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Five-Year Review for Remedial Actions at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

DEPARTMENT OF ENERGY · UNITED STATES OF AMERICA

I-00119-0011

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SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

contributed to the preparation of this document and should not be considered an eligible contractor for its review.

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Five-Year Review for Remedial Actions at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

Date Issued—October 2003

Approved by:

Dianna Feireisel
Deputy Site Manager

Date: 10/6/03

Prepared for the
U.S. Department of Energy
Office of Environmental Management

Environmental Management Activities at the
Paducah Gaseous Diffusion Plant
Paducah, Kentucky 42001
managed by
Bechtel Jacobs Company LLC
for the
U.S. DEPARTMENT OF ENERGY
under contract DE-AC05-03OR22980

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CONTENTS

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FIGURES

TABLES

ABBREVIATIONS AND ACRONYMS

ALARA	as low as reasonably achievable
AOC	Area of Concern
AR	Administrative Record
ARAR	applicable or relevant and appropriate requirement
bgs	below ground surface
BHHRA	Baseline Human Health Risk Assessment
BJC	Bechtel Jacobs Company LLC
BGOU	Burial Ground Operable Unit
CAB	Citizens Advisory Board
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CFR	*Code of Federal Regulations*
COC	contaminant of concern
COPC	contaminant of potential concern
D&D	decontamination and decommissioning
1,1-DCA	1,1-dichloroethane
1,1-DCE	1,1-dichloroethene
DNAPL	dense nonaqueous-phase liquid
DOE	U.S. Department of Energy
DQO	Data Quality Objective
EE/CA	engineering evaluation / cost analysis
EIC	Environmental Information Center
EPA	U.S. Environmental Protection Agency
EW	extraction well
FFA	*Federal Facility Agreement*
ft	foot/feet
FR	*Federal Register*
gpm	gallons per minute
GWOU	Groundwater Operable Unit
HSWA	Hazardous and Solid Waste Amendments of 1984
IRA	interim remedial action
KAR	*Kentucky Administrative Regulations*
KDEP	Kentucky Department for Environmental Protection
KDOW	Kentucky Division of Water
KDWM	Kentucky Division of Waste Management
KNREPC	Kentucky Natural Resources and Environmental Protection Cabinet
KPDES	Kentucky Pollutant Discharge Elimination System
LUC	Land Use Control
LUCAP	Land Use Control Assurance Plan
LUCIP	Land Use Controls Implementation Plan
MOA	Memorandum of Agreement
MCL	maximum contaminant level
MDL	Method Detection Limit
M&I	management and integration
MW	monitoring well
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NOV	Notice of Violation
NPL	National Priorities List
NSDD	North-South Diversion Ditch

O&M	operation and maintenance
OSWER	Office of Solid Waste and Emergency Response
OU	operable unit
Paducah OREIS	Paducah Oak Ridge Environmental Information System
PCB	polychlorinated biphenyl
pH	hydrogen-ion concentration notation
PGDP	Paducah Gaseous Diffusion Plant
PPE	personal protective equipment
PTSM	principal threat source material
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act of 1976
RGA	Regional Gravel Aquifer
ROD	record of decision
SOU	Soils Operable Unit
SWMU	solid waste management unit
SWOU	Surface Water Operable Unit
^{99}Tc	technetium-99
TBC	to-be-considered
TCE	trichloroethene
TVA	Tennessee Valley Authority
UCRS	Upper Continental Recharge System
USCA	*United States Code Annotated*
USEC	United States Enrichment Corporation
VOC	volatile organic compound
WAG	waste area group
WKWMA	West Kentucky Wildlife Management Area

EXECUTIVE SUMMARY

The final *Federal Facility Agreement for the Paducah Gaseous Diffusion Plant* (FFA) segregates remedial actions under four Operable Units (OUs): the Groundwater OU (GWOU), the Surface Water OU (SWOU), the Soils OU (SOU), and the Burial Grounds OU (BGOU) (EPA 1998). A fifth OU has been established for decontamination and decommissioning (D&D) activities (i.e., the D&D OU). Each OU is scoped to remediate an area and contaminated media associated with the Paducah Gaseous Diffusion Plant (PGDP). The GWOU will develop and implement remedial alternatives for chemicals of concern associated with the groundwater impacted by PGDP. The SWOU is directed at remediating the surface water bodies including the outfall ditches, impoundment ponds, and Little Bayou and Bayou Creeks. The SOU is designed to remediate the contaminated soils associated with PGDP not located in a waterway, outfall, ditch, or burial ground. The BGOU scope addresses the contamination that is associated with PGDP landfills and burial grounds. Once the BGOU, SWOU, GWOU, and SOU are completed, the U.S. Department of Energy (DOE) will conduct a Comprehensive Site-wide OU.

This Five-Year Review encompasses the interim remedial actions (IRAs) that DOE has taken under the respective OUs plus the Water Policy removal action. The FFA for PGDP includes requirements for combining five-year reviews of remedial actions (Section XXX). The triggering action for this statutory review is the five-year anniversary of the first five-year review conducted at this site (i.e., *Five-Year Review (Type I) Paducah Gaseous Diffusion Plant Northwest Plume, Interim Remedial Action Record of Decision* [DOE 1998a]).

The assessments of this Five-Year Review find that DOE has implemented and operated the remedies in accordance with the requirements of the Records of Decision (RODs). Continuing remedial actions at PGDP include the following: the Northwest Plume Interim Action, the Northeast Plume Interim Action, and the Waste Area Groupings 1 and 7 (Solid Waste Management Unit [SWMUs] 8 and 100) Interim Action, the North-South Diversion Ditch Interim Action, and the SWMUs 2 and 3 Interim Action. These continuing remedies are functioning primarily as designed. (Monitoring data indicate that the high-concentration core of the Northwest Plume may be significantly bypassing the capture zone of the north extraction well (EW) field of the Northwest Plume action.) DOE has completed one remedial action (as prescribed in the ROD for SWMU 91). In addition, the DOE continues to supply potable water to nearby residents as part of the Water Policy removal action.

In March of 2003, the subcontractor operating the C-743-T-17 Field Laboratory identified and reported to Bechtel Jacobs Company LLC (BJC) possible quality issues with the analytical data produced by the Field Laboratory. On March 24, 2003, a DOE contractor/subcontractor joint evaluation was initiated to define the nature and extent of the Field Laboratory quality issues and any resultant impacts on the usability of the data. On June 20, 2003, the evaluation team issued a draft evaluation report that presented the quality issues reviewed during the evaluation and the impacts on data usability. Impacts on the usability of Field Laboratory data referenced in this Five-Year Review are discussed in the relevant sections of this report.

This Five-Year Review indicates that additional actions are not required to meet the remedial action objectives of the decision documents (with the possible exception of the Northwest Plume IRA). Alone, these actions are not expected to return the environment to acceptable risk-based contaminant levels. DOE, the U.S. Environmental Protection Agency, and the Commonwealth of Kentucky currently are negotiating schedule and scope of upcoming remedial actions.

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Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name ***(from WasteLAN)***: Paducah Gaseous Diffusion Plant		
EPA ID ***(from WasteLAN)***: KY8890008982		
Region: 4	**State:** KY	**City/County:** Paducah/McCracken

SITE STATUS	
NPL status: ☒ Final ☐ Deleted ☐ Other (specify)	
Remediation status (choose all that apply): ☒ Under Construction ☒ Operating ☐ Complete	
Multiple OUs?* ☒ YES ☐ NO	**Construction completion date:** ___/___/______
Has site been put into reuse? ☐ YES ☒ NO	

REVIEW STATUS	
Lead agency: ☐ EPA ☐ State ☐ Tribe ☒ Other Federal Agency Department of Energy	
Author name: Science Applications International Corporation, Inc.	
Author title: Remedial Action Assessment Subcontractor	**Author affiliation:** Bechtel Jacobs Company LLC
Review period:** 02/19/2003 to 05/19/2003	
Date(s) of site inspection: ___/___/______	
Type of review: ☒ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only ☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead ☐ Regional Discretion	
Review number: ☐ 1 (first) ☐ 2 (second) ☐ 3 (third) ☒ Other (specify) first combined review	
Triggering action: ☐ Actual RA On-site Construction at OU #____ ☐ Actual RA Start at OU#____ ☐ Construction Completion ☒ Previous Five-Year Review Report ☐ Other (specify)	
Triggering action date ***(from WasteLAN)***: 07/18/1998	
Due date ***(five years after triggering action date)***: 07/18/2003	

* ("OU" refers to operable unit.)
** (Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.)

Five-Year Review Summary Form (cont'd.)

Issues:

Issues are summarized in Sect. 8 of this Five-Year Review. They are as follows:
Northwest Plume (GWOU): Some dissolved contamination is bypassing the east side of the South Extraction Well (EW) Field; the high-concentration core of the Northwest Plume at the North EW Field has migrated eastward and is bypassing the capture zone of the well field; well efficiency for the EWs has been reduced (primarily due to operational "down-time").
Northeast Plume (GWOU): Well efficiency for the EWs has been reduced (primarily due to operational "down-time"); dissolved technetium-99 (^{99}Tc) contamination may migrate into the area of the EW field.
SWMU 91 (GWOU): None.
WAGs 1 and 7 (SWOU): Evidence of nonessential maintenance vehicle tracks is present on the protective cap; signage is not adequately placed. Occasional elevated concentrations of uranium detected in downstream surface water.
SWMUs 2 and 3 (BGOU): ^{99}Tc appears to be being released from SWMU 2.

Water Policy: Inconsistent implementation of Water Policy (i.e., some residents have declined to sign license agreements; DOE has paid all water bills, even when they have been excessive; and extent of Water Policy area may be reduced to be more cost-efficient)

Recommendations and Follow-up Actions:

Recommendations and follow-up actions are summarized in Sect. 9 of this Five-Year Review. They are as follows:
Northwest Plume (GWOU): Evaluate EW optimization; continue to assess monitoring data on semiannual basis until a final remedy is determined; continue to monitor drawdown and redevelop well when required.
Northeast Plume (GWOU): Monitor drawdown and redevelop well when required; quarterly review of monitoring data.
North-South Diversion Ditch (NSDD) source control (SWOU): None required.
WAGs 1 and 7 (SWOU): Traffic on the top and side slopes of the landfill should be restricted to foot traffic and necessary maintenance equipment only; place signs on the south side of the unnamed tributary along its central and western boundaries with the landfill; continue monitoring.
SWMUs 2 and 3 (BGOU): Monitor concentration levels of contaminant from monitoring wells; enhance annual evaluation.

Water Policy: Revisit Water Policy (including license agreements and boundaries) to determine if revisions are warranted; implement Water Policy in a consistent, cost-effective manner.

Protectiveness Statement(s):

The remedies taken for the GWOU (Northwest Plume Interim Action and Northeast Plume Interim Action) are not protective. DOE's Water Policy is an institutional control that prevents exposure of area residents to the groundwater contaminants. The remedies of the SWOU (Waste Area Groupings 1 and 7 [SWMUs 8 and 100] and NSDD Interim Action [Source Control]), and the BGOU (SWMUs 2 and 3) are protective of human health and the environment and in the interim exposure pathways that could result in unacceptable risks are being controlled.

Because the remedial action at SWMU 91 (Lasagna™) is protective, this site is protective of human health and the environment with regard to trichloroethene contamination, as prescribed in the ROD.

Other Comments:

None.

1. INTRODUCTION

The purpose of this Five-Year Review is to ensure that the interim remedial actions (IRAs) taken to date at the Paducah Gaseous Diffusion Plant (PGDP) remain protective of human health and the environment and continue to function as designed. The methods, findings, and conclusions of reviews are documented in five-year review reports. In addition, five-year review reports identify issues found during the review, if any, and identify recommendations to address them. This Five-Year Review is part of the Administrative Record (AR) at PGDP.

The U.S. Department of Energy (DOE) has conducted this Five-Year Review pursuant to the Federal Facility Agreement (FFA) (EPA 1998) in addition to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) [42 USCA § 9621(c)], the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) [40 CFR § 300.400(f)(4)(ii)], the U.S. Environmental Protection Agency (EPA) Office of Solid Waste and Emergency Response (OSWER) Directive 9355.7-03B-P (EPA 540-R-01-007) (EPA 2001). CERCLA requires that reviews be conducted no less often than once every five years at all sites where contamination remains above concentrations that allow unlimited use and unrestricted exposure. Additionally, DOE has made commitments in the North-South Diversion Ditch (NSDD) Record of Decision (ROD), the ROD for Solid Waste Management Units (SWMUs) 2 and 3, the Waste Area Groupings (WAGs) 1 and 7 ROD, the Northwest Plume ROD, the Northeast Plume ROD, and the SWMU 91 ROD to perform five-year reviews of those respective actions (DOE 1994a, DOE 1995a, DOE 1998b, DOE 1993a, DOE 1995b, and DOE 1998c).

This review encompasses all of the above-mentioned IRAs. The FFA includes provisions for combining five-year reviews of remedial actions as stated in Section XXX:

> Consistent with Section 121(c) of CERCLA, 42 U.S.C. § 9621 (c), and in accordance with this Agreement, DOE agrees that if the selected, final RAs for any operable unit, including selected alternatives entailing institutional controls with remedial action, result in Hazardous Substances, pollutants or contaminants, or Hazardous Wastes and Hazardous Constituents remaining at the Site above levels that allow for unlimited use and unrestricted exposure in accordance with Section 300.430(f) (4) (ii) of the NCP, DOE will submit to EPA and KNREPC a review of the RAs no less often than once every five (5) years (Five Year Review) after the initiation of such RAs (i.e., date of issuance of final ROD) for as long as the site remains on the NPL to assure that human health and the environment are being protected by the RAs being implemented. To facilitate the Five Year Review process for multiple OUs, the Five Year Reviews shall be synchronized as follows: reviews which are required for RA OUs will be conducted every five years starting from the initiation of the RA for the first OU. Every five years thereafter, all subject OU RAs which were started prior to the next Five Year Review date, shall be included in the next Five Year Review. For OU RAs which started after the most recent Five Year Review, the level of the review shall be commensurate to the completeness of the RA and the quantity of operation and maintenance data collected.
>
> If, based on the Five Year Review, it is the judgment of EPA or KNREPC that additional action or modification of a RA is appropriate in accordance with Sections 104, 106 or 120 of CERCLA, 42 U.S.C. §§9604, 9606, or 9620, the RCRA Permits or KRS 224 Subchapter 46, then EPA or KNREPC shall require DOE to submit a proposal to implement such additional or modified actions, which shall be subject to review and approval by EPA and KNREPC.

DOE is the lead agency for these response actions, and EPA and the Kentucky Department for Environmental Protection (KDEP) provide regulatory oversight pursuant to the FFA. With the exception of SWMU 91, all of these reviews are subsequent reviews of remedial actions performed at the site. The triggering action for this statutory review is the five-year anniversary of the first five-year review conducted at this site (i.e., *Five-Year Review (Type I) Paducah Gaseous Diffusion Plant Northwest Plume. Interim Remedial Action Record of Decision* [DOE 1998a]).

The reviews of the six interim remedial actions were conducted during January through March 2003, and supplemented with a review of the Water Policy removal action during September 2003. The DOE, its prime management and integration contractor, Bechtel Jacobs Company LLC, and its subcontractor, Science Applications International Corporation, conducted the reviews. As specified in the PGDP Site Management Plan, there are 533 SWMUs at PGDP that are divided into the following five OUs: Groundwater OU, Surface Water OU, Soils OU, Burial Grounds OU, and D&D OU (DOE 2003e). Chapter 4 of this report identifies the locations of the actions that were reviewed. With limited exceptions, the remaining SWMUs and OUs are being characterized or are scheduled for remediation.

2. SITE CHRONOLOGY

In August 1988, trichloroethene (TCE), an organic solvent, and technetium-99 (^{99}Tc), a beta-emitting radionuclide, were detected in four private wells north of the PGDP facility. DOE placed affected residences/businesses on alternate water supplies and began an intensive monitoring and investigation program to define the extent and temporal variations of the groundwater contaminant plumes. Since that time, several investigations and response actions have taken place. Those significant to this review are listed in the table below; those response actions included in this review are in bold. This Five-Year Review will assess only those actions classified as remedial actions.

Table 2.1. Chronology of significant site events at PGDP

Site Events	Date
PGDP begins enriching uranium for nuclear fuel reactors.	1952
PGDP conducts cylinder drop tests using TCE pit (later to be designated SWMU 91).	1964-1965, 1979
Off-site groundwater contaminants are discovered in neighboring residential wells.	August 1988
Agreed Consent Order is signed.	November 23, 1988
Phase I Site Investigation is conducted.	1989-1990
Phase I Site Investigation Report is issued.	December 1990
Phase II Site Investigation is conducted.	1990-1991
Kentucky Hazardous Waste Management Permit and EPA Hazardous and Solid Waste Amendments of 1984 (HSWA) permit are issued.	July 16, 1991
Phase II Site Investigation Report is issued.	October 1991
PGDP applies for listing on National Priorities List (NPL).	May 1993
ROD: Northwest Plume Interim Action is issued.	**July 10, 1993**
Engineering Evaluation / Cost Analysis (EE/CA) for PGDP Water Policy is approved.	August 1993
Institutional Controls Interim Measures are conducted.	October 1993
ROD: NSDD Interim Action is issued.	**March 1994**
PGDP is placed on NPL.	May 31, 1994
Action Memorandum for PGDP Water Policy is approved.	**August 1994**
Scrap Yards Interim Measures are conducted.	August 1994
ROD: Northeast Plume Interim Action is issued.	**June 1995**
ROD: WAG 22, SWMUs 2 and 3, is issued.	**August 1995**
Northwest Plume Groundwater System begins operation.	August 28, 1995
Time Critical Removal Action: Area of Concern (AOC) 124 is issued.	January 1996
ROD: WAG 17 (No Further Action) is issued.	September 1997
FFA is signed with the EPA and KDEP.	February 13, 1998
First Five-Year Review is completed for Northwest Plume Action.	July 1998
ROD: WAGs 1 and 7 is issued.	**August 1998**
First Five-Year Review is completed for Water Policy.	August 1998
ROD is signed for SWMU 91 (Lasagna™).	**August 10, 1998**
First Five-Year Review is completed for Scrap Yards.	August 1999

Table 2.1 (continued)

Site Events	Date
SWMU 91 (Lasagna™) remedial operations begin.	December 31, 1999
Non-Time Critical Removal Action: Drum Mountain is issued.	March 2000
First Five-Year Review is completed for Burial Grounds Operable Unit (BGOU).	August 2000
First Five-Year Review is completed for Surface Water Operable Unit (SWOU).	August 2000
Non-Time Critical Removal Action: Scrap Metal Disposition is issued.	October 2001
Lasagna™ remedial operations are completed.	December 2001
Time Critical Removal Action: SWMU 193 is issued.	March 2002
Time Critical Removal Action: Sulfuric And Hydrofluoric Tanks is issued.	July 2002
Non-Time Critical Removal Action: C-410 Infrastructure Removal Action is issued.	August 2002
ROD: NSDD is issued.	October 2002

3. BACKGROUND

3.1 PHYSICAL CHARACTERISTICS

PGDP is located in northwestern Kentucky, approximately 10 miles west of the city of Paducah, and approximately 3 miles south of the Ohio River (Fig. 3.1). The total amount of land held by DOE at the Paducah Site is 3556 acres. The industrial portion of PGDP is situated within a fenced security area consisting of approximately 748 acres. Surrounding the industrial portion of the reservation is the West Kentucky Wildlife Management Area (WKWMA).

3.2 LAND AND RESOURCE USE

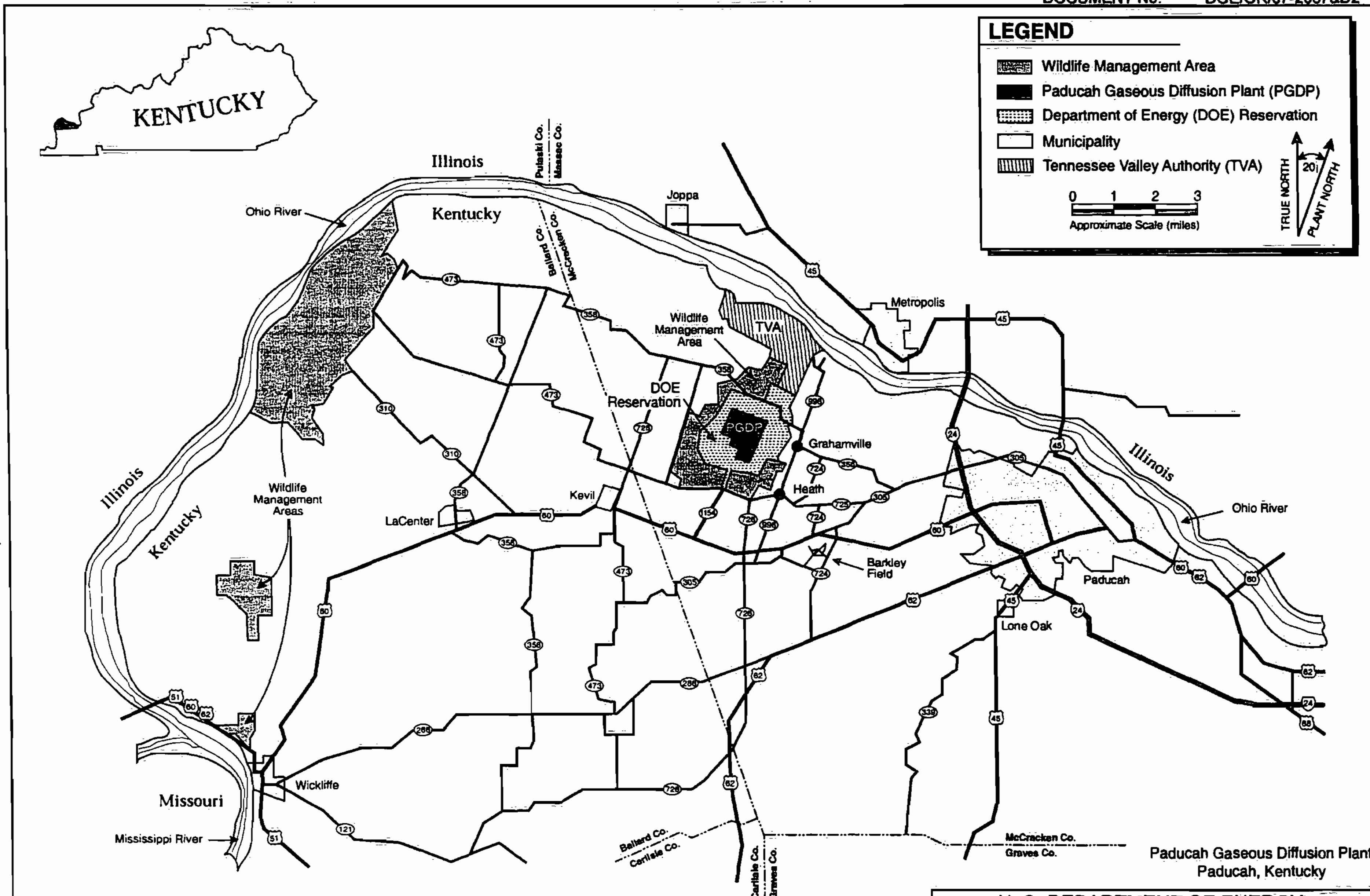
PGDP is an active uranium enrichment plant. The plant is owned by DOE and currently is operated by the United States Enrichment Corporation (USEC). Enrichment operations began in 1952, and the plant became fully operational in 1955. Hazardous, nonhazardous, and radioactive wastes have been generated, stored, and disposed of at PGDP.

Within the industrial portion of PGDP, designated as secured (i.e., fenced and patrolled) industrial land use, are numerous buildings and offices, support facilities, equipment storage areas, and active and inactive waste management units.

Portions of both the DOE Reservation and WKWMA occupy land that once was part of the Kentucky Ordnance Works, a trinitrotoluene production facility in operation between 1942 and 1946. DOE property outside the security area is classified as on-site, unsecured (i.e., not fenced) industrial.

The entire WKWMA covers approximately 2761 ha (6823 acres). The land leased to the WKWMA is designated as recreational and is used extensively for outdoor recreation such as hunting and fishing. DOE currently holds lease agreements with USEC for the production facilities at PGDP and with Kentucky Department of Fish and Wildlife Resources for certain portions of the WKWMA.

North of the DOE Reservation and WKWMA is the Shawnee Steam Plant, operated by the Tennessee Valley Authority (TVA). This TVA property is designated as industrial.



Paducah FS 1.3

U. S. DEPARTMENT OF ENERGY
DOE OAK RIDGE OPERATIONS
PADUCAH GASEOUS DIFFUSION PLANT

BECHTEL JACOBS
BECHTEL JACOBS COMPANY, LLC
MANAGED FOR THE US DEPARTMENT OF ENERGY UNDER US GOVERNMENT CONTRACT DE-AC05-03OR22980
Oak Ridge, Tennessee • Paducah, Kentucky • Portsmouth, Ohio

Fig. 3.1. PGDP vicinity map.

Science Applications International Corporation
P.O. Box 2502
Oak Ridge, Tennessee 37831

FIGURE No. Fig 3-1.pdf
DATE 07-03-03

Surrounding the DOE Reservation, WKWMA, and TVA is private property. This property is primarily rural and agricultural. In the vicinity of PGDP, the main crops include soybeans, corn, and various grain crops.

Several water-bearing zones are present in the PGDP area. The primary water-bearing units, in order of increasing depth, are the Upper Continental Recharge System (UCRS), the Regional Gravel Aquifer (RGA), and the McNairy Formation (Fig. 3.2). The RGA has been identified as the uppermost aquifer at PGDP (MMES 1992). The RGA is the dominant groundwater flow system at PGDP and contains the major on-site and off-site contaminant plumes.

Groundwater flow is predominately vertically downward in the UCRS, providing recharge to the RGA. In general, the depth to the UCRS water table is less than 20 ft in the western half of PGDP and as much as 40 ft in the northeastern corner. The main features of the local water table are (1) a broad trough in the northeast and central areas of PGDP, (2) a linear discharge area associated with a ditch in the northwest quadrant of PGDP, and (3) a lateral hydraulic gradient toward Bayou Creek on the west side of PGDP.

The RGA typically has a relatively high hydraulic conductivity and so serves as the dominant flow system in the area. Hydraulic gradients direct groundwater flow in the RGA laterally to the north where the regional groundwater systems discharge into the Ohio River.

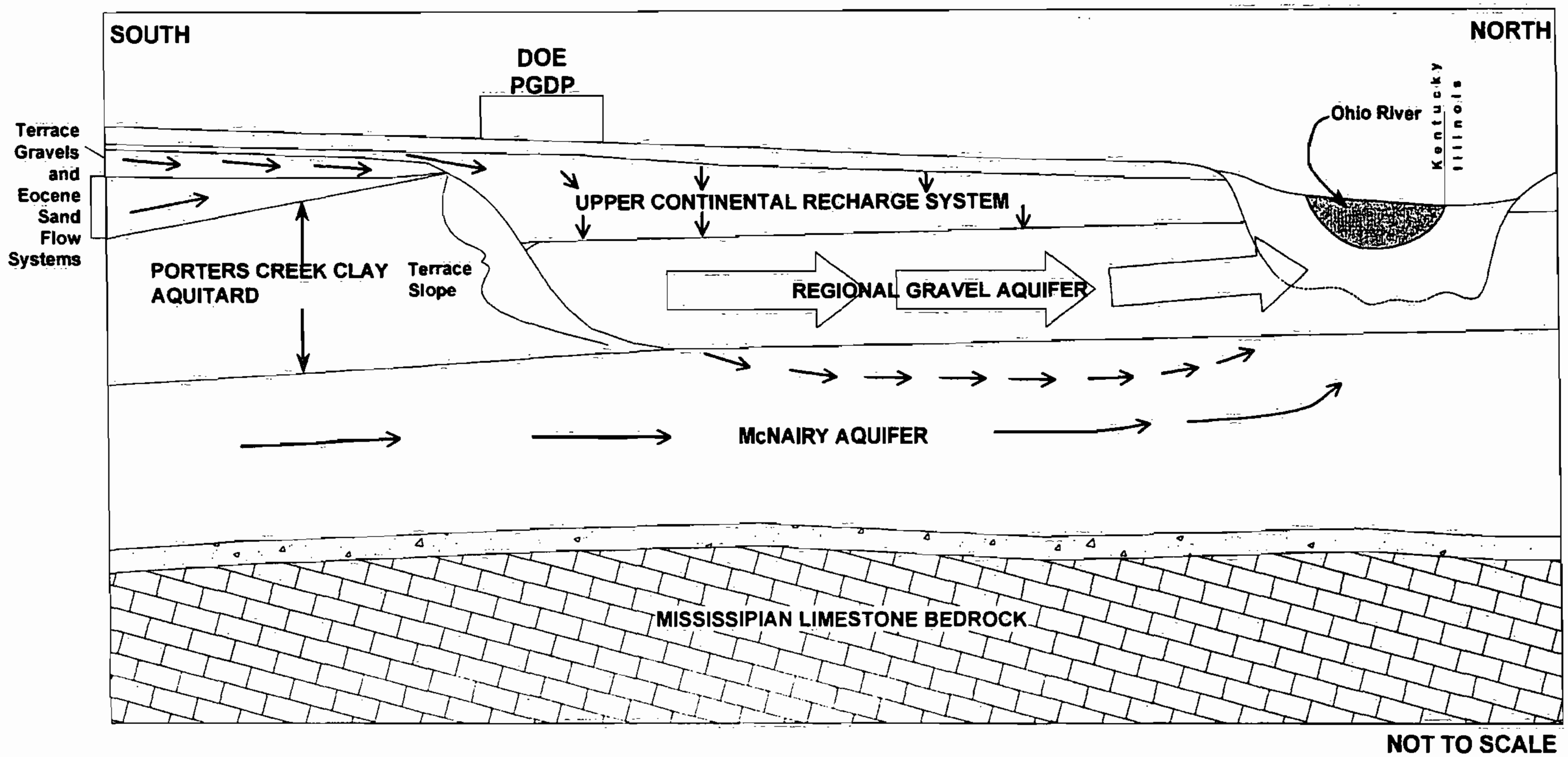
Silts and fine sands of the McNairy Formation, found beneath the RGA sediments, form the lower confining unit to the shallow aquifer system. The regional groundwater flow direction in the McNairy Formation is toward the Ohio River. Vertical hydraulic gradients in the McNairy Formation are downward beneath PGDP, but upward near the Ohio River.

3.3 HISTORY OF CONTAMINATION

Historical activities at PGDP have generated various nonhazardous, hazardous, and radioactive wastes that have been managed, stored, and/or disposed of by different methods. These activities have, in some cases, resulted in the release of contaminants to the environment. The primary contaminants of concern (COCs) at PGDP are ^{99}Tc, TCE, polychlorinated biphenyls (PCBs), and uranium.

In August 1988, contamination was found in an off-site drinking water well north of PGDP. The contaminants included ^{99}Tc, which is a man-made radionuclide created as a byproduct of the fission of uranium. Initially, ^{99}Tc was introduced to PGDP in 1953 as a contaminant in feed material during a program in which spent nuclear reactor fuel was fed into the cascade.

Further sampling showed that a commonly used solvent, TCE, also was present in off-site wells. TCE has been used as a cleaning solvent at PGDP since its construction. In the C-400 Building, process piping and equipment from the cascade system have been cleaned with TCE. In 1986, TCE was found to have been discharging inadvertently (apparently for many years) from a sump pump in the degreaser area to a storm sewer and was found to have leaked into the soil. Other sources of TCE releases at PGDP are the TCE degreaser at the C-720 Building, switchyard transfer equipment washed with TCE. TCE also was reportedly used in the fabrication of the cascade pipes in the Kellogg Building. Waste TCE was disposed of in on-site landfills and in a historical landfarming operation. TCE was placed into a pit and used as a refrigerant in tests to determine cylinder integrity. The on-site use of TCE was discontinued in July 1993 (DOE 2001a).



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U. S. DEPARTMENT OF ENERGY
DOE OAK RIDGE OPERATIONS
PADUCAH GASEOUS DIFFUSION PLANT

BECHTEL JACOBS COMPANY, LLC
MANAGED FOR THE US DEPARTMENT OF ENERGY UNDER US GOVERNMENT CONTRACT DE-AC05-03OR22980
Oak Ridge, Tennessee • Paducah, Kentucky • Portsmouth, Ohio

Science Applications International Corporation
P.O. Box 2502
Oak Ridge, Tennessee 37831

Fig. 3.2. Water-bearing zones near PGDP.

FIGURE No. Fig 3-2.pdf
DATE 07-03-03

PCBs later were found in sediment and fish downstream of the plant. PCBs have been used extensively as an insulating, nonflammable, thermally conductive fluid in electrical capacitors and transformers at PGDP. The large switchyards that service the process buildings included PCB-filled transformers. PCBs also have been used as flame retardants (on the gaskets of diffusion cascades in other sections of the plant) and as a hydraulic fluid. Sources of PCB releases include spill sites throughout the plant that have occurred from specific transformer ruptures and as part of general operations over the years.

Uranium, thorium, and transuranic elements (i.e., plutonium and neptunium) were detected in off-site sediments near PGDP in 1988. Sources of uranium releases are primarily from burial in historical landfills (such as SWMU 2).

3.4 INITIAL RESPONSE

After the discovery of groundwater contamination in 1988, DOE placed affected residences and businesses on an alternate water supply and began an intensive monitoring and investigation program to define the extent of contamination. DOE's first objective was to reduce immediate risks to off-site residents. The resulting response action is documented in the *Action Memorandum for the Water Policy at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 1994b). In addition to providing an alternate water supply, DOE implemented plume control actions (the Northwest Pump-and-Treat Facility and the Northeast Containment System) and surface water institutional controls.

After addressing immediate off-site risks, DOE identified potential areas of contamination at the site (e.g., burial grounds, spill sites, container storage areas) as SWMUs and AOCs. DOE then divided the SWMUs and AOCs into WAGs, based upon common characteristics (similar contaminants, type of media affected, etc.), and gave those WAGs with the greatest potential for contributing to off-site contamination the highest priority for investigation and remediation, as necessary. Subsequently, DOE began conducting response activities to address the contamination.

DOE has combined these WAGs and AOCs into operable units (OUs) based on specific remedial objectives for the PGDP site. DOE's OU designations include the Groundwater OU (GWOU), the Surface Water OU (SWOU), the Soils OU (SOU), and the Burial Grounds OU (BGOU). Each OU is scoped to remediate an area and contaminated media associated with PGDP. The GWOU will develop and implement remedial alternatives for COCs associated with the groundwater beneath and near PGDP. The SWOU is directed at remediating the surface water bodies including the outfall ditches, impoundment ponds, and Little Bayou and Bayou Creeks. The SOU is designed to remediate the contaminated soils associated with the plant and not located in a waterway, outfall, ditch, or burial ground. The BGOU scope addresses the contamination that is associated with PGDP landfills and burial grounds. Once the BGOU, SWOU, GWOU, and SOU are completed, a Comprehensive Site-wide OU will be conducted.

In order to keep residents and the community informed of the remedial efforts taking place at PGDP, DOE established a Site-Specific Advisory Board, now named the Citizens Advisory Board (CAB). This board originally was composed of 12 members who reflected the diversity of gender, race, and interests of persons surrounding PGDP. The CAB meets monthly to hear from persons working on relevant environmental efforts, listen to and discuss input from concerned citizens, form advice and recommendations to submit to DOE, and conduct business. All meetings are open to the public.

3.5 BASIS FOR TAKING ACTION

In August 1998, DOE, EPA, and the Commonwealth of Kentucky agreed to restructure the remedial strategy for PGDP. This restructuring reflects the accomplishment of site-wide remedial objectives as opposed to the original strategy, which emphasized a SWMU-by-SWMU approach. The basis for the revised strategy is the protection of human health and the environment through implementation of actions focused on accomplishing the following remedial objectives.

- Return surface waters to classified use(s), to the maximum extent practicable.
- Return groundwater to classified use(s), to the maximum extent practicable.
- Ensure that media (e.g., soil, sediment, air) pose no unacceptable human health risk for industrial land use for those areas with a future industrial land use designation.
- Ensure that media (e.g., soil, sediment, air) pose no unacceptable human health risk for recreational land use by land managers and nearby residents for those areas with a future recreational land use designation.
- Ensure that ecological receptors are protected from exposure to contaminated media.

Additional information regarding the risks associated with each remedial action site is included in the following sections.

4. RESPONSE ACTIONS

Seven response actions that require five-year reviews have taken place at PGDP to date. The PGDP Water Policy is the only removal action that requires a five-year review. The six remedial actions that require five-year reviews are listed in Table 4.1 and shown on Fig. 4.1.

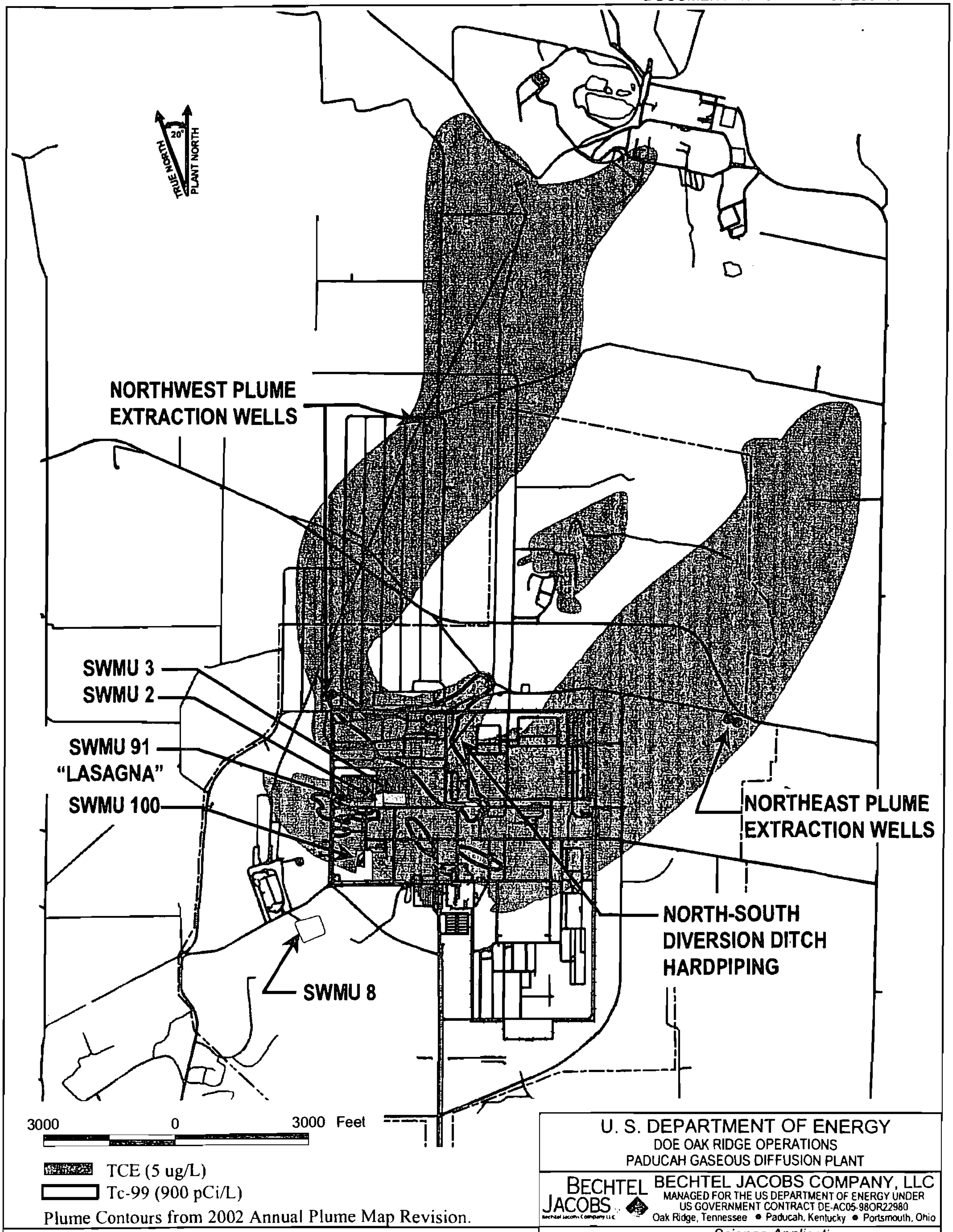
Table 4.1. Remedial actions taken at PGDP

Remedial action	Operable unit
Northwest Plume Interim Action	GWOU
Northeast Plume Interim Action	GWOU
SWMU 91 (Lasagna™)	GWOU
WAGs 1 and 7 (SWMUs 8 and 100)	SWOU
NSDD Interim Action (Source Control)	SWOU
SWMUs 2 and 3	BGOU

4.1 NORTHWEST PLUME (GWOU)

4.1.1 Remedy Selection

After discovery of off-site contamination, DOE conducted a site investigation to identify the nature and extent of the contamination. The investigation determined that the groundwater contamination is spreading generally northward toward the Ohio River in multiple plumes. The most prominent of the plumes, containing both TCE and ^{99}Tc, is the Northwest Plume. Figure 4.1 illustrates the extent of the off-site plumes and the location of the contaminant, high-concentration zones and the two extraction well (EW)



U. S. DEPARTMENT OF ENERGY
DOE OAK RIDGE OPERATIONS
PADUCAH GASEOUS DIFFUSION PLANT

BECHTEL JACOBS COMPANY, LLC
MANAGED FOR THE US DEPARTMENT OF ENERGY UNDER US GOVERNMENT CONTRACT DE-AC05-98OR22980
Oak Ridge, Tennessee • Paducah, Kentucky • Portsmouth, Ohio

Science Applications International Corporation
P.O. Box 2502
Oak Ridge, Tennessee 37831

Fig. 4.1. Locations of remedial actions taken at PGDP.

FIGURE No.c5ac90001sk637r2.ppt
DATE 07-14-03

fields installed for the Northwest Plume Groundwater System. The outer boundary of the Northwest Plume is approximately 4 km (2.5 miles) north of the PGDP security fence.

EPA and DOE, with the concurrence of the Commonwealth of Kentucky, agreed to a ROD for an IRA for the Northwest Plume on July 22, 1993 (DOE 1993a). This IRA consisted of the installation and maintenance of two EW fields for a period of two years to initiate control of the high-concentration zone of TCE and ^{99}Tc in the Northwest Plume. A water treatment facility was constructed to treat effluent from the EWs. The Northwest Plume Groundwater System has continued to operate beyond the two-year period.

The *Record of Decision for Interim Remedial Action of the Northwest Plume at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 1993a) delineated the remedial action as follows:

- The contaminated groundwater will be extracted at two locations. The first location, immediately north of the plant on DOE property, is intended to control the source. The second groundwater extraction location is off-site of DOE property at the northern tip of the most contaminated portion of the plume (greater than 1000 µg/L of TCE). The contaminated groundwater will be pumped at a rate to reduce further contribution to contamination northwest of the plant without changing hydraulic gradients enough to mobilize dense nonaqueous-phase liquid (DNAPL) or significantly affect other plumes. This pumping rate may be modified during operation to optimize hydraulic containment by adjusting flow from the EWs and to support subsequent actions.

- The extracted groundwater will be collected in a manifold and piped to the treatment system, which will consist of two ion exchange units in parallel followed by an air stripper with treatment for off-gas emissions. This technology will provide the treatment to COCs. The target level for treatment of discharge water was set to be equal to EPA-established maximum contaminant levels (MCLs) (5 µg/L for TCE and 900 pCi/L for ^{99}Tc [assumed to yield a dose equivalent to the 4 mrem/yr for beta-emitting radionuclides]).

- The amount of treated water discharged was to be limited by the flow capacity of the skid-mounted treatment units. Treated water is to be discharged at Outfall 001 of the Kentucky Pollution Discharge Elimination System (KPDES).

- The interim action also was to include implementation of a treatability study to evaluate an innovative technology. The technology to be studied was to be the utilization of iron filings as a viable alternative to pump-and-treat technology.

- The interim action was not directed as a source remediation action, but rather as a remedy to address continuing release from a DNAPL principal threat source material area (PTSM).

4.1.2 Remedy Implementation

DOE signed the ROD for the Northwest Plume action on July 15, 1993, and EPA signed on July 22, 1993. The remedial action work plan and remedial design for the construction and implementation were completed January 18, 1994. The construction of the facility was performed in two phases. The first phase was the installation of monitoring wells (MWs) and extraction field. The second phase of work was the installation of the treatment facility and all internal equipment, as well as subsurface pipelines to transport the contaminated water through the WKWMA to the treatment system. The total construction was completed in May 1995, with calibration and operational shakedown occurring through August 27, 1995. The Northwest Plume Groundwater System began pump-and-treat operations on August 28, 1995.

The interim action, as installed, includes:

- four EWs and associated monitoring network with two EWs located at the north end of the high-concentration zone and two immediately north of the plant;
- double-walled subsurface pipelines with leak detection equipment to transport the contaminated water to the treatment facility;
- active treatment equipment located in the facility including an equalization tank, dual sand filter unit, low-profile air stripper, two double ion exchange units, and on-line volatile organic analyzer; and
- support equipment installed in the facility including backwash, settling tank, sludge handling equipment, air compressor, and filter press.

DOE issued an *Explanation of Significant Differences for the Interim Remedial Action of the Northwest Plume at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/06-1481&D2, in August 1996 that proposed modifying the original remedial action (DOE 1996). The three propositions in the document were as follows: (1) elimination of the activated carbon filters, (2) reversal of the sequence of the two treatment units (ion exchange unit and air stripper), and (3) elimination of the iron filings treatability study (DOE 1996). At that time, DOE determined that the remedy would remain protective of human health and the environment and would meet the applicable or relevant and appropriate requirements (ARARs) identified in the ROD and additional ARARs triggered by the modifications. Although removing the carbon filters would not result in violation of Clean Air Act standards, DOE withdrew its proposal to eliminate the carbon filters in response to public comments. The additional ARARs triggered by the reversal of the treatment units are identified in the Explanation of Significant Differences document, approved by EPA November 18, 1996. The Northwest Plume remedial action continues to comply with these ARARs.

4.1.3 Systems Operations/Operations and Maintenance

Operations and maintenance (O&M) for the Northwest Plume Groundwater System are conducted in accordance with the *Operations and Maintenance Plan for the Northwest Plume Groundwater System Interim Remedial Action at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/07-1253&D4/R2 (DOE 2002a). Routine and preventive maintenance is conducted in accordance with the Northwest Plume Groundwater System Calibration and Maintenance Plan.

The treatment facility began operating August 28, 1995. Since initial operations, the frequency of repair to the system has been normal and routine. Since operation began, the Northwest Plume treatment system has processed 771,117,655 gal, as of the close of the last semiannual reporting period on March 31, 2003. Mass balance evaluations indicate that the treatment system has removed approximately 1,623 gallons of TCE at an operation cost of $17,444,737 by the end of March 2003.

The costs associated with the O&M of the Northwest Plume Groundwater System and the Northeast Plume Containment System no longer are tracked separately. O&M of the two systems have been combined under the current contract. The combined cost for both systems for the five-year reporting period is $10,254,503, or an average of $2,050,900 per year. This cost is a total project cost that includes, but is not limited to, the following items.

- O&M of the systems
- Sampling and analysis
- Health and safety
- Data management

- Technical reporting
- Financial tracking
- Groundwater model recalibration and reporting
- Regulatory document preparation

No major modifications were encountered to the treatment system during this reporting period (i.e., replacement of primary equipment), except for the beds in the sand filter, ion exchange capacity units, and vapor phase activated carbon units. The ion exchange and activated carbon are changed routinely due to contaminant loading. The sand filter bed, which is a more long-term item, required replacement due to plugging. The process of changing this bed currently is ongoing.

The treatment system influent and effluent values for TCE and ^{99}Tc concentrations are continuing to be met as indicated from the latest semiannual reporting period of October 1, 2002, to March 31, 2003 (see Table 4.2).

