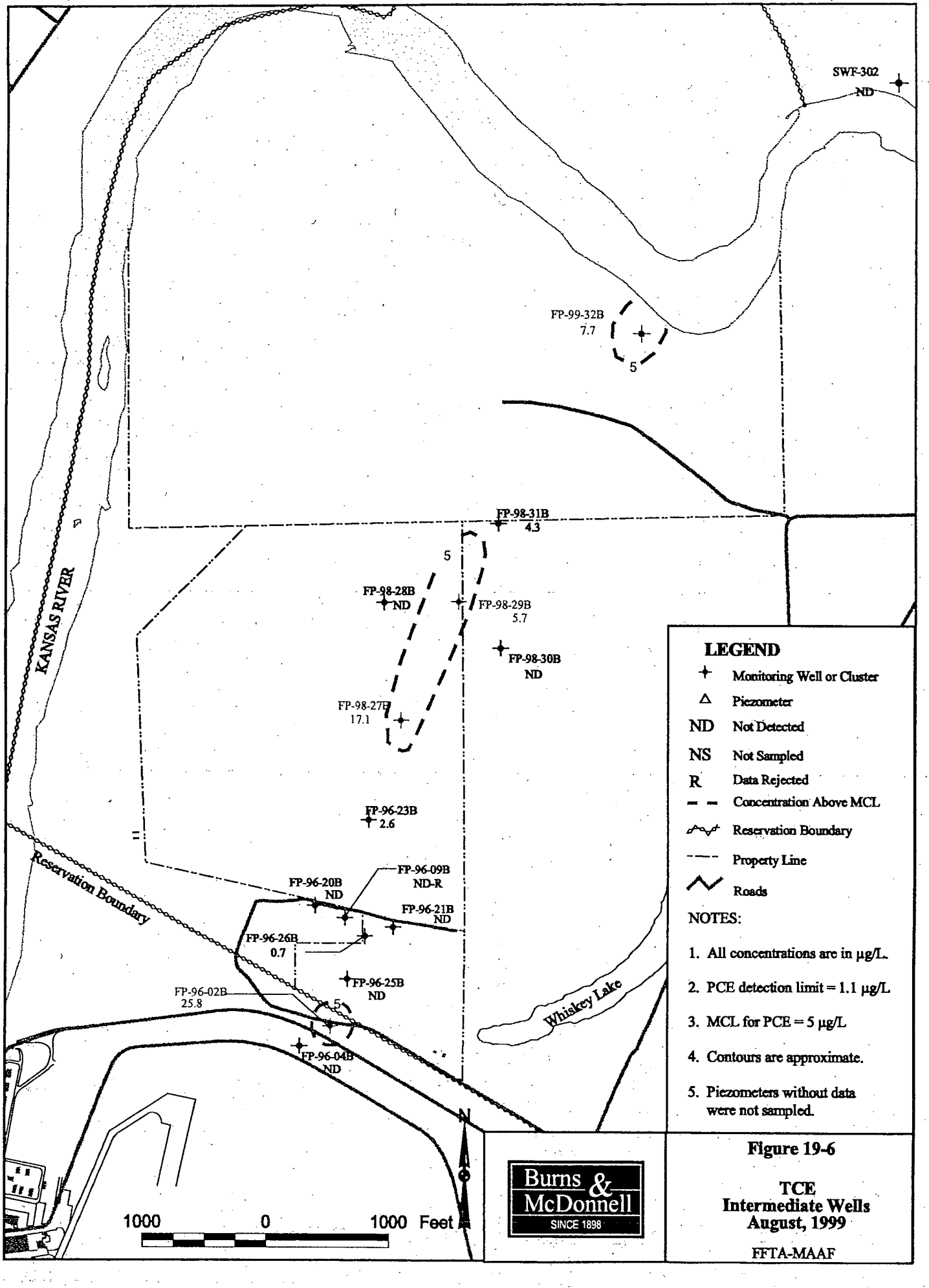

SWF-301
ND
FP-99-32
ND
FP-98-31
NS
FP-99-40PZ
FP-99-39PZ
KANSAS RIVER
FP-98-28
NS
FP-98-29
NS
FP-98-30
NS
FP-98-27
ND
FP-96-22
ND
FP-96-23
ND
FP-96-24
ND
Reservation Boundary
FP-96-13PZ
FP-96-20
ND
FP-94-09
ND-R
FP-96-26
3.7
FP-96-21
ND
FP-94-10
NS
FP-94-08
NS
FP-96-18
NS
FP-94-11
ND
FP-96-14PZ
FP-96-19
ND
FP-93-01
ND
FP-96-25
ND
FP-96-15PZ
FP-94-12PZ
FP-93-02
5.9
Whiskey Lake
FP-96-16PZ
FP-93-04
ND
FP-93-03
ND
FP-93-06
NS
FP-96-17PZ
FP-93-07
ND
FP-93-05
NS
1000 0 1000 Feet
N
LEGEND
Monitoring Well or Cluster
Piezometer
ND Not Detected
NS Not Sampled
R Data Rejected
Concentration Above MCL
Reservation Boundary
Property Line
Roads
NOTES:
1. All concentrations are in µg/L.
2. PCE detection limit = 1.1 µg/L
3. MCL for PCE = 5 µg/L
4. Contours are approximate.
5. Piezometers without data were not sampled.
Burns & McDonnell
SINCE 1898
Figure 19-2
PCE
Shallow Wells
August, 1999
FFTA-MAAF
U:\arc\usafirmgw\0999FFTA.apr\Shallow PCE view\Shallow PCE layout 1:12000 lgb 10/26/99


SWF-301
ND
FP-99-32
ND
FP-98-31
NS
FP-99-40PZ
FP-99-39PZ
KANSAS RIVER
FP-98-28
NS
FP-98-29
NS
FP-98-30
NS
FP-98-27
ND
FP-96-22
ND
FP-96-23
ND
FP-96-24
0.7
5
FP-96-20
ND
FP-94-09
17R
FP-96-26
3.9
FP-96-21
ND
FP-94-10
NS
Reservation Boundary
FP-96-13PZ
FP-94-08
NS
FP-96-18
NS
FP-94-11
ND
FP-96-14PZ
FP-96-19
ND
FP-96-25
8.9
FP-96-15PZ
FP-93-01
ND
FP-94-12PZ
FP-96-16PZ
FP-93-02
1.7
Whiskey Lake
FP-93-09
ND
FP-93-04
ND
FP-93-08
NS
FP-96-17PZ
FP-93-07
ND
FP-93-05
NS
N
1000
0
1000 Feet
LEGEND
Monitoring Well or Cluster
Piezometer
ND Not Detected
NS Not Sampled
R Data Rejected
Concentration Above MCL
Reservation Boundary
Property Line
Roads
NOTES:
1. All concentrations are in µg/L.
2. PCE detection limit = 1.1 µg/L
3. MCL for PCE = 5 µg/L
4. Contours are approximate.
5. Piezometers without data were not sampled.
Burns & McDonnell
SINCE 1898
Figure 19-3
TCE
Shallow Wells
August, 1999
FFTA-MAAF
U:\arc\usafmgw\0699FFTA.apr\Shallow TCE view\Shallow TCE layout 1:12000 lgb 10/26/99