Table 4.2. Northwest Plume Groundwater System influent and effluent concentrations

	TCE (μg/L)			^{99}Tc (pCi/L)		
	High	**Low**	**Average[a]**	**High**	**Low**	**Average[a]**
Influent	9083	1640	5915	426	157	282
Effluent	7.8	<MDL	3.5	40.1[b]	0[b]	1.6[b]

Data is taken from *the U.S. Department of Energy Paducah Gaseous Diffusion Plant Federal Facility Agreement Semiannual Progress Report for Fiscal Year 2003* (DOE 2003a).

<MDL = Less than Method Detection Limit and is used as 1 μg/L for calculations.

[a] Average is calculated as an arithmetic average.

[b] Numerous ^{99}Tc effluent samples from this reporting period were rejected as unusable for the intended use during the C-743-T-17 Field Laboratory Evaluation. However, confirmation samples collected during the same time frame and analyzed by an independent laboratory indicate that the treatment system is performing as intended.

Summaries of progress of the Northwest Plume IRA over the period of this review and a technical assessment of the action follow in Sects. 5.1 and 7.1, respectively.

On March 11, 2003, a representative of the Five-Year Review Team conducted a site inspection of the Northwest Plume Pump-and-Treat Facility. The facility includes the C-612 Treatment Facility, the South EW Field, and the North EW Field. The treatment facility and the south well field are located just outside the northwest corner of the perimeter fence of PGDP, but within the security buffer zone around the plant. The north well field is located approximately one mile north of the treatment facility on the WKWMA.

The C-612 Treatment Facility is a pre-engineered metal building with one vehicular entrance and two pedestrian entrances. The exterior of the building appears in good condition with no signs of damage, rust, or deterioration. The area around the building is maintained well, including mowing and weed trimming. A chain-link security fence that is in good condition encloses the building.

All treatment process equipment is located within the building. Groundwater treatment equipment inside included a sand filter unit, an air stripper and carbon filtration unit, and four ion exchange columns. The interior of the building is clean, free of clutter and debris, and maintained well. Access-controlled areas within the building are clearly marked and identified. Process piping in the facility is identified properly as to content and flow direction, adequately supported, and in a well-maintained condition. There were no signs of leaks or deterioration. Process control panels are maintained well with all components clearly identified and labeled. All electrical power and control panels are labeled properly. The building contains a wet-type fire sprinkler system that is inspected and tested regularly by the PGDP Fire Services Department, as determined by the system inspection tags.

4.2 NORTHEAST PLUME (GWOU)

4.2.1 Remedy Selection

After the initial discovery of contamination at PGDP in August 1988, DOE conducted a site investigation to determine the extent of contamination. Results of the groundwater monitoring Phase IV investigation presented in the *Northeast Plume Preliminary Characterization Summary Report*, DOE/OR/07-1339VI&D2 (DOE 1995c), delineated numerous plumes within the RGA that coalesce to form the Northeast Plume. One of these plumes is a zone of high TCE concentrations (TCE concentrations exceeding 1000 µg/L) that emanates from the eastern portion of the plant and extends off DOE property. Figure 4.1 depicts the aerial extent of the plumes at PGDP, including the Northeast Plume.

Because of the risks to future off-site residents, DOE initiated a remedial action for the Northeast Plume. DOE signed the Northeast Plume ROD (DOE 1995b) June 13, 1995; EPA signed June 15, 1995. The KDEP conditionally concurred with the selected remedy June 5, 1995. The ROD identified the selected remedy, outlined the performance objectives, and provided rationale for the remedy selection. The primary objective of the IRA was to implement a first-phase remedial action to initiate hydraulic control of the high-TCE concentration area (> 1000 µg/L) within the Northeast Plume that extended outside the plant security fence.

The major components of the selected remedial action include the following.

- Contaminated groundwater will be pumped from EWs located at the northern end of the high-concentration TCE portion of the Northeast Plume. The high-concentration portion has TCE at greater than 1000 mg/L. The pumping rate was included at approximately 100 gal per minute (gpm) to initiate hydraulic control, but not change groundwater gradients to adverse effects on the overall plume.
- The extracted groundwater is collected and piped to a treatment system before being released to a KPDES outfall. The treatment system consists of existing cooling towers located at PGDP that will volatilize the TCE and 1,1-dichloroethene (1,1-DCE) during processing.
- In the interim action, two treatability studies also were included that would evaluate the use of photocatalytic oxidation for the treatment of TCE in vapor phase and *in situ* treatment of TCE contaminated groundwater. The treatability studies subsequently were removed as part of a minor change to the ROD.

4.2.2 Remedy Implementation

Following the signing of the ROD on June 15, 1995, DOE began the remedial design process for the selected remedial alternative. Minor modifications to the remedial action were required during the design phase. These minor modifications included the following:

- removing the sand filter,
- adding an equalization tank,
- increasing pumping rate from 100 gpm to 170 gpm, and
- postponing the two treatability studies.

Rationale for removing the sand filtration system was based on the lack of dissolved metals and particulate in the groundwater to be extracted. Should concentrations of dissolved metals or particulate increase to levels of concern, the current treatment system design configuration allows for addition of a sand filter. As standard engineering practice, the equalization tank was added to equalize water flow. Currently, the average pumping rate for the Northeast Plume EWs is approximately 170 gpm; however, DOE is evaluating the need to further increase it to 200 gpm. After initially postponing the treatability studies, DOE later completely eliminated the two treatability studies, since results at other DOE sites indicated that the technologies would not be beneficial to restoration activities at PGDP.

DOE issued a Notice to Proceed with construction April 5, 1996, and construction of the Northeast Plume pump-and-treat system was completed in December 1996. Major equipment installed for this project included two EWs capable of producing a combined maximum discharge of 260 gpm, a 20,000-gal underground fiberglass-reinforced plastic equalization tank, and a submersible transfer pump capable of producing a maximum discharge of 263 gpm. This process equipment was installed along with associated piping, valves, and fittings. The construction of the facilities was documented in the *Postconstruction Report for the Northeast Plume Interim Remedial Action at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/07-1555&D1, and was issued February 7, 1997 (DOE 1997a). The postconstruction report presents the summary of the construction activities for the remedial action. Operation of the Northeast Plume IRA began February 28, 1997.

4.2.3 System Operations/O&M

O&M for the Northeast Plume Groundwater System are conducted in accordance with the *Operations and Maintenance Plan for the Northeast Plume Groundwater System Interim Remedial Action at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/07-1535&D3/R2 (DOE 2002b). The O&M Plan provides an overview of the activities required to operate and maintain the treatment system to meet DOE, EPA, and Commonwealth of Kentucky policies and statutes. Since operation began, the Northeast Plume treatment system has processed 469,450,304 gal of water since the close of the last semiannual reporting period on March 31, 2003. The treatment system has removed approximately 160 gallons of TCE at an operation cost of $1,109,150 through March 2003.

The costs associated with the O&M of the Northwest Plume Groundwater System and the Northeast Plume Containment System no longer are tracked separately. O&M of the two systems have been combined under the current contract. The combined cost for both systems for the five-year reporting period is $10,254,503, or an average of $2,050,900 per year. This cost is a total project cost that includes, but is not limited to, the following:

- O&M of the systems,
- Sampling and analysis,
- Health and safety,
- Data management,
- Technical reporting,
- Financial tracking,
- Groundwater model recalibration and reporting, and
- Regulatory document preparation.

In order to perform maintenance activities at the cooling towers, DOE began a 67-day shutdown of the cooling towers June 25, 1999. Modeling performed to determine the impacts of the shutdown is presented in the *Transport Modeling Results for the Northeast Plume Interim Remedial Action and the Northwest Plume at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/07-1803&D1 (DOE 1999a). Simulated particle tracking near the Northeast Plume EWs indicated the shutdown would result in a minor loss of capture area, approximately 61 m (200 ft) upgradient of the wells. This means that any particle within this "area of influence" will pass the well-heads during the shutdown, whereas they otherwise would have been captured by the wells. Prior to the shutdown, DOE notified the EPA and KDEP of its intentions to perform the maintenance.

There have been no noncompliances associated with the management or operation of this action.

The treatment system influent and effluent TCE concentrations are continuing to be met as indicated for the latest semiannual reporting period of October 1, 2002, to March 31, 2003 (see Table 4.3).

Table 4.3. Northeast Plume Groundwater System influent and effluent concentrations

		TCE (µg/L)	
	High	Low	Average[a]
Influent	784	440	614
Effluent	<MDL	<MDL	1

Data is taken from the *U.S. Department of Energy Paducah Gaseous Diffusion Plant Federal Facility Agreement Semiannual Progress Report for Fiscal Year 2003, Paducah, Kentucky* (DOE 2003a).

<MDL = Less than the Method Detection Limit and is valued at 1 µg/L for calculations purposes.
[a]Average is calculated as an arithmetic average.

Summaries of progress of the Northeast Plume IRA over the period of this review and a technical assessment of the action follow in Sections 5.2 and 7.2, respectively.

The Northeast Plume Containment System currently is not capable of removing ^{99}Tc from water extracted from the RGA. MW256, which is upgradient of the Northeast extraction field, first exceeded the ^{99}Tc Data Quality Objective (DQO) requirement for twice the MDL of 50pCi/L in the fourth quarter of 1998. An analysis performed and documented in the *Contingency Plan for ^{99}Tc Treatment at the Northeast Plume Containment System*, BJC/PAD-12 determined that if ^{99}Tc activities were confirmed in MW292 above the 50 pCi/L limit it would be approximately one year before those levels would reach the extraction field (BJC 1998). Since 1998, there has been a gradual increase in ^{99}Tc activities in MW256 (57 to 115 pCi/L). MW256 is located approximately 4000 ft upgradient of the extraction field. Due to the elevated activity and the potential of off-site migration of ^{99}Tc impacting the treatment facility, the contingency evaluation was completed. MW292 is an off-site MW downgradient of MW256 and approximately 1200 ft upgradient of the extraction field, which places MW292 positioned to provide an early warning of ^{99}Tc approaching the extraction field. The ^{99}Tc activities in MW292 have remained below the 50 pCi/L limit. Based on activity information from MW256 and MW292, normal operations at the Northeast Plume Containment System are continuing.

A representative of the Five-Year Review Team inspected the Northeast Plume IRA on March 11, 2003. This facility is located south and east of the intersection of Ogden Landing Road (Ky. Hwy 358) and Little Bayou Creek, northeast of PGDP. The facility consists of two EWs, a pumping station, associated piping, electrical power and control systems, security fencing and gates, and interconnecting gravel access roads.

The main access road into the area is secured by two chain-link gates located just south of its intersection with Ogden Landing Road. Operators indicated that the gates are locked at all times except when O&M personnel are in the area. The gates are in good condition and serve their intended function. All the roads in the area appear to be maintained well and in good condition.

The two EWs are located approximately 200 ft apart. Each well is located in an underground concrete vault with a hinged aluminum lid. Each vault is protected by guard posts. Each well also is surrounded by a chain-link security fence with an access gate that is locked to prevent unauthorized entry. The vaults are in good condition and are free of foreign debris. The security fences around each well also are in good condition. The immediate area around each fenced location was mowed and appears to be maintained well. During this inspection, both wells were pumping with no apparent problems.

The pumping station, which consists of a large underground equalization tank, two discharge pumps and associated piping, and electrical power and control panels, also is completely enclosed in a chain-link security fence with an access gate at one end. All aboveground piping is insulated to prevent freezing. All the exposed piping and insulation are in good condition and functional. During this inspection, the pumps were running and no problems were observed. All exposed valves are labeled properly. The electrical power and control panels are in good condition and properly labeled. The area immediately around the pumping station is maintained and mowed on a regular basis.

A representative of the Five-Year Review Team interviewed a representative of the O&M contractor regarding system operations and system performance. The volatile organic compounds (VOCs) are stripped from the water in the cooling towers. Intermingled well and plant operation water is collected in the basins of the cooling towers and recirculated through the cooling tower. After recirculation, water eventually is discharged to the C-616 Lagoons and through Outfall 001.

Only minor repairs and routine maintenance have been performed. Shutdowns for repairs have been infrequent; no shutdowns have been long-term, except for the period of maintenance at the cooling towers that lasted 67 days. A summary of both routine and nonroutine maintenance is reported in the DOE PGDP FFA Semiannual Progress Reports issued no later that 30 days after each reporting period of each year.

4.3 SWMU 91 (GWOU)

The Cylinder Drop Test Area (SWMU 91) encompasses approximately 1.7 acres and is located in the extreme west-central area of PGDP on the southern edge of the C-745-B Cylinder Yard. Drop tests were conducted at the site from late 1964 until early 1965 and in February 1979 to demonstrate the structural integrity of the steel cylinders used to store and transport uranium hexafluoride. Prior to structural testing, the cylinders went through thermal conditioning by immersing them in a concrete pit containing dry ice and TCE. During tests, a crane lifted the cylinders to a specified height and dropped them onto a concrete and steel pad to simulate worst-case transportation accidents. The TCE was not removed from the pit after the tests and eventually leaked into the surrounding shallow soil and groundwater. The likely maximum quantity lost to the surrounding soil is approximately 1635 L (430 gal). Additional information regarding the nature and extent of contamination is presented in the *Results of the Site Investigation, Phase II*, KY/SUB/13B-97777-031991/1 (CH2M HILL 1992), and the *Preliminary Site Characterization/Baseline Risk Assessment/Lasagna™ Technology Demonstration at Solid Waste Management Unit 91 of the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, KY/EM-128 (LMES 1996a).

4.3.1 Remedy Selection

In 1993, SWMU 91 was selected as the site of an innovative technology demonstration. The technology, known as Lasagna™, is an *in situ* technology that uses electroosmosis to move shallow groundwater and contaminants in fine-grained or clayey soils. Contaminants are treated by passing contaminated groundwater through in-ground treatment cells. The success of the initial 120-day demonstration (Phase I), which began in January 1995, led to a full-scale demonstration (Phase IIA) that was conducted from August 1996 through July 1997. Sampling and analytical results documenting the Phase I study are reported in the *Preliminary Site Characterization/Baseline Risk Assessment/Lasagna™ Technology Demonstration at Solid Waste Management Unit 91 of the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, (LMES 1996a). During the second phase of the technology demonstration, the average TCE concentration in the demonstration area soil was reduced by 95%. Post-test soil sampling conducted for the Phase IIA demonstration indicated that cleanup effectiveness of TCE would achieve the remediation goals. The results of the Phase IIA are discussed further in the *Lasagna™ Soil Remediation: Innovative Technology Summary Report* (LMES 1996b).

DOE then selected Lasagna™ for full-scale remediation in the SWMU 91 ROD issued by the DOE, *Record of Decision for Remedial Action at Solid Waste Management Unit 91 of Waste Area Group 27 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 1998c) with EPA approval and KDEP concurrence, September 1998. The ROD identified the selected remedy, outlined the performance objectives, and provided rationale for the remedy selection. The remedy consisted of treatment of contaminated soil pore water by the Lasagna™ electroosmosis technology. The primary objective was to reduce the level of TCE-contaminated soil, thereby reducing the potential future concentrations in groundwater that could pose a threat to human health and the environment. The specific components of the selected remedy included the following.

- Electrodes energized by direct current that cause soluble contaminants (i.e., TCE) to be transported into or through the treatment layers and heat the soil. The contaminated water in the pore volumes will flow from the anode through treatment zones toward the cathode (DOE 1998c).
- Treatment zones containing reagents that either can decompose the TCE to nontoxic products or can adsorb the TCE contaminants for immobilization, depending on the medium design (DOE 1998c).
- A water management system that recycles and returns the water that accumulates at the cathode back to the anode for acid-base neutralization (DOE 1998c).

The ROD specified the Lasagna™ system to operate for two years in an attempt to meet cleanup objectives specified in the ROD. If necessary to meet the objectives, the technology could have operated an additional 12 months. The ROD further included a contingency action to implement *in situ* enhanced soil mixing to remediate the unit in the event that the Lasagna™ technology is incapable of achieving established cleanup objectives. Additional information regarding the selected remedy is presented in the ROD for SWMU 91 (DOE 1998c).

4.3.2 Remedy Implementation

All phases of the Lasagna™ technology demonstration have been completed at PGDP. In March 1999, DOE's Management and Integration (M&I) contractor awarded the contract for installation and operation of Phase IIB of the Lasagna™ technology. The Remedial Design Report to support the construction was issued in May 1999 and construction of the necessary facilities began in August 1999. The construction was completed and start-up of operations began in December 1999. The *Post-Construction Report for the Lasagna™ Phase IIb In-Situ Remediation of Solid Waste Management Unit 91 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/07-1856&D1 (DOE 2000a) documents the remedial construction process. The construction phase also included the taking of soil samples to provide a baseline of contamination in the system area.

4.3.3 System Operations/O&M

Operation of the system began in December 1999. Weekly inspections were performed on the system during the operational phase. The weekly inspections included verifying that the water recycling system was functioning correctly and that sufficient water was contained in the sump to insure that the anodes would remain wetted. An auto-dialer also was incorporated into the operations so that an operator was notified if one of a series of predetermined events would occur.

The system operated continuously for the first several months. Once soil temperatures of 90°C were achieved, the system was put into pulse mode that prevented overheating of the soil. Pulsed-mode operations consisted of energizing the system for one to four days and then shutting it down for several days to allow for cooling. Progress check soil sampling was performed in August of 2000 as well as in August of 2001. Due to mechanical problems associated with the rectifier, the system was shut off for approximately eight weeks in August 2001 to allow for mechanical repairs to occur. A number of additional operational problems were encountered during the operational phase and are detailed in the *Final Remedial Action Report for Lasagna™ Phase IIb In-Situ Remediation of Solid Waste Management Unit 91 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/OR/07-2037&D1 (DOE 2002c). The Commonwealth of Kentucky and EPA approved the final remedial action report on October 31, 2002.

A representative of the Five-Year Review Team conducted a site visit March 6, 2003. The SWMU 91 site is located along the southern edge of the C-745-B Cylinder Yards in the west-central portion of the PGDP secured area. The site transitions from a grassy area south of the cylinder yard to underlying the cement-paved cylinder yard. No construction or operations activities were being conducted at the time of the site visit.

The C-743-T-17 Field Laboratory evaluation identified quality issues with the Lasagna™ verification sampling analytical data. As a result, the TCE data were rejected as unusable for the intended use. Lasagna™ verification resampling and analysis were conducted in April 2003 and have confirmed that the remediation objective was met. Details of the Lasagna™ verification resampling and analysis are included in the *Addendum to the Final Remedial Action Report for Lasagna™ Phase IIb In-Situ Remediation of Solid Waste Management Unit 91 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2003b).

The Lasagna™ equipment and site was demobilized on September 30, 2002. The remediation site has largely been returned to its original condition prior to the start of remedial activities. With the exception of the primary power distribution equipment, all aboveground material, piping, office trailers, etc., have been removed from the site. All barricades, and warning signs erected during construction and operation have been removed from the site. The primary disconnect for the power system has been placed in the open position and locked. Grassed areas around the site have been maintained well. A representative of the Five-Year Review Team conducted an interview with the M&I contractor project manager for SWMU 91; he confirmed the completion of the Lasagna™ process and the demobilization of the remedial area.

The total cost of the implementation of the Lasagna™ remediation (i.e., post-ROD activities) was $3.96M (DOE 2002c). There have been no noncompliances associated with this action.

4.4 NSDD SOURCE CONTROL (SWOU)

The NSDD originates within the north central portion of PGDP and joins with Little Bayou Creek to the north of the plant. Historically, the NSDD received wastewater from the C-400 Cleaning Building. The primary activities at C-400 have included cleaning, metal etching and plating, metals recovery, radioactive materials stabilization and recovery, uranium trioxide production, diffusion process equipment testing, and uranium tetrafluoride pulverization. Sources of runoff to the ditch include a steam plant (C-600), process buildings (C-335 and C-337), a cooling tower (C-635), and switchyards (C-535 and C-537). As a consequence, the soil and sediment in the ditch have been contaminated. The principal contaminants are radionuclides, metals, and PCBs. Over the years, fly ash and coal dust from the C-600 Steam Plant and sediment from the ditch watershed have nearly filled the NSDD. Prior to the interim action, runoff from heavy rainfall events caused the ditch to overflow onto an adjacent stretch of 10th Street at PGDP.

Risks associated with the NSDD are presented in *Record of Decision for Interim Action Source Control at the North-South Diversion Ditch at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 1994a). According to the NSDD ROD, there was potential for exposure of plant maintenance personnel to the contaminants within the ditch through routine maintenance activities. In addition, aquatic organisms living in the NSDD likely were to be at risk from adverse effects that could reduce populations. Predators of aquatic organisms also may have been at equivalent levels of risk due to bioaccumulation of PCBs.

4.4.1 Remedy Selection

In March 1994, DOE and EPA, with the concurrence of KDEP, signed a ROD for an interim action at the NSDD as an incremental step toward addressing site-wide problems (DOE 1994a). The primary objectives of the interim action were to mitigate the discharge of contaminants into the NSDD, decrease the off-site migration of contaminants already present in the NSDD, and decrease the potential for worker exposure (i.e., direct human contact) to the contaminants within the ditch (DOE 1994a). The IRA consisted of the following activities.

- Installation of an ion exchange system in the C-400 Building to reduce radionuclide levels in the effluent to be discharged to the NSDD.
- Removal of fly ash from the C-600 Steam Plant effluent discharged to the NSDD.
- Flow from the sediment-filled southern end of the NSDD was piped northward to the C-616-H Lift Station to reduce the potential for mobilization of contaminants. This was accomplished by constructing a lift station (C-400-L) near the southern end of the NSDD.
- A gabion-type rock structure was constructed in the NSDD upstream of the C-616-H Lift Station to trap sediment and mitigate the potential for sediment transport to off-site areas from the portion of the NSDD that was bypassed with the piping (i.e., the section from the C-400-L Lift Station to the C-616-H Lift Station).
- Warning signs were installed on both sides of the portions of the NSDD inside the security fence from Virginia Avenue to the C-616-C Lift Station. These signs provide notice that elevated levels of radionuclides, metals, and PCBs are present in the area.

Warning signs are a form of institutional control, which, in turn, is a form of land use control (LUC). The EPA regional office issued a policy in April 1998 for assuring the long-term effectiveness of LUCs at federal facilities (Johnston 1998). PGDP subsequently developed a site-specific Memorandum of Agreement (MOA) and LUC Assurance Plan (LUCAP) (DOE 2000d). The PGDP LUCAP specifies that decision documents, approved prior to the effective date of the MOA in which LUCs were selected as part of the remedy, will be analyzed for the effectiveness of the LUCs during the ROD Five-Year Reviews. The effectiveness of the warning signs is addressed in this Five-Year Review. Since the ROD for this IRA was signed prior to the effective date of the PGDP MOA and LUCAP, a LUC Implementation Plan (LUCIP) does not exist for the warning signs in this IRA.

4.4.2 Remedy Implementation

DOE completed construction of the IRA during August 1995 (DOE 1995d). Once construction was completed, two components of the actions, the C-400 Ion Exchange and C-600 Fly Ash Lagoons, were incorporated into the daily operations of PGDP by USEC, and the discharge from the C-400 Ion Exchange system was routed into the Outfall 008 storm water drain to eliminate discharges from the C-400 Building to the NSDD. Lagoons constructed at the C-600 facility eliminated fly ash deposition in the NSDD.

Since construction of the NSDD IRA, a second ROD for IRA at the NSDD has been signed. The second ROD, signed September 25, 2002, will be discussed in Sect. 5.4 (DOE 2002d). Because this ROD is in early stages of implementation, a review at this time is not appropriate. Discussion will be limited to the current status of the ROD implementation.

4.4.3 Systems Operations/O&M

DOE contractors and subcontractors conduct inspection and maintenance activities according to the O&M Plan, *Operation and Maintenance Plan for the Surface Water Operable Unit at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/OR/07-1904&D1 (DOE 2000b). The primary activities associated with O&M include the following.

- Daily inspections of lift stations (fully automated) are conducted by a DOE contractor, or subcontractor, to ensure the lift station screens remain clean, the lift stations are operational, and the pipeline is not leaking.
- Heat tracing installed on the aboveground piping is activated in the fall and deactivated in the spring.
- The warning signs along the ditch are inspected as part of this daily routine.
- The area adjacent to the pipeline and warning signs is mowed twice during the summer months.

Monitoring consists of a visual inspection of vaults, pumps, piping, and diversion dams. This inspection is performed once a day.

On March 6, 2003, a representative of the Five-Year Review Team conducted a site inspection of the following facilities associated with the NSDD IRA: (1) the C-400-L Lift Station and associated piping, (2) the C-616-L Lift Station and associated piping, (3) a Gabion installed in the NSDD near Outfall 001, and (4) signs posted along the southern reaches of the ditch that warn plant personnel of the hazards associated with sediments in the ditch.

Signs are posted along the southern reaches of the NSDD warning personnel of possible exposures to radionuclides, metals, and PCBs from sediments in the ditch. The signs are spaced at regular intervals on both sides of the ditch, are in good condition, and are legible. The ditch also is posted as a radiological area requiring special permits and notifications prior to entry. It did not appear that the ditch and adjacent banks had been mowed prior to the onset of winter. Cattails in the bottom of the ditch were abundant and quite tall. Grass along the banks was long and thick and weeds were quite evident.

The C-400-L Lift Station is located on the north side of the NSDD near its upper reach near the intersection of 10th Street and Virginia Avenue. It is included in the radiological boundary posting along the NSDD, with the exception of a gravel walkway access to the station electrical control panels and the east side of the lift station. The lift station is in good condition and appears to be functioning normally. During this inspection, there were no visible indications that water had been at excessive levels in the recent past. The inlet grating to the lift station was free of excessive debris, and water was running into the sump. The lift station did not run during this visit, due to minimal water flow in the ditch. The electrical power and control panels and associated conduits located just east of the lift station are in good condition, although labels need to be replaced on some boxes.

The C-616-L Lift Station is located on the south side of Virginia Avenue and north of the C-600 Steam Plant. This lift station collects coal pile runoff and fly ash settling basin water from C-600 and pumps it around the southern reaches of the NSDD to a point just south of Outfall 001. Water from the fly ash settling basins enters the station through underground piping from the basins. Coal pile runoff is routed into the west side of the lift station by an excavated trench. This lift station is under the control and operation of USEC. During this inspection, the lift station was functioning as designed. There were no indications of water overflow in the vicinity of the lift station. Water levels in the settling basins were normal. It was evident that two check valves located on the discharge piping had just been replaced. Insulation on the aboveground piping at the station, including the two new check valves, is in some need of repair. Power and control panels associated with the lift station are in good condition.

The discharge piping from both lift stations, which is mounted on above grade concrete and steel pipe supports, originally routed water around the more contaminated southern-most reaches of the NSDD to a point just south of Outfall 001. In recent months, in preparation for additional cleanup work on the NSDD, this piping has been extended, both aboveground and underground, to a point just north of the C-616-C Lift Station inlet. The original piping appears in good condition with no evidence of leaks or damage and is performing its designed function. In some areas, small pieces of the metal jacket that protects the pipe insulation are loose or missing and need repair.

The gabion structure, installed in the NSDD just south of Outfall 001, still is in place, is in good condition, and appears to be performing its intended function of retarding the transport of sediments from the southern end of the ditch. Water trickling through the structure during this inspection was clear and free of visible sediments.

The costs associated specifically with O&M activities are small and are not accounted for separately, since they are performed as part of the plant-wide, long-term surveillance and maintenance program and as part of a plant-wide environmental monitoring program.

4.5 WAGs 1 AND 7 (SWOU)

Located within the DOE's property boundary, WAGs 1 and 7 are comprised of nine SWMUs. Of those SWMUs, this Five-Year Review addresses SWMU 8, the C-746-K Landfill, and SWMU 100, the Fire Training Area. The other SWMUs associated with WAGs 1 and 7 either were deferred (evaluation of SWMU 38, the C-615 Sewage Treatment Plant, was deferred because its operations are ongoing) or determined not to pose an unacceptable risk to human health and the environment, based on the surface water and sediment exposure pathways (these "no action" sites include SWMUs 130 through 134 and SWMU 136).

The C-746-K Sanitary Landfill, SWMU 8, is located southwest of the PGDP fenced security area approximately 200 m (656 ft) southeast of the C-611 Water Treatment Plant. It is situated immediately west of Bayou Creek and north of an unnamed tributary to Bayou Creek. Drainage ditches located along the western and northern edges of the landfill flow to the south into the unnamed tributary and to the east into Bayou Creek, respectively. Figure 4.1 depicts the location of SWMU 8.

Records indicate that PGDP used the landfill between 1951 and 1981 for disposal of fly ash from the plant's coal combustion boilers, uncontaminated combustible plant waste, and potential radiologically contaminated plant waste. The fly ash was believed to have been disposed of in trenches excavated 2 to 3 m (5 to 10 ft) below ground surface (bgs). During operations, trenches were cut in the fly ash and used for burning trash. This practice ceased in 1967, after which waste was buried without burning. The waste, containing primarily office waste and some construction debris and kitchen waste, was placed in trenches excavated within the fly ash and covered, when necessary, with additional fly ash or soil fill. In addition to these materials, sludge from the C-615 Sewage Treatment Plant may have been buried at the unit, as it reportedly was used as fill material. Soil boring information indicates that up to 9 m (28 ft) of fly ash and trash was placed in the landfill. The landfill was closed in 1982 and covered with a 15- to 30-cm (6- to 12-inch) clay cap and a 46-cm (18-inch) vegetative cover.

On January 30, 1992, PGDP personnel discovered leachate in a ditch on the southwest side of the landfill. DOE conducted sampling at five leachate seep locations around the landfill. VOCs (TCE; 1,1-DCE; 1,1-dichloroethane [1,1-DCA]; and trans-1,2-DCE) and metals (aluminum, iron, manganese, and zinc) were detected above background levels in the leachate samples. The leachate was acidic and the particulate matter in the leachate generally was orange to yellow in color. The precipitation of dissolved metals from the leachate was thought to be causing the orange to yellow staining observed at various points along the creek banks. The condition was deemed to be in noncompliance with the water quality provisions of 401 *Kentucky Administrative Regulations* (*KAR*) 5:031, which prohibit discharges that produce "objectionable color" into waters of the Commonwealth of Kentucky. On September 15, 1992, the Kentucky Division of Water (KDOW), issued a Notice of Violation (NOV) to DOE for "unpermitted seepage areas from the C-746-K Sanitary Landfill into waters of the Commonwealth."

As a result of the NOV, DOE, with the approval of the EPA and KDEP, undertook an interim corrective action to address the seeps. To prevent any further release of solids to the unnamed tributary, DOE installed a sandbag dam with a liner in the drainage ditch southwest of the landfill. The interim action also repaired the subsidence of the existing landfill cap by recontouring the cap to promote surface water runoff. Since the landfill cap repair was completed in October 1992, these measures have been effective in reducing seepage into the creeks. In addition, a surface water monitoring program was initiated at the landfill to monitor contaminant levels in the leachate and adjacent creeks.

The Fire Training Area, SWMU 100, is located in the southwest corner of PGDP. It consists of one large rectangular surface burn area, two circular burn pan areas, once circular electric pump area, an elevated and bermed fuel tank area, and two square burn area depressions. The burn areas are unlined and are not bermed. The Fire Training Area has been used since 1982 for staging fire training exercises involving waste oils, fuels, and other combustible liquids. Combustible liquids were not burned in the unlined areas after 1987. Fire training exercises continue to be conducted in the vicinity, but in order to prevent any negative impacts to the environment, no burning is conducted in unlined areas and flammable liquids are no longer used.

4.5.1 Remedy Selection

DOE signed the WAGs 1 and 7 ROD February 20, 1998, and EPA signed August 10, 1998 (DOE 1998b). KDEP concurred with the selected remedy June 24, 1998. The remedial action objectives (RAOs) for this unit established in the WAGs 1 and 7 ROD are to control the release of COCs from the unit, limit direct contact by humans, and reduce overall risks to ecological receptors.

The WAGs 1 and 7 ROD defined and identified the following components of the remedial action for SWMU 8.

- Signs will be posted at the entrance to the C-746-K Landfill site and along the creeks, visible at any access point to the landfill, that clearly state the potential risks to human health posed by the leachate seeps and contaminated sediments in the creeks. The signs will be designed to be resistant to the elements.
- Riprap will be placed along the creek banks at the apparent seep locations along the unnamed tributary and Bayou Creek to minimize erosion. The riprap will be sized appropriately to reduce the potential to be displaced during high-flow events.

- A deed notice and restrictions will be placed in the chain of title to the deed of the property to inform potential buyers and/or users of the potential risks to human health and the environment posed by the leachate seeps and the controls implemented at the site to minimize potential exposure. Additionally, the deed restrictions legally will bind the buyer to restricted uses of the property.

- DOE will continue to monitor four sampling points along Bayou Creek and the unnamed tributary adjacent to the landfill. Further interim actions will be implemented if monitoring indicates that additional remedial activity is necessary. These measures will continue until such time as the KDOW implements a discharge permit that allows for monitoring of landfill discharges and protection of the environment afforded by the permit conditions. At that time, criteria set forth in the permit for monitoring will be adhered to and the current monitoring practices will be discontinued.

- The groundwater monitoring program at the landfill will be modified so that MW303 no longer will be monitored, and it will be replaced by another well. The new well will be located within the vicinity of MW303 and will be screened to the base of the Terrace Gravel deposits. Initially, samples will be collected from the new MW on a quarterly basis in order to discern seasonal variations in contaminant levels. The new well will be monitored for the parameters established under the environmental surveillance (new MW) program. The parameters analyzed and the frequency sampled will be reevaluated after one year, and any necessary modifications will be documented in the annual update to the Sampling and Analysis Plan Addendum.

- The current landfill cap maintenance program will be continued (DOE 1998b).

The selected remedy for SWMU 100 was no further action beyond the existing institutional controls.

The institutional controls for SWMUs 8 and 100 are forms of LUCs. The EPA regional office issued a policy in April 1998 for assuring the long-term effectiveness of LUCs at federal facilities (Johnston 1998). PGDP subsequently developed a site-specific MOA and LUCAP (DOE 2000d). The PGDP LUCAP specifies that decision documents, approved prior to the effective date of the MOA in which LUCs were selected as part of the remedy, will be analyzed for the effectiveness of the LUCs during the ROD Five-Year Reviews. The effectiveness of the LUCs at SWMUs 8 and 100 are addressed in this Five-Year Review. Since the ROD for this IRA was signed prior to the effective date of the PGDP MOA and LUCAP, a LUCIP does not exist for the LUCs at SWMUs 8 and 100 in this IRA.

4.5.2 Remedy Implementation

The Post-Construction Report and Operations and Maintenance Plan for Waste Area Groupings (WAGs) 1 and 7 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, DOE/OR/07-1743&D1, documents the construction of the remedial actions taken as a result of the WAGs 1 and 7 ROD as well as the postconstruction O&M activities (DOE 1999b). Because SWMU 100 is a no further action site (maintenance of existing institutional controls), it is not discussed in detail in this section.

Portions of the remedial action described in the WAGs 1 and 7 ROD for SWMU 8 were initiated prior to regulatory approval of the document due to damaging spring flooding in April and May 1997. A small section of the landfill cap, specifically the 0.46 m (18 inches) of vegetative cover on top of the 0.30 m (12 inches) of clay cap, failed on the 3:1 slope and sloughed into Bayou Creek.

In February 1997, the Kentucky Division of Waste Management (KDWM) gave approval to remove the drainage swale diversion dam located to the southwest of the C-746-K Sanitary Landfill because the dam no longer was performing its intended purpose. The dam was constructed in February 1992 in response to the initial discovery of discoloration from the landfill leachate. The dam was intended to bypass and isolate the contamination from the rest of the drainage swale; however, it soon was discovered that the interim action was insufficient due to the dam's being flooded and breached during significant rainfall events. Although this construction activity helped facilitate the remedial action to be conducted, it was not part of the remedial action defined in the WAGs 1 and 7 ROD, and no additional documentation or modification to the remedy was associated with this activity.

4.5.2.1 Surface water and groundwater monitoring

The new surface water monitoring requirements at the C-746-K Landfill have been incorporated into the Watershed Monitoring Plan directed by the KPDES permit. Groundwater monitoring continues under the PGDP Groundwater Monitoring Program.

4.5.2.2 Riprap placement

The remedy identified in the WAGs 1 and 7 ROD included the placement of riprap on visible leachate seep locations to prevent direct exposure. The design for this project provided for the covering of three leachate seep sites and the stabilization of the Bayou Creek bank located on the east side of the C-746-K Sanitary Landfill. The typical leachate seep cover construction consisted of clearing existing vegetation and placing a geotextile fabric layer under a layer of riprap at each leachate seep site. An Agreement In Principle representative requested that additional riprap be placed in the southwest portion of the west drainage swale; therefore, Class II-size stone was required to reduce flow restriction in the smaller swale. A total of three leachate seep sites was covered to minimize the potential for human and animal exposure. Construction work for this component of the action began August 5, 1997, and was completed August 12, 1997.

4.5.2.3 Warning and landfill entrance sign installation

DOE installed warning signs in November 1997 at each of the leachate seep areas and around the landfill. The signs notify the public of the risk associated with the areas. PGDP maintenance personnel installed an entrance sign at the entrance of the C-746-K Sanitary Landfill in February 1998. These signs are inspected on a routine basis and are replaced as necessary.

4.5.2.4 MW abandonment and installation

The two MWs identified in the ROD (MW184 and MW303) were abandoned as approved by the KDWM. One new well (MW344) was installed to replace MW303 at the C-746-K Sanitary Landfill in March 1998. The intent of the new well is to detect any contamination that could be coming from the landfill and traveling along the top of the Porters Creek Clay and into the RGA.

4.5.2.5 Deed restriction implementation

According to the ROD, a deed notice and a restriction were placed in the chain of title to the deed of the property to inform potential buyers and/or users of the potential risks to human health and the environment posed by the leachate seeps. The notice and restriction were filed August 24, 1998, with the McCracken County Court Clerk.

4.5.3 Systems Operations/O&M

A representative of the Five-Year Review Team conducted a site inspection of the C-746-K Sanitary Landfill (SWMU 8) and its immediate surroundings March 3, 2003, to determine continued compliance with the required remedial actions for this SWMU as directed in the WAGs 1 and 7 ROD (DOE 1998b).

A sign posted at the entrance to the landfill area clearly identifies the potential human health risks posed by the leachate seeps and contaminated sediments present in the creeks and drainage ditches around the landfill. Additional warning signs are posted at periodic intervals along the west bank of Bayou Creek to the east and along the north bank of the unnamed tributary to the south. Although the posts on which some signs are mounted have been bent, the signs are in good condition and clearly legible. Additionally, SWMU 8 now falls within the boundaries of an extended security buffer zone around PGDP that was established by DOE immediately following the events of September 11, 2001. This buffer zone severely restricts access to the area by the general public.

Riprap placed along the west bank of Bayou Creek for erosion protection and to cover apparent seep sites is in place and is functioning as intended. Riprap has also been placed at one apparent seep area along the unnamed tributary on the south side of the landfill and the area drainage ditch along the west side. These areas also are in good condition and performing their intended function.

The covered and capped area of the landfill is in good condition with a well-established vegetative cover that appears to drain well. There are no visible indications that water stands on the cap or side slopes. There were no signs of erosion on the landfill cap or side slopes. The area is maintained well and is mowed regularly. There are seven passive gas vents on top of the landfill that are in good condition and show no signs of leakage or settlement. With the exception of a few minor potholes, the service road around the landfill is maintained and in good condition.

Four locations in the unnamed tributary and Bayou Creek in the vicinity of SWMU 8 are sampled quarterly by the M&I Contractor's Environmental Services subcontractor.

During this site visit, warning signs were not evident on the south side of the unnamed tributary along its central and western boundaries with the landfill. This portion of the tributary is accessible to the public, since the area south of the tributary is part of the WKWMA.

During this site visit, there was visible evidence that vehicular traffic had been on the top and southern side slopes of the landfill. The landfill is covered with an engineered cap designed to promote drainage away from the landfill and to restrict the infiltration of water into the wastes below. Traffic on the top and side slopes of the landfill should be restricted to foot traffic and necessary maintenance equipment only to minimize the risk of damage to the engineered cap.

The costs associated specifically with SWMUs 8 and 100 activities are small and are not accounted for separately, since they are performed as part of the plant-wide, long-term surveillance and maintenance program and as part of a plant-wide environmental monitoring program.

4.6 SWMUs 2 AND 3 (BGOU)

In 1995, the *Record of Decision for Interim Remedial Action at Solid Waste Management Units 2 and 3 of Waste Area Group 22 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* was signed (DOE 1995a). Because SWMU 3 is closed with a RCRA cap and is being addressed by RCRA postclosure permit requirements, the ROD required no further action for SWMU 3.

4.6.1 Remedy Selection

The primary objective of the interim remedy for SWMU 2 was to reduce the infiltration of precipitation into buried wastes and mitigate any leaching of COCs from the wastes, while DOE collected additional data to support evaluation of a final remedial action. The SWOU and the GWOU at PGDP will be addressed comprehensively in subsequent OUs. SWMUs 2 and 3 are identified as source units at PGDP.

The principal threat associated with SWMU 2 was the potential for transport of contaminants to the GWOU and subsequent threats associated with the potential contamination of an aquifer and transport of contaminants beyond DOE property. The major components of the interim action remedy included investigation, multilayer low-permeability cap, groundwater monitoring, and institutional controls.

The institutional controls are forms of LUCs. The EPA regional office issued a policy in April 1998 for assuring the long-term effectiveness of LUCs at federal facilities (Johnston 1998). PGDP subsequently developed a site-specific MOA and LUCAP (DOE 2000d). The PGDP LUCAP specifies that decision documents, approved prior to the effective date of the MOA in which LUCs were selected as part of the remedy, will be analyzed for the effectiveness of the LUCs during the ROD Five-Year Reviews. The effectiveness of the institutional controls, or LUCs, is addressed in this Five-Year Review. Since the ROD for this IRA was signed prior to the effective date of the PGDP MOA and LUCAP, a LUCIP does not exist for the institutional controls at SWMUs 2 and 3.

4.6.2 Remedy Implementation

A Data Summary and Interpretation Report was issued and approved in 1997, after DOE conducted an investigation at SWMU 2 to provide needed information before the selected interim action was fully implemented and to provide additional data to evaluate a final remedial action for SWMU 2 (DOE 1997b). One of the goals of this investigation was to determine if the waste within SWMU 2 was saturated. The investigation concluded that the waste within SWMU 2 is predominately saturated (DOE 1997b). It was determined that placement of a cap on SWMU 2 would not prove effective, and the design and construction activities outlined within the ROD were canceled (Hodges 1996). Additionally, the investigation concluded the following.

- Uranium is the primary component of the buried waste (with minimal, associated PCB oil).
- Migration of contaminants from waste cell and soil sources may have contributed concentrations of TCE at the PGDP boundary that exceed both human health risk-based and regulatory (i.e., MCL) Preliminary Remediation Goals over the short-term. Modeling, however, indicates that migration of radionuclides is not a concern.
- Lateral movement of groundwater in the UCRS does occur, but not to a significant extent. Vertical transport of TCE is significant, but is not expected to be significant for uranium.

The SWMUs 2 and 3 ROD specified a groundwater monitoring program be implemented in the uppermost aquifer, the RGA, to detect any release of contaminants from SWMU 2 (DOE 1995a). In 1996, three RGA MWs were installed to detect potential releases from SWMU 2. MW337 and MW338 were installed downgradient of SWMU 2, and MW333 was installed upgradient of SWMU 2. The wells currently are sampled as part of the PGDP Groundwater Monitoring Program.

Further, institutional controls were implemented to prevent transferal of the SWMU 2 property and to prevent future intrusive activities at the unit.

4.6.3 Systems Operations/O&M

DOE will review this interim action at SWMU 2 periodically until a final remedial action is selected in a ROD. The CERCLA requires that remedial actions that result in hazardous substances, pollutants, or contaminants remaining at the site above levels that do not allow for unlimited use and unrestricted exposure, be reviewed no less often than once every five years after initiation of the selected remedial action. This IRA leaves waste in place that requires restricted access; therefore, SWMU 2 will be reviewed no less than once every five years. In addition to the five-year review, the ROD states that the groundwater data will be evaluated annually. The groundwater monitoring program for SWMU 2 is specified in the annual *Environmental Monitoring Plan* (BJC 2002).

On March 11, 2003, a site inspection of the C-749 Uranium Burial Ground was performed. This area is located north and west of Building C-600 within the boundaries of the Controlled Access Area of PGDP.

The entire area of the burial ground is roped off and posted as a Radiation Area. A permit is required prior to entering the area. The area is covered with a good stand of grass and is mowed and maintained. There were no indications of erosion or standing water in the area. An access road is located on the south side of the area outside the radiological boundary. The road is well maintained and in good condition. Access to the north side of the area is through the C-745-C Cylinder Storage yard. This area also is well maintained.

MWs in the area appear to be in good condition and well maintained. The wells are secured with protective caps or casings with locks and are surrounded with guard posts.

4.7 WATER POLICY

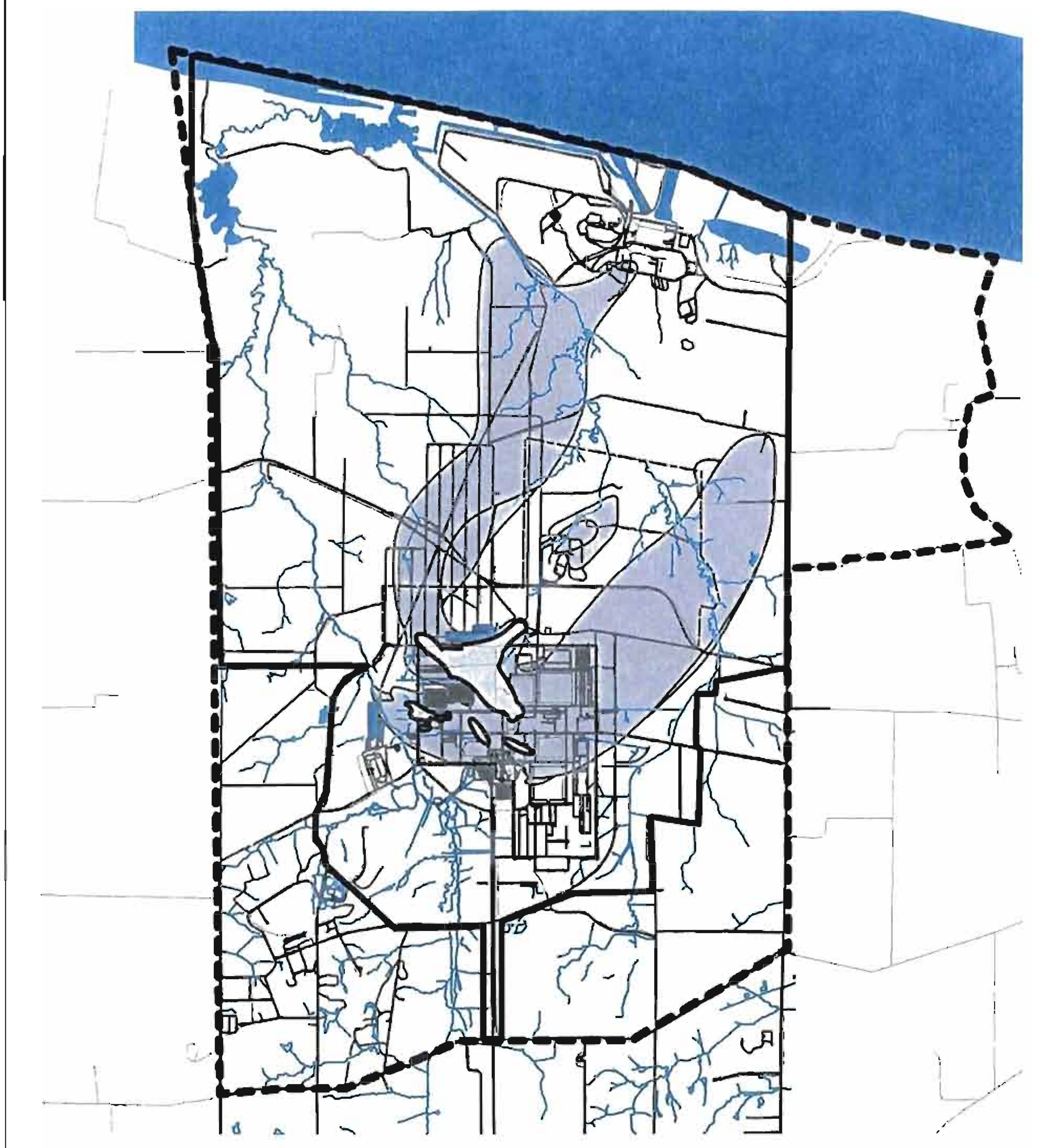
4.7.1 Remedy Selection

When TCE and ^{99}Tc were detected in private wells located north of the PGDP in August 1988, DOE immediately placed affected residences/businesses on alternate water supplies and began an intensive monitoring and investigation program to define the extent and temporal variations of the groundwater contaminant plumes. DOE developed the PGPD Water Policy and conducted an *Engineering Evaluation/Cost Analysis for the Water Policy at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 1993c).

The PGDP Water Policy states, "It is the intent of the Paducah Gaseous Diffusion Plant Environmental Restoration Program to offer municipal water service in accordance with this Policy to all existing private residences and businesses within the projected migration area of the contaminated ground water originating at Paducah Gaseous Diffusion Plant (affected area)." With the adoption of the Water Policy, DOE focused its groundwater monitoring program on the Water Policy area and adjacent areas potentially downgradient of the contaminant plumes (i.e., water sampling box). Refer to Fig. 4.2 for a map of the current groundwater contaminant plumes and definition of the Water Policy area.

DOE signed the Action Memorandum for the Water Policy removal action in June 1994, and the removal action is described in text from the Action Memorandum, as follows.

- DOE formally offered to provide municipal water to all existing residences and businesses within the affected area surrounding PGDP. They also offered to pay for connection of those residences that were not yet connected to a public water supply. These residences and businesses were responsible for cooperating and working with the West McCracken Water District to connect the water supply.
- DOE offered to pay the reasonable costs of water bills in the affected area through December 1997, at which time the Water Policy would be reevaluated and a determination would be made regarding whether the Water Policy would continue, undergo modification, or be eliminated. The determination of what constitutes a reasonable cost of water consumption for residents is based on the historical usage of the applicable wells. Water usage costs caused by increases in agricultural water use, livestock water use, or subdivision of property would not be reimbursed under this action.



LEGEND:
Water Policy Boundary
Water Sampling Box
TCE (5 ug/L)
Tc-99 (900 pCi/L)
Plume Contours from 2002 Annual Plume Map Revision

2000 0 2000 4000 Feet

TRUE NORTH 20° PLANT NORTH

U.S. DEPARTMENT OF ENERGY
DOE OAK RIDGE OPERATIONS
PADUCAH GASEOUS DIFFUSION PLANT

BECHTEL JACOBS

BECHTEL JACOBS COMPANY LLC
MANAGED FOR THE US DEPARTMENT OF ENERGY UNDER US GOVERNMENT CONTRACT DE-AC05-03OR22980
Oak Ridge, Tennessee • Paducah, Kentucky • Portsmouth, Ohio

SAIC

Science Applications International Corporation
P.O. Box 2502
Oak Ridge, Tennessee 37831

Fig. 4.2. Location of Water Policy boundary.

FIGURE No. c5ac90001sk665.apr
DATE 09-16-03

the applicable wells. Water usage costs caused by increases in agricultural water use, livestock water use, or subdivision of property would not be reimbursed under this action.

- DOE pursued water-use agreements, which delineated the respective responsibilities of the residents, businesses, and DOE, with each household or business that receives free water. Provisions included in the agreements specify that the resident or business may not drill new water supply wells or use existing water wells. Also, PGDP personnel are permitted property access for groundwater sampling purposes. PGDP personnel installed locks to prevent unauthorized use of the existing water wells.
- Existing PGDP MWs continue to be sampled regularly to track migration of groundwater contaminant plumes. Additional MWs were installed in conjunction with other DOE environmental restoration programs.

The Engineering Evaluation/Cost Analysis (DOE 1993c) also specified the need to conduct a five-year review.

4.7.2 Remedy Implementation

The Water Policy removal action was implemented as described in the Action Memorandum. In 1997, DOE conducted a five-year review of the action and a reevaluation of the Water Policy. The review concluded that the Water Policy protects residents from risks associated with use of contaminated groundwater. The reevaluation resulted in the following recommendations for revising the Water Policy.

- DOE should offer to pay the reasonable costs of water bills in the affected area through December 2002, at which time the Water Policy was to be reevaluated and a determination would be made as to whether the Water Policy will continue, undergo modification, or be eliminated. The determination of what constitutes a reasonable cost will be decided by DOE.
- As new residents and businesses move into the Water Policy area, DOE should make decisions on a case-by-case basis about whether to provide water to the new area water user at DOE's expense.

DOE has secured formal agreements, known as license agreements, with the majority of residents located within the area affected by the Water Policy. All residents have chosen to use municipal water, but some residents have chosen not to sign the license agreements. There is no mechanism to prevent current or future residents from using potentially contaminated groundwater from private wells. Some residences for which DOE pays for municipal water are located in areas without contaminated groundwater.

4.7.3 Systems Operations/O&M

DOE paid for water supply line extensions of the West McCracken Water District into the Water Policy area. Total capital construction costs for implementation of the Water Policy were $1,027,781. The annual cost of the water bills is shown in Table 4.4. On average, DOE pays approximately $4,400 to $6,700 per month for 102 water bill accounts. O&M of the water supply lines are the responsibility of the West McCracken Water District.

Table 4.4 Annual cost of water bills

DOE Fiscal Year	Water Bills
1994 (June 1994 – September 1994)	$38,104.30
1995 (October 1994 – September 1995)	$55,496.16
1996 (October 1995 – September 1996)	$80,142.69
1997 (October 1996 – September 1997)	$66,613.79
1998 (October 1997 – September 1998)	$52,689.27
1999 (October 1998 – September 1999)	$78,378.88
2000 (October 1999 – September 2000)	$74,530.99
2001 (October 2000 – September 2001)	$67,011.46
2002 (October 2001 – September 2002)	$74,624.34
2003 (October 2002 – August 2003)	$60,138.95

DOE and the West McCracken Water District have experienced some problems with residents that are provided municipal water under the Water Policy. As a standard practice, the homeowners are responsible for water line repairs downstream of their respective water meters, and the West McCracken Water District is responsible for water line repairs upstream of the residents' water meters. Some residents have experienced water leaks for which they are responsible, but they chose not to repair the leaks. In order to reduce the increased cost of the water bill created by the unrepaired leaks, DOE chose to hire a licensed plumber and repair the leaks, even though they were clearly the responsibility of the residents.

The DOE regularly collects groundwater samples from the area in the water box. Three residential wells are sampled each month, 18 residential wells are sampled semiannually, and several groundwater MWs are sampled at various frequencies (BJC 2002). The interval of sampling of each well within the water box has been adjusted to characterize temporal variation within the plumes and to detect the further spread of contaminants. Beginning in 1997, DOE expanded the number of wells sampled on an annual basis along the eastern edge of the Water Policy area, and three additional MWs were installed during 2003.

All PGDP groundwater monitoring data is maintained in DOE's computer database, the Oak Ridge Environmental Information System (Paducah-OREIS). DOE reports the results of groundwater monitoring in its annual series of environmental reports. All occurrences of off-site groundwater contamination related to PGDP have occurred within the Water Policy area. The Northwest Plume does not appear near the residences located in extreme northwest corner of the Water Policy area.

5. PROGRESS SINCE LAST REVIEW

The following text presents the progress of each remedial action for the 1998-2002 period. With the exception of the SWMU 91 action, all remedial actions are continuing remedies.

5.1 NORTHWEST PLUME (GWOU)

The previous five-year review for this action included the following statements of protectiveness (DOE 1999d):

The GWOU response actions taken to date at the PGDP are protective of human health and the environment. The combination of these actions minimizes the potential for local residents to be exposed to the contaminated groundwater and controls further migration of contaminants until a final remedial action for the GWOU is developed and implemented. These actions also generate valuable information and data that is being used to develop a final action for the GWOU.

The Northwest Plume IRA is protective of human health and the environment within its limited scope. Since the action is interim, it was not designed to fully remediate the dissolved plume; however, the action is controlling and reducing the migration of the high concentration portions of the Northwest Plume. The action also provides additional data needed to evaluate a final action for the GWOU. Although the Water Policy minimizes the potential threat to nearby residents by providing an alternate water supply, the Northwest Plume action further reduces threats by controlling off-site migration of the high concentration portions of the plume.

In addition, the previous review included recommendations to continue the Water Policy removal action and the Northwest Plume IRA to control the migration of the high-concentration portion of the Northwest Plume and to prevent exposure of nearby residents to the contaminated groundwater, until such time as DOE, with the approval of the EPA and KDEP, determines that these actions no longer are necessary and/or appropriate. These recommendations continue to be implemented.

The Northwest Plume IRA has continued to operate as intended during the 1998-2002 period. This ROD action is reducing contaminant concentrations in the core of the Northwest Plume. The ROD is not intended or expected to return groundwater quality to MCLs.

A downhole camera inspection revealed that the casings of MW234 and MW235, located in the north well field, appeared to be compromised by corrosion. DOE replaced MW234 with MW380 and replaced MW235 with MW381 during the summer of 2002.

5.2 NORTHEAST PLUME (GWOU)

The previous five-year review for this action included the following statements of protectiveness (DOE 1999d):

The GWOU response actions taken to date at the PGDP are protective of human health and the environment. The combination of these actions minimizes the potential for local residents to be exposed to the contaminated groundwater and controls further migration of contaminants until a final remedial action for the GWOU is developed and implemented. These actions also generate valuable information and data that is being used to develop a final action for the GWOU.

Monitoring data indicates declining concentration trends in the Northeast Plume. However, due to the timing of this review, the DOE has only 2.5 years of quarterly monitoring data to assess the effectiveness of the action. While the DOE believes the action is effective and will meet remedial objectives, a complete evaluation can be made after a full five years of operation. If the declining concentration trends continue at the Northeast Plume, the DOE will determine the action to be meeting its limited interim objectives. Because monitoring data presently is indicating declining concentrations in the plume, the DOE concludes that the action is protective of human health and the environment, since off-site migration is being reduced and the Water Policy prevents human exposure to the contaminated groundwater. The Northeast Plume IRA also provides valuable data needed for evaluating a final action for the GWOU.

In addition, the previous review included recommendations to continue the Water Policy removal action and the Northeast Plume IRA to control the migration of the high-concentration portion of the Northeast Plume and to prevent exposure of nearby residents to the contaminated groundwater, until such time as DOE, with the approval of EPA and KDEP, determines that these actions no longer are necessary and/or appropriate. These recommendations continue to be implemented.

Groundwater extraction and treatment in the Northeast Plume largely continued as intended during the 1998-2002 period. The Northeast Plume ROD is an IRA to reduce contaminant levels in the high-concentration core of the plume near the northern extent of 1000 μg/L TCE. This ROD is a first phase of a GWOU action and is not expected to reduce contaminant levels to risk-based standards.

5.3 SWMU 91 (GWOU)

The previous five-year review for this action included the following statements of protectiveness (DOE 1999d):

> The GWOU response actions taken to date at the PGDP are protective of human health and the environment. The combination of these actions minimizes the potential for local residents to be exposed to the contaminated groundwater and controls further migration of contaminants until a final remedial action for the GWOU is developed and implemented. These actions also generate valuable information and data that is being used to develop a final action for the GWOU.
>
> The full-scale Lasagna™ remedial action at SWMU 91 has not been implemented yet. The unit is inside the DOE's security fence, the Water Policy is in place, and the DOE will follow appropriate procedures and meet pertinent ARARs during construction and operation of the action. Therefore, human health and the environment will be protected.

In addition, the previous review included a recommendation to continue the IRA at SWMU 91, to reduce the unit's contribution to groundwater contamination and to provide valuable information for remediating other sources of groundwater contamination. This recommendation was implemented.

DOE initiated and completed the SWMU 91 remedial action during the period covered by this Five-Year Review. This action reduced the average level of TCE in soil to far below the ROD RAO of 5.6 mg/kg (refer to Sect. 7.3.1). Quality issues associated with the C-743-T-17 Field Laboratory initially were identified in a February 2003 QA surveillance. In March 2003, a joint investigation was initiated by DOE, Bechtel Jacobs Company LLC (BJC), and CDM Federal Programs, Inc., to identify the issues, causes, and corrective actions associated with the C-743-T-17 Field Laboratory. This investigation determined that all the required QA/QC elements to support the reported numbers associated with the Lasagna™ sampling events could not be located. In April 2003, the Lasagna™ site was resampled to verify the initial analytical results from the C-743-T-17 Field Laboratory. The resampling confirmed that the average level of TCE had been reduced to far below the ROD RAO of 5.6 mg/kg.

5.4 NSDD SOURCE CONTROL (SWOU)

The previous five-year review for this action included the following statements of protectiveness (DOE 2000b):

> The interim remedy selected for the NSDD is protective of human health and the environment and is achieving remedial objectives outlined in the ROD. Specifically, the interim remedy is mitigating the entry of contaminants into the NSDD, is reducing migration of contaminants already present in the ditch, and is decreasing the potential for direct contact with contaminated material. Human exposure to the contaminants is prevented by mitigating the entry of additional contaminants into the ditch, by restricting access to the site through signs, and by reducing the potential for contaminant migration.

The DOE certifies that the SWOU response actions taken to date at the PGDP remain protective of human health and the environment. These actions are reducing immediate risks until a final remedy for the SWOU can be implemented.

In addition, the previous review included a recommendation to continue the NSDD IRA until a final remedial action is selected and implemented for the SWOU. This recommendation continues to be implemented.

On September 25, 2002, DOE signed a second ROD for the NSDD, the *Record of Decision for Interim Remedial Action at the North-South Diversion Ditch at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* as revised by EPA and the Commonwealth of Kentucky to approve implementation of remedial actions at Sections 1 and 2 of the NSDD (DOE 2002d).

In the second ROD, RAOs for sections of the NSDD located inside the security-fenced area at PGDP (i.e., Sections 1 and 2) are as follows:

- prevent future discharge of process water to the NSDD;
- reduce the risk to industrial workers and ecological receptors from exposure to contaminated surface soil, sediment, and surface water; and
- prevent future on-site runoff from being transported off-site (i.e., outside the existing security fence) via the NSDD.

The LUC objective identified to assure the protectiveness of the preferred alternative for Sections 1 and 2 of the NSDD is as follows.

- Sections 1 and 2 (Industrial areas) – Restrict unauthorized access, restrict unauthorized excavations or penetrations below prescribed contamination cleanup depth, and restrict uses of the area that are inconsistent with the assumed industrial use (i.e., to prevent recreational and/or residential use).

Implementation of LUCs designed to meet these objectives will be documented in a LUCIP. DOE is responsible for implementing, maintaining, monitoring, reporting on, and enforcing the LUCs selected under this ROD.

The selected remedy will be implemented in a two-phase approach. Phase I, which includes the following, was initiated in October 2002:

- installation of piping to route process discharges, which go to the NSDD, directly to the C-616 Water Treatment Facility;
- installation of a plug in the NSDD at the PGDP security fence and in three other ditches within the watershed to prevent discharge of storm-water runoff to sections of the NSDD outside of the security-fenced area; and
- installation of storm-water runoff controls in the NSDD downstream of Section 2 prior to excavation of a surge basin during Phase I (existing culverts at the downgradient end of Section 2 will be plugged and filled with controlled low-strength material as an initial step in surge basin construction and existing sediment basins inside the security fenced area will remain in place to receive runoff).

Installation of hard piping to reroute process discharges in the NSDD was completed in January 2003. Installation of plugs in the NSDD at the security fence and excavation of the surge basin are pending regulatory approval of the *Remedial Design/Remedial Action Work Plant for the North-South Diversion*

Ditch Detention Basin at the *Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/OR/07-2008&D2 (DOE 2003c), and the *Sampling Plan for the Remedial Actions for Sections 1 and 2 of the North-South Diversion Ditch to Address Near-Surface Soil Contamination at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* BJC/PAD-400 (BJC 2003a), which were submitted to regulators on February 28, 2003.

DOE will initiate Phase II upon completion of Phase I; Phase II will consist of excavation of contaminated soils and sediments along the entire length of Sections 1 and 2 of the NSDD to a depth of 4 ft bgs, together with appropriate staging and disposal of contaminated materials excavated during Phases I and II. Following excavation, soil samples will be collected from the bottom of the excavation. If the sampling indicates the presence of excess levels of residual contamination (i.e., PTSM), DOE will review the data and determine if additional, limited excavation is required. Wastes will be characterized and disposed of at an appropriate facility after excavation and characterization. Following excavation, the ditch channel will be restored to grade with 2 ft of clay cover, approximately 2 ft of clean soil, and vegetated. In Sections 1 and 2 of the NSDD, some contamination is expected to remain at depth; therefore, the five-year reviews mandated by CERCLA will be required.

Sections 1 and 2 of the NSDD, located within the security-fenced area of PGDP, are identified as an industrial zone for both current and anticipated future land use. As part of the selected remedy for the NSDD remedial action, LUCs consisting of property record notices and restrictions; administrative controls (e.g., excavation/penetration permits); and access controls (e.g., fences, gates, security measures) will be imposed for portions of the NSDD within the security-fenced area of PGDP. The D2/R1 LUC Implementation Plan (LUCIP for the NSDD) was submitted to EPA and the Kentucky Natural Resources and Environmental Protection Cabinet (KNREPC) for approval on February 28, 2003 (DOE 2003d).

5.5 WAGs 1 AND 7 (SWOU)

The previous five-year review for this action included the following statements of protectiveness (DOE 2000b):

> As objectified in the WAGs 1 and 7 ROD, the remedial action at SWMU 8 of WAGs 1 and 7 is reducing the potential for human exposure by notifying persons of the potential hazards in the area. The potential for direct human contact also is reduced by the placement of riprap along the seeps and by deed restrictions recorded for SWMU 8. The action is protective of human health until a final action can be implemented. The no further action at SWMU 100 is being met through the continued maintenance and existence of the PGDP security fence.
>
> The DOE certifies that the SWOU response actions taken to date at the PGDP remain protective of human health and the environment. These actions are reducing immediate risks until a final remedy for the SWOU can be implemented.

In addition, the previous review included a recommendation to continue the SWMU 8 IRA until a final remedial action is selected and implemented for the SWOU. This recommendation continues to be implemented.

During the 1998-2002 review period, the remedial action at SWMU 8 has continued to reduce the potential for human exposure by notifying persons of the potential hazards in the area as identified in the WAGs 1 and 7 ROD (DOE 1998b). The potential for direct human contact also is reduced by the placement of riprap along the seeps and by deed restrictions recorded for SWMU 8. There have been no changes to SWMU 100.

5.6 SWMUs 2 AND 3 (BGOU)

The previous five-year review for this action included the following statements of protectiveness (DOE 2000e):

> The interim remedy selected for SWMU 2 is meeting remedial objectives defined in the ROD. Until a final BGOU action can be implemented, the current action is protective of human health by preventing human exposure to buried wastes and groundwater through rigorous operational controls (i.e., radiological postings, radiological work permits, and excavation permits).
>
> The DOE certifies that the BGOU response actions taken to date at the PGDP remain protective of human health and the environment. These interim actions are reducing immediate risks until a final remedy for the BGOU can be implemented.

During the previous review, additional MWs were recommended, based on interpreted plume migration. Hydrologic information available at that time indicated that MW placement was not optimal, because groundwater migration was westward. Further review of contaminant trends, however, indicated groundwater flow direction is predominantly to the northwest—the condition for which the monitoring network was designed; therefore, the installation of additional MWs northwest of SWMU 2 is unnecessary.

5.7 WATER POLICY (GWOU)

The previous five-year review for this action included the following statements of protectiveness (DOE 1999d):

> The GWOU response actions taken to date at the PGDP are protective of human health and the environment. The combination of these actions minimizes the potential for local residents to be exposed to the contaminated groundwater and controls further migration of contaminants until a final remedial action for the GWOU is developed and implemented. These actions also generate valuable information and data that is being used to develop a final action for the GWOU.
>
> The Water Policy is protective of human health and the environment and is meeting its objectives by minimizing the potential threat to human health by preventing human exposure to contaminants in the groundwater. The Water Policy is integral to all other groundwater actions in that it protects local residents while the DOE is developing a final GWOU action. The Northwest Plume and Northeast Plume IRA are not designed to completely remediate the dissolved-phase plumes; therefore, the Water Policy is essential to ensuring that the Northwest Plume and Northeast Plume IRAs are protecting human health.

In addition, the previous review included a recommendation to continue the Water Policy removal action to prevent exposure of nearby residents to the contaminated groundwater until such time as DOE, with the approval of EPA and KDEP, determines that it is no longer necessary and/or appropriate. This recommendation continues to be implemented.

The Water Policy removal action has continued to operate as intended during the 1998-2003 period. All residences located within the Water Policy area utilize municipal water. Monitoring results indicate that the Northeast and Northwest Plumes have not expanded beyond the area encompassed by the Water Policy. No significant changes have occurred since the previous five-year review was conducted.

6. FIVE-YEAR REVIEW PROCESS

6.1 ADMINISTRATIVE COMPONENTS

The Remedial Action Assessment Subcontractor to BJC performs five-year reviews. BJC is the M&I Contractor to DOE, the responsible party for the site. The DOE Project Manager, Gary Bodenstein, with support from BJC, and its subcontractor, Science Applications International Corporation, conducted the initial reviews during January through March 2003, followed by a review of the Water Policy removal action during September 2003, and established the review schedule whose components included all of the following activities.

- Community Involvement
- Document Review
- Data Review
- Site Inspection
- Local Interviews
- Five-Year Review Report Development and Review

6.2 COMMUNITY NOTIFICATION AND INVOLVEMENT

Community involvement at the site is handled primarily in conjunction with the CAB. The CAB meets monthly to discuss many aspects of environmental restoration efforts at PGDP. All meetings are open to the public. Appendix B contains agendas from the meetings for the period January 1998 – September 2003.

Additionally, copies of AR documents, which include decision documents, are kept at the DOE-run Environmental Information Center (EIC). The EIC is open to the public during regular business hours.

During the CAB meeting held July 17, 2003, the DOE Project Manager provided a presentation to the CAB regarding the Five-Year Review, and indicated that the draft D1 report would be available to the public for review from July 17 through September 2, 2003. In addition, a public notice of this review was published in the local newspaper, *The Paducah Sun,* and the local community was encouraged to review the D1 draft of this report and provide comments. The DOE received no comments from the public.

6.3 DOCUMENT REVIEW

This activity consisted of a review of relevant documents to the remedial action of each of the units and the previous five-year reviews. This initially was conducted during January through March and during September 2003. These documents are included as references in Chap. 12.

6.4 DATA REVIEW

Groundwater, surface water, and sediment samples are collected routinely at PGDP to assess environmental conditions. These data are captured in Paducah's Oak Ridge Environmental Information System (Paducah OREIS). Data were downloaded for review from Paducah OREIS in February 2003 (BJC 2003b). The data initially was reviewed during January through March and during September 2003. Discussions of the results are presented in each of the technical assessment subsections of Chap. 7.

6.5 SITE INSPECTIONS

The Five-Year Review Team conducted inspections at each of the remedial action sites in February and March 2003. Results of the inspections are discussed in each of the technical assessment subsections of Chap. 7. Inspection checklists are presented in Appendix A. In addition to the inspections conducted for this Five-Year Review, SWMUs are inspected annually during routine O&M. These inspections also are summarized in Appendix A.

The Five-Year Review Team identified no significant issues during this review regarding the remedies; however, a few issues have been raised by the site inspections and these are discussed in Chap. 8.

6.6 INTERVIEWS

Members of the Five-Year Review Team conducted interviews during March, May, and September 2003 with various parties connected to the remediation sites. Issues noted during site inspections were discussed with personnel associated with the individual remedial actions. No additional issues were raised. The interviews are presented in Appendix A. The identified issues and recommendations for follow-up are summarized in Chapters 8 and 9 of this report.

7. TECHNICAL ASSESSMENT

This Five-Year Review assessed the remedies in place at six sites as to whether the remedy is protective of human health and the environment. Assessments of these remedies examined the following three questions.

- ***Question A*** – Is the remedy functioning as intended by the decision documents?
- ***Question B*** – Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?
- ***Question C*** – Has any other information come to light that could call into question the protectiveness of the remedy?

The following sections present Questions A, B, and C in more detail for each of the sites reviewed.

In March of 2003, the subcontractor operating the C-743-T-17 Field Laboratory identified and reported to BJC possible quality issues with the analytical data produced by the Field Laboratory. On March 24, 2003, a DOE contractor/subcontractor joint evaluation was initiated to define the nature and extent of the Field Laboratory quality issues and any resultant impacts on the usability of the data. On June 20, 2003, the evaluation team issued a draft evaluation report that presented the quality issues reviewed during the evaluation and the impacts on data usability. This investigation determined that all the required QA/QC elements to support the reported numbers associated with the Lasagna™ sampling events could not be located. Impacts on the usability of Field Laboratory data referenced in this Five-Year Review are discussed in the relevant sections of this report.

7.1 NORTHWEST PLUME (GWOU)

The primary objective of the Northwest Plume IRA is to initiate a first-phase action to control the source and mitigate the spread of contamination in the Northwest Plume. This action addresses a portion of the contaminated groundwater associated with PGDP. Additional interim actions that have been implemented, notably DOE's Water Policy and the removal of PGDP's "Drum Mountain," help to reduce risk related to the Northwest Plume.

7.1.1 Question A: Is the remedy functioning as intended by the decision documents?

Reviews of documents, ARARs, risk assumptions, groundwater monitoring data, and the results of the site inspection all indicate that the South EW Field is functioning primarily as described in the ROD. Dissolved TCE, at a concentration of approximately 100 µg/L, and ^{99}Tc, at an activity of approximately 100 pCi/L, continues to migrate past the east side of the south well field; however, recent groundwater monitoring data suggests that the North EW Field may be failing to reduce the high-concentration core of the Northwest Plume beginning in 2002.

The groundwater EWs of the north and south well fields have continued to operate nearly continuously since the start of pumping on August 28, 1995. Influent and effluent monitoring of the aboveground groundwater treatment system shows that the treatment system is significantly reducing the contaminant levels of the extracted water to levels that are approved for release to surface water.

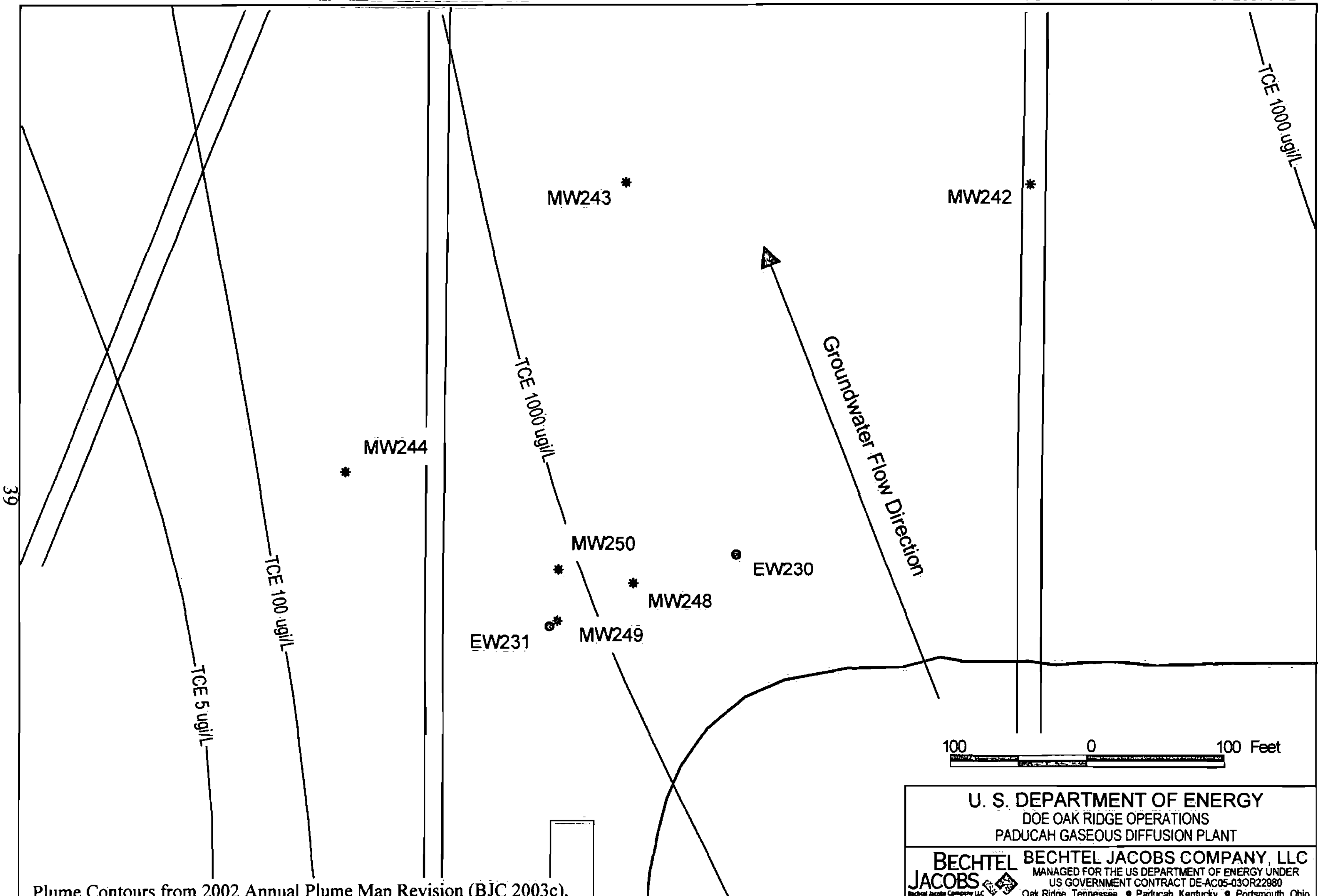
The primary concern with regard to the EW fields is the extent of the zones of capture. For the South EW Field (pumping EW230 and EW231) (see Fig. 7.1.1), groundwater analyses for TCE and ^{99}Tc representing samples from the MW system demonstrate that the EWs have reduced contaminant levels in the RGA and that these reduced levels persist. Table 7.1.1 summarizes contaminant analyses for late 1995, when groundwater extraction began, compared with 2002 levels.

Table 7.1.1. Summary of contaminant levels at the South EW Field

Well	TCE Concentration (µg/L)		Reduction in Concentration	^{99}Tc Activity (pCi/L)		Reduction in Activity
	Late 1995	2002		Late 1995	2002	
MW242	530	110-210	Yes	202	63-130	Yes[a]
MW243	13,500	200-2,800	Yes	3,781	163-1,060	Yes
MW244	3,600	2-71	Yes	1,948	54	Yes
MW249	2,900	2-190	Yes	187	78	Yes
MW250	13,300	200	Yes	3,358	97	Yes
MW245[b]	28	49-293	No	26	64	No

[a] ^{99}Tc levels have declined; however, the association of the decline and groundwater extraction is not obvious.
[b] Upgradient well.

For the years 1998 through 2002, MW261 and MW339, located in the core of the Northwest Plume and far upgradient of the South EW Field, continued to yield water with elevated levels of TCE (10,000 to 40,000 µg/L) and ^{99}Tc (1500 to 6000 pCi/L) (see Fig. 7.1.2). During the same period, the MW244, MW249, and MW250, located proximally to the south EWs at crossgradient and downgradient positions, experienced greatly reduced contaminant levels of 200 µg/L or less TCE and 97 pCi/L or less ^{99}Tc (Fig. 7.1.3). Meanwhile, contaminant levels in the remote downgradient wells (MW242 and MW243, located approximately 350 ft north of the south EWs) (see Fig. 7.1.4) persisted at higher levels than those of MW244, MW249, and MW250, but at levels significantly reduced from those of upgradient MW261 and MW339. Moreover, the current contaminant levels in MW242 and MW243 are significantly less than those that were present prior to the initiation of pump-and-treat. These data trends suggest that the south EWs are reducing contaminant levels in the core of the Northwest Plume, as intended by the ROD.



Plume Contours from 2002 Annual Plume Map Revision (BJC 2003c).

Fig. 7.1.1. NW Plume EW Field - south.

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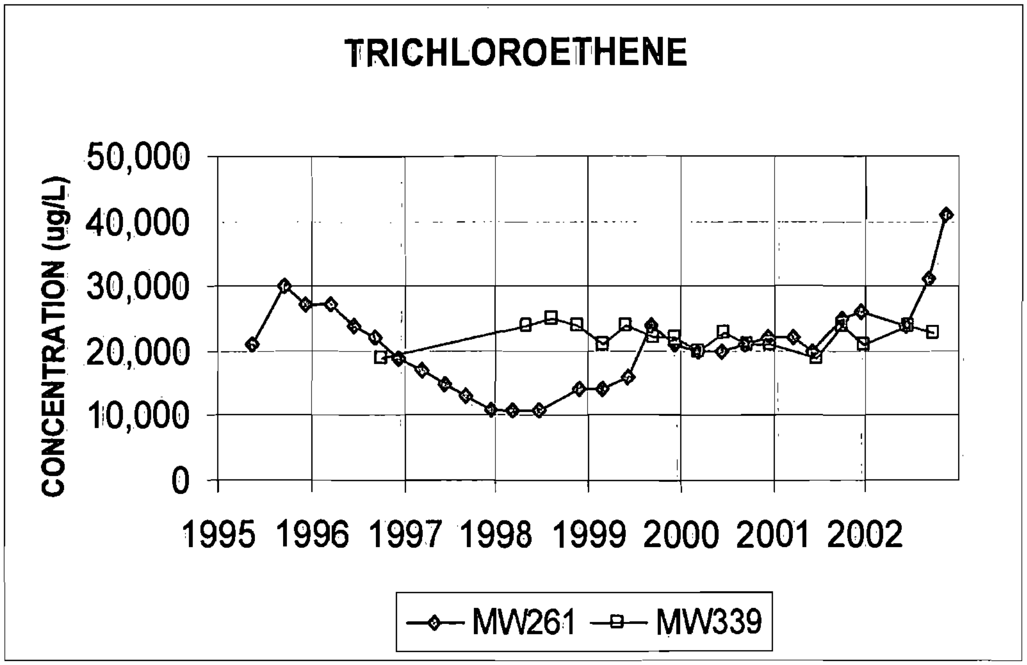

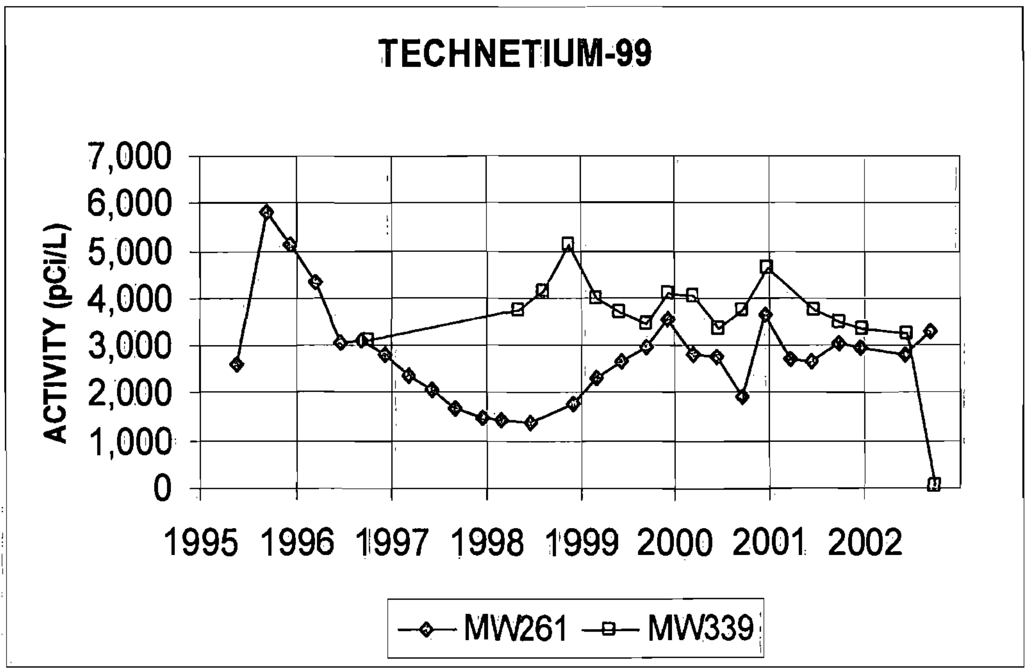

U. S. DEPARTMENT OF ENERGY
DOE OAK RIDGE OPERATIONS
PADUCAH GASEOUS DIFFUSION PLANT

BECHTEL JACOBS COMPANY, LLC
MANAGED FOR THE US DEPARTMENT OF ENERGY UNDER US GOVERNMENT CONTRACT DE-AC05-03OR22980
Oak Ridge, Tennessee • Paducah, Kentucky • Portsmouth, Ohio

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Oak Ridge, Tennessee 37831

Fig. 7.1.2. Contaminant trends in far upgradient MW261 and MW339.

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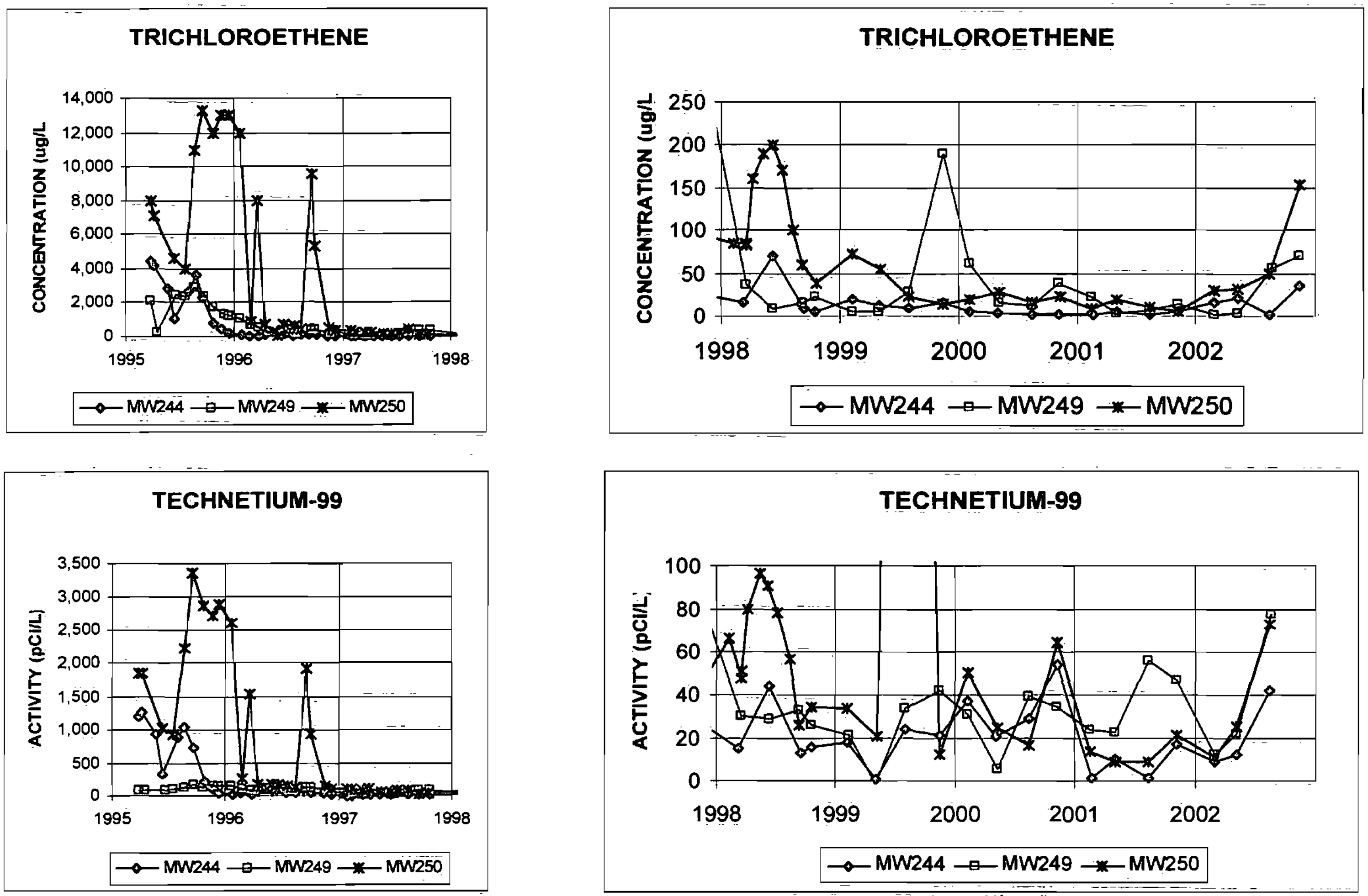
DATE 07-03-03



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DOE OAK RIDGE OPERATIONS
PADUCAH GASEOUS DIFFUSION PLANT

BECHTEL JACOBS
Bechtel Jacobs Company LLC

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Fig. 7.1.3. Contaminant trends in proximal MW244, MW249, and MW250.

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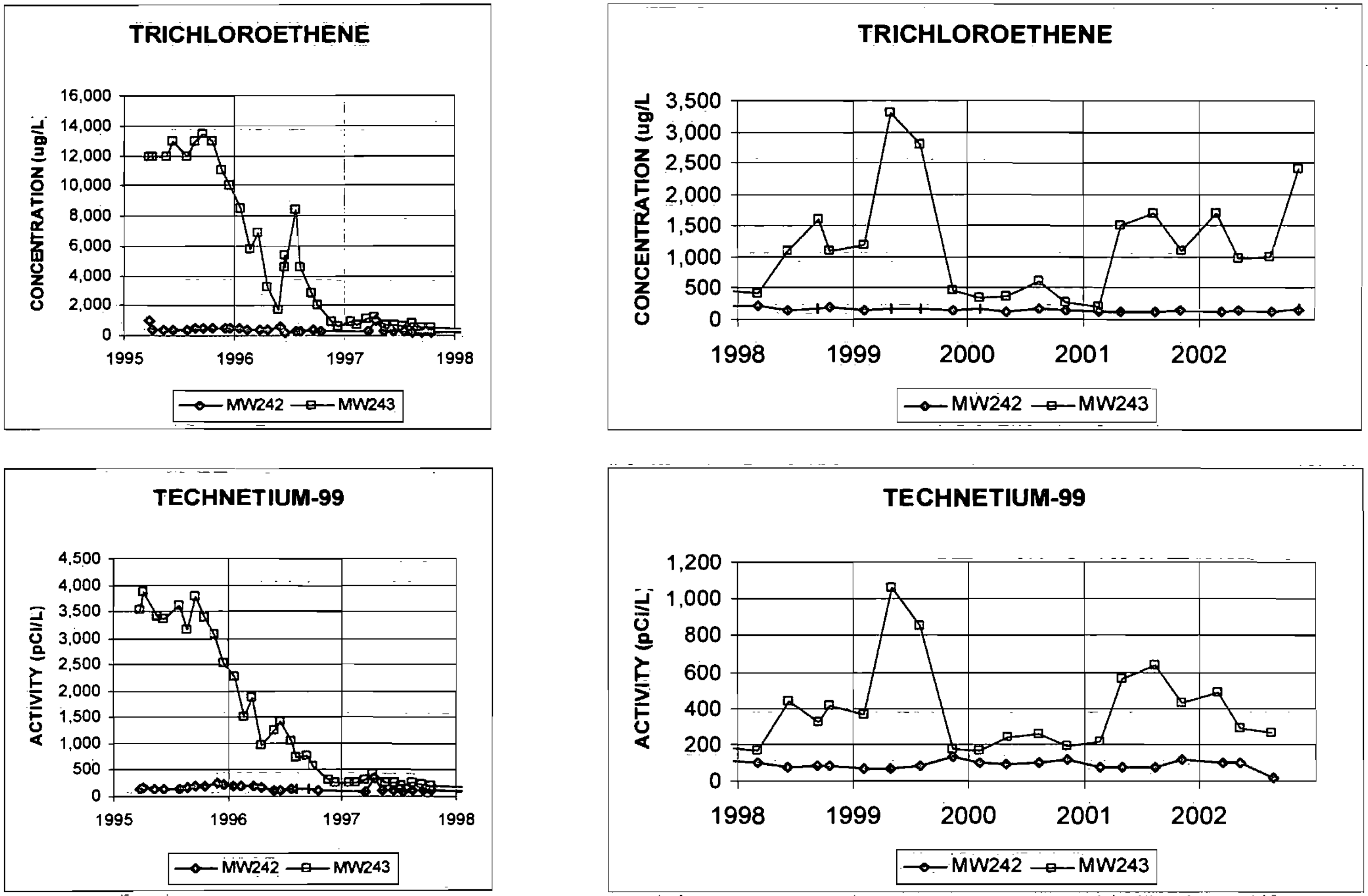

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DOE OAK RIDGE OPERATIONS
PADUCAH GASEOUS DIFFUSION PLANT

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Fig. 7.1.4. Contaminant trends in distal downgradient MW242 and MW243.

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FIGURE No. c5ac90001sk637.ppt
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Contaminant levels in MW248, located midway between the two south EWs, are significantly less than those of upgradient MW261 and MW339. Enough data now exists to show that MW248 monitors the same groundwater flow path as upgradient MW66 (Fig. 7.1.5). MW66 is thought to monitor dissolved contamination resulting from a shallow DNAPL in the SWMUs 7 and 30 Burial Grounds, which is independent of the highest concentration core of the Northwest Plume that is derived from the C-400 Cleaning Building area.

Monitoring data for the north well field (pumping wells EW228 and EW229) (see Fig. 7.1.6) evidence two distinct periods of contaminant level trends. Both TCE and ^{99}Tc trends for the period late 1995 through 1997 demonstrate that the North EW Field was reducing the high-concentration core of the Northwest Plume. Contaminant trends for the 1998 through 2002 period are less consistent (Table 7.1.2).