SWF-301
ND
FP-99-32
ND
FP-98-31
NS
FP-99-40PZ
FP-99-39PZ
KANSAS RIVER
FP-98-28
NS
FP-98-29
NS
FP-98-30
NS
FP-98-27
2
FP-96-22
ND
FP-96-23
13.7
FP-96-24
0.9
Reservation Boundary
FP-96-20
ND
FP-94-09
496R
FP-96-13PZ
FP-96-26
7.5
FP-96-21
ND
FP-94-10
NS
FP-94-08
NS
70
R-1
FP-96-18
NS
FP-94-11
561
R-2
FP-96-14PZ
FP-96-19
ND
FP-96-25
15.7
FP-96-15PZ
FP-93-01
ND
FP-94-12PZ
FP-93-02
2.4
FP-96-16PZ
FP-93-04
25
FP-93-09
ND
FP-93-08
NS
FP-96-17PZ
FP-93-07
ND
FP-93-05
NS
Whiskey Lake
1000
0
1000 Feet
N
LEGEND
Monitoring Well or Cluster
Piezometer
ND Not Detected
NS Not Sampled
R Data Rejected
Concentration Above MCL
Reservation Boundary
Property Line
Roads
NOTES:
1. All concentrations are in µg/L.
2. PCE detection limit = 1.1 µg/L
3. MCL for PCE = 5 µg/L
4. Contours are approximate.
5. Piezometers without data were not sampled.
Burns & McDonnell
SINCE 1898
Figure 19-4
cis-1,2-DCE
Shallow Wells
August, 1999
FFTA-MAAF
U:\arc\unfirmgw\06099FFTA.apr\Shallow DCE view\Shallow DCE layout 1:12000 lgb 10/26/99



U:\arc\usafmgw\06699FFTA.apr\Intermediate PCE view\Intermediate PCE layout 1:12000 lgb 10/26/99



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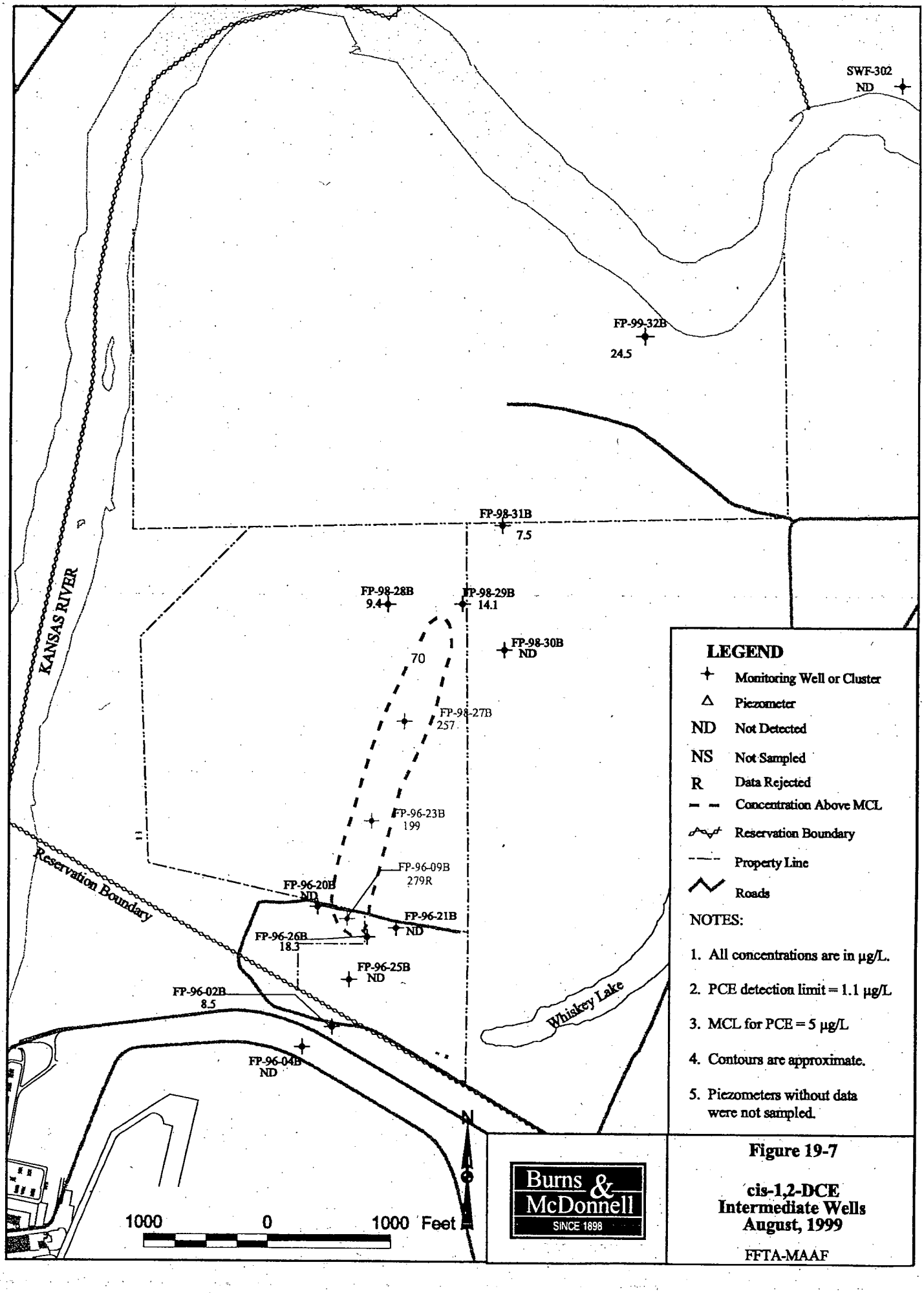