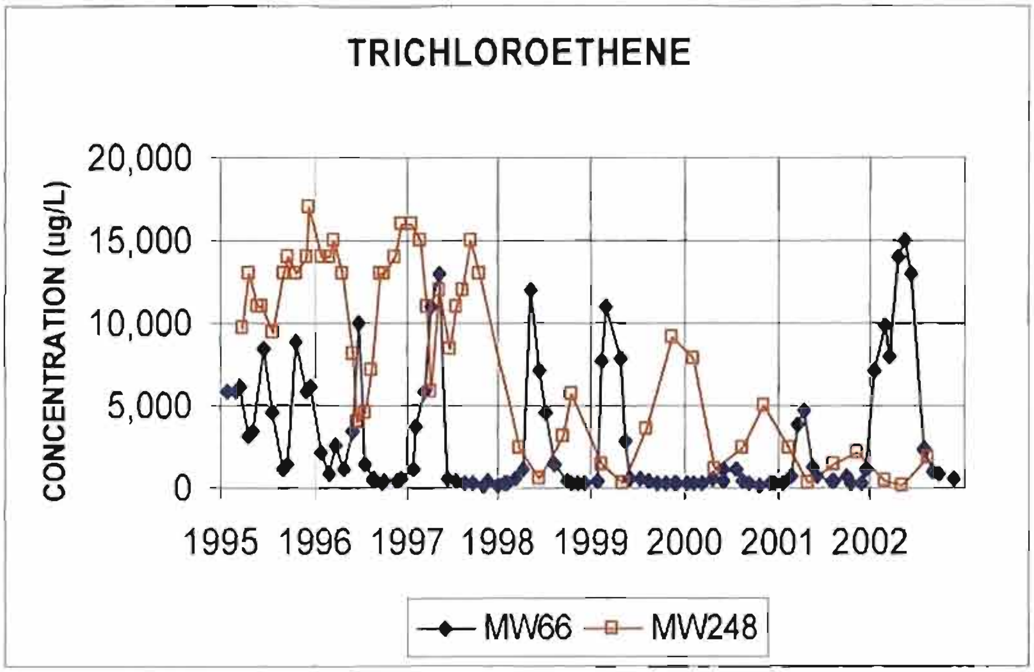
Table 7.1.2. Summary of contaminant levels in the area of the North EW Field

	Late 1995 (Start of Pumping)		Concentration Trends	2002		Activity Trends
Well	TCE (μg/L)	^{99}Tc (pCi/L)	1995-1997	TCE (μg/L)	^{99}Tc (pCi/L)	1998-2002
MW235/ MW381	900	570	Sharp decline with start of pumping.	1100	206-445	Abrupt rise in mid 1998.
MW236	1470	936	Sharp decline with start of pumping.	310-530	108-202	Abrupt rise in late 1998; sharp decline in 2002.
MW238	1500	948	Sharp decline with start of pumping.	90-200	45-69	Overall decline beginning in early 2000.
MW240	1400	846	Overall decline (started before pumping).	15-28	12-30	Continuation of overall decline.
MW241	1700	874	Overall decline beginning in 1996, with spike in late 1997.	11-26	-2 to 12	Abrupt drop in early 1998; followed by overall decline.
MW233*	810	320	Spike in early 1996, then decline.	16-23	8-24	Sharp drop in early 1998, followed by steady decline.
MW234*/ MW380	610	394	Overall rise.	290-410	167-311	Sharp rise in early 1998; then sharp decline in 2002.

*Upgradient well.

Contaminant trends in the upgradient MWs show a clear counter trend between the east well (MW 234) and west well (MW233) at the North EW Field (Fig. 7.1.7). The range of contaminant levels was approximately equal on the east and west sides from 1995 through 1997. In early 1998, contaminant levels soared on the east side of the EW field and rapidly declined on the west side. These trends suggest that the high concentration core of the Northwest Plume moved eastward beginning in 1998.

A comparison of contaminant trends for the period early 1998 through 2001 between upgradient MW234 (1000 to 1800 μg/L TCE and 473 to 924 pCi/L ^{99}Tc) and downgradient MW238, MW240, and MW241 (38 to 1200 μg/L TCE and 16 to 693 pCi/L) (see Fig. 7.1.8) demonstrates a significant reduction in contaminant levels due to the EWs. For the same period, comparable contaminant levels in MW234 and remote downgradient MW235 and MW236 (600 to 1800 μg/L TCE and 150 to 816 pCi/L ^{99}Tc) (Fig. 7.1.9) indicate that at least part of the high-concentration core of the Northwest Plume was bypassing the north well field on the east side; thus, while the North EW Field continued to capture some of the core of the Northwest Plume, it was allowing some groundwater with TCE concentration greater than 1000 μg/L to continue to migrate northward.



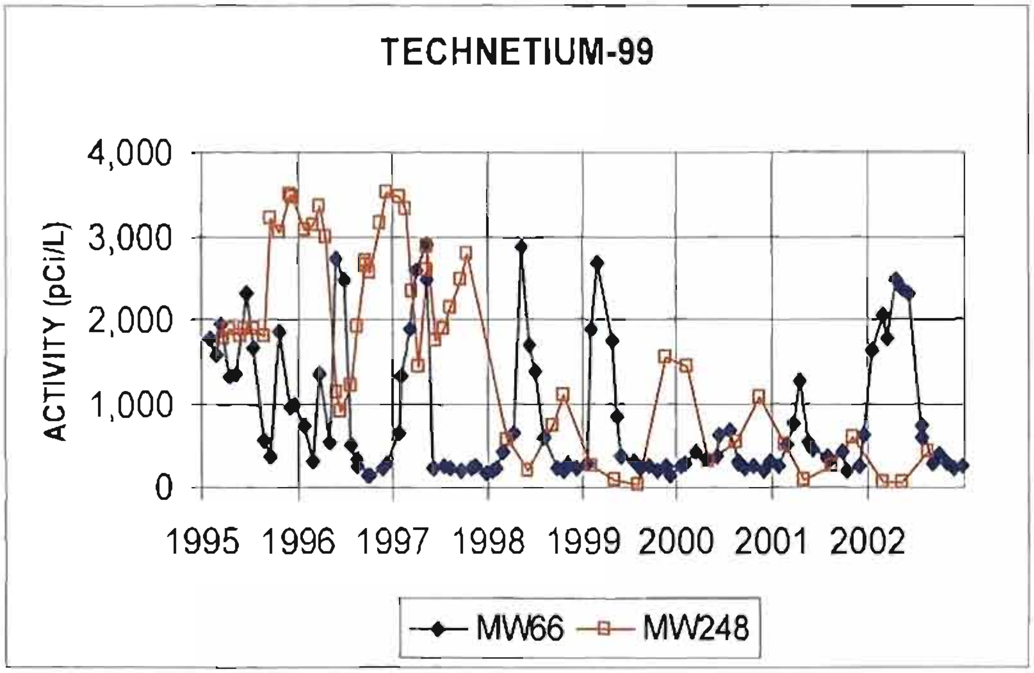


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Fig. 7.1.5. Contaminant trends in upgradient MW66 and MW248.

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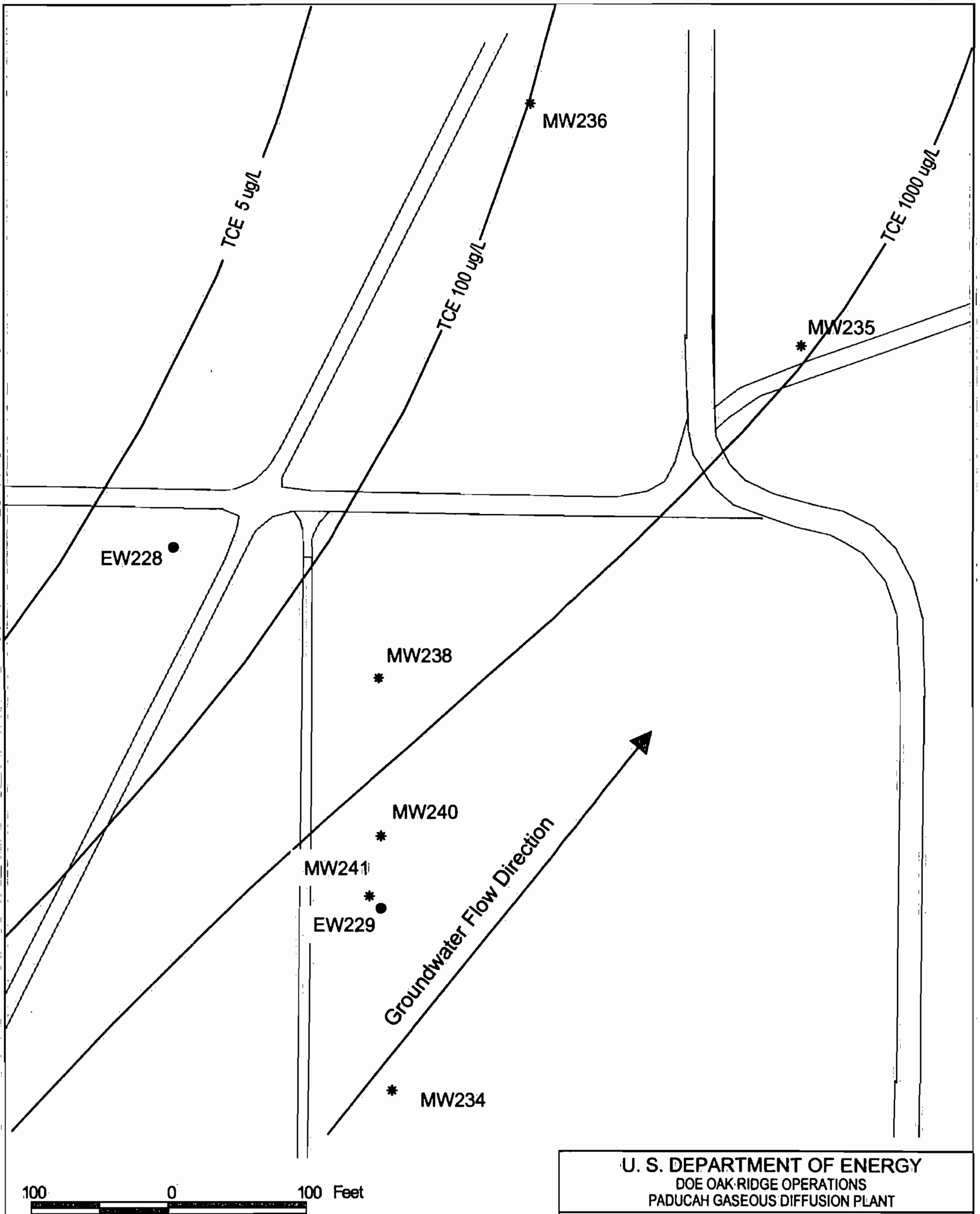

Plume Contours from 2002 Annual Plume Map Revision (BJC 2003c).

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Fig. 7.1.6. NW Plume EW Field - north.

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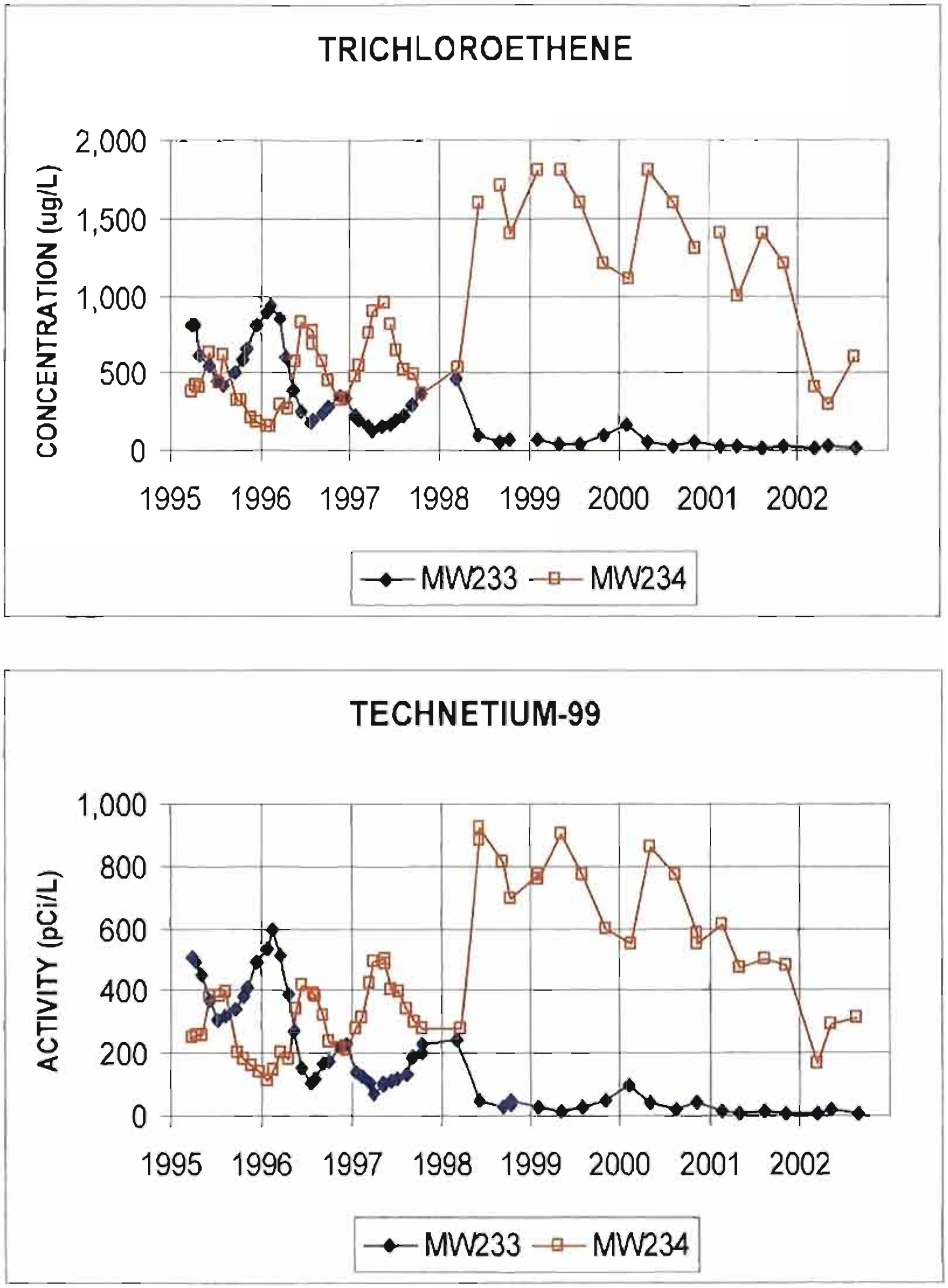

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Fig. 7.1.7. Contaminant trends in upgradient MW233 and MW234.

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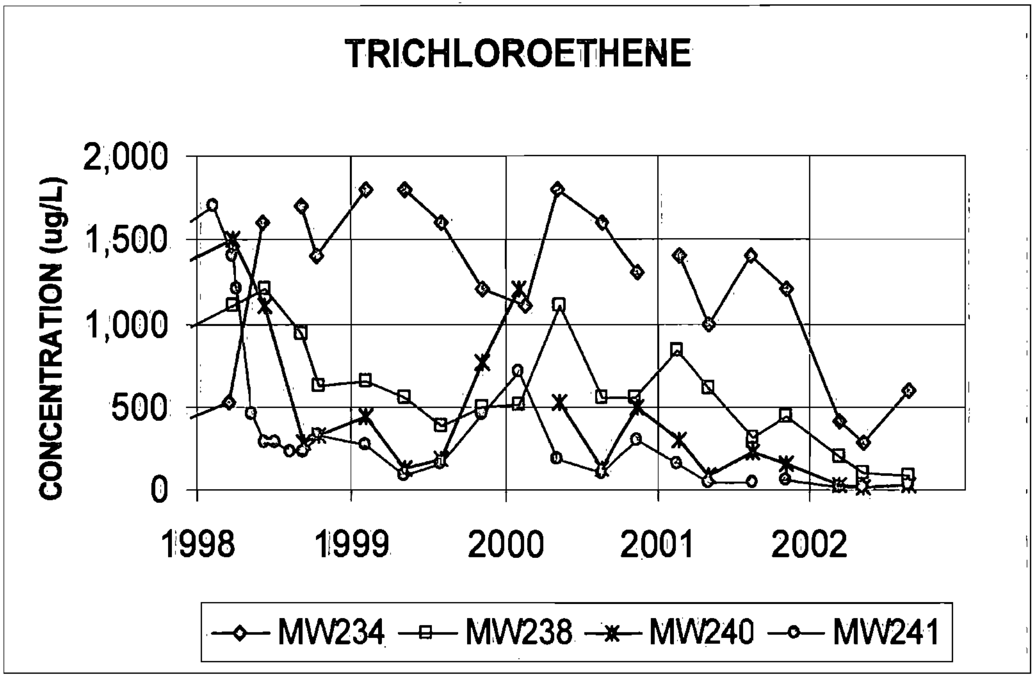

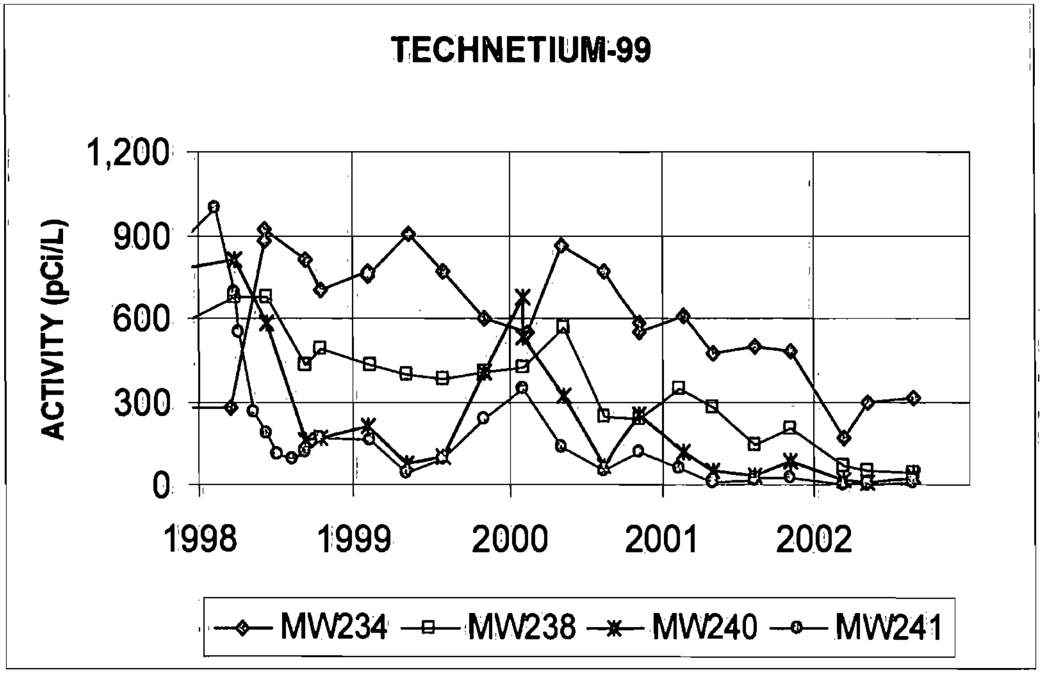

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Fig. 7.1.8. Contaminant trends in upgradient MW234 and downgradient MW238, MW240, and MW241.

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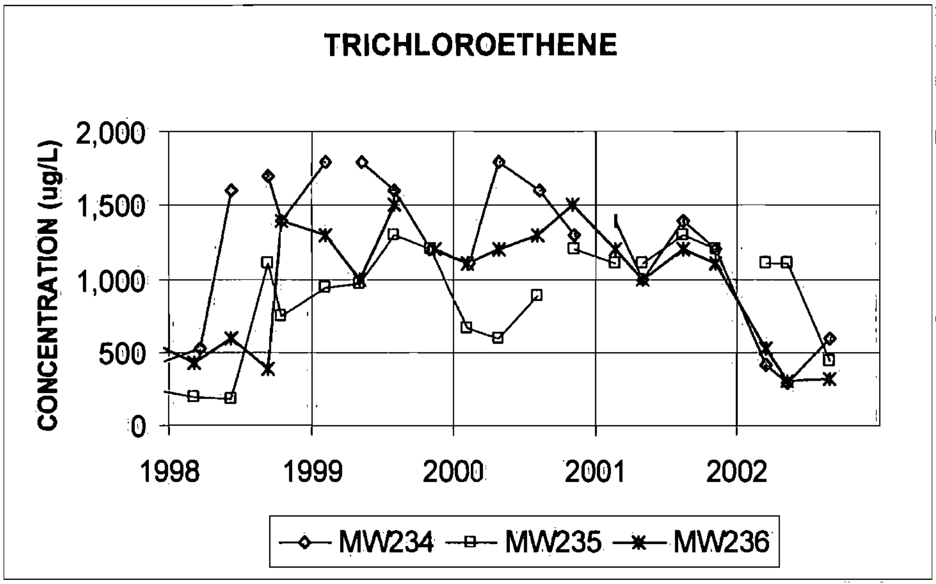

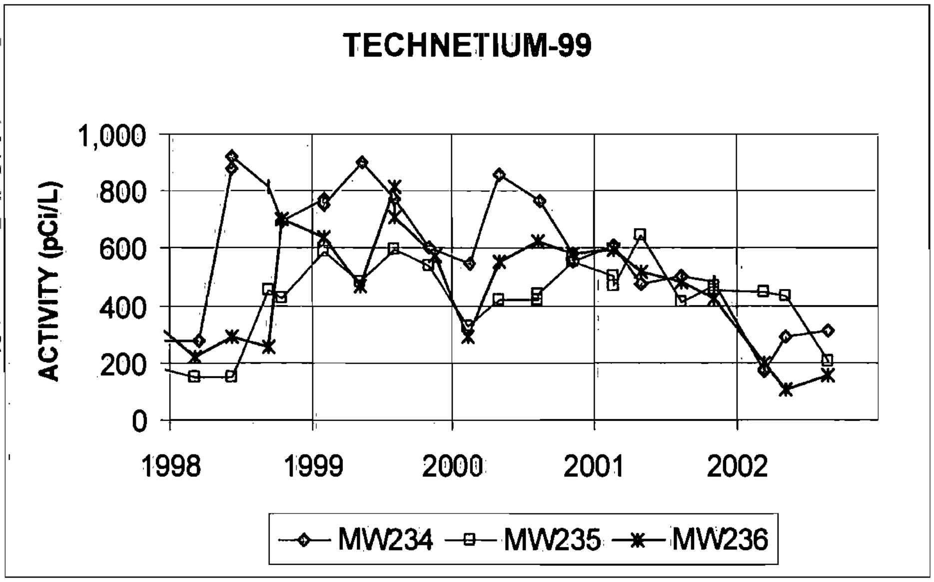

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Fig. 7.1.9. Contaminant trends in upgradient MW234 and remote downgradient MW235 and MW236.

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Contaminant levels during 2002 experienced a significant decline in upgradient MW234, proximal downgradient MW238 and MW240 and remote downgradient MW235 and MW236, while remaining very low (below 30 µg/L TCE and 25 pCi/L ^{99}Tc) in MW233 and MW241. Further monitoring is required to assess these trends, but this response is consistent with the continuing eastward migration of the high concentration core of the Northwest Plume beyond the capture zone of the North EW Field.

An annual, cyclic, rise-and-decline of contaminant levels of the Northwest Plume first was documented in 1992 (DOE 1992b). Monitoring of contaminant levels at the EW fields of the Northwest Plume records the continuation of this rise-and-decline pattern. As a potential explanation for the contaminant flux, researchers have noted that changes in the Ohio River stage influenced RGA hydraulic head up to two miles from the river (DOE 1992b). These changes in hydraulic potential would affect lateral shifts in the location of the centerline of the plume.

Moreover, later investigations (notably the Northwest Plume driven discrete depth sampler investigations of 1992 [DOE 1993b] and 1993-1994 [DOE 1995e] and the Groundwater Monitoring Phase IV Investigation [DOE 1995f]) demonstrated the very limited vertical and lateral extent of the high concentration core of the Northwest Plume. Thus, relatively small shifts in the groundwater flow lines that constitute the high-concentration core of the Northwest Plume would result in dramatic changes in groundwater contaminant concentrations for a given location.

During 1998, significant increases were evident in contaminant levels in wells MW234, MW235, and MW236. The other Northwest Plume EW-North Well Field wells (notably NW238, MW240, and MW241) experienced a significant decline in contaminant levels. Sufficient records now are available to document that this decline is the continuation of a trend that has persisted since 1995 (also evident in the data of MW202 and MW233). Thus, the record is adequate evidence of a shift in the high concentration core of the plume during 1998; it shows a continuing eastward migration of the core of the plume since 1995. The year 1998 just happens to be the period when the high-concentration core of the plume drifted eastward into the area of MW234, MW235, and MW236.

The cause of the continuing eastward migration of the high concentration core of the Northwest Plume in the area of the EW – North Well Field has not been determined. Likely factors appear to be a near-persistent rainfall deficit, beginning in 1992, that has reduced RGA hydraulic potential (see Figs. 5.1 and 5.2 of DOE 2003f) or the removal of groundwater at the Northwest Plume EW – South Well Field.

Sections 5.2.2 through 5.2.5 (Figs. 5.5 through 5.16) of *Trichloroethene and Technetium-99 Groundwater Contamination in the Regional Gravel Aquifer for Calendar Year 2002 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2003f) reviews contaminant level trends in the area of the Northwest Plume. The area wells are located at varying distances and locations relative to the Northwest Plume and the contaminant level trends vary widely.

Figure 7.1.10 summarizes TCE trends for 1994 through 2002, relative to the well locations for the Northwest Plume EW - North Well Field. ^{99}Technetium trends are similar. A continuing eastward migration of the high-concentration core of the Northwest Plume, for a core that arcs slightly to the east, best explains the observed contaminant trends.

DOE conducted groundwater flow modeling to assess the capture zone of each of the EW fields under the transient pumping rates that have occurred. Appendix D documents the groundwater flow models and the results of reverse particle tracking to define the extent of the capture zones. These models indicate that the both the South and North Well Fields have maintained a zone of capture throughout the period of pump-and-treat. The capture zone of the South Well Field is 1550-ft wide, and the capture zone of the North Well Field is 575-ft wide. These models do not simulate the transient nature of the regional

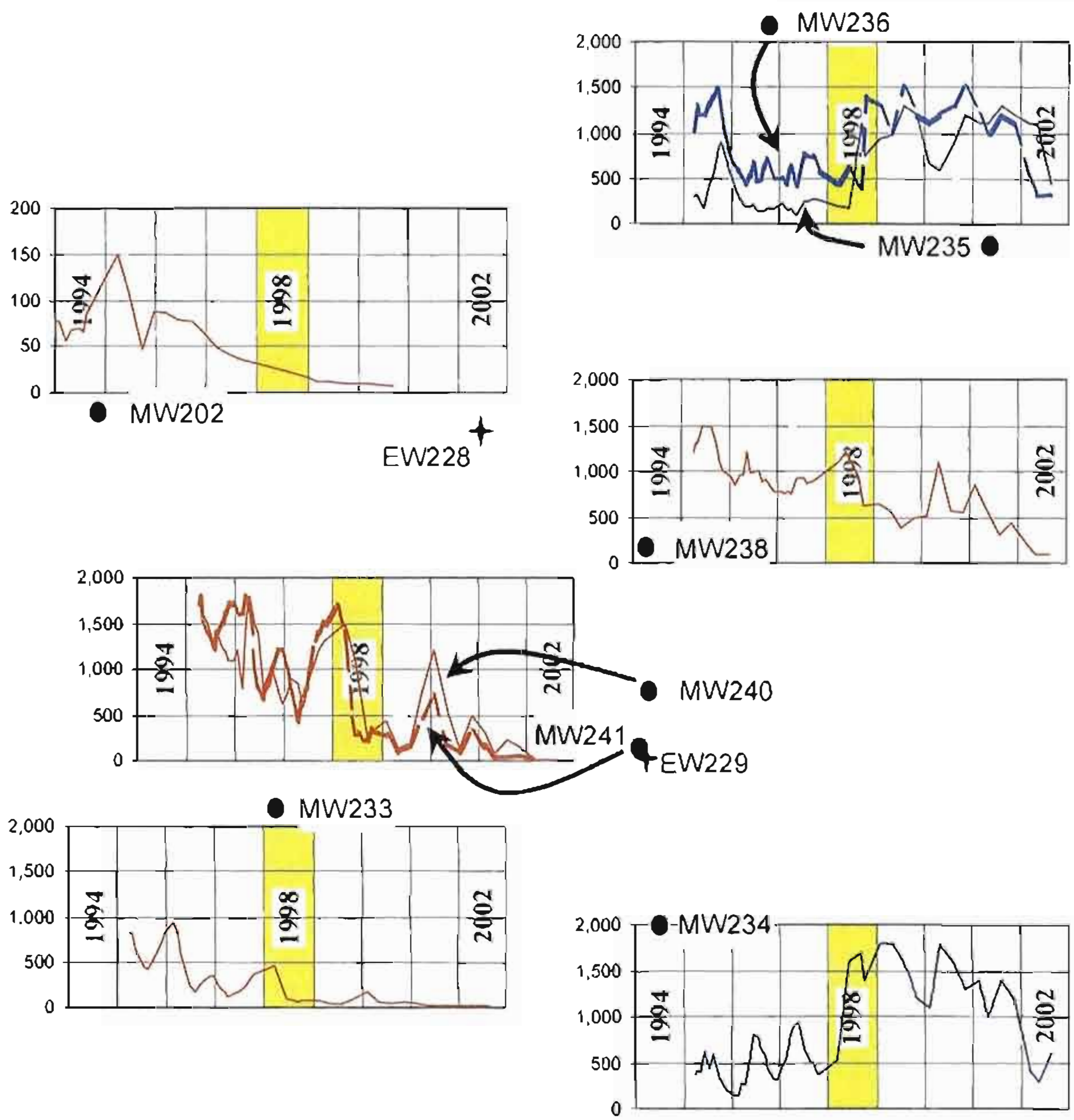

Fig. 7.1.10. Trichloroethene (μg/L) trends (1994 through 2002) in the Northwest Plume EW-North Well Field.

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hydraulic gradient that has existed during the period of pump-and-treat. The regional hydraulic gradients are minimal; however, and the results of this modeling task are applicable for this assessment.

7.1.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

There have been no changes in the physical conditions of the site that would affect the benefit of the remedy.

7.1.2.1 Changes in standards and TBC

The ROD does not address final cleanup levels for the groundwater because such goals are beyond the limited scope of this action; however, the treatment system is expected to meet all federal and state surface water quality standards. Additionally, the air stripper is designed to meet the federal and state air quality standards and the treated groundwater is expected to meet the substantive requirements of the KPDES program for discharge to surface water. Appendix C, Table C.1, lists the ARARs (chemical-specific, location-specific, and action-specific) that are applicable to the Northwest Plume ROD. There have been no changes in these ARARs and no new standards to "to be considereds" (TBCs) affecting the protectiveness of the remedy.

7.1.2.2 Changes in exposure pathways, toxicity, and other contaminant characteristics

This ROD does not document or reference specific exposure assumptions. The ROD is not supported by a risk assessment.

There have been some changes in the toxicity factors for the COCs that apply to the Northwest Plume ROD. Particularly, toxicity values for radionuclides have substantially increased. Moreover, values for parameters used for the exposure pathway assessments have changed. These revisions have not necessitated a new ROD because the remedial action is an interim measure only; this remedial action is not expected to reduce groundwater contaminants to risk-acceptable levels. The remedy is progressing as expected.

7.1.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

The evaluation of the C-743-T-17 Field Laboratory noted several data quality issues. All TCE data are usable for the intended use. The intended uses of the Northwest Plume samples are screening only. For the ^{99}Tc data, all data are usable except for 60% of the effluent samples collected from January 2000 through December 2002. These data were rejected as unusable due to data quality issues. Confirmation samples analyzed by an independent laboratory during this time period, however, indicate that the treatment system was operating as intended.

This remedy was not expected to be protective of human health and the environment. No events have compromised the effectiveness of the remedy.

7.1.4 Technical Assessment Summary

The operational data and the site inspection indicate that the mechanical components of the remedy are functioning as intended by the ROD. Persistent contaminant levels of approximately 100 μg/L TCE and 100 pCi/L ^{99}Tc in water samples from the east downgradient MW indicates that some dissolved contamination is bypassing the South EW Field. Moreover, 2002 contaminant level trends suggest that the high-concentration core of the Northwest Plume has persisted in migrating eastward and is now significantly bypassing the capture zone of the North EW Field. Continued monitoring over a period of one to two additional years is likely to provide a clear basis for assessing the effectiveness of the North EW Field. It should be noted, however, that this is an interim action that is working within the capabilities of the system, as it was designed. The assessment of the effectiveness of the EW Fields will be taken into consideration once a final remedy is decided.

7.2 NORTHEAST PLUME (GWOU)

The Northeast Plume IRA is intended to implement a first-phase action to initiate control of the high-concentration area within the Northeast Plume that extends outside the plant security fence. Final decisions for the Northeast Plume and the GWOU will be made through the remedial investigation and remedy selection process, after the nature and extent of contamination in the groundwater system(s) and the areas contributing contaminants to the groundwater are more fully understood.

7.2.1 Question A: Is the remedy functioning as intended by the decision documents?

This assessment of the Northeast Plume IRA, through review of documents, ARARs, risk assumptions, groundwater monitoring data, and the results of the site inspection, indicates that the Northeast Plume IRA is functioning as intended by the ROD. However, the Northeast Plume EW Field has intermittently missed operational efficiency goals during the period addressed in this Five-Year Review due to prolonged periods of down time. Scheduled maintenance of Cooling Tower C-637-2A, which constitutes the main element of the treatment system, forced a three-month idle period beginning in July of 1999. DOE added a split in the treatment system pipeline, to the C-637-2B Cooling Tower, in the fall of 2000 to provide an alternate treatment facility. Influent and effluent sampling demonstrates that the treatment system is consistently reducing TCE concentrations below the treatment goal of 5 μg/L.

The groundwater EWs of the Northeast Plume EW Field (EW331 and EW332) began operation on February 28, 1997 (Fig. 7.2.1). Trends of TCE concentrations in groundwater of the Northeast Plume EW Field monitoring system clearly show that TCE levels have been reduced by the pump-and-treat system (Table 7.2.1).

Table 7.2.1. Summary of TCE concentration in the Northeast Plume EW Field

	TCE Concentration (μg/L)			Concentration Trends	
Well	**Early 1997**	**Low of 2000**	**2002**	**Through 1999**	**1999 – 2002**
MW283	1300	180	170-200	Reduction	Near steady, rise to 200 μg/L
MW284	1500	200	180-210	Reduction	Near steady at approximately 200 μg/L
MW291	1600	200	170-180	Reduction	Near steady at 170/180 μg/L
MW293	2400	180	630-770	Reduction	Rise to 770 μg/L
MW294	2000	420	840-1100	Reduction	Rise to 1100 μg/L
MW288*	1600	120	280-650	Reduction	Average of 591 μg/L
MW292*	800	800	740-850	Rise to 1400 μg/L, then decline to 1000 μg/L	Decline to 780 μg/L

*MW288 and MW292 are upgradient wells.

The TCE degradation product, 1,1-DCE, is presented as the only other COC in the ROD. Of the 201 groundwater samples from the Northeast Plume MWs that have been submitted for 1,1-DCE analyses,

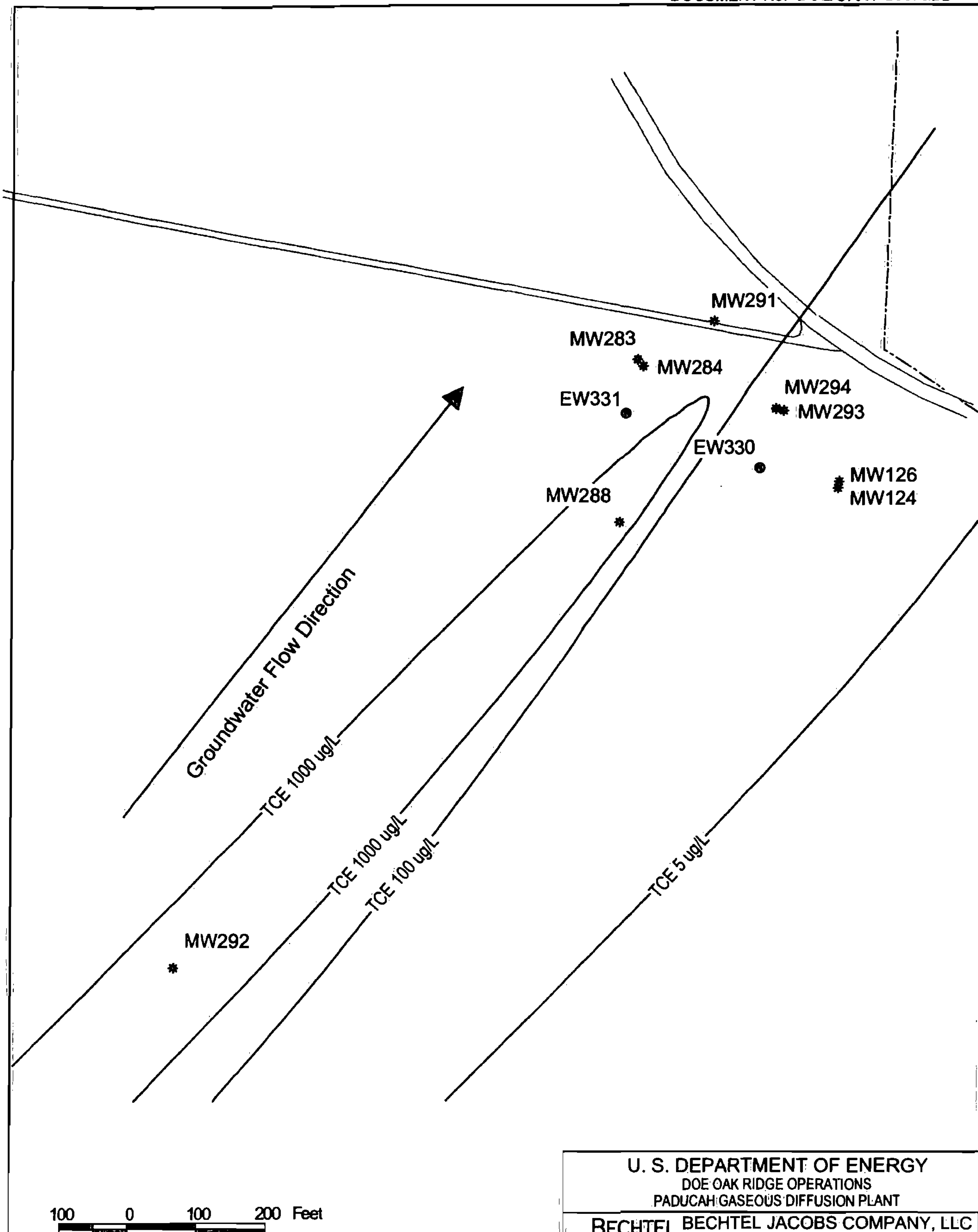

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Fig. 7.2.1. NE Plume EW Field.

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none have contained a detectable level. Although only one analysis provided a detection limit below the MCL for 1,1-DCE, the preponderance of data indicates that 1,1-DCE is not present in quantities (or greater extent) that would necessitate a larger capture zone for the Northeast Plume EW Field.

As with the Northwest Plume IRA, a primary concern of the Northeast Plume IRA is the extent of the zone of capture of the EW field. During periods when only one of the two well pumps has been idled, the system operators have increased the pumping rate of the working well to maintain the zone of capture.

Operational efficiency (actual run time compared to 100% run time) typically exceeds the operational goal of 85%, often averaging better than 95% over a three-month period. However, each of the wells has experienced prolonged periods of downtime during the 1998 to 2000 period of this Five-Year Review. EW331 (west side) was nonoperational for three extended periods: June 25 through October 4, 1999; July 21 through December 7, 2000; and July 11 through September 18, 2001. Monitoring data demonstrate that the TCE level in downgradient MW283, MW284, and MW291 had declined sharply prior to 1999. For the period 1999 through 2002, TCE levels have remained near steady, declining to approximately 200 μg/L (Fig. 7.2.2).

EW332 (east side) has been nonoperational, or operating at a significantly reduced rate, for two extended periods: June 25, 1999, through August 3, 2000, and July 11 through September 18, 2001. Both downgradient wells (MW293 and MW294) monitored significant TCE declines through 1999 (Fig. 7.2.3). TCE concentrations began to rebound during 2000 and continued to increase through 2002. This trend appears to be a response to the June 25, 1999, through August 3, 2000, period of little or no pumping in EW332.

MW124 and MW126 monitor the Northeast Plume farther to the east, adjacent to the buried terrace scarp that cuts through the Porters Creek Clay and defines the southeast limit of the RGA in the area and the southeast boundary of the Northeast Plume. TCE levels in these wells (Fig. 7.2.4) exhibited a steep decline in late 1997 (from 1100 to 370 μg/L), with a spike in late 2000 (up to 720 μg/L), followed by a period of sustained low TCE levels (44-110 μg/L). These trends suggest the following progression: (1) a rapid response to the initiation of the pump-and-treat system; (2) a period of decreased effectiveness in late 2000 related to the June 25, 1999, through August 3, 2000, period of little or no pumping in EW332; and (3) resumed control of the southeast edge of the Northeast Plume.

TCE levels in upgradient MW288 (proximal) and MW292 (remote) declined from 1998 through 2002 (Fig. 7.2.5). This trend is similar to declining TCE concentrations in upgradient MW255 and MW258, located near the core of the Northeast Plume near its source.

In total, the monitoring data indicate that the west EW (EW331) has remained effective at controlling the high-concentration core of the Northeast Plume. The June 25, 1999, through August 3, 2000, period of low or no pumpage in the east EW (EW332) has allowed groundwater with higher TCE levels (but still with significantly reduced TCE concentrations) to migrate past the well during 2001 and 2002.

DOE conducted groundwater-flow modeling to assess the capture zone of the Northeast Plume EW Field under the transient pumping rates that have occurred. Appendix D documents the groundwater-flow models and the results of reverse particle tracking to define the extent of the capture zone. This model indicates that the well field has maintained a capture zone of at least 1100-ft wide throughout the period of pump-and-treat. This model does not simulate the transient nature of the regional hydraulic gradient that has existed during the period of pump-and-treat. The regional hydraulic gradients, however, are minimal and the results of this modeling task are applicable for this assessment.

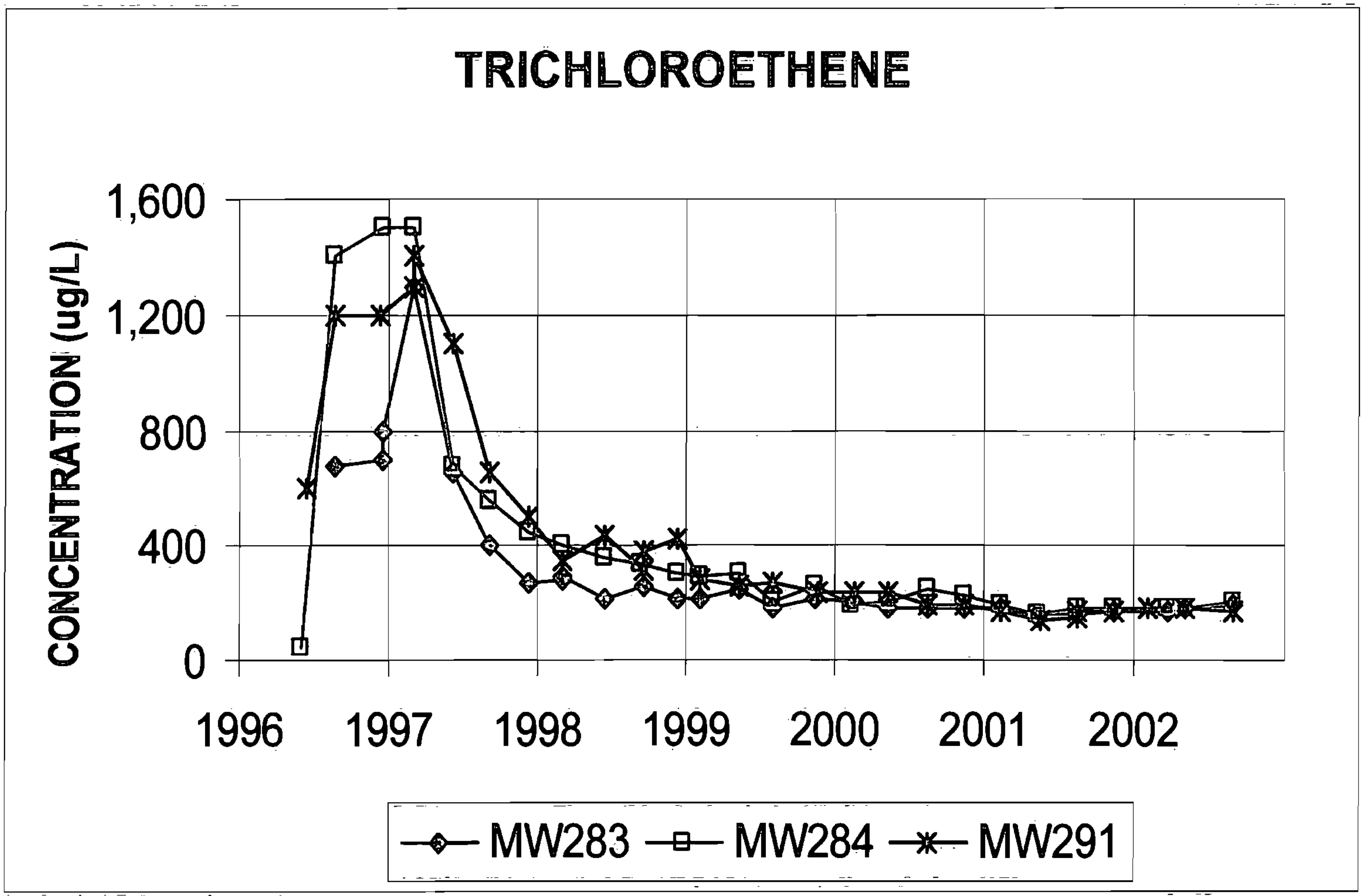

Fig. 7.2.2. Trichloroethene trends in downgradient MW283, MW284, and MW291.

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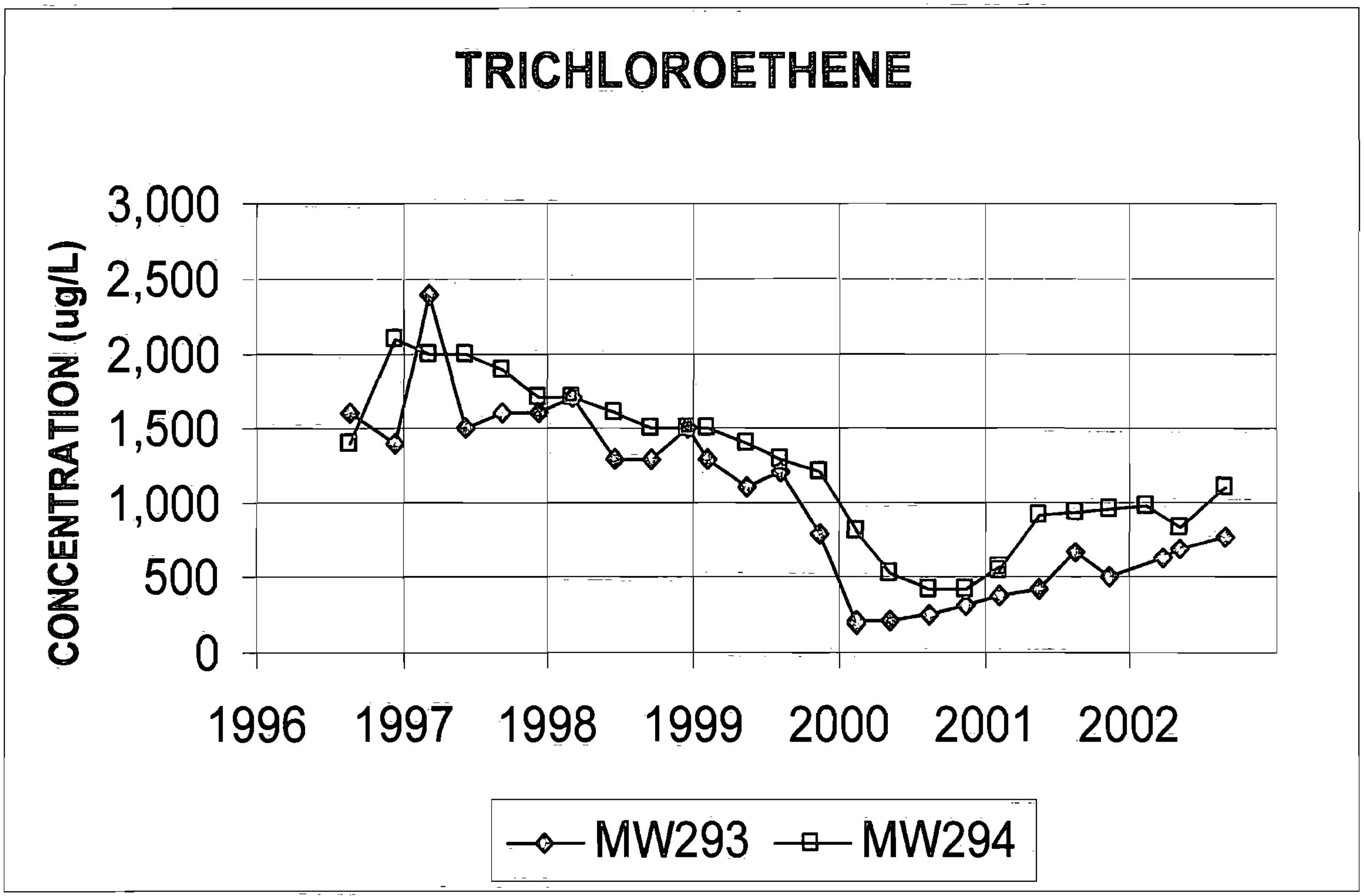

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Fig. 7.2.3. Trichloroethene trends in downgradient MW293 and MW294.