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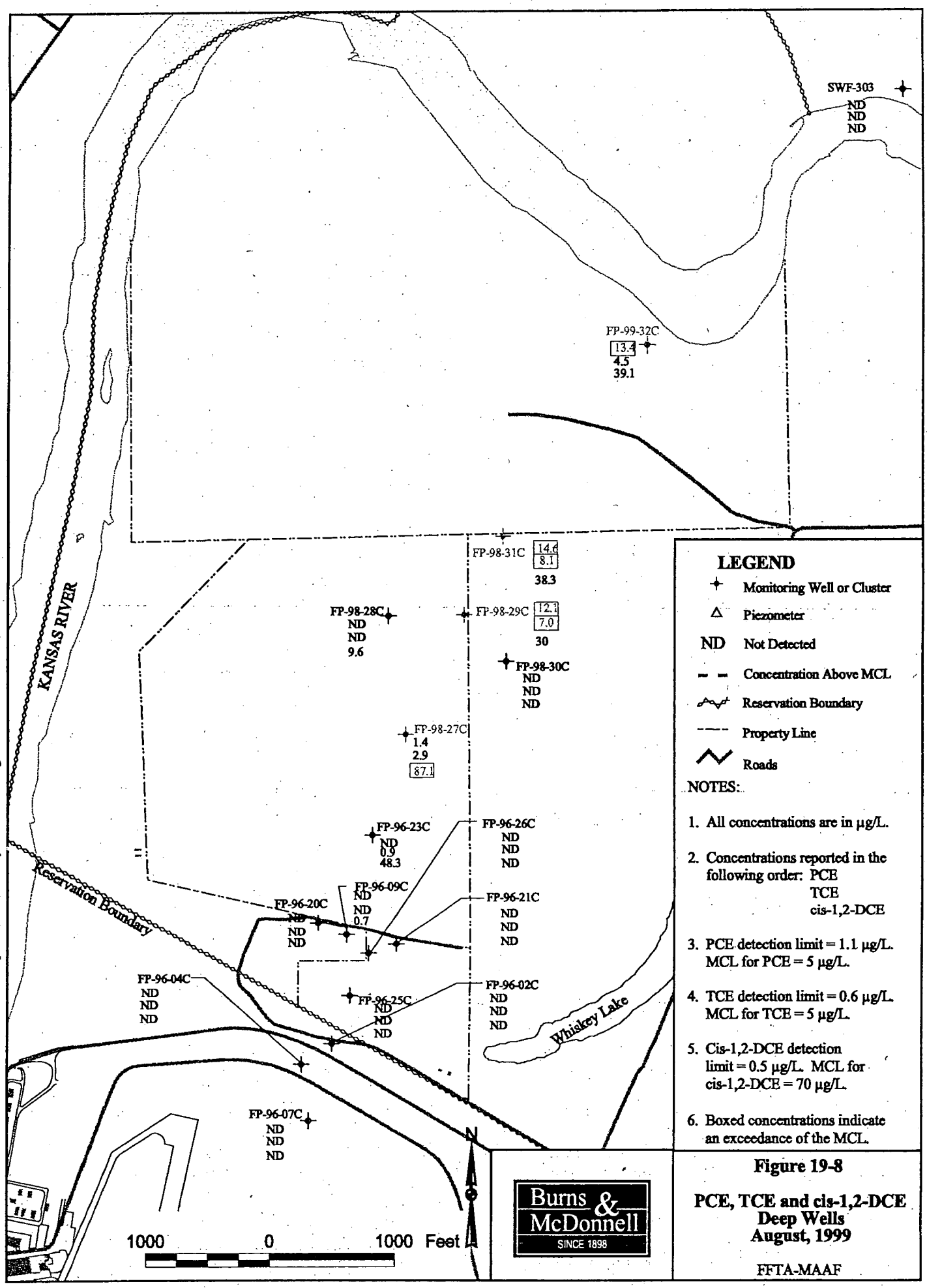
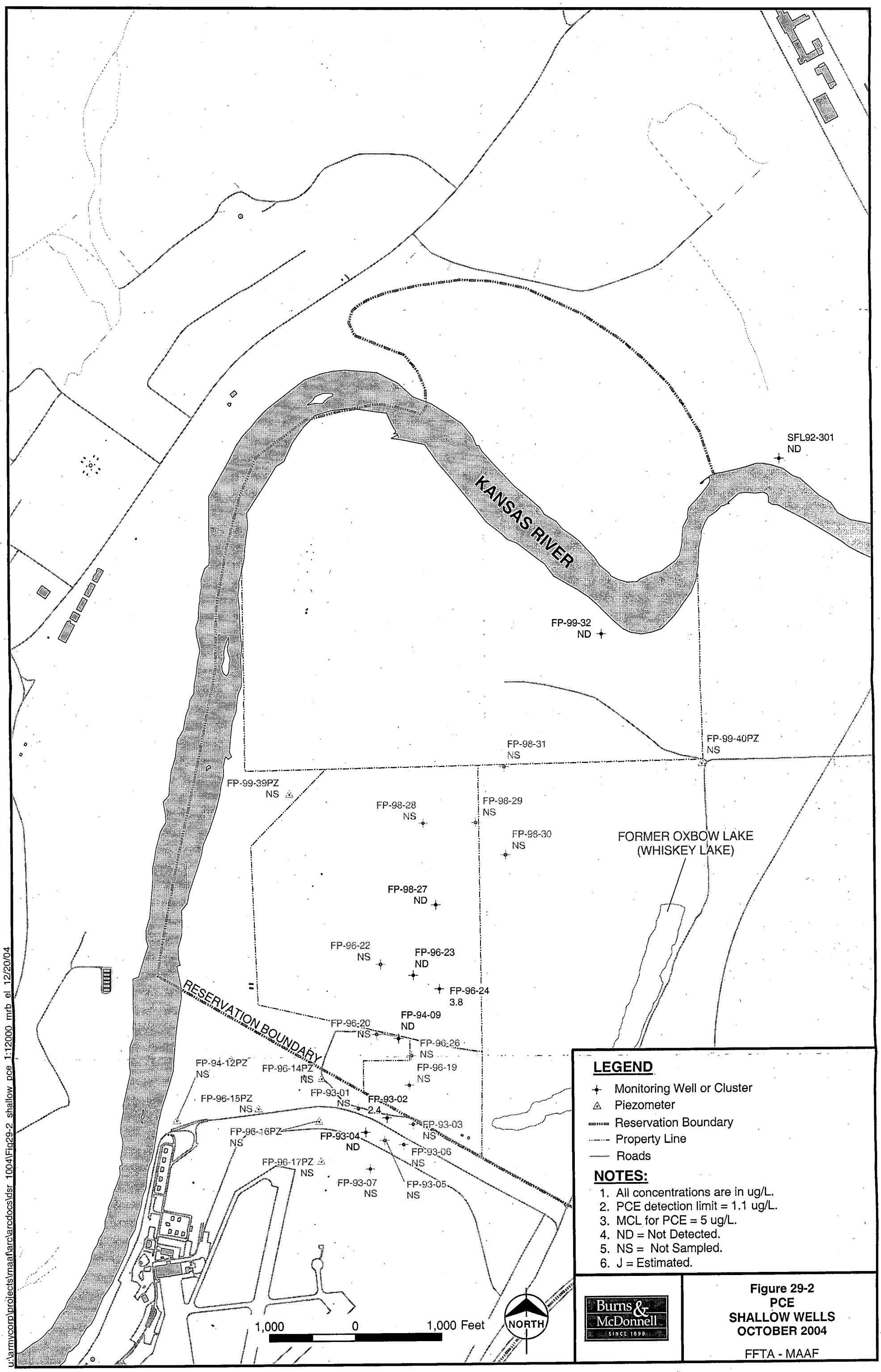