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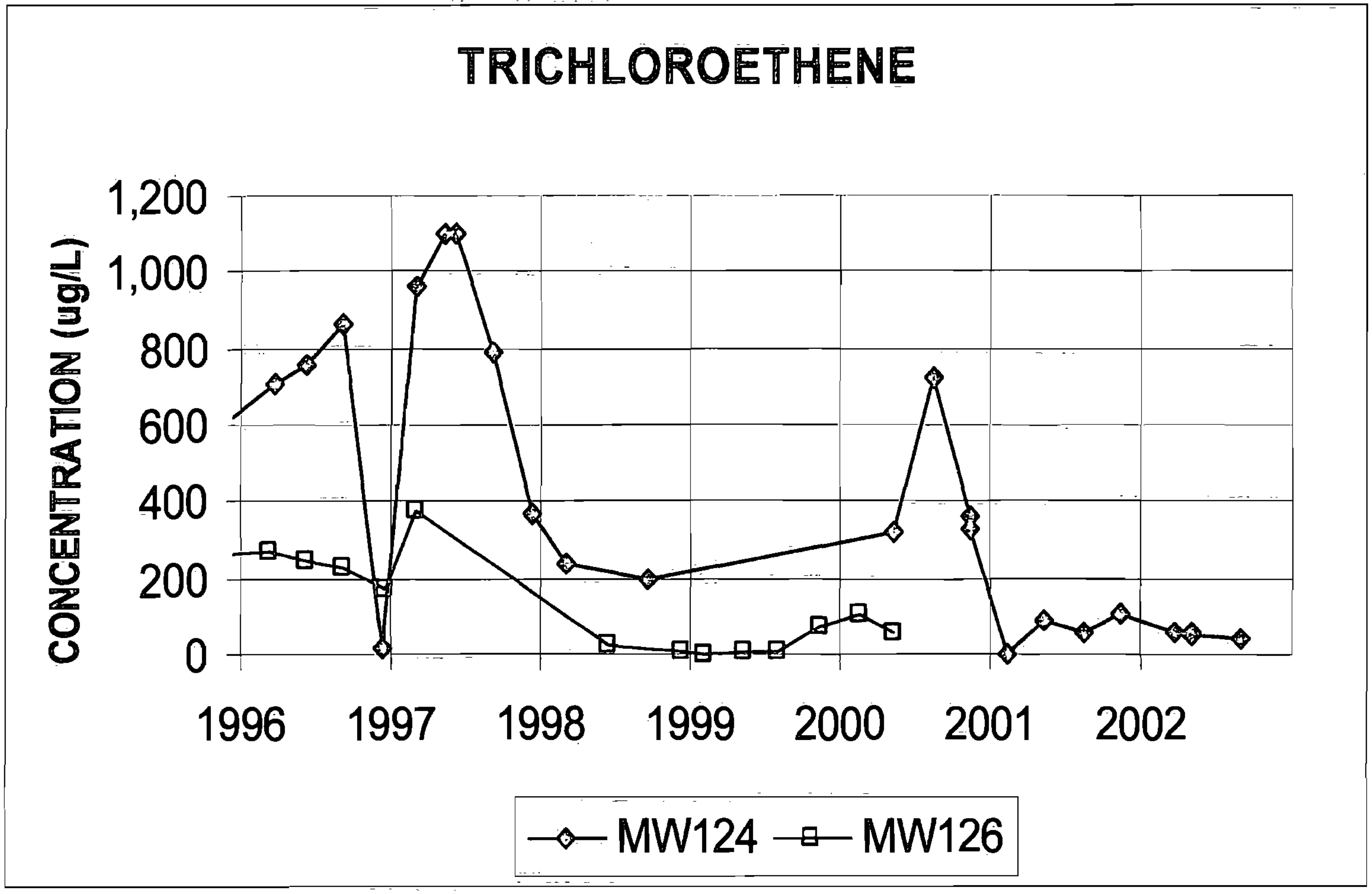

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Fig. 7.2.4. Trichloroethene trends in MW124 and MW126.

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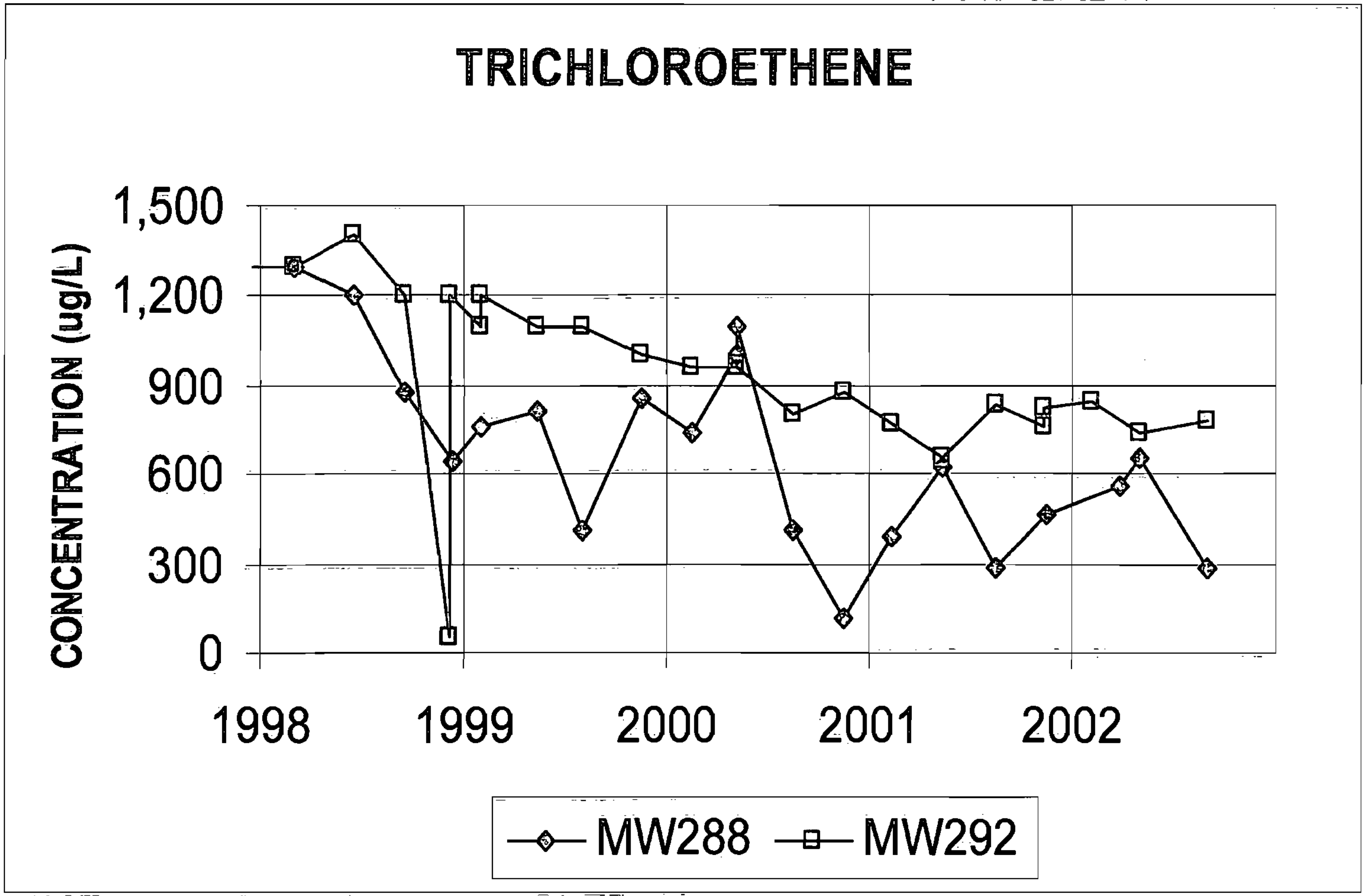

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Fig. 7.2.5. Trichloroethene trends in upgradient MW288 (proximal) and MW292 (distal).

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7.2.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

There have been no changes in the physical conditions of the site that would reduce the benefit of the remedy.

7.2.2.1 Changes in standards and TBC

This IRA does not intend to remediate the Northeast Plume to MCLs; however, water that is extracted is treated to meet surface water quality standards. The TCE off-gas concentrations were expected to be less than the regulatory significant level, with height correction; therefore, no off-gas treatment was proposed. Appendix C, Table C.2 lists the ARARs (chemical-specific, location-specific, and action-specific) that are applicable to the Northeast Plume ROD. There have been no changes in these ARARs and no new standards to TBCs affecting the protectiveness of the remedy.

7.2.2.2 Changes in exposure pathways, toxicity, and other contaminant characteristics

This ROD does not document or reference specific exposure assumptions. The ROD is not supported by a risk assessment. The *Summary of Comparative Analysis of the Interim Alternatives* (Sect. 2.8 of the ROD) discusses risk relative to nearby communities and workers associated with the construction and operation of the source control systems.

The remedy is progressing as expected. The remedy is an IRA that is not expected to achieve risk-based cleanup goals.

7.2.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

The evaluation of the C-743-T-17 Field Laboratory noted several data quality issues. All TCE data are usable for the intended use. The intended uses of the Northeast Plume samples are screening only. For the ^{99}Tc data, all data are usable except for 70% of the effluent (equalization tank) samples collected from January 2000 through December 2002. These data were rejected as unusable due to data quality issues. A review of data from the upgradient MWs for the same time period, however, indicates that no groundwater was pumped to the Northeast Plume cooling tower system that was in violation of the DQOs stated in the Northeast Plume Containment System O&M Plan.

This remedy was not expected to be protective of human health and the environment. No events have compromised the effectiveness of the remedy.

7.2.4 Technical Assessment Summary

This review of data and the site inspection indicate that the remedy is functioning as described in the ROD. There have been no changes in the physical conditions of the site that would affect the benefit of the remedy. Although the remedy is an interim measure and is not intended to return the Northeast Plume to MCL levels, the action inherently benefits downgradient areas by limiting the advance of the plume.

Although ^{99}Tc is not a COC in the Northeast Plume at the EW field, monitoring at the east PGDP security fence documents the presence of dissolved ^{99}Tc activity in the on-site Northeast Plume. The presence of ^{99}Tc in the EW field discharge water would compromise the cooling towers that are being used as the main element of the IRA treatment system. The monitoring program for the Northeast Plume EW Field includes analysis for ^{99}Tc. To date, ^{99}Tc activity has been reported only rarely in samples from the MWs at levels that exceed the laboratory MDL. Operation plans for the Northeast Plume include a contingency plan for ^{99}Tc (BJC 1998a). Should the presence of ^{99}Tc be confirmed in MW292, a MW located approximately one-year (travel time) upgradient of the EW field in the center of the plume, DOE would initiate procurement and construction of treatment facilities. Monitoring results at MW292 document the absence of measurable ^{99}Tc; however, at least one upgradient well near the PGDP security fence (MW256) is experiencing increasing ^{99}Tc levels.

7.3 SWMU 91 (GWOU)

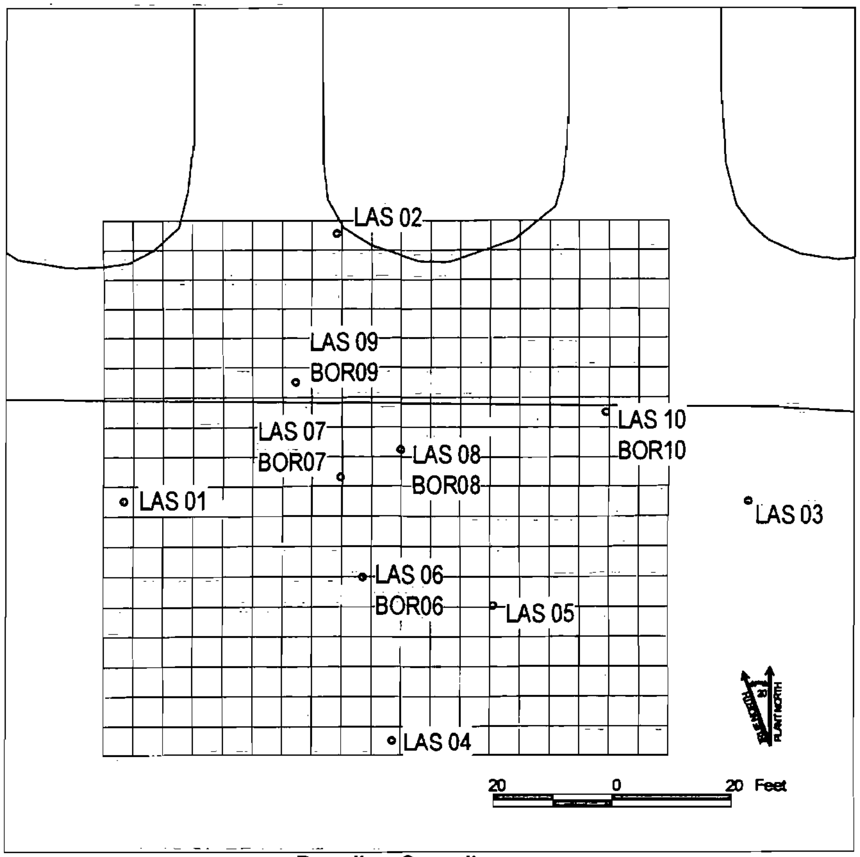
In 1993, SWMU 91 was selected as the area of an innovative technology demonstration. The technology, known as Lasagna™, was developed by a consortium (Monsanto, DuPont, and General Electric) with the support of DOE and EPA. The Lasagna™ technology is an *in situ* technology that uses electrical voltage to move shallow groundwater and contaminants in fine-grained or clayey soils. Contaminants are treated by passing contaminated groundwater through in-ground treatment cells. The demonstration was so successful that in 1998, a ROD was signed to implement the Lasagna™ technology to remediate the area. This review assesses the completion of the remedy selected for the TCE contamination at SWMU 91.

7.3.1 Question A: Is the remedy functioning as intended by the decision documents?

The remedial action taken at SWMU 91 has functioned as intended by the decision documents. The ROD for SWMU 91 established the objective of remediating the site to less than 5.6 mg/kg TCE in soil. The goal of the remedial action was to achieve these cleanup levels within two years of operation.

Results of the initial investigations conducted at SWMU 91 indicated that organic contaminants were present in both soil and groundwater at the unit. TCE with maximum levels of 1523 mg/kg and 943 mg/L was detected in subsurface soil and shallow groundwater samples, respectively. The areal extent of TCE-impacted soils at SWMU 91 had been estimated as approximately 6000 ft^2, with TCE concentrations in this area averaging 84 mg/kg. The sampling results indicated that TCE had migrated below the water table into the UCRS, but had not fully penetrated through the aquitard above the RGA at the unit. Residual contamination was present in the subsurface soils to an approximate depth of 45 ft bgs.

The final system started operation in December 1999 and concluded December 2001. The results of post-cleanup verification sampling indicated the average concentration of TCE was 0.38 mg/kg, with a high concentration of 4 mg/kg, as reported in the Final Remedial Action Report (DOE 2002c). The Lasagna™ remedial action did indeed reduce the TCE soil concentrations at SWMU 91 to a level well below the remedial action objective of 5.6 mg/kg average concentration, as stated in the ROD. These concentrations were reverified in subsequent post-cleanup sampling, at an average concentration of 0.41 mg/kg, as detailed in the *Addendum to the Final Remedial Action Report for Lasagna™ Phase IIb In-Situ Remediation of Solid Waste Management Unit 91 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2003b). Figures 7.3.1 through 7.3.2 demonstrate the progression of the cleanup.



Baseline Sampling

DEPTH	LAS 01	LAS 02	LAS 03	LAS 04	LAS 05	LAS 06	LAS 07	LAS 08	LAS 09	LAS 10
6'	ND	ND		ND	ND	3100	3400	2	353	27.7
11'	ND	ND	ND	ND	2.5	5100	6800	273	3600	ND
16'	ND	ND	ND	ND	57.7	29400	4000	176	5000	741
21'	ND	ND	ND	ND	ND	1800	9900	21700	16300	1250
26'	ND	ND	ND	2	365	26400	12700	3600	30100	113
31'-33'	ND	ND	ND	ND	358	2000	26300	594	3700	115
36'-38'	ND	ND	ND	ND	1	110	14900	1.5	1.6	1400
41'	ND	ND	ND	1.9	5.2	21	3.7	ND	616	290
46'-49'	ND	ND	ND	ND	ND	ND	3.4	1.8	6.9	254

1st Progress Event Sampling

DEPTH	BOR06	BOR07	BOR08	BOR09	BOR10
6'		552000			
11'		131000			
16'	1822	44000			
21'		16000		28000	
26'	232	1600		110	
31'		1100		4	
36'		959		10	
41'		543			9
46'					20

2nd Progress Event Sampling

DEPTH	BOR06	BOR07	BOR08	BOR09	BOR10
6'	21500	6700	780	ND	ND
11'	7900	27000	ND	ND	ND
16'	197	2900	ND	ND	ND
21'	594	92	ND	ND	ND
26'	25	12200		ND	
31'		1900			
36'		35			
41'		44			
46'		ND			

U. S. DEPARTMENT OF ENERGY
DOE OAK RIDGE OPERATIONS
PADUCAH GASEOUS DIFFUSION PLANT

BECHTEL JACOBS
BECHTEL JACOBS COMPANY, LLC
MANAGED FOR THE US DEPARTMENT OF ENERGY UNDER US GOVERNMENT CONTRACT DE-AC05-03OR22980
Oak Ridge, Tennessee • Paducah, Kentucky • Portsmouth, Ohio

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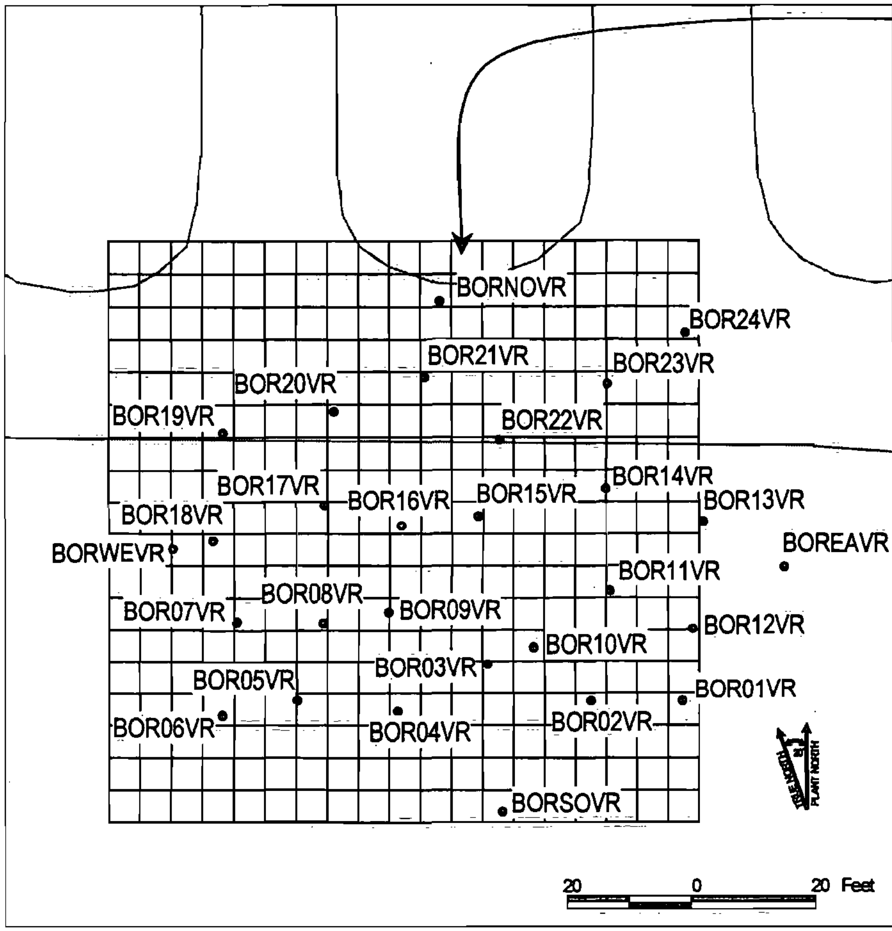
Fig. 7.3.1. TCE (ug/kg) baseline and progress sampling for Lasagna™.

FIGURE No. c5ac90001sk637.ppt
DATE 07-03-03



DEPTH	BORNOVR
4'	
8'	1.5
23'	15
38'	2800
48'	

DEPTH	BOR19VR	BOR20VR	BOR21VR	BOR22VR	BOR23VR	BOR24VR
4'						
8'	ND	2	2.7	ND	23	ND
23'	3.3	ND	30	29	4900	4000
38'	3.1	ND	28	ND	ND	120
48'		69				

DEPTH	BOR18VR	BOR17VR	BOR16VR	BOR15VR	BOR14VR	BOR13VR
4'			12	ND		
8'	ND	2.4	440	ND	ND	ND
23'	ND	ND	18	220	26	6.3
38'	170	3.5	37	ND	28	1.7
48'			ND			

DEPTH	BOR07VR	BOR08VR	BOR09VR	BOR10VR	BOR11VR	BOR12VR
4'						
8'	4.1	4.1	17000	33	1.6	6
23'	ND	24	9.1	680	2.4	18
38'	ND	ND	3	34	ND	ND
48'						

DEPTH	BOR06VR	BOR05VR	BOR04VR	BOR03VR	BOR02VR	BOR01VR
4'						
8'	ND	11	140	ND	ND	ND
23'	2.4	ND	ND	34	1.9	17
38'	ND	ND	ND	ND	ND	ND
48'						

DEPTH	BORWEVR
4'	
8'	18
23'	ND
38'	ND
48'	

DEPTH	BORSOVR
4'	
8'	ND
23'	1.5
38'	1.8
48'	

DEPTH	BOREAVR
4'	
8'	ND
23'	ND
38'	ND
48'	

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Fig. 7.3.2. TCE (ug/kg) reverification sampling for Lasagna™.

FIGURE No. c5ac90001sk637r5.ppt
DATE 07-03-03

7.3.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

Exposure assumptions, toxicity data, cleanup levels, and RAOs are identified in the ROD for SWMU 91 and in the Preliminary Site Characterization/Baseline Risk Assessment/Lasagna™ Technology Demonstration at SWMU 91 (DOE 1998c and LMES 1996a) and summarized below.

The toxicity assessment evaluates adverse effects to human health resulting from exposure to all contaminants of potential concern (COPCs); however, the only COC considered at SWMU 91 is TCE. Consequently, the toxicity assessment for this document focuses on TCE. During the development of the baseline human health risk assessment (BHHRA), TCE still was classified as a B2 (probable carcinogen) chemical, which may cause cancer in humans through prolonged exposure. Between development of the document containing the BHHRA and the ROD, the classification of TCE changed from being a Class B2 to being considered a Class C – B2 (possible to probable carcinogen) chemical, meaning there still is scientific uncertainty about whether TCE will cause cancer in humans through prolonged exposure. Since the BHHRA assumed a more conservative risk than advised at the time, there was no need to perform a new risk evaluation at the time the ROD was developed.

Uncertainties that could affect the results of the BHHRA and the groundwater modeling would have resulted in an overestimation of risk, thereby protecting the environment to an even greater degree than required. TCE and its breakdown products were singled out for much of the sampling efforts at SWMU 91; therefore, contributions to total risk from other contaminants that may be present were not considered.

ARARs identified during the ROD development are listed in Appendix C, Table C.3. These ARARs are relevant and have been considered, as appropriate.

7.3.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

Eight duplicate samples collected for confirmation analysis by a fixed-base laboratory and four split samples taken by the Commonwealth of Kentucky support that the cleanup objective was achieved. Quality issues associated with the C-743-T-17 Field Laboratory initially were identified in a February 2003 QA surveillance. In March 2003, a joint investigation was initiated by DOE, BJC, and CDM Federal Programs, Inc., to identify the issues, causes and corrective actions associated with the C-743-T-17 Field Laboratory. This investigation determined that all the required QA/QC elements to support the reported data associated with the Lasagna™ sampling events could not be located. In April 2003, the Lasagna™ site was resampled to verify the initial analytical results from the C-743-T-17 Field Laboratory. Results of the reverification are reported as an addendum to the *Final Remedial Action Report for Lasagna™ Phase IIb In-Situ Remediation of Solid Waste Management Unit 91 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2002c). The resampling confirmed that the average level of TCE had been reduced to far below the ROD RAO of 5.6 mg/kg.

No additional information has come to light since implementation of the remedy that could call into question the protectiveness of the remedy. No land use changes for the site are being considered. Further, the remedial investigation report for WAG 27 concluded "TCE released at SWMU 91 does not appear to have had a measurable impact on the RGA groundwater" (DOE 1999c).

7.3.4 Technical Assessment Summary

According to the documents and data reviewed, the site inspection, and the interviews, the remedy functioned as intended by the ROD. There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy. ARARs for soil contamination cited in the ROD have been met. There has been no change in the toxicity factors for the COCs that were used in the baseline risk assessment that are more stringent than those used, and there has been no change to the standardized risk assessment methodology that could affect the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

7.4 NSDD SOURCE CONTROL (SWOU)

The primary objectives of the interim action were to mitigate the discharge of contaminant into the NSDD, decrease the off-site migration of contaminants already present in the NSDD, and decrease the potential for worker exposure (i.e., direct human contact) to the contaminants within the ditch.

7.4.1 Question A: Is the remedy functioning as intended by the decision documents?

Based upon a review of monitoring information and other documentation, the site inspection, and interviews, DOE concludes that the NSDD remedial action is meeting the remedial objectives specified in the ROD. The following paragraphs discuss how the remedial action is meeting these objectives.

The ion exchange system was installed in the C-400 Cleaning Building to treat elevated levels of radionuclides in effluent being released from the C-400-B Storage Tank. USEC leased the C-400 Building and its operations from DOE in 1996.

Although the C-400 Building's wastewater is treated to as low as reasonably achievable (ALARA), monitoring data (presented in the previous Five-Year Review [DOE 2000c]) indicate that discharges have exceeded the original treatment goal (4 mrem/yr effective dose equivalent, equal to a derived activity standard of 900 pCi/l). Still, DOE believes that the primary objective, to mitigate the entry of contaminants into the NSDD, is being met. Since the effluent discharge from the C-400 Building was rerouted to Outfall 008 during the design phase, the introduction of contaminants into the NSDD from the C-400 Building has been eliminated completely.

DOE monitors surface water at Outfall 008 quarterly as a part of its Environmental Monitoring Program. Since August 2001, this location has been monitored for volatiles, PCBs, metals, anions/cations, and radionuclides. The maximum ^{99}Tc detection is 26.6 pCi/L.

Two concrete settling lagoons were constructed to collect fly ash from the C-600 Steam Plant effluent prior to discharge. The lagoons are functioning properly and are effectively lowering the levels of contamination reaching the NSDD.

A lift station was installed near the C-400 Cleaning Building and the C-600 Steam Plant to bypass the contaminated southern portion of the NSDD. Upon inspection, the lift station is functioning properly, thereby lowering the levels of contamination migrating from the NSDD by eliminating plant discharge through a portion of the ditch.

To mitigate the release of elevated contaminant levels from the contaminated southern portion, a gabion with nonwoven, geotextile material was installed. Upon inspection, the gabion is effectively controlling the transport of sediment from the NSDD during rainfall events.

To address direct contact concerns to industrial workers (no recreational users or members of the public have access to the on-site ditch), warning signs providing notice of elevated levels of contamination were installed. The signs are an effective means of warning workers of contamination in the NSDD.

7.4.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

During the period of this review, there have been no changes in the physical conditions of the on-site NSDD that would affect the protectiveness of the remedy. Changes in risk assessment methodology subsequent to approval of the ROD have been significant.

The risk assessment for the on-site NSDD determined that the unit poses unacceptable risk to industrial workers and animals via direct gamma irradiation from contaminated sediment and soil; dermal contact with soil, sediment, and debris; inhalation of resuspended particulate during mowing; and incidental ingestion of contaminated surface water, soil, and sediment. Subsequent changes to the parameters used for the exposure pathways may reduce the assessment of protectiveness of the remedial actions. Moreover, the potential COCs included radionuclides. Toxicity parameters for all radionuclides have changed and, in general, the values for radionuclide toxicity have increased.

The 1994 NSDD ROD identifies ARARs pertinent to the remedial action (DOE 1994a). The previous Five-Year Review found that jurisdictional wetlands have been identified in the NSDD since the signature of the ROD. Because the wetlands were not identified prior to the signature of the 1994 ROD, ARARs for the protection of wetlands were not identified, but are included with the ARARs presented in Appendix C, Table C.4. Further, the 1994 ROD for the NSDD was signed prior to the DOE's Secretarial Policy requiring that National Environmental Policy Act values be incorporated in CERCLA documents (DOE 1994a). These also are included in Appendix C. DOE complied with all requirements during implementation of the remedial action and continues to comply with identified requirements during operation of the action. None of these standards identified in the 1994 ROD have changed.

7.4.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has come to light that could call into question the protectiveness of the interim remedy.

7.4.4 Technical Assessment Summary

The *Operation and Maintenance Plan for the Surface Water Operable Unit at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2000b) requires daily inspections to ensure that the screen of the lift station remains clean; that the lift station is operational; and, if the lift pump is running at the time of inspection, that the pipeline is not leaking.

Exposure of plant personnel to flood water on 10th Street from the NSDD was a primary risk driver and objective for the interim action. Daily inspections reveal that there have been few overflow problems since implementation of the interim action.

There is no analytical data for sediment or water from the NSDD that can be used to assess the impact of the interim corrective action; however, its implementation inherently reduces contaminant transport from the ditch's upper reaches. Changes in risk assessment methodology subsequent to the ROD have been significant and could impact the evaluation of protectiveness. A second ROD (based on a current risk assessment) for the on-site NSDD (DOE 2002d) has been approved that will reduce risk to acceptable levels by removal of contaminated sediments and other measures.

The ion exchange system effluent is routed to the USEC-operated C-400 Cleaning Building collection tank, where it is stored until the treatment levels are assessed. Consistent with the concept of ALARA, the wastewater is repeatedly processed through the uranium precipitation and ion exchange systems until a point of diminishing return is reached (i.e., until the percentage of reduction becomes insignificant with subsequent treatments). The final concentration achievable in the treated water is contingent upon the initial concentrations. After treatment, the water either is recycled in C-400 Building processes or is discharged via Outfall 008.

7.5 WAGs 1 AND 7 (SWOU)

The RAOs for SWMU 8 of this unit were to control the release of COCs from the unit, limit direct contact by humans, and reduce overall risks to ecological receptors. The action implemented at SWMU 8 was intended to satisfy these objectives by limiting human and animal exposure to contaminated sediments and acidic leachate associated with the unit. The reduction of human risks was accomplished by posting warning signs and by placing a deed notice and restrictions on the SWMU 8 property. The reduction of ecological risks was accomplished by installing riprap over exposed acidic leachate seeps.

No further action, other than maintaining institutional controls (to maintain the industrial nature of the area), is necessary to protect workers at SWMU 100. It will not be discussed further.

7.5.1 Question A: Is the remedy functioning as intended by the decision documents?

Reviews of documents, ARARs, risk assumptions, surface water monitoring data, and the results of the site inspection all indicate that the remedial action at SWMU 8 is functioning according to the objectives established in the WAGs 1 and 7 ROD.

Surface water monitoring at the C-746-K Sanitary Landfill began in February 1992, following the discovery of leachate in adjacent ditches and creek banks. DOE summarized the monitoring data through October 1992 in the *Work Plan for Interim Corrective Measures at the C-746-K Sanitary Landfill*, DOE/OR/07-1211&D2, and developed the monitoring program that was used until October 1998 (DOE 1992a). Four stations made up the surface water monitoring network. Two stations (Points 1 and 4) located on the adjacent unnamed tributary and Bayou Creek, respectively, provided upstream monitoring. Two other stations close to the C-746-K Sanitary Landfill (Points 3A and 5) provided downstream monitoring on the adjacent unnamed tributary and Bayou Creek, respectively. The analysis suite for samples collected from the stream monitoring locations included 13 common metals, arsenic, mercury, uranium, VOCs, PCBs, and pH.

Samples were collected monthly through September 1995 and quarterly thereafter until October 1998. DOE presented an evaluation of results of the surface-water monitoring program in semiannual reports to the state. In summary, the data demonstrated that water quality at monitoring station Point 3A is impacted by the leachate from the C-746-K Sanitary Landfill, while monitoring station Point 5 appeared to be unaffected. The leachate from the landfill (as determined by seep sample sites GA-1 and GA-3) characteristically contained high levels of dissolved metals, low levels of dissolved VOCs, and a low pH (2.3 to 3.3 standard pH units).

The WAGs 1 and 7 ROD continued the existing surface-water monitoring program until the KDOW implemented a discharge permit that allowed for the monitoring of landfill discharges and protection of the environment afforded by the permit conditions. With the October 14, 1998, approval of the Watershed Monitoring Plan included in KPDES Permit, the C-746-K Sanitary Landfill surface-water monitoring requirements were incorporated into the KPDES compliance program.

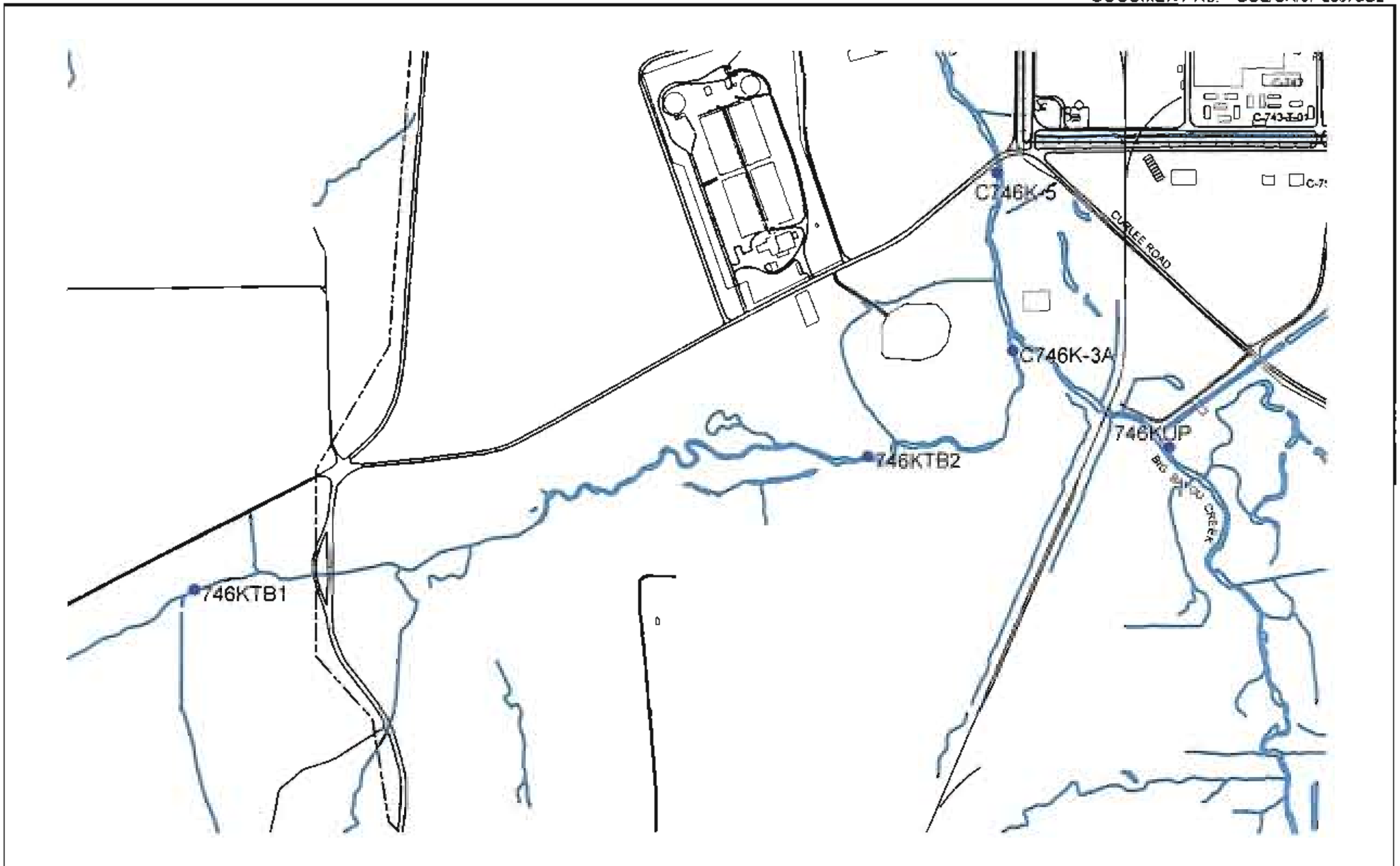
As shown on Fig. 7.5.1, four locations in the unnamed tributary and Bayou Creek in the vicinity of SWMU 8 are sampled quarterly by the M&I Contractor's Environmental Services subcontractor. The current analytical suite outlined in the CY 2003 Environmental Monitoring Plan for samples collected from these stream monitoring locations includes 21 common metals, arsenic, mercury, uranium, TCE, PCBs, pH, and other field measurements.

Table 7.5.1 summarizes relevant data for COCs and COPCs since the last Five-Year Review.

Table 7.5.1. Summary of water quality analyses for SWMU 8 COCs—since the last Five-Year Review

		Bayou Creek (surface water)		Unnamed Tributary (surface water)	
Analyte	**Unit**	**C-746-KUP (upstream)**	**C-746-K-5 (downstream)**	**746KTB1 (upstream)**	**746KTB2 (downstream)**
Aluminum		No upstream data	0.624[ac]	10.4[a]	7.03[a]
Iron	mg/l	No upstream data	0.918[ad]	10[a]	7.24[a]
Manganese		Not sampled quarterly since last review, but is included in the Environmental Monitoring Plan CY 2003[e] for quarterly sampling.			
Zinc		Non-detect	Non-detect	Non-detect	Non-detect
TCE	µg/l	Non-detect	Non-detect	Non-detect	Non-detect
1,1 DCE		Not analyzed	Non-detect	Not analyzed	Not analyzed
1,1 DCA		Not analyzed	Non-detect	Not analyzed	Not analyzed
trans-1,2–DCE		Not analyzed	Non-detect	Not analyzed	Not analyzed

[a] Maximum of reported quarterly mean values.
[b] Range of reported quarterly mean values.
[c] Not definitive—no upstream data.
[d] Not definitive—no upstream data.
[e] Environmental Monitoring Plan under which these locations were sampled required only TCE for volatile analysis. Current Environmental Monitoring Plan (calendar year 2003) includes other volatile analyses.



LEGEND
Surface water monitoring location
DOE Property Boundary
Railroad
Road
Stream

500 0 500 1000 Feet

TRUE NORTH
PLANT NORTH

U.S. DEPARTMENT OF ENERGY
DOE OAK RIDGE OPERATIONS
PADUCAH GASEOUS DIFFUSION PLANT

BECHTEL JACOBS COMPANY LLC
MANAGED FOR THE US DEPARTMENT OF ENERGY UNDER US GOVERNMENT CONTRACT DE-AC05-98OR22700
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Fig. 7.5.1. C-746-K Landfill surface-water monitoring locations.

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FIGURE No. c5ac90001sk655 apr
DATE 07-07-03

7.5.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

There have been no changes in the physical conditions of SWMU 8 that would affect the protectiveness of the remedy; however, subsequent changes in risk assessment methodology may necessitate a review of the site risk.

The risk assessment for SWMU 8 determined that the unit poses unacceptable risk to industrial workers and animals via direct contact with associated leachate and contaminated sediments. Although the ROD recognized that this assessment developed an overestimation of risk from the direct contact exposure pathway (because of conservative assumptions), subsequent changes to the parameters used for the exposure pathways may reduce the assessment of protectiveness of the remedial actions.

ARARs identified during the ROD development are listed in Appendix C, Table C.5. These ARARs are relevant and have been considered, as appropriate.

7.5.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has come to light since implementation of the remedy that could call into question the protectiveness of the remedy.

7.5.4 Technical Assessment Summary

According to the documents and COC data reviewed, the site inspection, and the interviews, the remedy is functioning as intended by the ROD. ARARs for leachate discharges and radionuclide exposures cited in the ROD have been met.

7.6 SWMUs 2 AND 3 (BGOU)

The ROD for SWMUs 2 and 3, signed in 1995, dealt primarily with SWMU 2 because SWMU 3 is covered under RCRA closure. According to the *Record of Decision for Interim Remedial Action at Solid Waste Management Units 2 and 3 of Waste Area Group 22 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, this goal was to be accomplished by designing a remedy consisting of the following components: a low-permeability cap, a groundwater monitoring program, and institutional controls (DOE 1995a). After a 1996 investigation to determine the saturation of the waste in SWMU 2, stakeholders concluded that placement of a cap on SWMU 2 would not prove effective, so that portion of the remedy was canceled.

When the construction of the cap was canceled, DOE determined that the change to the ROD was considered nonsignificant in nature, based on the definition of nonsignificant per the Final NCP Preamble (55 *FR* 8772, 03/08/90). A letter dated October 23, 1996, from DOE to EPA and KDEP documented this position and was placed in the AR post-ROD file (Hodges 1996).

7.6.1 Question A: Is the remedy functioning as intended by the decision documents?

The goal of the interim actions for SWMU 2, to provide overall protection of human health and the environment until a final remedy is enacted for SWMU 2, is functioning as intended.

Groundwater monitoring program for the RGA, consisting of two downgradient wells (MW337 and MW338) and one upgradient well (MW333), is functioning as intended. Additionally, the downgradient RGA well (MW67), the UCRS well (MW74), and the upgradient UCRS well (MW154) are available to provide potentiometric information. Four other RGA wells, intended to monitor SWMU 3, also provide upgradient data.

Tables 7.6.1 and 7.6.2 present downgradient vs. upgradient data in order to evaluate whether a release has occurred from SWMU 2. The table provides a comparison of the initial and current maximum concentrations of the principal contaminants detected in RGA wells at SWMU 2, based on groundwater sampling conducted between 1988 and 2002. The table indicates that the maximum detected concentrations of TCE in two RGA wells located at SWMU 2 currently exceed the National Primary Drinking Water Standards and applicable state standards. Concentrations of ^{99}Tc have remained below the MCL, but appear to be rising in the SWMU 2 downgradient well. Concentrations of uranium currently are at nondetectable levels, with the exception of one sampling event from which uranium was detected at a high level in a downgradient well. Subsequent sampling at the well and isotopic uranium analysis of the same sample show nondetectable levels; therefore, the credibility of the high result is questionable. Most other detected concentrations are comparable.

Further, Fig. 7.6.1 demonstrates TCE trends in wells upgradient and downgradient of SWMU 2. The trend from the most upgradient well (MW226) is super imposed upon the downgradient wells to illustrate the apparent contaminant flow pattern. The TCE trend found in MW226 appears in a similar form in MW337 and MW338, approximately three months later. MW333, which is situated between the groundwater flow path from MW226 to MW337 and MW338, also indicates a similar trend, though not as distinct, because it is not in the direct flow line.

Additionally, Fig. 7.6.2 demonstrates ^{99}Tc trends in the two RGA wells in the SWMU 2 area in which the radionuclide was detected at greater than 25 pCi/L. The ^{99}Tc trend seems to suggest a source of the radionuclide migrating into the RGA at SWMU 2.

Institutional controls are achieved to prevent transfer of the SWMU 2 property and to prevent future intrusive activities at the unit. Since SWMU 2 is located inside the plant secured area and under DOE ownership and control, deed restrictions have not been necessary. Signs are posted along the perimeter of the unit to identify it as a radiation-contaminated zone requiring personal protective equipment (PPE), special training, and permits to gain access or to work within the SWMU.

7.6.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

The RAOs established in the *Record of Decision for Interim Remedial Action at Solid Waste Management Units 2 and 3 of Waste Area Group 22 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, were to mitigate migration of uranium and TCE from SWMU 2 to groundwater and to prevent disturbance or contact with the buried waste materials within SWMU 2. The RAOs in the ROD were developed prior to the field investigation that indicated that the buried waste is partially saturated.

Table 7.6.1. Comparison of initial and current contaminant concentrations in RGA groundwater, downgradient to SWMU 2

Analyte	Initial Conditions (Pre-1996)			Current Conditions (Post-ROD)			Screening Levels		Units
	Maximum	Associated Well	Sampling Date	Maximum	Associated Well	Sampling Date	RGA Background Values[a]	Maximum Contaminant Level	
TCE	0.003	MW50	10/15/1991	0.320	MW337	6/10/2002	No Value	0.005	mg/L
Uranium	0.001	MW51	5/1/1991	0.35[b]	MW338	9/24/2001	0.002	0.03[c]	mg/L
cis-1,2-DCE				0.029	MW337	6/10/2002	No Value	0.07	mg/L
Beryllium	2.3	MW50	4/5/1990	0.0014	MW337	10/4/1996	0.004	0.004	mg/L
Calcium	16.8	MW50	10/20/1989	16	MW337	10/4/1996	40	No Value	mg/L
Chloride	13	MW67	2/18/1988	24.3	MW338	3/10/1998	89.2	250[d]	mg/L
Fluoride	0.89	MW51	5/1/1991	0.41	MW338 MW67	10/4/1996 10/8/1996	0.245	4	mg/L
Iron	82.8	MW50	10/20/1989	56	MW337	10/4/1996	3.72	0.3[d]	mg/L
Magnesium	6.43	MW67	2/24/1993	7.3	MW337	10/4/1996	15.7	No Value	mg/L
Manganese	1.8	MW51	1/13/1988	2.1	MW337	10/4/1996	0.082	0.05[d]	mg/L
Nitrate/Nitrite	0.07	MW50	4/5/1990	0.21	MW337	10/4/1996	13.5[e]	10[e]/1[f]	mg/L
Potassium	2.38	MW50	10/20/1989	3.9	MW337	10/4/1996	4.47	No Value	mg/L
Sodium	333	MW50	10/20/1989	14	MW338	10/4/1996	63.5	No Value	mg/L
Sulfate	12	MW67	2/24/1993	8.7	MW67	10/8/1996	19.1	No Value	mg/L
Vanadium	56.8	MW50	10/20/1989	0.052	MW337	10/4/1996	0.139	No Value	mg/L
Gross Alpha	33.3[g]	MW50	10/20/1989	8.97[g]	MW338	3/13/2002	2.36	15	pCi/L
Gross Beta	38 38[g]	MW50 MW51	10/20/1989 3/28/1991	115	MW337	9/5/2002	7.3	50[h]	pCi/L
^{241}Am	1.6	MW51	1/13/1988	0.35	MW67	10/8/1996	No Value	No Value	pCi/L
^{239}Pu	0.28	MW67	3/11/1991	0.13	MW338	10/4/1996	0.03	No Value	pCi/L
^{99}Tc	53.2	MW51	7/23/1992	196	MW337	9/5/2002	10.8	900	pCi/L
^{230}Th				0.74	MW67	10/8/1996	0.54	No Value	pCi/L
^{234}U	2.5	MW67	3/11/1991	0.56	MW338	10/4/1996	0.7	No Value	pCi/L
^{235}U/^{236}U				0.11	MW337	10/4/1996	0.3[i]	No Value	pCi/L
^{238}U	3.3	MW67	3/11/1991	0.67	MW338	10/4/1996	0.7	No Value	pCi/L

[a] Background values of RGA wells from Volume 5 of the GWOU FS, *Background Concentrations of Naturally Occurring Inorganic Chemicals and Selected Radionuclides in the Regional Gravel Aquifer and McNairy Formation at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2001b).
[b] Isolated detection, isotopic analysis shows non-detects.
[c] Proposed Value.
[d] Secondary MCL.
[e] Value is Nitrate as Nitrogen.
[f] Value is Nitrite as Nitrogen.
[g] Dissolved activity.
[h] Administrative Consent Order Value.
[i] Background value for ^{235}U.