SWF-303
ND
ND
ND
FP-99-32C
13.4
4.5
39.1
FP-98-31C
14.6
8.1
38.3
FP-98-28C
ND
ND
9.6
FP-98-29C
12.1
7.0
30
FP-98-30C
ND
ND
ND
FP-98-27C
1.4
2.9
87.1
FP-96-23C
ND
0.9
48.3
FP-96-26C
ND
ND
ND
FP-96-09C
ND
ND
0.7
FP-96-20C
ND
ND
ND
FP-96-21C
ND
ND
ND
FP-96-04C
ND
ND
ND
FP-96-25C
ND
ND
ND
FP-96-02C
ND
ND
ND
FP-96-07C
ND
ND
ND
KANSAS RIVER
Reservation Boundary
Whiskey Lake
1000
0
1000 Feet
N
LEGEND
Monitoring Well or Cluster
Piezometer
ND Not Detected
Concentration Above MCL
Reservation Boundary
Property Line
Roads
NOTES:
1. All concentrations are in µg/L.
2. Concentrations reported in the following order: PCE
TCE
cis-1,2-DCE
3. PCE detection limit = 1.1 µg/L. MCL for PCE = 5 µg/L.
4. TCE detection limit = 0.6 µg/L. MCL for TCE = 5 µg/L.
5. Cis-1,2-DCE detection limit = 0.5 µg/L. MCL for cis-1,2-DCE = 70 µg/L.
6. Boxed concentrations indicate an exceedance of the MCL.
Burns & McDonnell
SINCE 1898
Figure 19-8
PCE, TCE and cis-1,2-DCE
Deep Wells
August, 1999
FFTA-MAAF
U:\arc\usfrmgw\0999FFTA.apr\Deep Well Results view\Deep DCE, PCE, TCE layout 1:12000 lgb 10/27/99


KANSAS RIVER
RESERVATION BOUNDARY
SFL92-301
ND
FP-99-32
ND
FP-98-31
NS
FP-99-40PZ
NS
FP-99-39PZ
NS
FP-98-28
NS
FP-98-29
NS
FP-98-30
NS
FORMER OXBOW LAKE
(WHISKEY LAKE)
FP-98-27
ND
FP-96-22
NS
FP-96-23
ND
FP-96-24
3.8
FP-94-09
ND
FP-96-20
NS
FP-96-26
NS
FP-96-19
NS
FP-94-12PZ
NS
FP-96-14PZ
NS
FP-93-01
NS
FP-93-02
2.4
FP-96-15PZ
NS
FP-93-03
NS
FP-96-16PZ
NS
FP-93-04
ND
FP-93-06
NS
FP-96-17PZ
NS
FP-93-07
NS
FP-93-05
NS
1,000
0
1,000 Feet
NORTH
LEGEND
Monitoring Well or Cluster
Piezometer
Reservation Boundary
Property Line
Roads
NOTES:
1. All concentrations are in ug/L.
2. PCE detection limit = 1.1 ug/L.
3. MCL for PCE = 5 ug/L.
4. ND = Not Detected.
5. NS = Not Sampled.
6. J = Estimated.
Burns & McDonnell
SINCE 1898
Figure 29-2
PCE
SHALLOW WELLS
OCTOBER 2004
FFTA - MAAF
u:\armycorp\projects\maaf\arc\arcdocs\dsr 1004\Fig29-2 shallow pce 1:12000 mrb el 12/20/04

Trichloroethylene (ug/L)						
Sample Point	Mar-02	Aug-02	Mar-03	Aug-03	Feb-04	Oct-04
FP-93-02	***2.6***	***2.1***	***3.4***	***2.8***	***1.5***	***1.0***
FP-94-04	0.6 U	0.6 U	0.6 U	0.6 U	0.6 UJ	0.6 U
FP-94-09	***1.2***	0.6 U	0.6 U	0.6 U	0.6 UJ	0.6 U
FP-96-20	0.6 U	NS	0.6 U	NS	0.6 U	NS
FP-96-23	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
FP-96-24	***1.6***	***2***	***1.2***	***1.5***	***2.3 J***	***3.6***
FP-96-26	***1.6***	***0.9***	***1.1***	NS	***0.8***	NS
FP-98-27	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
FP-98-29	0.6 U	NS	0.6 U	NS	0.6 U	NS
FP-99-32	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
SFL92-301	0.6 U	0.6 U	0.6 U	0.6 UJ	0.6 U	0.6 U

KANSAS RIVER

SFL92-301
ND

FP-99-32
ND

FP-98-31
NS

FP-99-40PZ
NS

FP-99-39PZ
NS

FP-98-28
NS

FP-98-29
NS

FP-98-30
NS

FORMER OXBOW LAKE
(WHISKEY LAKE)

FP-98-27
ND

FP-96-22
NS

FP-96-23
ND

FP-96-24
3.6

RESERVATION BOUNDARY

FP-94-09
ND

FP-96-20
NS

FP-96-26
NS

FP-94-12PZ
NS

FP-96-14PZ
NS

FP-96-19
NS

FP-96-15PZ
NS

FP-93-01
NS

FP-93-02
1.0

FP-96-16PZ
NS

FP-93-04
ND

FP-93-03
NS

FP-93-06
NS

FP-96-17PZ
NS

FP-93-07
NS

FP-93-05
NS

1,000 0 1,000 Feet

NORTH

LEGEND

- Monitoring Well or Cluster
- Piezometer
- Reservation Boundary
- Property Line
- Roads

NOTES:

1. All concentrations are in ug/L.
2. TCE detection limit = 0.6 ug/L.
3. MCL for TCE = 5 ug/L.
4. ND = Not Detected.
5. NS = Not Sampled.
6. J = Estimated.