Table 7.6.2. Comparison of initial and current contaminant concentrations in RGA groundwater, upgradient to SWMU 2

	Initial Conditions (Pre-1996)			Current Conditions (Post-ROD)			Screening Levels		
Analyte	Maximum	Associated Well	Sampling Date	Maximum	Associated Well	Sampling Date	RGA Background Values[a]	Maximum Contaminant Level	Units
TCE				0.420	MW333	6/10/2002	No Value	0.005	mg/L
Uranium	0.19	MW48	8/1/89	ND	MW333	ALL	0.002	0.03[b]	mg/L
cis-1,2-DCE				0.008	MW333	3/19/2001	No Value	0.07	mg/L
Beryllium	0.01	MW48	8/1/1989	ND	MW333	ALL	0.004	0.004	mg/L
Calcium	17.2	MW48	4/3/1991	24	MW333	10/14/1996	40	No Value	mg/L
Chloride	12	MW48	3/9/1993	12.1	MW333	3/10/1998	89.2	250[c]	mg/L
Fluoride	0.18	MW48	5/24/1989	0.32	MW333	10/14/1996	0.245	4	mg/L
Iron	706	MW48	8/1/1989	6.2	MW333	10/14/1996	3.72	0.3[c]	mg/L
Magnesium	0.00699	MW48	4/3/1991	9.2	MW333	10/14/1996	15.7	No Value	mg/L
Manganese	5.87	MW48	8/1/89	2.6	MW333	10/14/1996	0.082	0.05[c]	mg/L
Nitrate/Nitrite	2.4[d]	MW48	10/13/1989	0.05	MW333	10/14/1996	13.5[e]	10[e]/1[f]	mg/L
Potassium	2.07	MW48	10/13/1989	1.2	MW333	10/14/1996	4.47	No Value	mg/L
Sodium	13.7	MW48	4/3/1991	16	MW333	10/14/1996	63.5	No Value	mg/L
Sulfate	12	MW48	3/9/1993	16	MW333	10/14/1996	19.1	No Value	mg/L
Vanadium	8.5	MW48	10/13/1989	0.0097	MW333	10/14/1996	0.139	No Value	mg/L
Gross Alpha	20.4[g]	MW48	1/13/88	5.1	MW333	5/4/1998	2.36	15	pCi/L
Gross Beta	23[g]	MW48	1/13/88	15	MW333	5/4/1998	7.3	50[h]	pCi/L
^{241}Am	3.7	MW48	3/27/1991	0.19	MW333	10/14/1996	No Value	No Value	pCi/L
^{239}Pu				ND[i]	MW333	ALL	0.03	No Value	pCi/L
^{99}Tc	33	MW48	8/1/89	19.27	MW333	3/3/1999	10.8	900	pCi/L
^{230}Th				0.25	MW333	10/14/1996	0.54	No Value	pCi/L
^{234}U				9.66	MW333	10/14/1996	0.7	No Value	pCi/L
$^{235}U/^{236}U$				0.35	MW333	10/14/1996	0.3[j]	No Value	pCi/L
^{238}U	1.3	MW48	4/3/1991	ND	MW333	ALL	0.7	No Value	pCi/L

[a] Background values of RGA wells from Volume 5 of the GWOU FS, *Background Concentrations of Naturally Occurring Inorganic Chemicals and Selected Radionuclides in the Regional Gravel Aquifer and McNairy Formation at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2001b).
[b] Proposed Value.
[c] Secondary MCL.
[d] Value is Nitrate.
[e] Value in Nitrate as Nitrogen.
[f] Value is Nitrite as Nitrogen.
[g] Dissolved activity.
[h] Administrative Consent Order Value.
[i] Result reported is less than radiological error and thus considered a non-detect..
[j] Background value for ^{235}U.

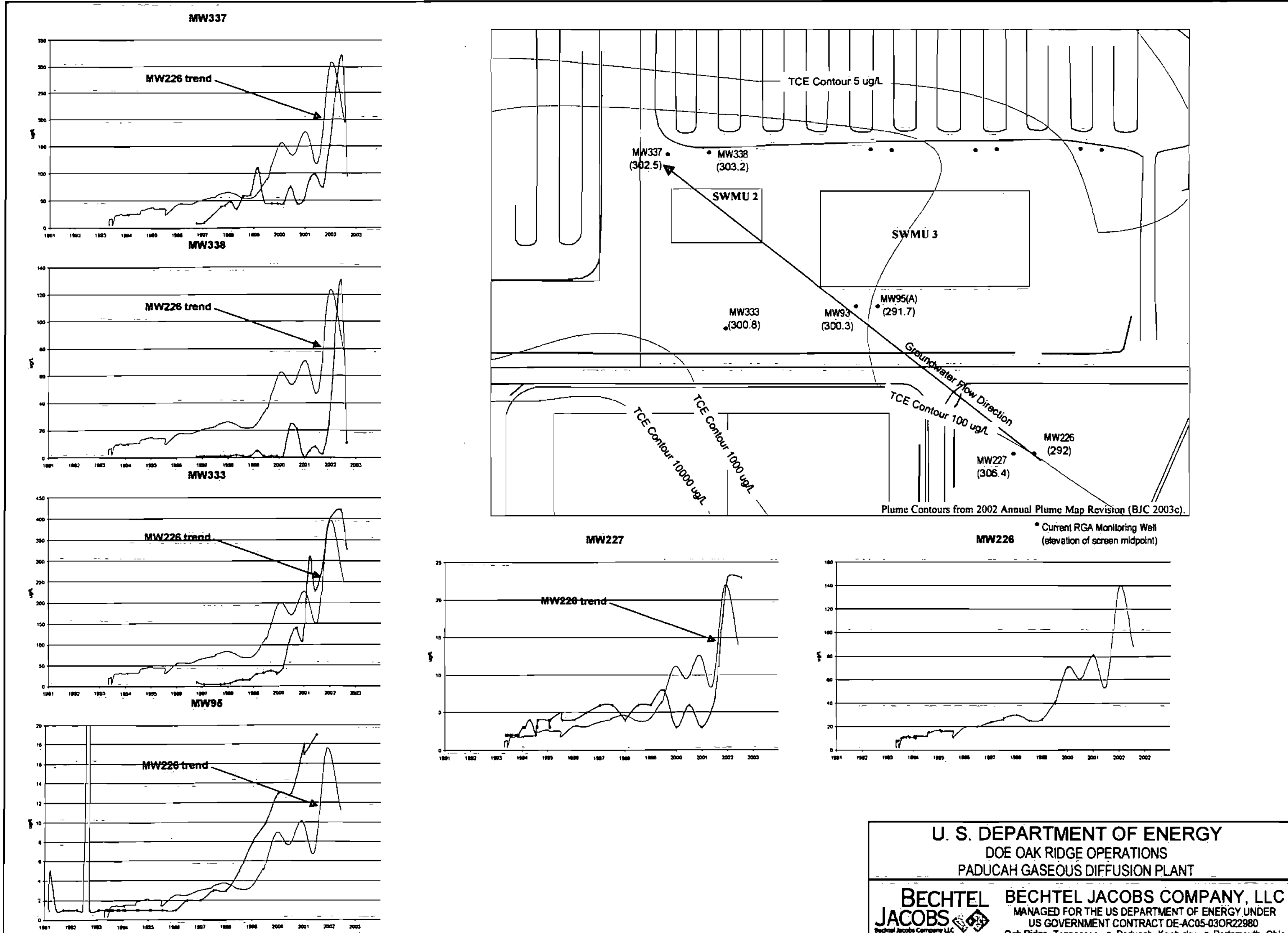

Fig. 7.6.1. TCE trends near SWMU 2.

U. S. DEPARTMENT OF ENERGY
DOE OAK RIDGE OPERATIONS
PADUCAH GASEOUS DIFFUSION PLANT

BECHTEL JACOBS COMPANY, LLC
MANAGED FOR THE US DEPARTMENT OF ENERGY UNDER
US GOVERNMENT CONTRACT DE-AC05-03OR22980
Oak Ridge, Tennessee • Paducah, Kentucky • Portsmouth, Ohio

Science Applications International Corporation
P.O. Box 2502
Oak Ridge, Tennessee 37831

FIGURE No. 7-6-1.ppt
DATE 07-02-03

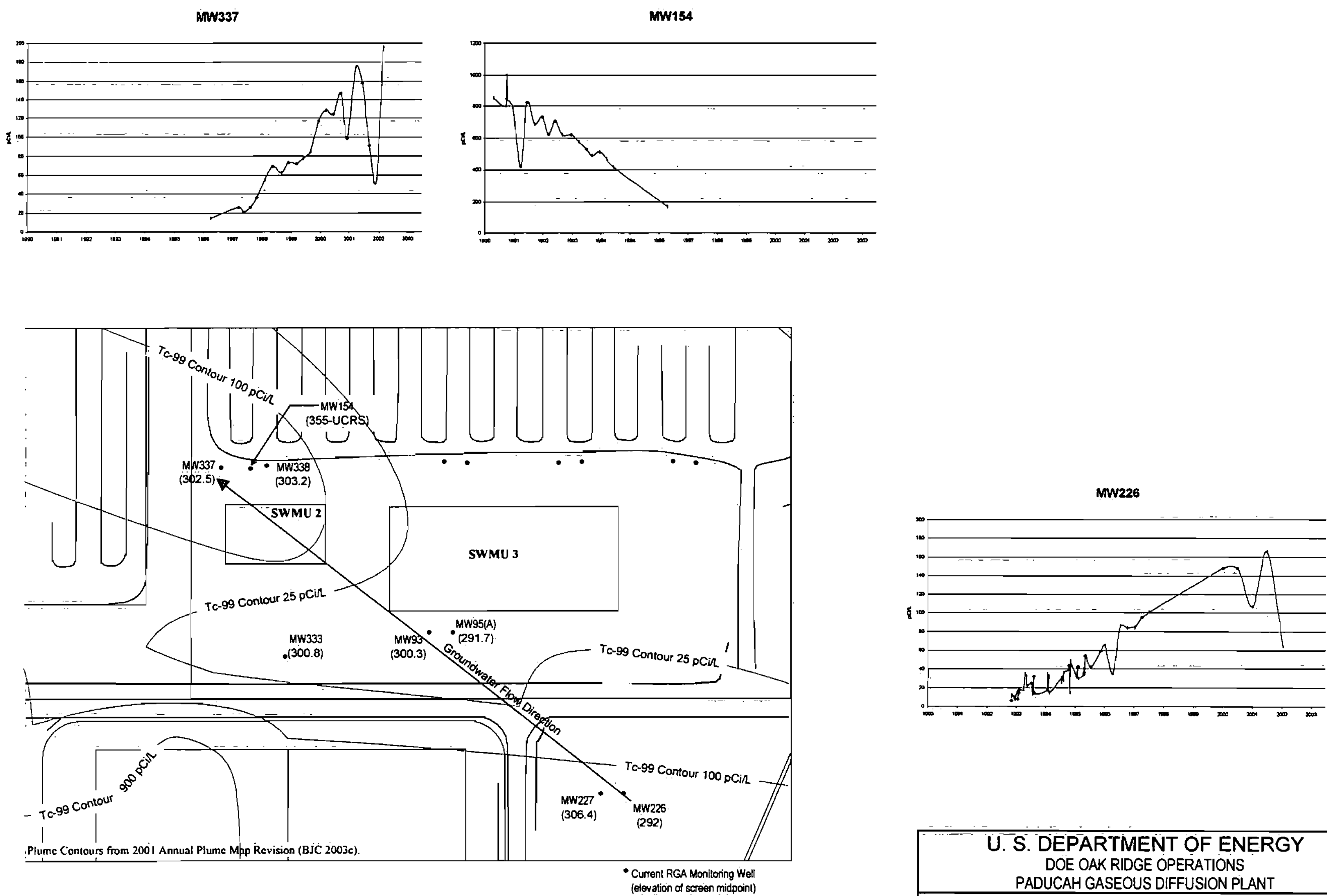

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Fig. 7.6.2. [99]Tc trends near SWMU 2.

FIGURE No. 7-6-2.ppt
DATE 07-02-03

The current groundwater data indicate that assumptions underlying the remedy selection in the ROD still are valid. The recent data demonstrate that the unit is a relatively small contributor to groundwater contamination in the area. While TCE remains at concentrations above drinking water MCLs, the existing institutional controls, environmental monitoring, and site maintenance activities at the unit continue to ensure protection of human health and the environment. The contaminant concentrations found in the wells are consistent with expectations at the time of ROD implementation, and no new contaminants or routes of exposure have been identified.

Many of the ARARs developed for the ROD are no longer applicable, because a cap was not constructed for the SWMU. A listing of these ARARs is included in Appendix C, Table C.6. Since current ARARs are above and beyond the remedy actually in place, there is no reason to question their current validity.

7.6.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has come to light since implementation of the remedy that could call into question the protectiveness of the remedy. No land use changes for the site are being considered.

7.6.4 Technical Assessment Summary

According to the documents and data reviewed, the site inspection, and the interviews, the remedy is functioning as described in the ROD. ARARs cited in the ROD have been met. There has been no change in the toxicity factors for the COCs that were used in the baseline risk assessment that are more stringent than those used, and there has been no change to the standardized risk assessment methodology that could affect the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

DOE will continue the current monitoring and institutional control activities at SWMU 2 until a final remedial action is selected and implemented for the BGOU. Previously, five-year reviews have indicated current hydrologic conditions were not the same as originally thought when the monitoring network was designed. As presented in Section 7.6.2, monitoring data appear to indicate that the current downgradient wells are located properly. It is recommended that groundwater data be evaluated annually, as required by the ROD, to determine any change.

The interim remedy selected for SWMU 2 is meeting remedial objectives defined in the ROD (DOE 1995a). The current action is protective of human health by preventing human exposure to buried wastes and groundwater through rigorous operational controls (i.e., radiological postings, radiological work permits, and excavation permits).

7.7 WATER POLICY

The primary objective of the removal action is to prevent local residents from using contaminated groundwater by providing municipal water to residences and businesses and eliminating the use of private water wells.

7.7.1 Question A: Is the remedy functioning as intended by the decision documents?

Based upon the interviews and review of other information, the Water Policy removal action is meeting the objectives specified in the Action Memorandum. The following paragraph discusses how the remedial action is meeting these objectives:

DOE is providing municipal water to all existing residences and businesses within the area affected by the Water Policy, and DOE pays, or has offered to pay, the water bills for all users. The bills have been paid, even in instances where the water usage has increased significantly for short periods or extended periods of time. The groundwater and the contaminant plumes continue to be monitored on at least a monthly basis.

7.7.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

During the period of this review, there have been no significant changes in the Northeast and Northwest groundwater contaminant plumes. An additional Southwest Plume was discovered, but it does not affect any private wells or residences. The exposure pathways were eliminated with the implementation of the Water Policy, and they remain eliminated. The contaminant concentrations have not changed. The toxicity data for these contaminants have changed over time, but these changes have not impacted the protectiveness that the Water Policy provides. The regulatory cleanup levels remain the same: the MCL for TCE is 5 ug/l, and the MCL for ^{99}Tc is 4 mrem/yr. The RAOs remain unchanged.

7.7.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has come to light that could call into question the protectiveness of the removal action.

7.7.4 Technical Assessment Summary

DOE is providing municipal water to residences and businesses located within the Water Policy area. This eliminates potentials pathways for the public to come into contact with the contaminated groundwater. The contaminant plumes are monitored regularly to ensure that the limits of the affected area do not need to be expanded. This action remains effective for the purpose for which it was intended.

8. ISSUES

Issues identified during this Five-Year Review that currently are preventing the remedial action from being protective, or may do so in the future, are summarized in the tables below for each action.

8.1 NORTHWEST PLUME (GWOU)

The Northwest Plume IRA consists of groundwater extraction at two locations. One of the EW fields is intended to control the source of groundwater contamination to the Northwest Plume immediately north of the PGDP main plant boundary. The other EW field is intended to reduce further contribution to contamination northwest of the plant at the northern tip of the most contaminated portion of the plume. **This action will minimally reduce risk by removing contaminant mass, but is not expected to be protective of human health or the environment.** Table 8.1 outlines issues related to the effectiveness of the action to meet its intended goals.

Table 8.1. Northwest Plume (GWOU) issues

Issue	Currently Affects Effectiveness	Affects Future Effectiveness
Some dissolved contamination is bypassing the east side of the South EW Field.	Yes	Yes
The high-concentration core of the Northwest Plume at the North EW Field has migrated eastward and is bypassing the capture zone of the well field.	Yes	Yes
Well efficiency for the EWs has been reduced.	No	Yes

8.2 NORTHEAST PLUME (GWOU)

Record of Decision for Interim Remedial Action at the Northeast Plume, Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE 1995b) requires that DOE extract groundwater at a location in the northern portion of the high TCE concentration area of the plume to initiate hydraulic control. **The Northeast Plume IRA will minimally reduce risk by removing contaminant mass, but is not expected to be protective of human health or the environment.** Table 8.2 presents issues that will affect the action and may bear on the continuing use of a PGDP cooling tower as a main component of the effluent treatment system.

Table 8.2. Northeast Plume (GWOU) issues

Issue	Currently Affects Effectiveness	Affects Future Effectiveness
Well efficiency for the EWs has been reduced.	No	Yes
Dissolved ^{99}Tc contamination may migrate into the area of the EW field.	No	Possibly

8.3 SWMU 91 (GWOU)

Table 8.3. SWMU 91 (GWOU) issues

Issue	Currently Affects Protectiveness	Affects Future Protectiveness
Resampling and analysis of the initial verification event took place in April 2003, to address quality issues identified during the evaluation of the C-746-T-17 Field Laboratory. The reverification confirmed that the average level of TCE had been reduced to far below the ROD RAO.	No	No

8.4 NSDD SOURCE CONTROL (SWOU)

There are no issues related to the interim remedial actions taken at NSDD.

8.5 WAGs 1 AND 7 (SWOU)

Table 8.4. WAGs 1 and 7 (SWOU) issues

Issue	Currently Affects Protectiveness	Affects Future Protectiveness
Evidence of nonessential maintenance vehicle tracks is present on the protective cap of SWMU 8.	No	Yes
Signage is not adequately placed at SWMU 8.	Yes	Yes

8.6 SWMUs 2 AND 3 (BGOU)

The SWMUs 2 and 3 ROD (DOE 1995a) specifies that a groundwater monitoring program be implemented in the RGA to detect any release of contaminants from SWMU 2. Further, the ROD requires an annual evaluation of groundwater data. Groundwater data are collected and assessed at least annually from SWMU 2.

Table 8.5. SWMUs 2 and 3 (BGOU) issues

Issue	Currently Affects Protectiveness	Affects Future Protectiveness
^{99}Tc appears to be being released from SWMU 2.	No	Yes

8.7 WATER POLICY

The DOE supplies municipal water to the residences and businesses in the Water Policy area. Table 8.6 outlines issues related to the implementation of the Water Policy.

Table 8.6. Water Policy removal action issues

Issue	Currently Affects Effectiveness	Affects Future Effectiveness
Inconsistent implementation of Water Policy: • Some residents have declined to sign license agreements. • DOE has paid all water bills, even when they have been excessive. • Extent of Water Policy area may be reduced to be more cost-efficient.	No	No

9. RECOMMENDATIONS AND FOLLOW-UP ACTIONS

Based upon the issues for each remedial action, listed previously, Table 9.1 identifies recommendations and follow-up actions.

Table 9.1. Recommendations and follow-up actions

Issue	Recommendations/ Follow-up Actions
Northwest Plume (GWOU)	
Some contaminated groundwater is bypassing the south well field on the east side.	Evaluate EW optimization.
Core of NW Plume is bypassing north wells.	Continue to assess monitoring data on semiannual basis until a final remedy is determined.
Reduced well efficiency.	Continue to monitor drawdown and redevelop well when required.
Northeast Plume (GWOU)	
Reduced well efficiency.	Monitor drawdown and redevelop well when required.
^{99}Tc migration to well field.	Quarterly review of monitoring data.
SWMU 91 (GWOU)	
The remedial action of SWMU 91 is complete. Reverification sampling has been conducted and results have confirmed that the remediation objective was met. Details of the Lasagna™ verification resampling and analysis event are given in the *Addendum to the Final Remedial Action Report for Lasagna™ Phase IIb In-Situ Remediation of Solid Waste Management Unit 91 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2003b).	
NSDD (SWOU)	
The interim remedial actions at NSDD do not require follow-up.	
WAGs 1 and 7 (SWOU)	
Evidence of nonessential maintenance vehicle tracks is present on the protective cap of SWMU 8.	Traffic on the top and side slopes of the landfill should be restricted to foot traffic and necessary maintenance equipment only.
Signage is not adequately placed at SWMU 8.	Place signs on the south side of the unnamed tributary along its central and western boundaries with the landfill.
SWMUs 2 and 3 (BGOU)	
^{99}Tc appears to be being released from SWMU 2.	Enhance annual groundwater evaluation to document site-specific trends.
Water Policy	
Inconsistent implementation of Water Policy: • Some residents have declined to sign license agreements; and • DOE has paid all water bills, even when they have been excessive. • Extent of Water Policy area may be reduced to be more cost-efficient	• Revisit Water Policy (including license agreements and boundaries) to determine if revisions are warranted. • Implement Water Policy in a consistent, cost-effective manner.

As the lead agency, DOE is responsible for implementing these recommendations. EPA and KDEP will provide oversight. The DOE's M&I contractor has a program for tracking and resolving issues that arise from facility inspections (BJC 2003d). The issues identified in Table 9.1 will be entered into the tracking system for this program and will be addressed in a timely manner. DOE will interface with EPA and the Commonwealth of Kentucky, as necessary, to implement these recommendations.

10. PROTECTIVENESS STATEMENTS

The remedies taken for the GWOU (Northwest Plume Interim Action and Northeast Plume Interim Action) are not protective. DOE's Water Policy is an institutional control that prevents exposure of area residents to the groundwater contaminants. The remedies of the SWOU (WAGs 1 and 7 [SWMU 8] and NSDD Interim Action [Source Control]) and the BGOU (SWMUs 2 and 3) are protective of human health and the environment, and, in the interim, exposure pathways that could result in unacceptable risks are being controlled.

Because the remedial action at SWMU 91 (Lasagna™) is protective, this site is protective of human health and the environment with regard to TCE contamination, as prescribed by the ROD.

11. NEXT REVIEW

The next five-year review for PGDP is required by July 2008, five years from the date of this review. All remedial actions discussed within this text, in addition to any new actions completed within the next five years, will be included in that review.

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APPENDIX A

SITE INSPECTIONS/INTERVIEWS

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NORTHWEST PLUME (GWOU)
Site Inspection of the Northwest Plume Pump-and-Treat Facility

Summary of Overall Observations

On March 11, 2003, a site inspection of the Northwest Plume Pump-and-Treat Facility was conducted. The facility includes the C-612 Treatment Facility, the South EW Field, and the North EW Field. The treatment facility and the south well field are located just outside the northwest corner of the perimeter fence of PGDP, but within the security buffer zone around the plant. The north well field is located approximately one mile north of the treatment facility on the WKWMA. The EWs pump groundwater from the high-concentration core of the Northwest Plume to the treatment facility, where contaminants are removed prior to discharge into KPDES Outfall 001.

The EWs are located in underground concrete vaults with hinged aluminum lids that are secured with locks. Electrical power and controls for each well are located in weatherproof electrical enclosures adjacent to each well. The enclosures also are secured by locks and are in good operating condition. The roads to each site are in a well-maintained condition. The area immediately around each site is mowed on a regular basis. On the day of this inspection all EWs were functioning normally.

The C-612 treatment facility is a pre-engineered metal building with one vehicular entrance and two pedestrian entrances. The exterior of the building appears in good condition with no signs of damage, rust, or deterioration. The area around the building is maintained well. Mowing and weed trimming are performed on a regular basis. A chain-link security fence that is in good condition encloses the building.

All treatment process equipment is located within the building. Groundwater treatment consists of a sand filter unit, an air stripper and carbon filtration unit, and four ion-exchange columns. The interior of the building is clean, free of clutter and debris, and is maintained well. Access-controlled areas within the building are clearly marked and identified. Process piping in the facility is properly identified as to content and flow direction, adequately supported, and in a well-maintained condition. There were no signs of leaks or deterioration. Process control panels are maintained well with all components clearly identified and labeled. All electrical power and control panels are properly labeled. The building contains a wet-type fire sprinkler system that is inspected and tested regularly by the PGDP Fire Services Department.

Site Inspection Checklist

I. SITE INFORMATION	
Site name: GWOU NW Plume P&T	**Date of inspection:** 3/11/2003
Location and Region: Paducah, KY/Region 4	**EPA ID:** KY8890008982
Agency, office, or company leading the five-year review: DOE	**Weather/temperature:** Spring

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- ☐ Institutional controls
- ☒ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other ______
- ☐ Monitored natural attenuation
- ☒ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Mr. Jim Montgomery — Facility Manager — 5/16/2003
   Name / Title / Date
   Interviewed ☐ at site ☒ at office ☐ by phone Phone no. ______
   Problems, suggestions; ☒ Report attached ______

2. **O&M staff** ______ ______ ______
   Name / Title / Date
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______
   Problems, suggestions; ☐ Report attached ______

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency ______________________________
Contact ______________________________ ____________________ __________ ______________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ____
____

Agency ______________________________
Contact ______________________________ ____________________ __________ ______________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ____
____

Agency ______________________________
Contact ______________________________ ____________________ __________ ______________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ____
____

Agency ______________________________
Contact ______________________________ ____________________ __________ ______________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ____
____

4. **Other interviews** (optional) ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)			
1. O&M Documents			
☒ O&M manual	☒ Readily available	☒ Up to date	☐ N/A
☒ As-built drawings	☒ Readily available	☒ Up to date	☐ N/A
☒ Maintenance logs	☒ Readily available	☒ Up to date	☐ N/A
Remarks			
2. Site-Specific Health and Safety Plan	☒ Readily available	☒ Up to date	☐ N/A
Contingency plan/emergency response plan	☒ Readily available	☒ Up to date	☐ N/A
Remarks			
3. O&M and OSHA Training Records	☒ Readily available	☒ Up to date	☐ N/A
Remarks			
4. Permits and Service Agreements			
☐ Air discharge permit	☐ Readily available	☐ Up to date	☐ N/A
☒ Effluent discharge	☒ Readily available	☒ Up to date	☐ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☐ N/A
☒ Other permits Water Withdrawal	☒ Readily available	☒ Up to date	☐ N/A
Remarks Effluent discharge is through a KPDES-permitted outfall			
5. Gas Generation Records	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
6. Settlement Monument Records	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
7. Groundwater Monitoring Records	☒ Readily available	☒ Up to date	☐ N/A
Remarks			
8. Leachate Extraction Records	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
9. Discharge Compliance Records			
☒ Air	☒ Readily available	☒ Up to date	☐ N/A
☒ Water (effluent)	☒ Readily available	☒ Up to date	☐ N/A
Remarks			
10. Daily Access/Security Logs	☒ Readily available	☒ Up to date	☐ N/A
Remarks Visitor Access Log			

IV. O&M COSTS

1. **O&M Organization**
☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☒ Contractor for Federal Facility
☐ Other____

2. **O&M Cost Records** *Refer to Sect. 4.1 of the report.*
☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate__________________ ☐ Breakdown attached

Total annual cost by year for review period if available

From	To		
From________ (Date)	To________ (Date)	________ (Total cost)	☐ Breakdown attached
From________ (Date)	To________ (Date)	________ (Total cost)	☐ Breakdown attached
From________ (Date)	To________ (Date)	________ (Total cost)	☐ Breakdown attached
From________ (Date)	To________ (Date)	________ (Total cost)	☐ Breakdown attached
From________ (Date)	To________ (Date)	________ (Total cost)	☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period** *Costs are discussed in Sect. 4.1 of the report.*
Describe costs and reasons: Replacement of resin in two ion exchange column due to plugging.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. Fencing damaged ☐ Location shown on site map ☐ Gates secured ☐ N/A
Remarks Perimeter fence around treatment building is in good condition.

B. Other Access Restrictions

1. Signs and other security measures ☐ Location shown on site map ☐ N/A
Remarks Area is adequately posted. Site visitors are required to sign in and out.

C. Institutional Controls (ICs)			
1. **Implementation and enforcement**			
Site conditions imply ICs not properly implemented	☐ Yes	☐ No	☒ N/A
Site conditions imply ICs not being fully enforced	☐ Yes	☐ No	☒ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) ______________________
Frequency ______________________
Responsible party/agency ______________________
Contact ______________________

Name	Title	Date	Phone no.

Reporting is up-to-date	☐ Yes	☐ No	☒ N/A
Reports are verified by the lead agency	☐ Yes	☐ No	☒ N/A
Specific requirements in deed or decision documents have been met	☐ Yes	☐ No	☒ N/A
Violations have been reported	☐ Yes	☐ No	☒ N/A

Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☐ ICs are adequate ☐ ICs are inadequate ☒ N/A
Remarks ______________________

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks ______________________

2. **Land use changes on site** ☐ N/A
Remarks No changes.

3. **Land use changes off site** ☐ N/A
Remarks No changes.

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks ______________________

B. Other Site Conditions

Remarks ____

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement (Low spots)** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent______________ Depth____________
   Remarks____

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths____________ Widths___________ Depths__________
   Remarks____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent______________ Depth____________
   Remarks____

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent______________ Depth____________
   Remarks____

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks____

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks____

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent______________ Height____________
   Remarks____

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
   ☐ Wet areas ☐ Location shown on site map Areal extent______________
   ☐ Ponding ☐ Location shown on site map Areal extent______________
   ☐ Seeps ☐ Location shown on site map Areal extent______________
   ☐ Soft subgrade ☐ Location shown on site map Areal extent______________
   Remarks____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
   Areal extent______________
   Remarks____

B. Benches ☐ Applicable ☐ N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks____

C. Letdown Channels ☐ Applicable ☐ N/A
Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent______________ Depth____________
Remarks____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type______________Areal extent____________
Remarks____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent______________ Depth____________
Remarks____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent______________ Depth____________
Remarks____

5. **Obstructions** Type____________________ ☐ No obstructions
☐ Location shown on site map Areal extent______________
Size____________
Remarks____

6. **Excessive Vegetative Growth** Type____________________
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent______________
Remarks____

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____

3.	**Monitoring Wells (within surface area of landfill)** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks_______________
4.	**Leachate Extraction Wells** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks_______________
5.	**Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A Remarks_______________
E.	**Gas Collection and Treatment** ☐ Applicable ☐ N/A
1.	**Gas Treatment Facilities** ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse ☐ Good condition ☐ Needs Maintenance Remarks_______________
2.	**Gas Collection Wells, Manifolds and Piping** ☐ Good condition ☐ Needs Maintenance Remarks_______________
3.	**Gas Monitoring Facilities (*e.g.*, gas monitoring of adjacent homes or buildings)** ☐ Good condition ☐ Needs Maintenance ☐ N/A Remarks_______________
F.	**Cover Drainage Layer** ☐ Applicable ☐ N/A
1.	**Outlet Pipes Inspected** ☐ Functioning ☐ N/A Remarks_______________
2.	**Outlet Rock Inspected** ☐ Functioning ☐ N/A Remarks_______________
G.	**Detention/Sedimentation Ponds** ☐ Applicable ☐ N/A
1.	**Siltation** Areal extent__________ Depth__________ ☐ N/A ☐ Siltation not evident Remarks_______________
2.	**Erosion** Areal extent__________ Depth__________ ☐ Erosion not evident Remarks_______________
3.	**Outlet Works** ☐ Functioning ☐ N/A Remarks_______________
4.	**Dam** ☐ Functioning ☐ N/A Remarks_______________

H. Retaining Walls ☐ Applicable ☐ N/A	
1.	**Deformations** ☐ Location shown on site map ☐ Deformation not evident Horizontal displacement__________ Vertical displacement__________ Rotational displacement__________ Remarks______________________________
2.	**Degradation** ☐ Location shown on site map ☐ Degradation not evident Remarks______________________________
I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☐ N/A	
1.	**Siltation** ☐ Location shown on site map ☐ Siltation not evident Areal extent__________ Depth__________ Remarks______________________________
2.	**Vegetative Growth** ☐ Location shown on site map ☐ N/A ☐ Vegetation does not impede flow Areal extent__________ Type__________ Remarks______________________________
3.	**Erosion** ☐ Location shown on site map ☐ Erosion not evident Areal extent__________ Depth__________ Remarks______________________________
4.	**Discharge Structure** ☐ Functioning ☐ N/A Remarks______________________________
VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A	
1.	**Settlement** ☐ Location shown on site map ☐ Settlement not evident Areal extent__________ Depth__________ Remarks______________________________
2.	**Performance Monitoring** Type of monitoring__________ ☐ Performance not monitored Frequency__________ ☐ Evidence of breaching Head differential__________ Remarks______________________________

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A
A. Groundwater Extraction Wells, Pumps, and Pipelines ☒ Applicable ☐ N/A
1. **Pumps, Wellhead Plumbing, and Electrical** ☒ Good condition ☒ All required wells properly operating ☐ Needs Maintenance ☐ N/A Remarks
2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☒ Good condition ☐ Needs Maintenance Remarks
3. **Spare Parts and Equipment** ☒ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A 1. **Collection Structures, Pumps, and Electrical** ☐ Good condition ☐ Needs Maintenance Remarks
2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks
3. **Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks

C. Treatment System	☒ Applicable ☐ N/A
1.	**Treatment Train (Check components that apply)** ☒ Metals removal ☐ Oil/water separation ☐ Bioremediation ☒ Air stripping ☒ Carbon adsorbers ☒ Filters sand filter ☐ Additive (*e.g.*, chelation agent, flocculent) none ☐ Others ☒ Good condition ☐ Needs Maintenance ☒ Sampling ports properly marked and functional ☒ Sampling/maintenance log displayed and up to date ☒ Equipment properly identified ☐ Quantity of groundwater treated annually Refer to Sect. 4.1 of the report ☐ Quantity of surface water treated annually Remarks
2.	**Electrical Enclosures and Panels (properly rated and functional)** ☐ N/A ☒ Good condition ☐ Needs Maintenance Remarks
3.	**Tanks, Vaults, Storage Vessels** ☐ N/A ☒ Good condition ☒ Proper secondary containment ☐ Needs Maintenance Remarks
4.	**Discharge Structure and Appurtenances** ☐ N/A ☒ Good condition ☐ Needs Maintenance Remarks
5.	**Treatment Building(s)** ☐ N/A ☒ Good condition (esp. roof and doorways) ☐ Needs repair ☐ Chemicals and equipment properly stored Remarks
6.	**Monitoring Wells (pump and treatment remedy)** ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition ☒ All required wells located ☐ Needs Maintenance ☐ N/A Remarks
D. Monitoring Data	
1.	**Monitoring Data** ☒ Is routinely submitted on time ☒ Is of acceptable quality
2.	**Monitoring data suggests:** *Refer to Sect. 7.1 of report.* ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D.	**Monitored Natural Attenuation**
1.	**Monitoring Wells (natural attenuation remedy)** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☒ N/A Remarks

X. OTHER REMEDIES
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.
XI. OVERALL OBSERVATIONS *Refer to Summary of Overall Observations, above.*

A.	**Implementation of the Remedy**
	Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).
B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

INTERVIEW RECORD

Site Name: Paducah Gaseous Diffusion Plant	**EPA ID No.:** KY8890008982
Subject: Northwest Plume Pump-and-Treat Facility	**Time:** 1:00 pm / **Date:** 05/16/03
Type: ☐ Telephone ☒ Visit ☐ Other **Location of Visit:** Mr. Montgomery's office	☐ Incoming ☐ Outgoing

Contact Made By:

Name: LeAnne Garner	**Title:** Environmental Engineer	**Organization:** SAIC

Individual Contacted:

Name: Jim Montgomery	**Title:** Facility Manager	**Organization:** BJC

Summary Of Conversation

Typical list of questions:

- What is your overall impression of the project? (general sentiment)
- Is the remedy functioning as expected? How well is the remedy performing?
- What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?
- Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.
- Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.
- Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.
- Have there been opportunities to optimize O&M or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.
- Do you have any comments, suggestions, or recommendations regarding the project?
- Are inspections performed of the facility? What is the driver behind those inspections? Where is it documented?

Summary of responses:

Mr. Montgomery's overall impression of the project is that it is doing what it was intended to do. He feels the remedy is functioning as it was intended. Trends of the contaminant levels were discussed, but are included in the Five-Year Review. There is a continuous on-site O&M presence. Staff includes a Project Manager, an Engineering/Operations Manager, Techs, and Clerical. A 24-hour autodial is set up to alert staff of any problems via paging. No significant changes have been made in the O&M requirements, maintenance schedules, or sampling routines in the last five years. There have been no unexpected O&M difficulties or costs at the site in the last five years. The project team is always looking to improve optimization of O&M and sampling efforts. On-line analyzer is calibrated and inspected twice weekly. GSA and SAA inspections are performed weekly. Routine daily inspections are conducted.

NORTHEAST PLUME (GWOU)
Site Inspection of the Northeast Plume Pump-and-Treat Facility

Summary of Overall Observations

On March 11, 2003, a site inspection was conducted at the Northeast Plume Pump-and-Treat Facility. This facility is located south and east of the intersection of Ogden Landing Road (Ky. Hwy 358) and Little Bayou Creek, northeast of PGDP. The facility consists of two EWs, a pumping station, associated piping, electrical power and control systems, security fencing and gates, and interconnecting gravel access roads.

The main access road into the area is secured by two chain-link gates located just south of its intersection with Ogden Landing Road. These gates are locked at all times except when operations or maintenance personnel are in the area. The gates are in good condition and serve their intended function. All the roads in the area appear to be maintained well and to be in good condition.

The two EWs are located approximately 200 ft apart. Each well is located in an underground concrete vault with a hinged aluminum lid. Each vault is protected by guard posts. Each well also is surrounded by a chain-link security fence with an access gate that remains locked at all times when the area is unoccupied. The vaults are in good condition and kept free of debris. The security fences around each well also are in good condition. The immediate area around each fenced location appears to be maintained well and is mowed on a regular basis. During this inspection, both wells were pumping with no apparent problems.

The pumping station, which consists of a large underground equalization tank, two discharge pumps and associated piping, and electrical power and control panels, also is completely enclosed in a chain-link security fence with an access gate at one end. All aboveground piping is insulated to prevent freezing. All the exposed piping and insulation are in good condition and functional. During this inspection, the pumps were running and no problems were observed. All exposed valves were properly labeled. The electrical power and control panels are in good condition and properly labeled. The area immediately around the pumping station is maintained and mowed on a regular basis. Water from the pumping station is pumped through underground lines back into PGDP to the C-637 Cooling Tower. These lines are checked quarterly to insure proper operation.

Site Inspection Checklist

I. SITE INFORMATION	
Site name: GWOU NE Plume P&T	**Date of inspection:** 3/11/2003
Location and Region: Paducah, KY/Region 4	**EPA ID:** KY8890008982
Agency, office, or company leading the five-year review: DOE	**Weather/temperature:** Spring

Remedy Includes: (Check all that apply)

- Landfill cover/containment
- Access controls
- Institutional controls
- ☒ Groundwater pump and treatment
- Surface water collection and treatment
- Other ____________
- Monitored natural attenuation
- ☒ Groundwater containment
- Vertical barrier walls

Attachments: Inspection team roster attached Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Mr. Jim Montgomery (Name) Facility Manager (Title) 5/16/2003 (Date)

   Interviewed at site ☒ at office by phone Phone no. ____________

   Problems, suggestions; ☒ Report attached ____________

2. **O&M staff** ____________ (Name) ____________ (Title) ____________ (Date)

   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ____________

   Problems, suggestions; ☐ Report attached ____________

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency ______________________________
Contact ______________________________ ____________________ __________ ______________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ____
____

Agency ______________________________
Contact ______________________________ ____________________ __________ ______________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ____
____

Agency ______________________________
Contact ______________________________ ____________________ __________ ______________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ____
____

Agency ______________________________
Contact ______________________________ ____________________ __________ ______________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ____
____

4. **Other interviews** (optional) ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)
1. **O&M Documents** ☒ O&M manual ☒ Readily available ☒ Up to date ☐ N/A ☒ As-built drawings ☒ Readily available ☒ Up to date ☐ N/A ☒ Maintenance logs ☒ Readily available ☒ Up to date ☐ N/A Remarks
2. **Site-Specific Health and Safety Plan** ☒ Readily available ☒ Up to date ☐ N/A Contingency plan/emergency response plan ☒ Readily available ☒ Up to date ☐ N/A Remarks
3. **O&M and OSHA Training Records** ☒ Readily available ☒ Up to date ☐ N/A Remarks
4. **Permits and Service Agreements** ☐ Air discharge permit ☐ Readily available ☐ Up to date ☐ N/A ☒ Effluent discharge ☒ Readily available ☒ Up to date ☐ N/A ☐ Waste disposal, POTW ☐ Readily available ☐ Up to date ☐ N/A ☒ Other permits Water Withdrawal ☒ Readily available ☒ Up to date ☐ N/A Remarks Effluent discharge is to a KPDES-permitted outfall
5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A Remarks
6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A Remarks
7. **Groundwater Monitoring Records** ☒ Readily available ☒ Up to date ☐ N/A Remarks
8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A Remarks
9. **Discharge Compliance Records** ☐ Air ☐ Readily available ☐ Up to date ☒ N/A ☒ Water (effluent) ☒ Readily available ☒ Up to date ☐ N/A Remarks
10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A Remarks

IV. O&M COSTS

1. **O&M Organization**
☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☒ Contractor for Federal Facility
☐ Other ______

2. **O&M Cost Records** *Refer to Sect. 4.2 of the report.*
☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate ______ ☐ Breakdown attached

Total annual cost by year for review period if available

From ______ Date	To ______ Date	______ Total cost	☐ Breakdown attached
From ______ Date	To ______ Date	______ Total cost	☐ Breakdown attached
From ______ Date	To ______ Date	______ Total cost	☐ Breakdown attached
From ______ Date	To ______ Date	______ Total cost	☐ Breakdown attached
From ______ Date	To ______ Date	______ Total cost	☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period** *Costs are discussed in Sect. 4.2 of the report.*
Describe costs and reasons: ______

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. Fencing damaged ☐ Location shown on site map ☒ Gates secured ☐ N/A
Remarks Fences and gates are in good condition.

B. Other Access Restrictions

1. Signs and other security measures ☐ Location shown on site map ☐ N/A
Remarks Area is properly posted.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**
   Site conditions imply ICs not properly implemented ☐ Yes ☐ No ☒ N/A
   Site conditions imply ICs not being fully enforced ☐ Yes ☐ No ☒ N/A

   Type of monitoring (*e.g.*, self-reporting, drive by) ____________
   Frequency ____________
   Responsible party/agency ____________
   Contact ____________ ____________ ____________ ____________
   Name Title Date Phone no.

   Reporting is up-to-date ☐ Yes ☐ No ☒ N/A
   Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A

   Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☒ N/A
   Violations have been reported ☐ Yes ☐ No ☒ N/A
   Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☐ ICs are adequate ☐ ICs are inadequate ☒ N/A
   Remarks ____________

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
   Remarks ____________

2. **Land use changes on site** ☐ N/A
   Remarks No changes.

3. **Land use changes off site** ☐ N/A
   Remarks No changes.

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
   Remarks ____________

B. Other Site Conditions

Remarks Area immediately around extraction wells and pumping station is well-maintained.

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement (Low spots)** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent__________ Depth__________
   Remarks__________

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths__________ Widths__________ Depths__________
   Remarks__________

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent__________ Depth__________
   Remarks__________

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent__________ Depth__________
   Remarks__________

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks__________

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks__________

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent__________ Height__________
   Remarks__________

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
   ☐ Wet areas ☐ Location shown on site map Areal extent__________
   ☐ Ponding ☐ Location shown on site map Areal extent__________
   ☐ Seeps ☐ Location shown on site map Areal extent__________
   ☐ Soft subgrade ☐ Location shown on site map Areal extent__________
   Remarks__________

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
   Areal extent__________
   Remarks__________

B. Benches ☐ Applicable ☐ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks____

C. Letdown Channels ☐ Applicable ☐ N/A
Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent______________ Depth____________
Remarks____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_______________Areal extent_____________
Remarks____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent______________ Depth____________
Remarks____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent______________ Depth____________
Remarks____

5. **Obstructions** Type____________________ ☐ No obstructions
☐ Location shown on site map Areal extent_____________
Size___________
Remarks____

6. **Excessive Vegetative Growth** Type____________________
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____________
Remarks____

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____

3.	**Monitoring Wells (within surface area of landfill)** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks____
4.	**Leachate Extraction Wells** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks____
5.	**Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A Remarks____
E.	**Gas Collection and Treatment** ☐ Applicable ☐ N/A
1.	**Gas Treatment Facilities** ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse ☐ Good condition ☐ Needs Maintenance Remarks____
2.	**Gas Collection Wells, Manifolds and Piping** ☐ Good condition ☐ Needs Maintenance Remarks____
3.	**Gas Monitoring Facilities (*e.g.*, gas monitoring of adjacent homes or buildings)** ☐ Good condition ☐ Needs Maintenance ☐ N/A Remarks____
F.	**Cover Drainage Layer** ☐ Applicable ☐ N/A
1.	**Outlet Pipes Inspected** ☐ Functioning ☐ N/A Remarks____
2.	**Outlet Rock Inspected** ☐ Functioning ☐ N/A Remarks____
G.	**Detention/Sedimentation Ponds** ☐ Applicable ☐ N/A
1.	**Siltation** Areal extent______________ Depth____________ ☐ N/A ☐ Siltation not evident Remarks____
2.	**Erosion** Areal extent______________ Depth____________ ☐ Erosion not evident Remarks____
3.	**Outlet Works** ☐ Functioning ☐ N/A Remarks____
4.	**Dam** ☐ Functioning ☐ N/A Remarks____

H. Retaining Walls ☐ Applicable ☐ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement__________ Vertical displacement__________
   Rotational displacement__________
   Remarks__________

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
   Remarks__________

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Areal extent__________ Depth__________
   Remarks__________

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
   ☐ Vegetation does not impede flow
   Areal extent__________ Type__________
   Remarks__________

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent__________ Depth__________
   Remarks__________

4. **Discharge Structure** ☐ Functioning ☐ N/A
   Remarks__________

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent__________ Depth__________
   Remarks__________

2. **Performance Monitoring** Type of monitoring__________
   ☐ Performance not monitored
   Frequency__________ ☐ Evidence of breaching
   Head differential__________
   Remarks__________

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☒ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   ☒ Good condition ☒ All required wells properly operating ☐ Needs Maintenance ☐ N/A
   Remarks____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   ☒ Good condition ☐ Needs Maintenance
   Remarks____

3. **Spare Parts and Equipment**
   ☒ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
   Remarks____

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps, and Electrical**
   ☐ Good condition ☐ Needs Maintenance
   Remarks____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   ☐ Good condition ☐ Needs Maintenance
   Remarks____

3. **Spare Parts and Equipment**
   ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
   Remarks____

C. Treatment System	☒ Applicable ☐ N/A
1.	**Treatment Train (Check components that apply)** ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation ☒ Air stripping ☐ Carbon adsorbers ☐ Filters ____ ☐ Additive (*e.g.*, chelation agent, flocculent) none ☐ Others ____ ☒ Good condition ☐ Needs Maintenance ☒ Sampling ports properly marked and functional ☐ Sampling/maintenance log displayed and up to date ☒ Equipment properly identified ☐ Quantity of groundwater treated annually Refer to Sect. 4.2 of the report ☐ Quantity of surface water treated annually ____ Remarks ____
2.	**Electrical Enclosures and Panels (properly rated and functional)** ☐ N/A ☒ Good condition ☐ Needs Maintenance Remarks ____
3.	**Tanks, Vaults, Storage Vessels** ☐ N/A ☒ Good condition ☒ Proper secondary containment ☐ Needs Maintenance Remarks ____
4.	**Discharge Structure and Appurtenances** ☐ N/A ☒ Good condition ☐ Needs Maintenance Remarks ____
5.	**Treatment Building(s)** ☒ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair ☐ Chemicals and equipment properly stored Remarks ____
6.	**Monitoring Wells (pump and treatment remedy)** ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition ☒ All required wells located ☐ Needs Maintenance ☐ N/A Remarks ____
D. Monitoring Data	
1.	**Monitoring Data** ☒ Is routinely submitted on time ☒ Is of acceptable quality
2.	**Monitoring data suggests:** *Refer to Sect. 7.2 of the report.* ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells (natural attenuation remedy)**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☒ N/A
Remarks____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS *Refer to Summary of Overall Observations, above.*

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

INTERVIEW RECORD

Site Name: Paducah Gaseous Diffusion Plant	**EPA ID No.:** KY8890008982
Subject: Northeast Plume Pump-and-Treat Facility	**Time:** 1:00 pm / **Date:** 05/16/03
Type: ☐ Telephone ☒ Visit ☐ Other **Location of Visit:** Mr. Montgomery's office	☐ Incoming ☐ Outgoing

Contact Made By:

Name: LeAnne Garner	**Title:** Environmental Engineer	**Organization:** SAIC

Individual Contacted:

Name: Jim Montgomery	**Title:** Facility Manager	**Organization:** BJC

Summary Of Conversation

Typical list of questions:

- What is your overall impression of the project? (general sentiment)
- Is the remedy functioning as expected? How well is the remedy performing?
- What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?
- Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.
- Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.
- Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.
- Have there been opportunities to optimize O&M or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.
- Do you have any comments, suggestions, or recommendations regarding the project?
- Are inspections performed of the facility? What is the driver behind those inspections? Where is it documented?