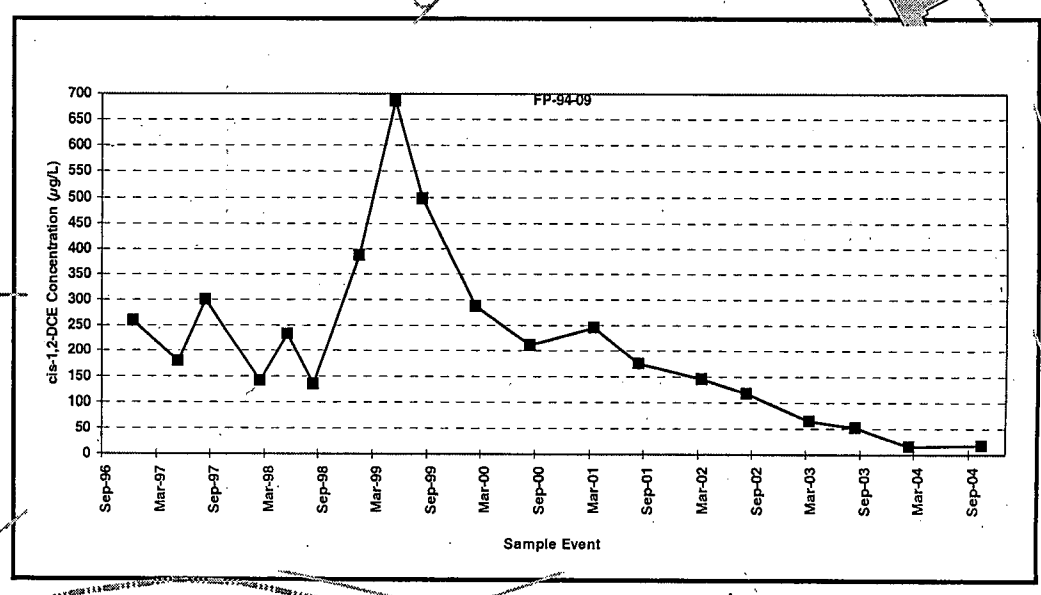
Burns & McDonnell
SINCE 1898

Figure 29-3
TCE
SHALLOW WELLS
OCTOBER 2004

FFTA - MAAF

u:\armycorp\projects\maaflarc\arcdocs\dsr_1004\Fig29-3_shallow_tce_1:12000_mrb_el_12/21/04

cis-1,2-Dichloroethylene (ug/L)						
Sample Point:	Mar-02	Aug-02	Mar-03	Aug-03	Feb-04	Oct-04
FP-93-02	***5.3***	***6.9***	***11.5***	***16***	***30.1***	***20.3***
FP-94-04	***3.7***	***1.4***	0.5 U	***1.2***	***0.5 J***	***2.4***
FP-94-09	***145***	***116***	***64.9***	***52.5***	***16.1 J***	***17.7***
FP-96-20	0.5 U	NS	0.5 U	NS	0.5 U	NS
FP-96-23	***2.3***	***2.8***	***1***	***7.6***	***5.3***	***2.3***
FP-96-24	***2.1***	***3.6***	***1.7***	***4.4***	***8.1 J***	***14.2***
FP-96-26	***17.8***	***20.8***	***25.4***	NS	***32.8***	NS
FP-98-27	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
FP-98-29	0.5 U	NS	0.5 U	NS	0.5 U	NS
FP-99-32	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
SFL92-301	***0.5***	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U



KANSAS RIVER

SFL92-301
ND

FP-99-32
ND

FP-98-31
NS

FP-99-40PZ
NS

FP-99-39PZ
NS

FP-98-28
NS

FP-98-29
NS

FP-98-30
NS

FORMER OXBOW LAKE
(WHISKEY LAKE)

FP-98-27
ND

FP-96-22
NS

FP-96-23
2.3

FP-96-24
14.2

FP-94-09
17.7

FP-96-20
NS

FP-96-26
NS

RESERVATION BOUNDARY

FP-94-12PZ
NS

FP-96-14PZ
NS

FP-96-19
NS

FP-96-15PZ
NS

FP-93-01
NS

FP-93-02
20.3

FP-93-03
NS

FP-96-16PZ
NS

FP-94-04
2.4

FP-93-06
NS

FP-96-17PZ
NS

FP-93-07
NS

FP-93-05
NS

1,000 0 1,000 Feet

NORTH

LEGEND

- Monitoring Well or Cluster
- Piezometer
- Concentration above MCL
- Reservation Boundary
- Property Line
- Roads

NOTES:

1. All concentrations are in ug/L.
2. cis-1,2-DCE detection limit = 0.5 ug/L.
3. MCL for cis-1,2-DCE = 70 ug/L.
4. ND = Not Detected.
5. NS = Not Sampled.
6. J = Estimated.

Burns & McDonnell
SINCE 1898

Figure 29-4
cis-1,2-DCE
SHALLOW WELLS
OCTOBER 2004

FFTA - MAAF

u:\armycorp\projects\maaf\arc\arcdocs\dsr 1004\Fig29-4 shallow dce 1:12000 mrb el 12/21/04

KANSAS RIVER

RESERVATION BOUNDARY

FORMER OXBOW LAKE
(WHISKEY LAKE)

FP-04-33b
ND

SFL92-302
ND

FP-99-32b
ND

FP-98-31b
ND

FP-98-28b
ND

FP-98-29b
ND

FP-98-30b
NS

FP-98-27b
ND

FP-96-23b
ND

FP-96-09b
ND

FP-96-20b
NS

FP-96-26b
ND

FP-96-02b
ND

FP-96-04b
NS

1,000 0 1,000 Feet

NORTH

LEGEND

- Monitoring Well or Cluster
- Reservation Boundary
- Property Line
- Roads

NOTES:

1. All concentrations are in ug/L.
2. PCE detection limit = 1.1 ug/L.
3. MCL for PCE = 5 ug/L.
4. ND = Not Detected.
5. NS = Not Sampled.
6. Subscript b refers to intermediate wells.