Summary of responses:

Mr. Montgomery's overall impression of the project is that it is doing what it was intended to do. He feels the remedy is functioning as it was intended. Trends of the contaminant levels were discussed, but are included in the Five-Year Review. There is a continuous on-site O&M presence. Staff includes a Project Manager, an Engineering/Operations Manager, Techs, and Clerical. No significant changes have been made in the O&M requirements, maintenance schedules, or sampling routines in the last five years. There have been no unexpected O&M difficulties or costs at the site in the last five years. The project team is always looking to improve optimization of O&M and sampling efforts. Adding another extraction well has been suggested to enhance performance; but the system is currently doing what it was designed to do. On-line analyzer is calibrated and inspected twice weekly. GSA and SAA inspections are performed weekly. Routine daily inspections are conducted.

SWMU 91 (GWOU)
Site Inspection of SWMU 91, Lasagna™ Remediation

Summary of Overall Observations

On March 6, 2003, a site visit was conducted at the Lasagna™ Remediation site. This site is located in the southwest corner of the C-745-B Cylinder Storage Yard within the Controlled Access Area of PGDP. Since the last review of this project, all work associated with Phase IIB, final remediation of the site, has been completed.

The remediation site has largely been returned to its original condition prior to the start of remedial activities. With the exception of the primary power distribution equipment, all aboveground material, piping, office trailers, etc., have been removed from the site. All fences, barricades, and warning signs erected during construction and operation have been removed from the site. The primary disconnect for the power system has been placed in the open position and locked. Grassed areas around the site have been maintained well.

Site Inspection Checklist

I. SITE INFORMATION	
Site name: GWOU SWMU 91 - Lasagna	**Date of inspection:** 3/6/2003
Location and Region: Paducah, KY/Region 4	**EPA ID:** KY8890008982
Agency, office, or company leading the five-year review: DOE	**Weather/temperature:** Spring

Remedy Includes: (Check all that apply)

Landfill cover/containment
Monitored natural attenuation
Access controls
Groundwater containment
Institutional controls
Vertical barrier walls
Groundwater pump and treatment
Surface water collection and treatment
☒ Other In-situ contaminant source reduction

Attachments: Inspection team roster attached   Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Mr. Chris Marshall (Name)   Project Manager (Title)   5/20/2003 (Date)

   Interviewed   at site ☒ at office   by phone   Phone no. ____________

   Problems, suggestions; ☒ Report attached ____________

2. **O&M staff** ____________ (Name)   ____________ (Title)   ____________ (Date)

   Interviewed ☐ at site ☐ at office ☐ by phone   Phone no. ____________

   Problems, suggestions; ☐ Report attached ____________

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency ____________________
Contact ____________________ ____________ ______ ________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ______________________________

Agency ____________________
Contact ____________________ ____________ ______ ________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ______________________________

Agency ____________________
Contact ____________________ ____________ ______ ________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ______________________________

Agency ____________________
Contact ____________________ ____________ ______ ________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ______________________________

4. **Other interviews** (optional) ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)			
1. **O&M Documents**			
☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
2. **Site-Specific Health and Safety Plan**	☐ Readily available	☐ Up to date	☒ N/A
☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
3. **O&M and OSHA Training Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
4. **Permits and Service Agreements**			
☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits ____________	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
5. **Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
6. **Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
7. **Groundwater Monitoring Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
8. **Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
9. **Discharge Compliance Records**			
☐ Air	☐ Readily available	☐ Up to date	☒ N/A
☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
10. **Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			

IV. O&M COSTS

1. **O&M Organization**
☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☒ Contractor for Federal Facility
☐ Other ____________________

2. **O&M Cost Records** *Refer to Sect. 4.3 of the report.*
☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate ____________ ☐ Breakdown attached

Total annual cost by year for review period if available

From ________ To ________ ____________ ☐ Breakdown attached
Date Date Total cost
From ________ To ________ ____________ ☐ Breakdown attached
Date Date Total cost
From ________ To ________ ____________ ☐ Breakdown attached
Date Date Total cost
From ________ To ________ ____________ ☐ Breakdown attached
Date Date Total cost
From ________ To ________ ____________ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period** *Costs are discussed in Sect. 4.3 of the report.*
Describe costs and reasons: Repair of rectifier controls.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. Fencing damaged ☐ Location shown on site map ☐ Gates secured ☐ N/A
Remarks Area was adequately secured during operation.

B. Other Access Restrictions

1. Signs and other security measures ☐ Location shown on site map ☐ N/A
Remarks Area was properly posted during operation.

C. Institutional Controls (ICs)
1. **Implementation and enforcement** Site conditions imply ICs not properly implemented ☐ Yes ☐ No ☒ N/A Site conditions imply ICs not being fully enforced ☐ Yes ☐ No ☒ N/A Type of monitoring (*e.g.*, self-reporting, drive by) ____ Frequency ____ Responsible party/agency ____ Contact ____ Name ____ Title ____ Date ____ Phone no. Reporting is up-to-date ☐ Yes ☐ No ☒ N/A Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☒ N/A Violations have been reported ☐ Yes ☐ No ☒ N/A Other problems or suggestions: ☐ Report attached
2. **Adequacy** ☐ ICs are adequate ☐ ICs are inadequate ☒ N/A Remarks ____
D. General
1. **Vandalism/trespassing** ☐ Location shown on site map ☐ No vandalism evident Remarks N/A
2. **Land use changes on site** ☐ N/A Remarks No changes.
3. **Land use changes off site** ☐ N/A Remarks No changes.
VI. GENERAL SITE CONDITIONS
A. Roads ☒ Applicable ☐ N/A
1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A Remarks ____

B. Other Site Conditions

Remarks Remediation site has been restored and returned to normal use; i.e., cylinder storage yard.

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement (Low spots)** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent______________ Depth____________
   Remarks____

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths____________ Widths___________ Depths__________
   Remarks____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent______________ Depth____________
   Remarks____

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent______________ Depth____________
   Remarks____

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks____

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks____

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent______________ Height____________
   Remarks____

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
   ☐ Wet areas ☐ Location shown on site map Areal extent______________
   ☐ Ponding ☐ Location shown on site map Areal extent______________
   ☐ Seeps ☐ Location shown on site map Areal extent______________
   ☐ Soft subgrade ☐ Location shown on site map Areal extent______________
   Remarks____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
   Areal extent______________
   Remarks____

B. Benches ☐ Applicable ☐ N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1.	**Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay Remarks____________
2.	**Bench Breached** ☐ Location shown on site map ☐ N/A or okay Remarks____________
3.	**Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay Remarks____________

C. Letdown Channels ☐ Applicable ☐ N/A

Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1.	**Settlement** ☐ Location shown on site map ☐ No evidence of settlement Areal extent________ Depth________ Remarks____________
2.	**Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation Material type________ Areal extent________ Remarks____________
3.	**Erosion** ☐ Location shown on site map ☐ No evidence of erosion Areal extent________ Depth________ Remarks____________
4.	**Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting Areal extent________ Depth________ Remarks____________
5.	**Obstructions** Type________ ☐ No obstructions ☐ Location shown on site map Areal extent________ Size________ Remarks____________
6.	**Excessive Vegetative Growth** Type________ ☐ No evidence of excessive growth ☐ Vegetation in channels does not obstruct flow ☐ Location shown on site map Areal extent________ Remarks____________

D. Cover Penetrations ☐ Applicable ☐ N/A

1.	**Gas Vents** ☐ Active ☐ Passive ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks____________
2.	**Gas Monitoring Probes** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks____________

3.	**Monitoring Wells (within surface area of landfill)** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks_______________
4.	**Leachate Extraction Wells** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks_______________
5.	**Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A Remarks_______________
E.	**Gas Collection and Treatment** ☐ Applicable ☐ N/A
1.	**Gas Treatment Facilities** ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse ☐ Good condition ☐ Needs Maintenance Remarks_______________
2.	**Gas Collection Wells, Manifolds and Piping** ☐ Good condition ☐ Needs Maintenance Remarks_______________
3.	**Gas Monitoring Facilities (*e.g.*, gas monitoring of adjacent homes or buildings)** ☐ Good condition ☐ Needs Maintenance ☐ N/A Remarks_______________
F.	**Cover Drainage Layer** ☐ Applicable ☐ N/A
1.	**Outlet Pipes Inspected** ☐ Functioning ☐ N/A Remarks_______________
2.	**Outlet Rock Inspected** ☐ Functioning ☐ N/A Remarks_______________
G.	**Detention/Sedimentation Ponds** ☐ Applicable ☐ N/A
1.	**Siltation** Areal extent_______ Depth_______ ☐ N/A ☐ Siltation not evident Remarks_______________
2.	**Erosion** Areal extent_______ Depth_______ ☐ Erosion not evident Remarks_______________
3.	**Outlet Works** ☐ Functioning ☐ N/A Remarks_______________
4.	**Dam** ☐ Functioning ☐ N/A Remarks_______________

H. Retaining Walls ☐ Applicable ☐ N/A	
1.	**Deformations** ☐ Location shown on site map ☐ Deformation not evident Horizontal displacement____________ Vertical displacement_______________ Rotational displacement____________ Remarks____ ____
2.	**Degradation** ☐ Location shown on site map ☐ Degradation not evident Remarks____ ____
I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☐ N/A	
1.	**Siltation** ☐ Location shown on site map ☐ Siltation not evident Areal extent______________ Depth____________ Remarks____
2.	**Vegetative Growth** ☐ Location shown on site map ☐ N/A ☐ Vegetation does not impede flow Areal extent______________ Type____________ Remarks____ ____
3.	**Erosion** ☐ Location shown on site map ☐ Erosion not evident Areal extent______________ Depth____________ Remarks____ ____
4.	**Discharge Structure** ☐ Functioning ☐ N/A Remarks____ ____
VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A	
1.	**Settlement** ☐ Location shown on site map ☐ Settlement not evident Areal extent______________ Depth____________ Remarks____ ____
2.	**Performance Monitoring** Type of monitoring__________________________ ☐ Performance not monitored Frequency________________________________ ☐ Evidence of breaching Head differential__________________________ Remarks____ ____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☐ N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A	
1.	**Pumps, Wellhead Plumbing, and Electrical** ☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A Remarks
2.	**Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks
3.	**Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks
B.	**Surface Water Collection Structures, Pumps, and Pipelines** ☐ Applicable ☐ N/A 1. **Collection Structures, Pumps, and Electrical** ☐ Good condition ☐ Needs Maintenance Remarks All water collection and distribution and piping and equipment have been removed.
2.	**Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks N/A
3.	**Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks N/A

C. Treatment System ☐ Applicable ☒ N/A
1. **Treatment Train (Check components that apply)** ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation ☐ Air stripping ☐ Carbon adsorbers ☐ Filters ____________ ☐ Additive (*e.g.*, chelation agent, flocculent) ____________ ☐ Others ____________ ☐ Good condition ☐ Needs Maintenance ☐ Sampling ports properly marked and functional ☐ Sampling/maintenance log displayed and up to date ☐ Equipment properly identified ☐ Quantity of groundwater treated annually ____________ ☐ Quantity of surface water treated annually ____________ Remarks ____________
2. **Electrical Enclosures and Panels (properly rated and functional)** ☐ N/A ☐ Good condition ☐ Needs Maintenance Remarks ____________
3. **Tanks, Vaults, Storage Vessels** ☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance Remarks ____________
4. **Discharge Structure and Appurtenances** ☐ N/A ☐ Good condition ☐ Needs Maintenance Remarks ____________
5. **Treatment Building(s)** ☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair ☐ Chemicals and equipment properly stored Remarks ____________
6. **Monitoring Wells (pump and treatment remedy)** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks ____________
D. Monitoring Data
1. **Monitoring Data** ☐ Is routinely submitted on time ☐ Is of acceptable quality
2. **Monitoring data suggests:** *Refer to Sect. 7.3 of the report.* ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation
1. **Monitoring Wells (natural attenuation remedy)** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☒ N/A Remarks
X. OTHER REMEDIES
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.
XI. OVERALL OBSERVATIONS *Refer to Summary of Overall Observations, above.*
A. Implementation of the Remedy
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). The goal of this remedial action was to reduce the average contaminant soil concentration within the treatment area to less than 5.6 mg/kg Contaminant reduction goals were achieved. See Final Remedial Action Report for complete sampling results.
B. Adequacy of O&M
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. ____

D.	Opportunities for Optimization
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. ____

INTERVIEW RECORD

Site Name: Paducah Gaseous Diffusion Plant	**EPA ID No.:** KY8890008982	
Subject: SWMU 91 Lasagna™ Remediation	**Time:** 7:45 a.m.	**Date:** 05/20/03
Type: ☐ Telephone ☒ Visit ☐ Other **Location of Visit:** Mr. Marshall's office	☐ Incoming ☐ Outgoing	

Contact Made By:

Name: LeAnne Garner	**Title:** Environmental Engineer	**Organization:** SAIC

Individual Contacted:

Name: Chris Marshall	**Title:** Project Manager	**Organization:** BJC

Summary Of Conversation

Typical list of questions:

- What is your overall impression of the project? (general sentiment)
- Is the remedy functioning as expected? How well is the remedy performing?
- What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?
- Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.
- Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.
- Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.
- Have there been opportunities to optimize O&M or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.
- Do you have any comments, suggestions, or recommendations regarding the project?
- Are inspections performed of the facility? What is the driver behind those inspections? Where is it documented?

Summary of responses:

Mr. Marshall's overall impression of the project is that Lasagna™ works. The remedy performed better than expected. Monitoring data showed the system was effective in degrading and reducing TCE as monitored against baseline. The groundwater levels were lowered to 0.38, less than what was projected. The project is undergoing re-verification and as the data is evaluated, it is very close to what was previously found. There was a continuous on-site presence. Surge and water level triggers were in place to automatically call out to staff. In addition, weekly downloads were collected of continuous data readings.

There were no significant changes in the O&M requirements, maintenance schedules, or sampling routines, however, this was the 3rd iteration of the Lasagna™ process (Phase 1, Phase 2a, and Phase 2b).

As for difficulties, the rectifier had electrical problems. The rectifier converted AC to DC and was designed to apply continuous current. It was discovered that the ground was heating too much, so the continuous current was decreased to pulsing with a temperature trigger (typically 4 days on and 3 days off). This required a change in monitoring. Instead of going out once per week as planned, the staff had to go out there at least twice a week.

Lasagna™ was successful, but it is geologically dependent. Lasagna™ is effective at a site where the right geological conditions exist.

Data downloads were collected weekly, in the last 15 months of operation; during pulsing, the system was inspected twice weekly to check the temperature.

NSDD SOURCE CONTROL (SWOU)
Site Inspection of the NSDD IRA Facilities

Summary of Overall Observations

On March 6, 2003, a site inspection was conducted of the following facilities associated with the NSDD IRA: (1) the C-400-L Lift Station and associated piping, (2) the C-616-L Lift Station and associated piping, (3) a Gabion installed in the NSDD near Outfall 001, and (4) signs posted along the southern reaches of the ditch that warn plant personnel of the hazards associated with sediments in the ditch.

Signs are posted along the southern reaches of the NSDD warning personnel of possible exposures to radionuclides, metals, and PCBs from sediments in the ditch. The signs are spaced at regular intervals on both sides of the ditch, in good condition, and legible. The ditch also is posted as a radiological area requiring special permits and notifications prior to entry. It did not appear that the ditch and adjacent banks had been mowed prior to the onset of winter. Cattails in the bottom of the ditch were abundant and quite tall. Grass along the banks was long and thick and weeds were quite evident.

The C-400-L Lift Station is located on the north side of the NSDD near its upper reach near the intersection of 10th Street and Virginia Avenue. It is included in the radiological boundary posting along the NSDD with the exception of a gravel walkway access to the station electrical control panels and the east side of the lift station. The lift station is in good condition and appears to be functioning normally. During this inspection, there were no visible indications that water had been at excessive levels in the recent past. The inlet grating to the lift station was free of excessive debris and water was running into the sump. The lift station did not run during this visit due to minimal water flow in the ditch. The electrical power and control panels and associated conduits located just east of the lift station are in good condition, although labels need to be replaced on some boxes.

The C-616-L Lift Station is located on the south side of Virginia Avenue and north of the C-600 Steam Plant. This lift station collects coal pile runoff and fly ash settling basin water from C-600 and pumps it around the southern reaches of the NSDD to a point just south of Outfall 001. Water from the fly ash settling basins enters the station through underground piping from the basins. Coal pile runoff is routed into the west side of the lift station by an excavated trench. This lift station is under the control and operation of USEC. During this inspection, the lift station was functioning as designed. There were no indications of water overflow in the vicinity of the lift station. Water levels in the settling basins were normal. It was evident that two check valves located on the discharge piping had just been replaced. Insulation on the aboveground piping at the station, including the two new check valves, is in some need of repair. Power and control panels associated with the lift station were in good condition.

The discharge piping from both lift stations, which is mounted on abovegrade concrete and steel pipe supports, originally routed water around the more contaminated southern-most reaches of the NSDD to a point just south of Outfall 001. In recent months, in preparation for additional cleanup work on the NSDD, this piping has been extended, both aboveground and underground, to a point just north of the C-616-C Lift Station inlet. The original piping appears in good condition with no evidence of leaks or damage and is performing its designed function. In some areas, small pieces of the metal jacket that protects the pipe insulation are loose or missing and need repair.

The gabion structure installed in the NSDD just south of Outfall 001 still is in place, in good condition, and appears to be performing its intended function of retarding the transport of sediments from the southern end of the ditch. Water trickling through the structure during this inspection was clear and free of visible sediments.

Site Inspection Checklist

I. SITE INFORMATION	
Site name: SWOU NSDD IRA	**Date of inspection:** 3/6/2003
Location and Region: Paducah, KY/Region 4	**EPA ID:** KY8890008982
Agency, office, or company leading the five-year review: DOE	**Weather/temperature:** Spring

Remedy Includes: (Check all that apply)

Landfill cover/containment Monitored natural attenuation
☒ Access controls Groundwater containment
☒ Institutional controls Vertical barrier walls
Groundwater pump and treatment
☒ Surface water collection and treatment
☒ Other 1. Effluent treatment 2. Sediment Control

Attachments: Inspection team roster attached Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Mr. Don Ulrich — Deputy Project Manager — 5/21/2003
   Name Title Date
   Interviewed at site ☒ at office by phone Phone no. ______
   Problems, suggestions; ☒ Report attached ______

2. **O&M staff** ______ ______ ______
   Name Title Date
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______
   Problems, suggestions; ☐ Report attached ______

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency ______________________________
Contact ______________________________ ____________________ __________ ______________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ____
____

Agency ______________________________
Contact ______________________________ ____________________ __________ ______________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ____
____

Agency ______________________________
Contact ______________________________ ____________________ __________ ______________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ____
____

Agency ______________________________
Contact ______________________________ ____________________ __________ ______________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ____
____

4. **Other interviews** (optional) ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)			
1. **O&M Documents**			
☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
☒ As-built drawings	☒ Readily available	☐ Up to date	☐ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A
Remarks Operation controlled by procedures.			
2. **Site-Specific Health and Safety Plan**	☐ Readily available	☐ Up to date	☒ N/A
☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
3. **O&M and OSHA Training Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
4. **Permits and Service Agreements**			
☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☒ Effluent discharge	☒ Readily available	☐ Up to date	☐ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits ____________	☐ Readily available	☐ Up to date	☒ N/A
Remarks Discharge from lift stations is ultimately through a KPDES-permitted outfall.			
5. **Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
6. **Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
7. **Groundwater Monitoring Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
8. **Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
9. **Discharge Compliance Records**			
☐ Air	☐ Readily available	☐ Up to date	☒ N/A
☒ Water (effluent)	☒ Readily available	☐ Up to date	☐ N/A
Remarks			
10. **Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			

IV. O&M COSTS
1. **O&M Organization** ☐ State in-house ☐ Contractor for State ☐ PRP in-house ☐ Contractor for PRP ☐ Federal Facility in-house ☒ Contractor for Federal Facility ☐ Other ________
2. **O&M Cost Records** *Refer to Sect. 4.4 of the report.* ☐ Readily available ☐ Up to date ☐ Funding mechanism/agreement in place Original O&M cost estimate ________ ☐ Breakdown attached Total annual cost by year for review period if available From ______ (Date) To ______ (Date) ______ (Total cost) ☐ Breakdown attached From ______ (Date) To ______ (Date) ______ (Total cost) ☐ Breakdown attached From ______ (Date) To ______ (Date) ______ (Total cost) ☐ Breakdown attached From ______ (Date) To ______ (Date) ______ (Total cost) ☐ Breakdown attached From ______ (Date) To ______ (Date) ______ (Total cost) ☐ Breakdown attached
3. **Unanticipated or Unusually High O&M Costs During Review Period** *Costs are discussed in Sect. 4.4 of the report.* Describe costs and reasons: None.
V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A
A. Fencing
1. Fencing damaged ☐ Location shown on site map ☐ Gates secured ☐ N/A Remarks The southern end of the NSDD is located within the controlled access area of the plant
B. Other Access Restrictions
1. Signs and other security measures ☐ Location shown on site map ☐ N/A Remarks Signs posted along the ditch banks warn site workers of potential hazards. Permits required for work in the area.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) ______
Frequency ______
Responsible party/agency ______
Contact ______ Name ______ Title ______ Date ______ Phone no.

Reporting is up-to-date ☐ Yes ☐ No ☒ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☐ No ☒ N/A
Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks Area is adequately posted. Special permits are required prior to performing any work in the area.

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks ______

2. **Land use changes on site** ☐ N/A
Remarks No changes.

3. **Land use changes off site** ☐ N/A
Remarks No changes.

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks ______

B. Other Site Conditions

Remarks Lift stations and sediment control structures appear well-maintained. Area along ditch needs mowing.

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement (Low spots)** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent________ Depth________
   Remarks________

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths________ Widths________ Depths________
   Remarks________

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent________ Depth________
   Remarks________

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent________ Depth________
   Remarks________

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks________

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks________

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent________ Height________
   Remarks________

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
   ☐ Wet areas ☐ Location shown on site map Areal extent________
   ☐ Ponding ☐ Location shown on site map Areal extent________
   ☐ Seeps ☐ Location shown on site map Areal extent________
   ☐ Soft subgrade ☐ Location shown on site map Areal extent________
   Remarks________

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
   Areal extent________
   Remarks________

B. Benches ☐ Applicable ☐ N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks____

C. Letdown Channels ☐ Applicable ☐ N/A
Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent______________ Depth____________
Remarks____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type______________ Areal extent____________
Remarks____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent______________ Depth____________
Remarks____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent______________ Depth____________
Remarks____

5. **Obstructions** Type____________________ ☐ No obstructions
☐ Location shown on site map Areal extent______________
Size____________
Remarks____

6. **Excessive Vegetative Growth** Type____________________
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent______________
Remarks____

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____

3.	**Monitoring Wells (within surface area of landfill)** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks____
4.	**Leachate Extraction Wells** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks____
5.	**Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A Remarks____
E.	**Gas Collection and Treatment** ☐ Applicable ☐ N/A
1.	**Gas Treatment Facilities** ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse ☐ Good condition ☐ Needs Maintenance Remarks____
2.	**Gas Collection Wells, Manifolds and Piping** ☐ Good condition ☐ Needs Maintenance Remarks____
3.	**Gas Monitoring Facilities (*e.g.*, gas monitoring of adjacent homes or buildings)** ☐ Good condition ☐ Needs Maintenance ☐ N/A Remarks____
F.	**Cover Drainage Layer** ☐ Applicable ☐ N/A
1.	**Outlet Pipes Inspected** ☐ Functioning ☐ N/A Remarks____
2.	**Outlet Rock Inspected** ☐ Functioning ☐ N/A Remarks____
G.	**Detention/Sedimentation Ponds** ☐ Applicable ☐ N/A
1.	**Siltation** Areal extent__________ Depth__________ ☐ N/A ☐ Siltation not evident Remarks____
2.	**Erosion** Areal extent__________ Depth__________ ☐ Erosion not evident Remarks____
3.	**Outlet Works** ☐ Functioning ☐ N/A Remarks____
4.	**Dam** ☐ Functioning ☐ N/A Remarks____

H. Retaining Walls ☐ Applicable ☐ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement__________ Vertical displacement____________
   Rotational displacement__________
   Remarks____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
   Remarks____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Areal extent____________ Depth__________
   Remarks____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
   ☐ Vegetation does not impede flow
   Areal extent____________ Type__________
   Remarks____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent____________ Depth__________
   Remarks____

4. **Discharge Structure** ☐ Functioning ☐ N/A
   Remarks____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent____________ Depth__________
   Remarks____

2. **Performance Monitoring** Type of monitoring______________________
   ☐ Performance not monitored
   Frequency__________________________ ☐ Evidence of breaching
   Head differential__________________________
   Remarks____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   ☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A
   Remarks

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   ☐ Good condition ☐ Needs Maintenance
   Remarks

3. **Spare Parts and Equipment**
   ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
   Remarks

B. Surface Water Collection Structures, Pumps, and Pipelines ☒ Applicable ☐ N/A

1. **Collection Structures, Pumps, and Electrical**
   ☒ Good condition ☐ Needs Maintenance
   Remarks

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   ☒ Good condition ☐ Needs Maintenance
   Remarks Minor repairs needed on pipe insulation/protective covering.

3. **Spare Parts and Equipment**
   ☒ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
   Remarks Both lift stations are equipped with redundant pumps.

C. Treatment System ☐ Applicable ☒ N/A

1. **Treatment Train (Check components that apply)**
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☐ Air stripping ☐ Carbon adsorbers
☐ Filters ______________________________
☐ Additive (*e.g.*, chelation agent, flocculent) ____________________
☐ Others______________________________
☐ Good condition ☐ Needs Maintenance
☐ Sampling ports properly marked and functional
☐ Sampling/maintenance log displayed and up to date
☐ Equipment properly identified
☐ Quantity of groundwater treated annually ____________
☐ Quantity of surface water treated annually____________
Remarks____

2. **Electrical Enclosures and Panels (properly rated and functional)**
☐ N/A ☐ Good condition ☐ Needs Maintenance
Remarks____

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
Remarks____

4. **Discharge Structure and Appurtenances**
☐ N/A ☐ Good condition ☐ Needs Maintenance
Remarks____

5. **Treatment Building(s)**
☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair
☐ Chemicals and equipment properly stored
Remarks____

6. **Monitoring Wells (pump and treatment remedy)**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks____

D. Monitoring Data

1. **Monitoring Data**
☐ Is routinely submitted on time ☐ Is of acceptable quality

2. **Monitoring data suggests:** *Refer to Sect. 7.4 of the report.*
☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation
1. **Monitoring Wells (natural attenuation remedy)** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☒ N/A Remarks________________________________
X. OTHER REMEDIES
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.
XI. OVERALL OBSERVATIONS *Refer to Summary of Overall Observations, above.*
A. Implementation of the Remedy
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).
B. Adequacy of O&M
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

B. Other Site Conditions

Remarks Area is well-maintained.

VII. LANDFILL COVERS ☒ Applicable ☐ N/A

A. Landfill Surface

1. **Settlement (Low spots)** ☐ Location shown on site map ☒ Settlement not evident
   Areal extent_____________ Depth___________
   Remarks_______________

2. **Cracks** ☐ Location shown on site map ☒ Cracking not evident
   Lengths___________ Widths__________ Depths_________
   Remarks_______________

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident
   Areal extent_____________ Depth___________
   Remarks_______________

4. **Holes** ☐ Location shown on site map ☒ Holes not evident
   Areal extent_____________ Depth___________
   Remarks_______________

5. **Vegetative Cover** ☒ Grass ☒ Cover properly established ☒ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_______________

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks Rip-rap along stream banks is in good condition.

7. **Bulges** ☐ Location shown on site map ☒ Bulges not evident
   Areal extent_____________ Height___________
   Remarks_______________

8. **Wet Areas/Water Damage** ☒ Wet areas/water damage not evident
   ☐ Wet areas ☐ Location shown on site map Areal extent_____________
   ☐ Ponding ☐ Location shown on site map Areal extent_____________
   ☐ Seeps ☐ Location shown on site map Areal extent_____________
   ☐ Soft subgrade ☐ Location shown on site map Areal extent_____________
   Remarks_______________

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☒ No evidence of slope instability
   Areal extent_____________
   Remarks_______________

B. Benches ☐ Applicable ☒ N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1.	**Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay Remarks______________________________
2.	**Bench Breached** ☐ Location shown on site map ☐ N/A or okay Remarks______________________________
3.	**Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay Remarks______________________________
C.	**Letdown Channels** ☐ Applicable ☒ N/A Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)
1.	**Settlement** ☐ Location shown on site map ☐ No evidence of settlement Areal extent______________ Depth___________ Remarks______________________________
2.	**Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation Material type______________Areal extent___________ Remarks______________________________
3.	**Erosion** ☐ Location shown on site map ☐ No evidence of erosion Areal extent______________ Depth___________ Remarks______________________________
4.	**Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting Areal extent______________ Depth___________ Remarks______________________________
5.	**Obstructions** Type____________________ ☐ No obstructions ☐ Location shown on site map Areal extent_____________ Size___________ Remarks______________________________
6.	**Excessive Vegetative Growth** Type___________________ ☐ No evidence of excessive growth ☐ Vegetation in channels does not obstruct flow ☐ Location shown on site map Areal extent_____________ Remarks______________________________
D.	**Cover Penetrations** ☒ Applicable ☐ N/A
1.	**Gas Vents** ☐ Active ☒ Passive ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☒ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks______________________________
2.	**Gas Monitoring Probes** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A Remarks______________________________

3. **Monitoring Wells (within surface area of landfill)**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A
Remarks_______________

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A
Remarks_______________

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☒ N/A
Remarks_______________

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

1. **Gas Treatment Facilities**
☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
☐ Good condition ☐ Needs Maintenance
Remarks_______________

2. **Gas Collection Wells, Manifolds and Piping**
☐ Good condition ☐ Needs Maintenance
Remarks_______________

3. **Gas Monitoring Facilities (*e.g.*, gas monitoring of adjacent homes or buildings)**
☐ Good condition ☐ Needs Maintenance ☐ N/A
Remarks_______________

F. Cover Drainage Layer ☐ Applicable ☒ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
Remarks_______________

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
Remarks_______________

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A

1. **Siltation** Areal extent_______ Depth_______ ☐ N/A
☐ Siltation not evident
Remarks_______________

2. **Erosion** Areal extent_______ Depth_______
☐ Erosion not evident
Remarks_______________

3. **Outlet Works** ☐ Functioning ☐ N/A
Remarks_______________

4. **Dam** ☐ Functioning ☐ N/A
Remarks_______________

H. Retaining Walls ☐ Applicable ☒ N/A	
1.	**Deformations** ☐ Location shown on site map ☐ Deformation not evident Horizontal displacement__________ Vertical displacement__________ Rotational displacement__________ Remarks__________
2.	**Degradation** ☐ Location shown on site map ☐ Degradation not evident Remarks__________
I. Perimeter Ditches/Off-Site Discharge ☒ Applicable ☐ N/A	
1.	**Siltation** ☐ Location shown on site map ☒ Siltation not evident Areal extent__________ Depth__________ Remarks__________
2.	**Vegetative Growth** ☐ Location shown on site map ☐ N/A ☒ Vegetation does not impede flow Areal extent__________ Type__________ Remarks__________
3.	**Erosion** ☐ Location shown on site map ☒ Erosion not evident Areal extent__________ Depth__________ Remarks__________
4.	**Discharge Structure** ☒ Functioning ☐ N/A Remarks__________
VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A	
1.	**Settlement** ☐ Location shown on site map ☐ Settlement not evident Areal extent__________ Depth__________ Remarks__________
2.	**Performance Monitoring** Type of monitoring__________ ☐ Performance not monitored Frequency__________ ☐ Evidence of breaching Head differential__________ Remarks__________

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☐ N/A
1. **Pumps, Wellhead Plumbing, and Electrical** ☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A Remarks
2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks
3. **Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☐ N/A 1. **Collection Structures, Pumps, and Electrical** ☐ Good condition ☐ Needs Maintenance Remarks
2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks
3. **Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks

C. Treatment System ☐ Applicable ☒ N/A
1. **Treatment Train (Check components that apply)** ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation ☐ Air stripping ☐ Carbon adsorbers ☐ Filters ______ ☐ Additive (*e.g.*, chelation agent, flocculent) ______ ☐ Others ______ ☐ Good condition ☐ Needs Maintenance ☐ Sampling ports properly marked and functional ☐ Sampling/maintenance log displayed and up to date ☐ Equipment properly identified ☐ Quantity of groundwater treated annually ______ ☐ Quantity of surface water treated annually ______ Remarks ______
2. **Electrical Enclosures and Panels (properly rated and functional)** ☐ N/A ☐ Good condition ☐ Needs Maintenance Remarks ______
3. **Tanks, Vaults, Storage Vessels** ☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance Remarks ______
4. **Discharge Structure and Appurtenances** ☐ N/A ☐ Good condition ☐ Needs Maintenance Remarks ______
5. **Treatment Building(s)** ☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair ☐ Chemicals and equipment properly stored Remarks ______
6. **Monitoring Wells (pump and treatment remedy)** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks ______
D. Monitoring Data
1. **Monitoring Data** ☐ Is routinely submitted on time ☐ Is of acceptable quality
2. **Monitoring data suggests:** *Refer to Sect. 7.5 of the report.* ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation
1. **Monitoring Wells (natural attenuation remedy)** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks________________________________

X. OTHER REMEDIES
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS *Refer to Summary of Overall Observations, above.*
A. Implementation of the Remedy
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).
B. Adequacy of O&M
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D.	Opportunities for Optimization
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

INTERVIEW RECORD

Site Name: Paducah Gaseous Diffusion Plant		**EPA ID No.:** KY8890008982
Subject: SWMU 8 C-746-K Landfill		**Time:** **Date:**
Type: ☐ Telephone ☒ Visit ☐ Other **Location of Visit:**		☐ Incoming ☐ Outgoing
Contact Made By:		
Name: Michelle Rinella	**Title:** Environmental Scientist	**Organization:** SAIC
Individual Contacted:		
Name: Don Ulrich	**Title:** Facility Manager	**Organization:** BJC

Summary Of Conversation

Typical list of questions:

- What is your overall impression of the project? (general sentiment)
- Is the remedy functioning as expected? How well is the remedy performing?
- What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?
- Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.
- Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.
- Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.
- Have there been opportunities to optimize O&M or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.
- Do you have any comments, suggestions, or recommendations regarding the project?
- Are inspections performed of the facility? What is the driver behind those inspections? Where is it documented?

Summary of responses:

Mr. Ulrich's overall impression of the project is that it is effective.

As far as remedy performance, riprap is o.k. for purpose and postings are o.k. to minimize traffic, especially with new secured area. Monitoring data is presented in the Five-Year Review.

SWMUs 2 AND 3 (BGOU)
Site Inspection of the C-749 Uranium Burial Ground (SWMU 2)

Summary of Overall Observations

On March 11, 2003, a site inspection of the C-749 Uranium Burial Ground was performed. This area is located north and west of Building C-600 within the boundaries of the Controlled Access Area of PGDP.

The entire area of the burial ground is roped off and posted as a Radiation Area. A permit is required prior to entering the area. The area is covered with a good stand of grass and is mowed and maintained. There were no indications of erosion or standing water in the area. An access road is located on the south side of the area outside the radiological boundary. The road is maintained well and is in good condition. Access to the north side of the area is through the C-745-C Cylinder Storage yard. This area also is maintained well.

MWs in the area appear to be in good condition and maintained well. The wells are secured with protective caps or casings with locks and are surrounded with guard posts.

Site Inspection Checklist

I. SITE INFORMATION	
Site name: BGOU SWMU 2 C-749	**Date of inspection:** 3/11/2003
Location and Region: Paducah, KY/Region 4	**EPA ID:** KY8890008982
Agency, office, or company leading the five-year review: DOE	**Weather/temperature:** Spring

Remedy Includes: (Check all that apply)

- Landfill cover/containment
- Access controls
- ☒ Institutional controls
- Groundwater pump and treatment
- Surface water collection and treatment
- ☒ Other Groundwater monitoring program
- Monitored natural attenuation
- Groundwater containment
- Vertical barrier walls

Attachments: Inspection team roster attached Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Mr. Jim Montgomery (Name) Facility Manager (Title) 5/16/2003 (Date)

   Interviewed at site ☒ at office by phone Phone no. ______
   Problems, suggestions; ☒ Report attached ______

2. **O&M staff** ______ (Name) ______ (Title) ______ (Date)

   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______
   Problems, suggestions; ☐ Report attached ______

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency ______________________
Contact ______________________ ______________ ______ __________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ______________________________

Agency ______________________
Contact ______________________ ______________ ______ __________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ______________________________

Agency ______________________
Contact ______________________ ______________ ______ __________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ______________________________

Agency ______________________
Contact ______________________ ______________ ______ __________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ______________________________

4. **Other interviews** (optional) ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1.	**O&M Documents**			
	☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
	☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
	☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A
	Remarks Operation controlled by procedures.			
2.	**Site-Specific Health and Safety Plan**	☐ Readily available	☐ Up to date	☒ N/A
	☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			
3.	**O&M and OSHA Training Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			
4.	**Permits and Service Agreements**			
	☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
	☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
	☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
	☒ Other permits RWP; Excavation	☐ Readily available	☐ Up to date	☒ N/A
	Remarks Permits are required prior to performing work in the area			
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			
6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			
7.	**Groundwater Monitoring Records**	☒ Readily available	☐ Up to date	☐ N/A
	Remarks			
8.	**Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			
9.	**Discharge Compliance Records**			
	☐ Air	☐ Readily available	☐ Up to date	☒ N/A
	☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			
10.	**Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			

IV. O&M COSTS
1. **O&M Organization** ☐ State in-house ☐ Contractor for State ☐ PRP in-house ☐ Contractor for PRP ☐ Federal Facility in-house ☒ Contractor for Federal Facility ☐ Other
2. **O&M Cost Records** *Refer to Sect. 4.6 of the report.* ☐ Readily available ☐ Up to date ☐ Funding mechanism/agreement in place Original O&M cost estimate ______ ☐ Breakdown attached Total annual cost by year for review period if available From ______ (Date) To ______ (Date) ______ (Total cost) ☐ Breakdown attached From ______ (Date) To ______ (Date) ______ (Total cost) ☐ Breakdown attached From ______ (Date) To ______ (Date) ______ (Total cost) ☐ Breakdown attached From ______ (Date) To ______ (Date) ______ (Total cost) ☐ Breakdown attached From ______ (Date) To ______ (Date) ______ (Total cost) ☐ Breakdown attached
3. **Unanticipated or Unusually High O&M Costs During Review Period** *Costs are discussed in Sect. 4.6 of the report.* Describe costs and reasons: None.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A
A. Fencing
1. Fencing damaged ☐ Location shown on site map ☐ Gates secured ☐ N/A Remarks The area is located within the controlled access area of the plant.
B. Other Access Restrictions
1. Signs and other security measures ☐ Location shown on site map ☐ N/A Remarks Area is roped off and posted. Work within the area is controlled by required permits and procedures.

C. Institutional Controls (ICs)
1. **Implementation and enforcement** Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A Type of monitoring (*e.g.*, self-reporting, drive by) ______ Frequency ______ Responsible party/agency ______ Contact ______ Name ______ Title ______ Date ______ Phone no. Reporting is up-to-date ☐ Yes ☐ No ☒ N/A Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A Violations have been reported ☐ Yes ☐ No ☒ N/A Other problems or suggestions: ☐ Report attached Property is still under ownership and control of DOE.
2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A Remarks ______
D. General
1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident Remarks ______
2. **Land use changes on site** ☐ N/A Remarks No changes.
3. **Land use changes off site** ☐ N/A Remarks No changes.
VI. GENERAL SITE CONDITIONS
A. Roads ☒ Applicable ☐ N/A
1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A Remarks ______

B. Other Site Conditions

Remarks ____

VII. LANDFILL COVERS ☒ Applicable ☐ N/A

A. Landfill Surface

1. **Settlement (Low spots)** ☐ Location shown on site map ☒ Settlement not evident
   Areal extent________ Depth________
   Remarks____

2. **Cracks** ☐ Location shown on site map ☒ Cracking not evident
   Lengths________ Widths________ Depths________
   Remarks____

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident
   Areal extent________ Depth________
   Remarks____

4. **Holes** ☐ Location shown on site map ☒ Holes not evident
   Areal extent________ Depth________
   Remarks____

5. **Vegetative Cover** ☒ Grass ☒ Cover properly established ☒ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks____

6. **Alternative Cover (armored rock, concrete, etc.)** ☒ N/A
   Remarks____

7. **Bulges** ☐ Location shown on site map ☒ Bulges not evident
   Areal extent________ Height________
   Remarks____

8. **Wet Areas/Water Damage** ☒ Wet areas/water damage not evident
   ☐ Wet areas ☐ Location shown on site map Areal extent________
   ☐ Ponding ☐ Location shown on site map Areal extent________
   ☐ Seeps ☐ Location shown on site map Areal extent________
   ☐ Soft subgrade ☐ Location shown on site map Areal extent________
   Remarks____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☒ No evidence of slope instability
   Areal extent________
   Remarks Area is relatively flat.

B. Benches ☐ Applicable ☒ N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay Remarks______	
2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay Remarks______	
3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay Remarks______	
C. Letdown Channels ☐ Applicable ☒ N/A Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)	
1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement Areal extent______ Depth______ Remarks______	
2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation Material type______ Areal extent______ Remarks______	
3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion Areal extent______ Depth______ Remarks______	
4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting Areal extent______ Depth______ Remarks______	
5. **Obstructions** Type______ ☐ No obstructions ☐ Location shown on site map Areal extent______ Size______ Remarks______	
6. **Excessive Vegetative Growth** Type______ ☐ No evidence of excessive growth ☐ Vegetation in channels does not obstruct flow ☐ Location shown on site map Areal extent______ Remarks______	
D. Cover Penetrations ☒ Applicable ☐ N/A	
1. **Gas Vents** ☐ Active ☐ Passive ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A Remarks______	
2. **Gas Monitoring Probes** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A Remarks______	

3. **Monitoring Wells (within surface area of landfill)**
☒ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☒ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks Wells serve as piezometers only

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A
Remarks

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☒ N/A
Remarks

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

1. **Gas Treatment Facilities**
☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
☐ Good condition ☐ Needs Maintenance
Remarks

2. **Gas Collection Wells, Manifolds and Piping**
☐ Good condition ☐ Needs Maintenance
Remarks

3. **Gas Monitoring Facilities (*e.g.*, gas monitoring of adjacent homes or buildings)**
☐ Good condition ☐ Needs Maintenance ☐ N/A
Remarks

F. Cover Drainage Layer ☐ Applicable ☒ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
Remarks

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
Remarks

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A

1. **Siltation** Areal extent______ Depth______ ☐ N/A
☐ Siltation not evident
Remarks

2. **Erosion** Areal extent______ Depth______
☐ Erosion not evident
Remarks

3. **Outlet Works** ☐ Functioning ☐ N/A
Remarks

4. **Dam** ☐ Functioning ☐ N/A
Remarks

H. Retaining Walls ☐ Applicable ☒ N/A	
1.	**Deformations** ☐ Location shown on site map ☐ Deformation not evident Horizontal displacement___________ Vertical displacement_____________ Rotational displacement___________ Remarks____
2.	**Degradation** ☐ Location shown on site map ☐ Degradation not evident Remarks____
I. Perimeter Ditches/Off-Site Discharge ☒ Applicable ☐ N/A	
1.	**Siltation** ☐ Location shown on site map ☒ Siltation not evident Areal extent_____________ Depth___________ Remarks____
2.	**Vegetative Growth** ☐ Location shown on site map ☐ N/A ☒ Vegetation does not impede flow Areal extent_____________ Type___________ Remarks____
3.	**Erosion** ☐ Location shown on site map ☒ Erosion not evident Areal extent_____________ Depth___________ Remarks____
4.	**Discharge Structure** ☐ Functioning ☒ N/A Remarks____
VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A	
1.	**Settlement** ☐ Location shown on site map ☐ Settlement not evident Areal extent_____________ Depth___________ Remarks____
2.	**Performance Monitoring** Type of monitoring_______________________ ☐ Performance not monitored Frequency_____________________________ ☐ Evidence of breaching Head differential_______________________ Remarks____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☐ N/A
1. **Pumps, Wellhead Plumbing, and Electrical** ☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A Remarks________________________________
2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks________________________________
3. **Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks________________________________
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☐ N/A **1. Collection Structures, Pumps, and Electrical** ☐ Good condition ☐ Needs Maintenance Remarks________________________________
2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks________________________________
3. **Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks________________________________

C. Treatment System ☐ Applicable ☒ N/A
1. **Treatment Train (Check components that apply)** ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation ☐ Air stripping ☐ Carbon adsorbers ☐ Filters ______ ☐ Additive (*e.g.*, chelation agent, flocculent) ______ ☐ Others ______ ☐ Good condition ☐ Needs Maintenance ☐ Sampling ports properly marked and functional ☐ Sampling/maintenance log displayed and up to date ☐ Equipment properly identified ☐ Quantity of groundwater treated annually ______ ☐ Quantity of surface water treated annually ______ Remarks ______
2. **Electrical Enclosures and Panels (properly rated and functional)** ☐ N/A ☐ Good condition ☐ Needs Maintenance Remarks ______
3. **Tanks, Vaults, Storage Vessels** ☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance Remarks ______
4. **Discharge Structure and Appurtenances** ☐ N/A ☐ Good condition ☐ Needs Maintenance Remarks ______
5. **Treatment Building(s)** ☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair ☐ Chemicals and equipment properly stored Remarks ______
6. **Monitoring Wells (pump and treatment remedy)** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks ______
D. Monitoring Data
1. **Monitoring Data** ☐ Is routinely submitted on time ☐ Is of acceptable quality
2. **Monitoring data suggests:** *Refer to Sect. 7.6 of the report.* ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation
1. **Monitoring Wells** ~~(natural attenuation remedy)~~ ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition ☒ All required wells located ☐ Needs Maintenance ☐ N/A Remarks Refer to Sect. 7.6 of the report.
X. OTHER REMEDIES
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.
XI. OVERALL OBSERVATIONS *Refer to Summary of Overall Observations, above.*
A. Implementation of the Remedy
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).
B. Adequacy of O&M
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

INTERVIEW RECORD

Site Name: Paducah Gaseous Diffusion Plant	**EPA ID No.:** KY8890008982
Subject: SWMU 2 C-749 Uranium Burial Ground	**Time:** 1:00 pm / **Date:** 05/16/03
Type: ☐ Telephone ☒ Visit ☐ Other **Location of Visit:** Mr. Montgomery's office	☐ Incoming ☐ Outgoing

Contact Made By:

Name: LeAnne Garner	**Title:** Environmental Engineer	**Organization:** SAIC

Individual Contacted:

Name: Jim Montgomery	**Title:** Facility Manager	**Organization:** BJC

Summary Of Conversation

Typical list of questions:

- What is your overall impression of the project? (general sentiment)
- Is the remedy functioning as expected? How well is the remedy performing?
- What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?
- Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.
- Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.
- Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.
- Have there been opportunities to optimize O&M or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.
- Do you have any comments, suggestions, or recommendations regarding the project?
- Are inspections performed of the facility? What is the driver behind those inspections? Where is it documented?