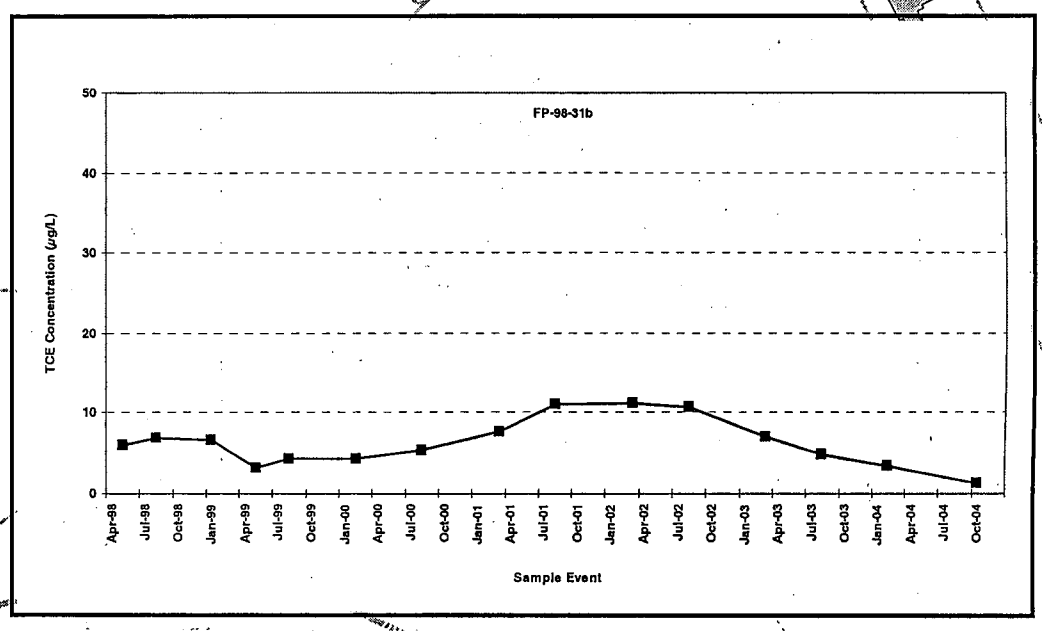
Burns & McDonnell
SINCE 1898

Figure 29-5
PCE
INTERMEDIATE WELLS
OCTOBER 2004

FFTA - MAAF

u:\armycorp\projects\maaf\arc\arcdocs\dsr 1004\Fig29-5 intermed pce 1:12000 mrb el 12/21/04

Trichloroethylene (ug/L)						
Sample Point	Mar-02	Aug-02	Mar-03	Aug-03	Feb-04	Oct-04
FP-96-02b	***5.7***	***7.5***	0.6 U	***10.5***	0.6 U	0.6 U
FP-96-09b	0.6 U	0.6 U	0.6 U	0.6 U	0.6 UJ	0.6 U
FP-96-23b	***0.6***	***0.7***	0.6 U	0.6 U	0.6 U	0.6 U
FP-96-26b	***2.6***	0.6 U	0.6 U	0.6 U	1 UJ	0.6 U
FP-98-27b	***1.1***	***1.2***	0.6 U	0.6 U	0.6 UJ	0.6 U
FP-98-28b	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
FP-98-29b	***9.8***	***7.6***	***6.4***	***3.9***	***2.6***	***0.7***
FP-98-30b	0.6 U	NS	0.6 U	NS	0.6 U	NS
FP-98-31b	***11.2***	***10.7***	***7***	***4.8***	***3.4***	***1.3***
FP-99-32b	***4.8***	***4.7***	***2.9***	***1.2***	0.6 U	0.6 U
FP-04-33b	NS	NS	NS	NS	NS	0.6 U
SFL92-302	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U



KANSAS RIVER

RESERVATION BOUNDARY

FORMER OXBOW LAKE
(WHISKEY LAKE)

FP-04-33b
ND

SFL92-302
ND

FP-99-32b
ND

FP-98-31b
1.3

FP-98-28b
ND

FP-98-29b
0.7

FP-98-30b
NS

FP-98-27b
ND

FP-96-23b
ND

FP-96-20b
NS

FP-96-09b
ND

FP-96-26b
ND

FP-96-02b
ND

FP-96-04b
NS

1,000 0 1,000 Feet

NORTH

LEGEND

- Monitoring Well or Cluster
- Concentration aboce MCL
- Reservation Boundary
- Property Line
- Roads

NOTES:

1. All concentrations are in ug/L.
2. TCE detection limit = 0.6 ug/L.
3. MCL for TCE = 5 ug/L.
4. ND = Not Detected.
5. NS = Not Sampled.
6. Subscript b refers to intermediate wells.

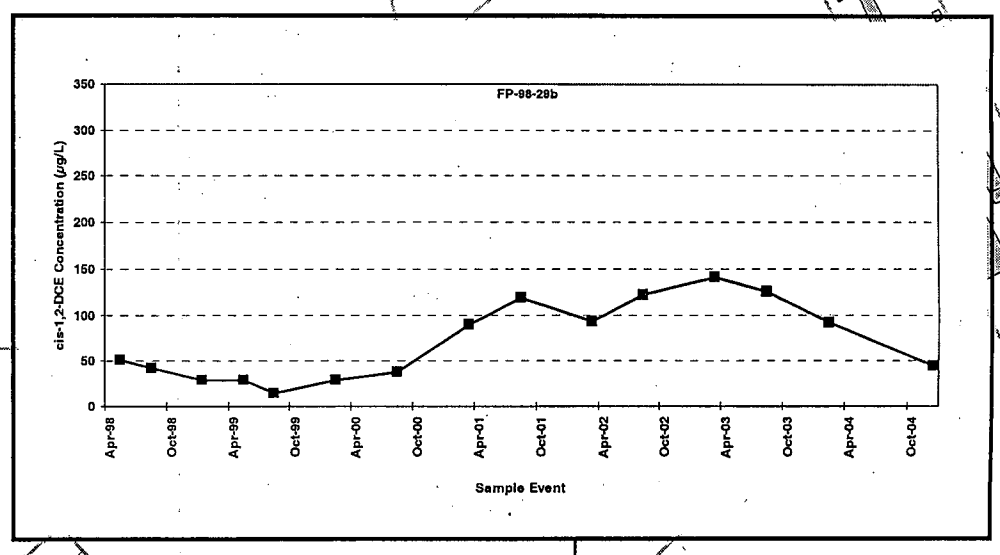
Burns & McDonnell
SINCE 1898

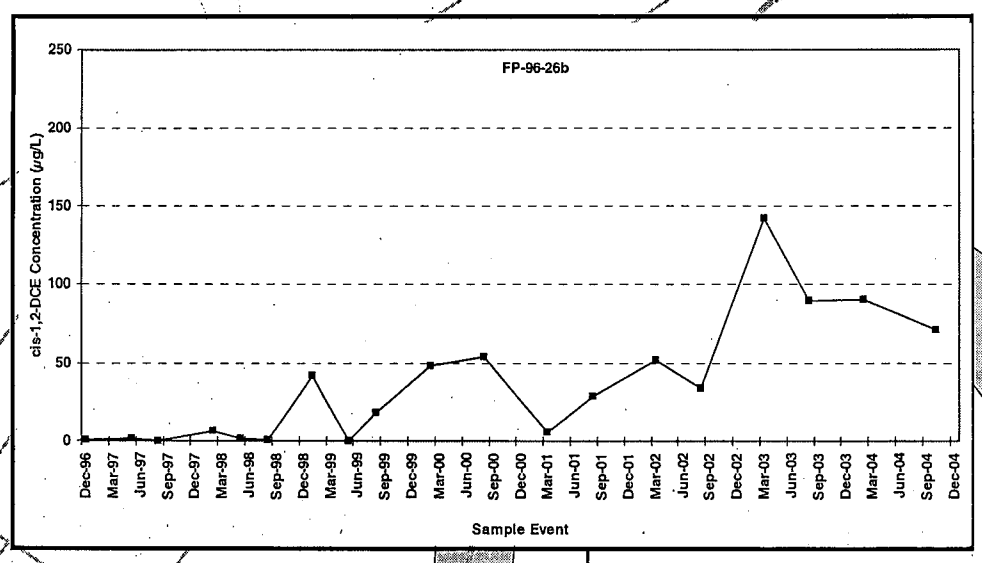
Figure 29-6
TCE
INTERMEDIATE WELLS
OCTOBER 2004

FFTA - MAAF

u:\armycorp\projects\maaf\arc\arcdocs\dsr 1004\Fig29-6 intermed tce 1:12000 mrb el 21/21/04

cis-1,2-Dichloroethylene (ug/L)						
Sample Point	Mar-02	Aug-02	Mar-03	Aug-03	Feb-04	Oct-04
FP-96-02b	***6.3***	***8.4***	***1.1***	***13.2***	0.5 U	0.5 U
FP-96-09b	***28.8***	***13.6***	***6***	***23.8***	***2.3 J***	***2.4***
FP-96-23b	***45.7***	***35.4***	***27.2***	***19.7***	***7.4***	***11.4***
FP-96-26b	***52.2***	***33.8***	***142***	***56.2***	***90.5***	***70.9***
FP-98-27b	***72***	***92.9***	***17.1***	***28.9***	***10.9***	***8.1***
FP-98-28b	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
FP-98-29b	***92.8***	***120***	***141***	***125***	***91.8***	***45.2***
FP-98-30b	0.5 U	NS	0.5 U	NS	0.5 U	NS
FP-98-31b	***70***	***98.9***	***59.4***	***67.8***	***69.9***	***54.4***
FP-99-32b	***50.1***	***54.5***	***41.4***	***20.5***	***8.2***	***2.9***
FP-04-33b	NS	NS	NS	NS	NS	0.5 U
SFL92-302	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U





LEGEND

- Monitoring Well or Cluster
- Concentration above MCL
- Reservation Boundary
- Property Line
- Roads

NOTES:

1. All concentrations are in ug/L.
2. cis-1,2-DCE detection limit = 0.5 ug/L.
3. MCL for cis-1,2-DCE = 70 ug/L.
4. Contours are approximate.
5. ND = Not Detected.
6. NS = Not Sampled.
7. J = Estimated.
8. Subscript b refers to intermediate wells.

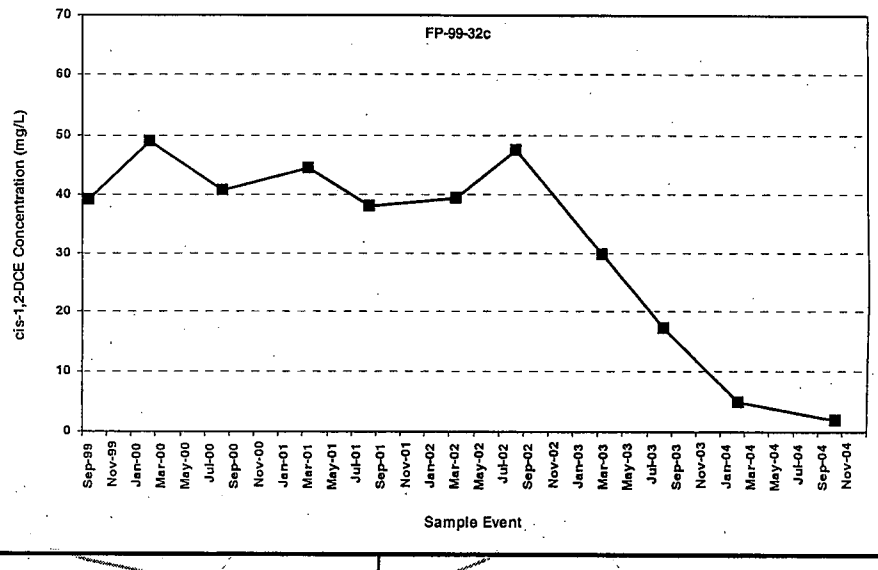
Burns & McDonnell SINCE 1898

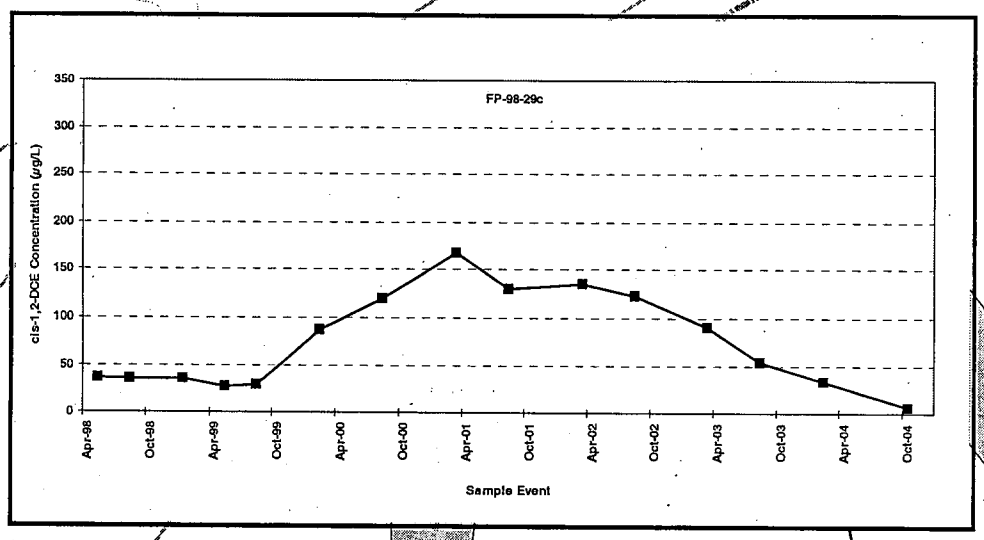
Figure 29-7
cis-1,2-DCE
INTERMEDIATE WELLS
OCTOBER 2004

FFTA - MAAF

u:\armycorp\projects\maaf\arc\arcdocs\dsr_1004\Fig29-7_intermed_dce_1:12000_mrb_el_12/21/04

cis-1,2-Dichloroethylene (ug/L)						
Sample Point	Mar-02	Aug-02	Mar-03	Aug-03	Feb-04	Oct-04
FP-96-02c	0.5 U	N S	0.5 U	NS	0.5 U	NS
FP-96-09c	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 U
FP-96-20c	0.5 U	NS	0.5 U	NS	0.5 U	NS
FP-96-23c	***0.6***	***1.1***	0.5 U	0.5 U	0.5 U	0.5 U
FP-96-26c	***2.2***	0.5 U	***1***	0.5 U	0.5 U	0.5 U
FP-98-27c	***19.2***	***6.4***	***2.1***	***2***	***1.6***	***0.7***
FP-98-28c	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
FP-98-29c	***135***	***122***	***90.9***	***54.9***	***34.2***	***6.3***
FP-98-30c	0.5 U	NS	***1.6***	NS	***5.8***	NS
FP-98-31c	***80***	***69.1***	***54***	***47.8***	***39***	***15.9***
FP-99-32c	***39.4***	***47.4***	***29.8***	***17.2***	***5 J***	***1.8***
FP-04-33c	NS	NS	NS	NS	NS	0.5 U
SFL92-303	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U





Trichloroethylene (ug/L)						
Sample Point	Mar-02	Aug-02	Mar-03	Aug-03	Feb-04	Oct-04
FP-96-02c	0.6 U	NS	0.6 U	NS	0.6 U	NS
FP-96-09c	0.6 U	0.6 U	0.6 U	0.6 U	0.6 UJ	0.6 U
FP-96-20c	0.6 U	NS	0.6 U	NS	0.6 U	NS
FP-96-23c	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
FP-96-26c	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
FP-98-27c	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
FP-98-28c	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
FP-98-29c	***4.7***	***2.9***	***2***	***1***	***0.6***	0.6 U
FP-98-30c	0.6 U	NS	***0.7***	NS	***1.1***	NS
FP-98-31c	***2.3***	***1.5***	***1.1***	***0.7 J***	***0.6***	0.6 U
FP-99-32c	***2.5***	***2.6***	***1.5***	***0.7***	0.6 UJ	0.6 U
FP-04-33c	NS	NS	NS	NS	NS	0.6 U
SFL92-303	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U

KANSAS RIVER

RESERVATION BOUNDARY

FORMER OXBOW LAKE
(WHISKEY LAKE)

FP-04-33c
ND
ND
ND

SFL92-303
ND
ND
ND

FP-99-32c
ND
ND
1.8 J

FP-98-31c
ND
ND
15.9

FP-98-29c
ND
ND
6.3

FP-98-28c
ND
ND
ND

FP-98-30c
NS
NS
NS

FP-98-27c
ND
ND
0.7

FP-96-23c
ND
ND
ND

FP-96-09c
ND
ND
ND

FP-96-20c
NS
NS
NS

FP-96-26c
ND
ND
ND

FP-96-02c
NS
NS
NS

FP-96-04c
NS
NS
NS

FP-96-07c
NS
NS
NS

1,000 0 1,000 Feet

NORTH

LEGEND

- Monitoring Well or Cluster
- Reservation Boundary
- Property Line
- Roads

NOTES:

1. All concentrations are in ug/L.
2. Concentrations reported in the following order:
   PCE
   TCE
   cis-1,2-DCE
3. PCE detection limit = 1.1 ug/L.
   MCL for PCE = 5 ug/L.
4. TCE detection limit = 0.6 ug/L.
   MCL for TCE = 5 ug/L.
5. cis-1,2-DCE detection limit = 0.5 ug/L.
   MCL for cis-1,2-DCE = 70 ug/L.
6. J = Estimated.
7. ND = Not Detected.
8. NS = Not Sampled.
9. Concentration and time scales vary on graphs.
10. Subscript c refers to deep wells.

Burns & McDonnell SINCE 1898

Figure 29-8
PCE, TCE, and cis-1,2-DCE
DEEP WELLS
OCTOBER 2004

FFTA - MAAF

u:\armycorp\projects\maaf\arc\arcdocs\dsr_1004\Fig29-8 deep pce tce dce 1:12000 mrb el 12/21/04

KANSAS RIVER

RESERVATION BOUNDARY

B-1
NS
NS
NS

I-1
NS
NS
NS

N-1
NS
NS
NS

M02-02
ND
ND
ND

F-1
NS
NS
NS

F-2
NS
NS
NS

R02-02
NS
NS
NS

1,000 0 1,000 Feet

NORTH

LEGEND

- Private Well (Sampled)
- Private Well (Not Sampled)
- Abandoned Well
- Reservation Boundary
- Property Line
- Roads

NOTES:

1. All concentrations are in micrograms per liter (ug/L).
2. Concentrations reported in the following order:
   PCE
   TCE
   cis-1,2-DCE
3. PCE detection limit = 1.1 ug/L. MCL for PCE = 5 ug/L.
4. TCE detection limit = 0.6 ug/L. MCL for TCE = 5 ug/L.
5. cis-1,2-DCE detection limit = 0.5 ug/L. MCL for cis-1,2-DCE = 70 ug/L.
6. ND = Not Detected.
7. NS = Not Sampled.

Burns & McDonnell
SINCE 1898

Figure 30-5
PCE, TCE, cis-1,2-DCE
PRIVATE WELLS
MARCH 2005

FFTA - MAAF

u:\armycorp\projects\maaf\arc\arcdocs\dsr_0305\Fig30-5_private_pce_tce_dce_1:12000_mrb_el_04/25-05