Summary of responses:

Mr. Montgomery. Trends of the contaminant levels were discussed, but are included in the Five-Year Review. There is a continuous on-site presence in that USEC guards provide security. The guards routinely patrol the area. No significant changes have been made in the O&M requirements, maintenance schedules, or sampling routines in the last five years. There have been no unexpected O&M difficulties or costs at the site in the last five years. There have been no opportunities to optimize O&M or sampling efforts. Routine O&M inspections are performed annually.

Site Inspection Checklist

I. SITE INFORMATION	
Site name: PGDP Water Policy	**Date of inspection:** 9/8/2003
Location and Region: Paducah, KY/Region 4	**EPA ID:** KY8890008982
Agency, office, or company leading the five-year review: DOE	**Weather/temperature:** Fall

Remedy Includes: (Check all that apply)

- Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- Groundwater pump and treatment
- Surface water collection and treatment
- Other ______________________
- Monitored natural attenuation
- Groundwater containment
- Vertical barrier walls

Attachments: Inspection team roster attached   Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Mr. Don Ulrich (Name)   Deputy Project Manager (Title)   9/8/2003 (Date)

   Interviewed   at site ☒ at office   by phone   Phone no. ______

   Problems, suggestions; ☒ Report attached ______

2. **O&M staff** ______ (Name)   ______ (Title)   ______ (Date)

   Interviewed ☐ at site ☐ at office ☐ by phone   Phone no. ______

   Problems, suggestions; ☐ Report attached ______

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency ______________________
Contact ______________________ ______________ ________ __________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ________________________________

Agency ______________________
Contact ______________________ ______________ ________ __________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ________________________________

Agency ______________________
Contact ______________________ ______________ ________ __________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ________________________________

Agency ______________________
Contact ______________________ ______________ ________ __________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ________________________________

4. **Other interviews** (optional) Report attached.
Mr. John Morgan, Technical Integration
Mr. Craig Dowdy, Lead Engineer
Mr. John Young, Subcontract Technical Representative for sampling

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - ☐ O&M manual — ☐ Readily available ☐ Up to date ☒ N/A
   - ☐ As-built drawings — ☐ Readily available ☐ Up to date ☒ N/A
   - ☐ Maintenance logs — ☐ Readily available ☐ Up to date ☒ N/A

   Remarks Water Policy, license agreements, water bills

2. **Site-Specific Health and Safety Plan** — ☐ Readily available ☐ Up to date ☒ N/A
   - ☐ Contingency plan/emergency response plan — ☐ Readily available ☐ Up to date ☒ N/A

   Remarks

3. **O&M and OSHA Training Records** — ☐ Readily available ☐ Up to date ☒ N/A

   Remarks

4. **Permits and Service Agreements**
   - ☐ Air discharge permit — ☐ Readily available ☐ Up to date ☒ N/A
   - ☐ Effluent discharge — ☐ Readily available ☐ Up to date ☒ N/A
   - ☐ Waste disposal, POTW — ☐ Readily available ☐ Up to date ☒ N/A
   - ☐ Other permits ____________ — ☐ Readily available ☐ Up to date ☒ N/A

   Remarks

5. **Gas Generation Records** — ☐ Readily available ☐ Up to date ☒ N/A

   Remarks

6. **Settlement Monument Records** — ☐ Readily available ☐ Up to date ☒ N/A

   Remarks

7. **Groundwater Monitoring Records** — ☒ Readily available ☒ Up to date ☐ N/A

   Remarks Sampling monthly and semi-annually. Results reported to resident in a letter.

8. **Leachate Extraction Records** — ☐ Readily available ☐ Up to date ☒ N/A

   Remarks

9. **Discharge Compliance Records**
   - ☐ Air — ☐ Readily available ☐ Up to date ☒ N/A
   - ☐ Water (effluent) — ☐ Readily available ☐ Up to date ☒ N/A

   Remarks

10. **Daily Access/Security Logs** — ☐ Readily available ☐ Up to date ☒ N/A

   Remarks

IV. O&M COSTS
1. **O&M Organization** ☐ State in-house ☐ Contractor for State ☐ PRP in-house ☐ Contractor for PRP ☐ Federal Facility in-house ☒ Contractor for Federal Facility ☐ Other ______
2. **O&M Cost Records** *Refer to Sect. 4.7 of the report* ☒ Readily available ☐ Up to date ☐ Funding mechanism/agreement in place Original O&M cost estimate ______ ☐ Breakdown attached Total annual cost by year for review period if available From ______ To ______ ______ ☐ Breakdown attached Date Date Total cost From ______ To ______ ______ ☐ Breakdown attached Date Date Total cost From ______ To ______ ______ ☐ Breakdown attached Date Date Total cost From ______ To ______ ______ ☐ Breakdown attached Date Date Total cost From ______ To ______ ______ ☐ Breakdown attached Date Date Total cost
3. **Unanticipated or Unusually High O&M Costs During Review Period** Describe costs and reasons: Increased usage by some users (multiple leaks, irrigation) DOE has repaired some leaks, although not their responsibility.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A
A. Fencing
1. Fencing damaged ☐ Location shown on site map ☐ Gates secured ☒ N/A Remarks ______
B. Other Access Restrictions
1. Signs and other security measures ☐ Location shown on site map ☐ N/A Remarks DOE-controlled pad locks and license agreements in place with 81 of 101 residential accounts.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented	☐ Yes	☒ No	☐ N/A
Site conditions imply ICs not being fully enforced	☒ Yes	☐ No	☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) ______

Frequency ______

Responsible party/agency ______

Contact ______ ______ ______ ______

Name Title Date Phone no.

Reporting is up-to-date	☒ Yes	☐ No	☐ N/A
Reports are verified by the lead agency	☒ Yes	☐ No	☐ N/A
Specific requirements in deed or decision documents have been met	☐ Yes	☐ No	☒ N/A
Violations have been reported	☐ Yes	☒ No	☐ N/A

Other problems or suggestions: ☐ Report attached

Agreements with all residents/landowners not secured.

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks ______

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks Some damage to MWs, but none associated with private wells or new lines

2. **Land use changes on site** ☒ N/A

Remarks ______

3. **Land use changes off site** ☒ N/A

Remarks ______

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks ______

B. Other Site Conditions

Remarks None.

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement (Low spots)** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent______________ Depth____________
   Remarks____

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths____________ Widths___________ Depths__________
   Remarks____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent______________ Depth____________
   Remarks____

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent______________ Depth____________
   Remarks____

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks____

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks____

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent______________ Height____________
   Remarks____

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
   ☐ Wet areas ☐ Location shown on site map Areal extent______________
   ☐ Ponding ☐ Location shown on site map Areal extent______________
   ☐ Seeps ☐ Location shown on site map Areal extent______________
   ☐ Soft subgrade ☐ Location shown on site map Areal extent______________
   Remarks____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
   Areal extent______________
   Remarks____

B. Benches ☐ Applicable ☒ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks____

C. Letdown Channels ☐ Applicable ☒ N/A
Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent______________ Depth____________
Remarks____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type______________ Areal extent____________
Remarks____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent______________ Depth____________
Remarks____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent______________ Depth____________
Remarks____

5. **Obstructions** Type____________________ ☐ No obstructions
☐ Location shown on site map Areal extent____________
Size____________
Remarks____

6. **Excessive Vegetative Growth** Type____________________
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent____________
Remarks____

D. Cover Penetrations ☐ Applicable ☒ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____

3. **Monitoring Wells (within surface area of landfill)**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks Wells serve as piezometers only

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

1. **Gas Treatment Facilities**
☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
☐ Good condition ☐ Needs Maintenance
Remarks

2. **Gas Collection Wells, Manifolds and Piping**
☐ Good condition ☐ Needs Maintenance
Remarks

3. **Gas Monitoring Facilities (*e.g.*, gas monitoring of adjacent homes or buildings)**
☐ Good condition ☐ Needs Maintenance ☐ N/A
Remarks

F. Cover Drainage Layer ☐ Applicable ☒ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
Remarks

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
Remarks

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A

1. **Siltation** Areal extent____ Depth____ ☐ N/A
☐ Siltation not evident
Remarks

2. **Erosion** Areal extent____ Depth____
☐ Erosion not evident
Remarks

3. **Outlet Works** ☐ Functioning ☐ N/A
Remarks

4. **Dam** ☐ Functioning ☐ N/A
Remarks

H. Retaining Walls ☐ Applicable ☒ N/A
1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident Horizontal displacement__________ Vertical displacement____________ Rotational displacement__________ Remarks____
2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident Remarks____
I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☒ N/A
1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident Areal extent____________ Depth__________ Remarks____
2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A ☐ Vegetation does not impede flow Areal extent____________ Type__________ Remarks____
3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident Areal extent____________ Depth__________ Remarks____
4. **Discharge Structure** ☐ Functioning ☐ N/A Remarks____
VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A
1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident Areal extent____________ Depth__________ Remarks____
2. **Performance Monitoring** Type of monitoring____________________ ☐ Performance not monitored Frequency____________________ ☐ Evidence of breaching Head differential____________________ Remarks____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A
1. **Pumps, Wellhead Plumbing, and Electrical** ☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A Remarks ______________________
2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks ______________________
3. **Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks ______________________
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A 1. **Collection Structures, Pumps, and Electrical** ☐ Good condition ☐ Needs Maintenance Remarks ______________________
2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks ______________________
3. **Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks ______________________

C. Treatment System ☐ Applicable ☒ N/A
1. **Treatment Train (Check components that apply)** ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation ☐ Air stripping ☐ Carbon adsorbers ☐ Filters ______________________ ☐ Additive (*e.g.*, chelation agent, flocculent) ______________________ ☐ Others______________________ ☐ Good condition ☐ Needs Maintenance ☐ Sampling ports properly marked and functional ☐ Sampling/maintenance log displayed and up to date ☐ Equipment properly identified ☐ Quantity of groundwater treated annually ____________ ☐ Quantity of surface water treated annually____________ Remarks____
2. **Electrical Enclosures and Panels (properly rated and functional)** ☐ N/A ☐ Good condition ☐ Needs Maintenance Remarks____
3. **Tanks, Vaults, Storage Vessels** ☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance Remarks____
4. **Discharge Structure and Appurtenances** ☐ N/A ☐ Good condition ☐ Needs Maintenance Remarks____
5. **Treatment Building(s)** ☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair ☐ Chemicals and equipment properly stored Remarks____
6. **Monitoring Wells (pump and treatment remedy)** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks____
D. Monitoring Data
1. **Monitoring Data** ☐ Is routinely submitted on time ☐ Is of acceptable quality
2. **Monitoring data suggests:** ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation
1. **Monitoring Wells (natural attenuation remedy)** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks
X. OTHER REMEDIES
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.
XI. OVERALL OBSERVATIONS
A. Implementation of the Remedy
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). Yes, very effective
B. Adequacy of O&M
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. Remedy functioning as intended, should obtain service agreements with all residents/landowners.

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. Cost issues have arisen due to increased usage, leaks, repairs, etc.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. Water policy may be enlarged. Water policy may be revised to be more consistent with implementation.

INTERVIEW RECORD

Site Name: Paducah Gaseous Diffusion Plant	**EPA ID No.:** KY8890008982
Subject: Water Policy Removal Action	**Dates:** September 8 & 10, 2003
Type: ☐ Telephone ☒ Visit ☐ Other **Location of Visit:** BJC offices in Kevil, KY	☐ Incoming ☐ Outgoing

Contact Made By:

Name: Bruce Ford	**Title:** Environmental Engineer	**Organization:** SAIC

Individuals Contacted:

Name:	**Title:**	**Organization:**
a. Don Ulrich	a. Deputy Project Manager	a. BJC
b. John Morgan	b. Technical Integration	b. BJC
c. Craig Dowdy	c. (former) Lead Engineer	c. BJC
d. John Young	d. STR – sampling subcontract	d. BJC
e. Gary Bodenstein	e. Project Manager	e. DOE

Summary Of Conversation

Typical list of questions:

- What is your overall impression of the project (general sentiment)?
- Is the remedy functioning as expected? How well is the remedy performing?
- Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.
- Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.
- Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.
- Have there been opportunities to optimize O&M or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.
- Do you have any comments, suggestions, or recommendations regarding the project?

Summary of responses:

The overall impression of the project of those interviewed is that it is doing what it was intended to do. They indicated that everyone uses municipal water, and the West McCracken Water District staff has been very helpful. Concerns are very limited. Some residents have significantly increased their water usage, and this is attributed to irrigation and water leaks. Some residents have experienced water leaks that are the resident's responsibility to repair. The residents chose not to fix the leaks, since DOE was paying for the water. In order to reduce the cost and eliminate the unnecessarily wasted water, DOE chose to hire a licensed plumber to repair the leaks for the residents.

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

INTERVIEW RECORD

Site Name: Paducah Gaseous Diffusion Plant	**EPA ID No.:** KY8890008982
Subject: NSDD IRA Facilities	**Time: 12:00 pm** / **Date: 05-21-03**
Type: ☐ Telephone ☒ Visit ☐ Other **Location of Visit:**	☐ Incoming ☐ Outgoing

Contact Made By:

Name: Michelle Rinella	**Title:** Environmental Scientist	**Organization:** SAIC

Individual Contacted:

Name: Don Ulrich	**Title:** Facility Manager	**Organization:** BJC

Summary Of Conversation

Typical list of questions:

- What is your overall impression of the project? (general sentiment)
- Is the remedy functioning as expected? How well is the remedy performing?
- What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?
- Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.
- Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.
- Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.
- Have there been opportunities to optimize O&M or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.
- Do you have any comments, suggestions, or recommendations regarding the project?
- Are inspections performed of the facility? What is the driver behind those inspections? Where is it documented?

Summary of responses:

Mr. Ulrich's overall impression of the project is that it is effective.

As far as remedy performance: the postings are effective in keeping people from the ditch and the lift station is performing its function to minimize drainage to ditch. Monitoring data is presented in the Five-Year Review.

WAGs 1 AND 7 (SWOU)
Site Inspection of the C-746-K Sanitary Closed Landfill (SWMU 8)

Summary of Overall Observations

On March 3, 2003, a site inspection of the C-746-K Sanitary Landfill (SWMU 8) and its immediate surroundings was conducted to determine continued compliance with the required remedial actions for this SWMU as directed in the WAGs 1 and 7 ROD (DOE 1998).

A sign posted at the entrance to the landfill area clearly identifies the potential human health risks posed by the leachate seeps and contaminated sediments present in the creeks and drainage ditches around the landfill. Additional warning signs are posted at periodic intervals along the west bank of Bayou Creek to the east and along the north bank of the unnamed tributary to the south. Although the posts on which some signs are mounted have been bent the signs are in good condition and clearly legible. Additionally, SWMU 8 now falls within the boundaries of an extended security buffer zone around PGDP that was established by DOE immediately following the events of September 11, 2001. This buffer zone severely restricts access to the area by the general public.

Riprap placed along the west bank of Bayou Creek for erosion protection and to cover apparent seep sites is in place and is functioning as intended. Riprap also has been placed at one apparent seep site along the unnamed tributary on the south side of the landfill and the area drainage ditch along the west side. These areas are also in good condition and performing their intended function.

The covered and capped area of the landfill is in good condition with a well-established vegetative cover that appears to drain well. There are no visible indications that water stands on the cap or side slopes. There were no signs of erosion on the landfill cap or side slopes. The area is maintained well and is mowed regularly. There are seven passive gas vents on top of the landfill that are in good condition and show no signs of leakage or settlement. With the exception of a few minor potholes, the service road around the landfill is maintained and in good condition.

Four locations in the unnamed tributary and Bayou Creek in the vicinity of SWMU 8 are sampled quarterly by the M&I Contractor's Environmental Services subcontractor.

RECOMMENDATIONS

During this site visit, warning signs were not evident on the south side of the unnamed tributary along its central and western boundaries with the landfill. This portion of the tributary is accessible to the public since the area south of the tributary is part of the WKWMA.

During this site visit there was visible evidence that vehicular traffic had been on the top and southern side slopes of the landfill. The landfill is covered with an engineered cap designed to promote drainage away from the landfill and to restrict the infiltration of water into the wastes below. Traffic on the top and side slopes of the landfill should be restricted to foot traffic only and necessary maintenance equipment to minimize the risk of damage to the engineered cap.

Site Inspection Checklist

I. SITE INFORMATION	
Site name: SWOU SWMU 8 C-746-K	**Date of inspection:** 3/3/2003
Location and Region: Paducah, KY/Region 4	**EPA ID:** KY8890008982
Agency, office, or company leading the five-year review: DOE	**Weather/temperature:** Spring

Remedy Includes: (Check all that apply)

- Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- Groundwater pump and treatment
- Surface water collection and treatment
- Other ______
- Monitored natural attenuation
- Groundwater containment
- Vertical barrier walls

Attachments: Inspection team roster attached   Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Mr. Don Ulrich | Deputy Project Manager | 5/21/2003
   Name | Title | Date
   Interviewed at site ☒ at office by phone Phone no. ______
   Problems, suggestions; ☒ Report attached ______

2. **O&M staff** ______ | ______ | ______
   Name | Title | Date
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______
   Problems, suggestions; ☐ Report attached ______

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency ______________________
Contact ______________________ ______________ ______ __________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ____________________________________

Agency ______________________
Contact ______________________ ______________ ______ __________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ____________________________________

Agency ______________________
Contact ______________________ ______________ ______ __________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ____________________________________

Agency ______________________
Contact ______________________ ______________ ______ __________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ____________________________________

4. **Other interviews** (optional) ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)			
1. **O&M Documents**			
☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A
Remarks ______			
2. **Site-Specific Health and Safety Plan**	☐ Readily available	☐ Up to date	☒ N/A
☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☒ N/A
Remarks ______			
3. **O&M and OSHA Training Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks ______			
4. **Permits and Service Agreements**			
☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits ______	☐ Readily available	☐ Up to date	☒ N/A
Remarks ______			
5. **Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks ______			
6. **Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks ______			
7. **Groundwater Monitoring Records**	☒ Readily available	☒ Up to date	☐ N/A
Remarks ______			
8. **Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks ______			
9. **Discharge Compliance Records**			
☐ Air	☐ Readily available	☐ Up to date	☒ N/A
☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A
Remarks ______			
10. **Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☒ N/A
Remarks ______			

IV. O&M COSTS

1. **O&M Organization**
☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☒ Contractor for Federal Facility
☐ Other ____________________

2. **O&M Cost Records** *Refer to Sect. 4.5 of the report.*
☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate ____________ ☐ Breakdown attached

Total annual cost by year for review period if available

From ________ (Date) To ________ (Date) ________ (Total cost) ☐ Breakdown attached
From ________ (Date) To ________ (Date) ________ (Total cost) ☐ Breakdown attached
From ________ (Date) To ________ (Date) ________ (Total cost) ☐ Breakdown attached
From ________ (Date) To ________ (Date) ________ (Total cost) ☐ Breakdown attached
From ________ (Date) To ________ (Date) ________ (Total cost) ☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period** *Costs are discussed in Sect. 4.5 of the report.*
Describe costs and reasons: None.

V. ACCESS AND INSTITUTIONAL CONTROLS ☐ Applicable ☐ N/A

A. Fencing

1. Fencing damaged ☐ Location shown on site map ☐ Gates secured ☒ N/A
Remarks ____________________

B. Other Access Restrictions

1. Signs and other security measures ☐ Location shown on site map ☐ N/A
Remarks Signs and postings are in place.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) ______
Frequency ______
Responsible party/agency ______
Contact ______

Name	Title	Date	Phone no.

Reporting is up-to-date ☐ Yes ☐ No ☒ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☐ No ☒ N/A
Other problems or suggestions: ☐ Report attached
Property is still under ownership and control of DOE.

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks Postings clearly warn of hazards in the area. Additional security measures greatly reduce the risk of unauthorized access to the area.

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks ______

2. **Land use changes on site** ☐ N/A
Remarks No changes.

3. **Land use changes off site** ☐ N/A
Remarks No changes.

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks ______

APPENDIX B

APPENDIX B

CAB AGENDAS

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PADUCAH GASEOUS DIFFUSION PLANT
SITE SPECIFIC ADVISORY BOARD

Chartered under the Federal Advisory Committee Act

MEMORANDUM
SITE SPECIFIC ADVISORY BOARD

TO: SSAB Members
Ex Officio Members

FROM: Mark Donham
Vicki Jones

DATE: January 5, 1998

SUBJECT: **MEETING REMINDER**

The special meeting of the SSAB scheduled for January 8, 1998, has been canceled. The next SSAB meeting will be January 15, 1998, at 5:00 p.m. in the Van Buren Room at the Executive Inn. The following is the tentative agenda and action items:

Tentative agenda for the January 15, 1998, meeting:
Administrative Plans for the Board - 5:00 p.m. - 6:30 p.m.
Minutes
Information (Handouts)
EMEF Project Updates
Review of the SSAB Draft Work Plan
WAG 22
Waste Management
Waste Transportation
Strategies for Effective & Meaningful Public Input Report
Vortec Environmental Assessment (if it is out by the January 15, 1998, meeting)
Media Contact Discussion

Action Items
1. Provide board with copies of the 1996 NESHAP report. COMPLETE
2. Provide the board with a list of environmental contractors/subcontractors associated with DOE.
3. Carlos will check on the issue date of the Vortec EA.
4. The SSAB requested that a Vortec EA update be added to the EMEF project updates.
5. Carlos Alvarado will check to see if DOE will be able to keep the comment period open on the EA so that the SSAB will have sufficient time to receive a presentation and have a chance to review and comment on the EA.

PADUCAH GASEOUS DIFFUSION PLANT
SITE SPECIFIC ADVISORY BOARD

Chartered under the Federal Advisory Committee Act

MEMORANDUM
SITE SPECIFIC ADVISORY BOARD

TO: SSAB Members
Ex Officio Members

FROM: Mark Donham
Vicki Jones

DATE: February 9, 1998

SUBJECT: MEETING REMINDER

The next SSAB meeting will be February 19, 1998, at 5:00 p.m. in the McKinley Room at the Executive Inn. The following is the tentative agenda and action items:

Tentative agenda for the February 19, 1998, meeting:

Administrative Plans for the Board - 5:00 p.m. - 6:30 p.m.
- Office Location
- Administrative Support
- Meeting Schedule
- Agenda Time Frames
- Policy on Presentations
- Activity between meetings
- Board Evaluation

Adjourn to attend PEIS for Depleted Uranium 7:00 p.m. - 8:00 p.m.
Minutes
Information (Handouts)
EMEF Project Updates
OCAW Health Study (Canceled)
Review of the SSAB Draft Work Plan
WAG 6
WAG 22 (If regulatory comments have been received)
Vortec EA (If available)

Action Items

Provide SSAB members with Feasibility Study Summary for Solid Waste Management Unit (SWMU) 2 of WAG 22 - COMPLETE

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MEMORANDUM
SITE SPECIFIC ADVISORY BOARD

TO: SSAB Members
Ex Officio Members

FROM: Mark Donham
Vicki Jones

DATE: March 9, 1998

SUBJECT: MEETING REMINDER

The next SSAB meeting will be March 19, 1998, at 5:00 p.m. in the Van Buren Room at the Executive Inn. The following is the tentative agenda and action items:

Tentative agenda for the March 19, 1998, meeting:
Administrative Plans for the Board - 5:00 p.m. - 6:00 p.m.
- Office Location (10 minutes)
- Administrative Support (10 minutes)
- Board Evaluation (10 minutes)
- Review of the SSAB Draft Work Plan (10 minutes)

Minutes
Information (Handouts)
EMEF Project Updates
DOE Response to SSAB Recommendations (15 minutes)
Decontamination and Decommissioning (D&D) (30 minutes)
Cost Effectiveness (30 minutes)
Site Treatment Plan (STP) Annual Report (30 minutes)
Bechtel/Jacobs Management and Integration (M&I) Presentation (30 minutes)
Report on Prioritization Meeting from Gregory Waldrop (30 minutes)
WAG 22 (If regulatory comments have been received) (30 minutes)
Vortec EA (if available) (30 minutes)

Action Items

DOE will mail the SSAB the Vortec EA when released.
Jeannie Brandstetter will provide the SSAB with copies of the results from the survey that was sent out last year.

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DRAFT

MEMORANDUM
SITE SPECIFIC ADVISORY BOARD

TO: SSAB Members
Ex Officio Members

FROM: Mark Donham
Vicki Jones

DATE: April 6, 1998

SUBJECT: **MEETING REMINDER**

The next SSAB meeting will be April 16, 1998, at 5:00 p.m. in the Roosevelt Room at the Executive Inn. The following is the tentative agenda and action items:

Tentative agenda for the April 16, 1998, meeting:

Minutes
Information (Handouts)
EMEF Project Updates
DOE Response to SSAB Recommendations (15 minutes)
Vortec EA (30 minutes)
Paths to Closure - Accelerated Cleanup Plan (30 minutes)
Cylinder Programmatic Environmental Impact Statement (PEIS) (30 minutes)
Administrative Plans for the Board -
- Office Location (10 minutes)
- Administrative Support (10 minutes)
- Board Evaluation (10 minutes)
- Review of the SSAB Draft Work Plan (10 minutes)

Action Items

Vicki Jones will send board copies of the board evaluation.
Teresa Fields will send the board copies of the revised SSAB work plan.
Jimmie Hodges will try to get Mark a copy of the Governor of Tennessee's Blue Ribbon panel on the TSCA Incinerator report.
Teresa Fields will distribute the Glossary Of Useful Terms Found in EMBAM, Risk Assessment, and Waste Management Reports.
Provide the SSAB with copies of the regulations on CXs and the list of CXs for Paducah for the last year.

PADUCAH GASEOUS DIFFUSION PLANT
SITE SPECIFIC ADVISORY BOARD

Chartered under the Federal Advisory Committee Act

MEMORANDUM
SITE SPECIFIC ADVISORY BOARD

TO: SSAB Members
Ex Officio Members

FROM: Mark Donham
Vicki Jones

DATE: May 11, 1998

SUBJECT: MEETING REMINDER

The next SSAB meeting with be May 21, 1998, at 5:00 p.m. in the VanBuren Room at the Executive Inn. The following is the tentative agenda and actions items:

Tentative agenda for the May 21, 1998, meeting:

- Minutes
- Information (Handouts)
- EMEF Project Updates
  - Northwest Plume Five-Year Review
- DOE Response to SSAB Recommendations (15 minutes)
- Bechtel Jacobs Management and Integration Contract Presentation (30 minutes)
- Comments on the 2006 Plan (30 minutes)
- Administrative Plans for the Board
  - Office Equipment and Computer (10 minutes)
  - Lease Agreement (10 minutes)
  - Board Evaluation (10 minutes)
  - Review of the SSAB Draft Work Plan (10 minutes)

Action Items

- Provide SSAB with correspondence between the state and the DOE concerning the uranium burial grounds
- Provide SSAB with software alternatives (such as NT Work Station) and printer alternatives and prices for a computer
- Provide SSAB with information on the Paducah Area Community Reuse Organization

PADUCAH GASEOUS DIFFUSION PLANT
SITE SPECIFIC ADVISORY BOARD

Chartered under the Federal Advisory Committee Act

MEMORANDUM
SITE SPECIFIC ADVISORY BOARD

TO: SSAB Members
Ex Officio Members

FROM: Mark Donham
Vicki Jones

DATE: June 8, 1998

SUBJECT: **MEETING REMINDER**

The next SSAB meeting will be held June 18, 1998, at 5:00 p.m. in the VanBuren Room at the Executive Inn. The following is the tentative agenda and actions items:

Tentative agenda for the June 18, 1998, meeting:

- Minutes
- Information (Handouts)
- EMEF Project Updates
- DOE Response to SSAB Recommendations (15 minutes)
- Northwest Plume Pump-and-Treat Facility Costs (30 minutes)
- Local NEPA Representative on Categorical Exclusions (30 minutes)
- Waste Area Group 6 — Fact Sheet and Q&A (30 minutes)
- Waste Area Group 22, SWMUs 7 and 30 — Fact Sheet and Q&A (30 minutes)
- Administrative Plans for the Board
  - Office Space, Computer, and Furniture (10 minutes)
  - Review of the SSAB Draft Work Plan (10 minutes)

Action Items

- Provide the board with a breakdown of cost figures for the Northwest Plume pump-and-treat facility.

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MEMORANDUM
SITE SPECIFIC ADVISORY BOARD

TO: SSAB Members
Ex Officio Members

FROM: Mark Donham
Vicki Jones

DATE: July 2, 1998

SUBJECT: **MEETING REMINDER**

The next meeting will be held July 16, 1998, at the Resource Center in the Information Age Park at 5:30 p.m.

Tentative agenda for the July 16, 1998, meeting:

- Minutes
- Introduction from Ms. Bradbury of Pacific Northwest National Laboratory
- Information (Handouts)
- EMEF Project Updates
- Local NEPA Representative on Categorical Exclusions (30 minutes)
- WAG 22, SWMUs 2 and 3 and SWMUs 7 and 30 (30 minutes)
- DOE Response to SSAB Recommendations (15 minutes)
- Administrative Plans for the Board
  - Computer (10 minutes)
  - Review of the SSAB Draft Work Plan (10 minutes)
  - Financial Update (10 minutes)

Action Items

- SSAB members need to bring their copies of CXs to July 16, 1998, meeting
- Provide SSAB members with copies of EPA and KDEP comments on the D1 WAG 22 FS
- Bryan Clayton will provide information from a chemical engineer on what happens when TCE oxidizes
- Provide SSAB members with a copy of the executive summary from the RI Report for WAG 6 (WAG 6 RI Report pushed back to August 14)
- Dennis Hill will contact Representative Whitfield to see if there is a time he and/or state representatives could meet with the SSAB
- Provide SSAB with a price list of printers for the computer

PADUCAH GASEOUS DIFFUSION PLANT
SITE SPECIFIC ADVISORY BOARD

Chartered under the Federal Advisory Committee Act

MEMORANDUM
SITE SPECIFIC ADVISORY BOARD

TO: SSAB Members
Ex Officio Members

FROM: Mark Donham
Vicki Jones

DATE: August 10, 1998

SUBJECT: MEETING REMINDER

The next meeting will be held August 20, 1998, at the Information Age Park at 5:30 p.m. The meeting was adjourned.

Tentative agenda for the August 20, 1998, meeting:

- Minutes
- Information (Handouts)
- EMEF Project Updates
- WAG 22, SWMUs 2, 7, and 30 (30 minutes)
- Accelerating Cleanup Plan, Paths to Closure (30 minutes)
- Depleted Uranium Hexafluoride PEIS, review of budget (30 minutes)
- Training Options for SSAB (15 minutes)
- DOE Response to SSAB Recommendations (15 minutes)
- Administrative Plans for the Board
  - Review of the SSAB Draft Work Plan (10 minutes)
  - Financial Update (10 minutes)

Action Items

- Provide SSAB members with the issue date of the final environmental impact statement on depleted uranium hexafluoride.
- Contact DOE Headquarters to see if the SSAB can be provided with a complete list of comments and responses on the Oak Ridge Operations Accelerating Cleanup Plan.
- Provide a financial spreadsheet and update to SSAB members in the August mailing.
- Provide SSAB members with a copy of the executive summary for the WAG 6 RI Report.

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MEMORANDUM
SITE SPECIFIC ADVISORY BOARD

TO: SSAB Members
Ex Officio Members

FROM: Mark Donham
Vicki Jones

DATE: September 3, 1998

SUBJECT: **MEETING REMINDER**

The next meeting will be held September 17, 1998, at the Information Age Park Resource Center at 5:30 p.m.

Tentative agenda for the September 17, 1998, meeting:

- Minutes
- Information (Handouts)
- EMEF Project Updates
- Vortec Update
- Depleted UF_6 PEIS Update
- Northeast and Northwest Plumes Pump and Treat Facilities, Water Policy
- WAG 22, SWMUs 7 and 30
- Training Options for SSAB
- DOE Response to SSAB Recommendations
- Administrative Plans for the Board
  - Review of the SSAB Draft Work Plan
  - Financial Update
  - SSAB Membership

Action Items

- Dennis Hill provide Mark Donham with list of projects in Paducah for which funding has been requested in the Accelerating Cleanup Plan.
- Vicki Jones check on how much it would cost for someone from the Government Institutes' Environmental, Health & Safety training program to come to Paducah to describe training options to the SSAB.
- Send members not present at this meeting a training catalog so they can review training options before the next meeting.
- Bill Tanner check with people who are affected by the Water Policy and see who would like to present information to the SSAB on this topic.

MEMORANDUM
SITE SPECIFIC ADVISORY BOARD

TO: SSAB Members
Ex Officio Members

FROM: Mark Donham
Vicki Jones

DATE: October 5, 1998

SUBJECT: **MEETING REMINDER**

The next meeting will be held October 15, 1998, at the Information Age Park Resource Center at 5:30 p.m.

Tentative agenda for the October 15, 1998, meeting:

- Public Comments from Guests
- Minutes
- Information (Handouts)
- EMEF Project Updates
- Vortec Update
- Depleted UF_6 PEIS Budget Update
- WAG 6 Remedial Investigation Report
- Federal Facilities Agreement Strategies
- Accelerating Cleanup Plan — Paths to Closure
- Northeast and Northwest Plumes Pump and Treat Facilities
- Training Options for SSAB
- DOE Response to SSAB Recommendations
- Administrative Plans for the Board
  - Review of the SSAB Draft Work Plan
  - Financial Update
  - SSAB Membership

Action Items

- Provide Craig Rhodes with information on the research and portions used in the Vortec flux.
- Provide SSAB with characterization on uranium precipitate or filter cake barrels generated by the USEC.

PADUCAH GASEOUS DIFFUSION PLANT
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Tentative agenda for the November 19, 1998, meeting:

- Public Comments from Guests
- Minutes
- Information (Handouts)
- EM&EF Project Updates
- Vortec Update
- Depleted UF_6 PEIS Update
- Transportation of Wastes/Hazardous Materials
- PACRO — how it relates to SSAB
- WAG 6 Remedial Investigation Report
- WAG 22, SWMU 2
- Northeast and Northwest Plumes Pump and Treat Facilities
- Training Options for SSAB
- DOE Response to SSAB Recommendations
- Administrative Plans for the Board
  - Review of the SSAB Draft Workplan
  - Financial Update
  - Web Page
  - SSAB Membership
  - Facilitator Contract

Action Items

- David Tidwell contact Craig Rhodes to answer questions about the Vortec flux and how the research was conducted.
- Provide Gregory Waldrop with five-year budget trend for Paducah.
- Check SSAB guidance on rules or prohibitions to SSAB lobbying.
- Check on how much web page space the SSAB is allowed to have under the Apex plan. **(complete — 50 megs)**
- Provide SSAB with a list of DOE-sponsored natural resource studies being conducted by the AIP department of the state.

Printed on recycled paper

MEMORANDUM
SITE SPECIFIC ADVISORY BOARD

TO: SSAB Members
Ex Officio Members

FROM: Mark Donham
Vicki Jones

DATE: December 23, 1998

SUBJECT: **MEETING REMINDER**

The next meeting will be held January 21, 1999, at the Information Age Park Resource Center at 5:30 p.m.

Tentative agenda for the January 21, 1999, meeting:

- Public Comments from Guests
- Minutes
- Information (Handouts)
- EM&EF Project Updates
- Vortec Update
- Depleted UF_6 Programmatic Environmental Impact Statement Update
- WAG 6
- WAG 22, SWMU 2
- WAG 22, SWMUs 7 and 30
- WAGs 9 and 11 Preliminary Assessment/ Site Inspection Process Site Evaluation Report
- Northeast and Northwest Plumes Pump and Treat Facilities
- Paducah-Area Community Reuse Organization
- Risk Assessment Training (1½ hours)
- DOE Response to SSAB Recommendations
- Administrative Plans for the Board
    - Review of the SSAB Draft Workplan
    - Financial Update
    - Web Page Update
    - SSAB Membership

PADUCAH GASEOUS DIFFUSION PLANT SITE SPECIFIC ADVISORY BOARD

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MEMORANDUM
SITE SPECIFIC ADVISORY BOARD

TO: SSAB Members
Ex Officio Members

FROM: Mark Donham
Vicki Jones

DATE: February 8, 1999

SUBJECT: **MEETING REMINDER**

The next meeting will be held February 18, 1999, at the Information Age Park Resource Center at 5:30 p.m.

Tentative agenda for the February 18, 1999, meeting:

- Public Comments from Guests
- Minutes
- Information (Handouts)
- EM&EF Project Updates
- Vortec Update
- Depleted UF_6 Programmatic Environmental Impact Statement Update
- SSAB Evaluations — Judith Bradbury
- Northeast and Northwest Plume Pump and Treat Facilities — Bill Tanner
- Groundwater Operable Unit Feasibility Study
- Cumulative Effects on the Site
- DOE Response to SSAB Recommendations — Jimmie Hodges
- Administrative Plans for the Board
  - Review of the SSAB Draft Workplan
  - Financial Update
  - Web Page Update
  - SSAB Membership

PADUCAH GASEOUS DIFFUSION PLANT
SITE SPECIFIC ADVISORY BOARD

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MEMORANDUM
SITE SPECIFIC ADVISORY BOARD

TO: SSAB Members
Ex Officio Members

FROM: Mark Donham
Vicki Jones

DATE: April 5, 1999

SUBJECT: **MEETING REMINDER**

The next meeting will be held April 15, 1999, at the Information Age Park Resource Center at 5:30 p.m.

Tentative agenda for the April 15, 1999, meeting:

- Public Comments from Guests
- Minutes
- Information (Handouts — HEPA Filters)
- EM&EF Project Updates
- Vortec Update
- Depleted UF_6 Programmatic EIS Update
- Surface Water Operable Unit
- WAG 6 — Gregory Waldrop
- WAGs 9 and 11
- Recommendations from SSAB Evaluation Subcommittee — Jim Smart
- Cumulative Effects on the Site
- DOE Response to SSAB Recommendations — Jimmie Hodges
- Administrative Issues for the Board
    - Review of the SSAB Draft Workplan
    - Financial Update
    - SSAB Letterhead

PADUCAH GASEOUS DIFFUSION PLANT
SITE SPECIFIC ADVISORY BOARD

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TO: Paducah SSAB Members
Ex Officio Members

DATE: May 3, 1999

SUBJECT: **MEETING REMINDER**

The next meeting will be held May 13, 1999, at the Information Age Park Resource Center at 5:30 p.m.

Tentative agenda for the May 13, 1999, meeting:

- Call to order/Discussions
- Minutes
- Public Comments and Questions
- Information Handouts
- Program Status Updates
  - EM&EF Projects
  - Vortec
  - Depleted UF_6
- Sitewide Cummulative Effects
- Programatic Presentations
  - WAG 6 — Gregory Waldrop
  - WAG 22 SWMU 2 & 3 -- Nola Courtney
  - National Metal Recycle Program: Scrap Metal Options
  - Operable Unit Strategy Overview -- John Morgan
- SSAB Subcommittee Reports
  - Board Evaluation -- Jim Smart
  - Community Relations -- Judy Ingram
  - Consultant -- Bill Tanner
  - New Members -- Nola Courtney
- SSAB Recommendations Status--Jimmie Hodges

PADUCAH GASEOUS DIFFUSION PLANT
SITE SPECIFIC ADVISORY BOARD

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2000 McCracken Boulevard • Paducah, Kentucky 42001 • (502) 744-9010

Final agenda for the June 17, 1999, meeting:

- Call to order/Discussions
- Minutes
- Public Comments and Questions
- Information Handouts
- Program Status Updates
    - EM&EF Projects
    - Vortec (new fact sheet)
    - Depleted UF_6
  - DOE Public Workshop
- Sitewide Cummulative Effects
- Programmatic Presentations
    - WAG 6—Gregory Waldrop
    - WAGs 3, 8, 28/ Data Gaps—Bob Pratt
    - Life Cycle Baseline—John Morgan
    - *Paths to Closure* document—Mark Donham
- SSAB Subcommittee Reports
    - Community Relations—Judy Ingram
    - Consultant—Bill Tanner
    - Membership—Nola Courtney
- SSAB Recommendations Status—Jimmie Hodges
- Administrative Issues for the Board
    - Co-chair Status
    - Review of the SSAB Draft Workplan
    - Tours
    - Financial Update
    - SSAB Letterhead
    - Status of Name Change Proposal

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SITE SPECIFIC ADVISORY BOARD

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Final agenda for the July 15, 1999, meeting:

- Call to order/Discussions
- Minutes
- Public Comments and Questions
- Information Handouts
- Program Status Updates
  - EM&EF Projects
  - Vortec
  - Depleted UF_6
  - DOE Public Workshop
- Sitewide Cumulative Effects
- Programmatic Presentations
  - WAG 6—Gregory Waldrop
  - ITRD
  - *Paths to Closure* document—Mark Donham
- SSAB Subcommittee Reports
  - Community Relations—Judy Ingram
  - Consultant—Bill Tanner
  - Membership—Nola Courtney
- SSAB Recommendations Status—Jimmie Hodges
- Administrative Issues for the Board
  - Co-chair Status
  - Review of the SSAB Draft Workplan
  - Tours
  - Financial Update
  - SSAB Letterhead
  - Status of Name Change Proposal
  - Member Orientation Packet

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Final agenda for the August 19, 1999, meeting:

- Call to order/Discussions
- Minutes
- Public Comments and Questions
- Information Handouts
- Program Status Updates
  - EM&EF Projects
  - Vortec—Draft Environmental Assessment
  - Depleted UF_6
  - Update on Former Worker Health—Jim Chesnut
- Sitewide Cumulative Effects
- Programmatic Presentations
  - WAG 6—Gregory Waldrop
  - ITRD
  - Response to requests for clarification of *Paths to Closure*
  - Overview on Scrap Metal Engineering Evaluation/Cost Analysis
- SSAB Subcommittee Reports
  - Community Relations—Judy Ingram
  - Consultant—Bill Tanner
  - Membership—Nola Courtney
- SSAB Recommendations Status—Jimmie Hodges
- Administrative Issues for the Board
  - Co-chair Status/vote on proposed by-laws change
  - Review of the SSAB Draft Workplan
  - Tours/September 16,1999 SSAB meeting/tour
  - Financial Update
  - National SSAB chairs meeting

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SITE SPECIFIC ADVISORY BOARD

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Agenda for the September 16, 1999, meeting:

- Call to order/Discussions
- Minutes
- Public Comments and Questions
- Update on DOE EH investigation of environmental, health and safety concerns
- Information Handouts
- Program Status Updates
  - EM&EF Projects
  - Vortec—Draft Environmental Assessment
  - Depleted UF_6
  - Scrap Metal
- Sitewide Cumulative Effects
- Programmatic Presentations
  - Surface Water Operable Unit Discussion
  - Land Use Control Assurance Plan (LUCAP)
  - Innovative Treatment Remediation Demonstration (ITRD)
  - WAG 6—Gregory Waldrop
  - Response to requests for clarification of *Paths to Closure*
- SSAB Subcommittee Reports
  - Community Relations—Judy Ingram
  - Consultant—Bill Tanner
  - Membership—Nola Courtney
- Action Items from August Meeting
- SSAB Recommendations Status—Jimmie Hodges
- Administrative Issues for the Board
  - Notification of members regarding news items
  - Co-chair Status/vote on proposed by-laws change
  - Review of the SSAB Draft Workplan
  - Future Tours
  - Financial Update
  - Chairs Meeting Agenda
  - Stewardship Conference in Oak Ridge

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SITE SPECIFIC ADVISORY BOARD

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Agenda for the October 21, 1999, meeting:

- Call to order/Discussions
- Minutes from July, August, September
- Public Comments and Questions
- Update on DOE EH investigation of environmental, health and safety concerns
- Information Handouts
- Program Status Updates
  EM&EF Projects
  Depleted UF_6
  Scrap Metal
  WAG 3, 8, 28/Data Gaps update
  Surface Water OU Work Plan (copy in board office)
- Sitewide Cumulative Effects
- Programmatic Presentations
  Land Use Control Assurance Plan (LUCAP)
  ITRD
  WAG 6—Gregory Waldrop
- SSAB Subcommittee Reports
  Community Relations—Judy Ingram
  Consultant—Bill Tanner
  Membership—Nola Courtney
  Chairs Meeting Report—Vicki Jones
- Action Items from September Meeting
- SSAB Recommendations Status
- Administrative Issues for the Board
  Notification of members regarding news items
  Review of the SSAB Draft Workplan
  Future Tours
  Financial Update/2000 Budget
  Upcoming Stewardship Conference in Oak Ridge

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Tentative agenda for November 18, 1999, meeting:

- Call to order
- Minutes from September, October
- Special Presentations
  Groundwater presentation
  Air presentation
- Public Comments and Questions
- Update on DOE EH investigation of environmental, health and safety concerns
- Program Status Updates
  EM&EF Projects
  Depleted UF_6
  Scrap Metal
  WAG 3, 8, 28/Data Gaps update
- Sitewide Cumulative Effects
- Programmatic Presentations
  Land Use Control Assurance Plan (LUCAP)
  ITRD
  WAG 6—Gregory Waldrop
- Information Handouts
- SSAB Subcommittee Reports
  Community Relations—Judy Ingram
  Consultant—Bill Tanner
  Membership—Nola Courtney
  Chairs Meeting Report—Vicki Jones
- SSAB Recommendations Status
- Administrative Issues for the Board
  Review of the SSAB Draft Workplan
  Agenda for December meeting

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Agenda for the January 20, 2000, meeting:

- Call to order
- Minutes from November 18 meeting
- Public Comments and Questions
- Update on DOE ES&H issues
- Information Handouts
- Program Status Updates
  EM&EF Projects
  Depleted UF_6
  Scrap Metal/Drum Mountain
- Sitewide Cumulative Effects
- Programmatic Presentations
  Five-Year Groundwater Operable Unit Review
  Lasagna
  Land Use Control Assurance Plan
  ITRD
  WAG 6—Gregory Waldrop
- SSAB Subcommittee Reports
  Community Relations—Judy Ingram
  Consultant—Bill Tanner
  Membership—Nola Courtney
- SSAB Recommendations Status
- Administrative Issues for the Board
  Review of the SSAB Draft Workplan
  Financial Update

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Agenda for the February 17, 2000, meeting:

5:30 Informal Discussion

6:00 Call to order
Review of Agenda
Minutes from November, December meetings

Public Comments and Questions (15 minutes)

Site Manager's Comments (20 minutes)
ES&H Issues
Site Office Personnel
Other

SSAB Recommendations Status (5 minutes)

Project Status Updates (20 minutes)
EM&EF Projects – Handout
Scrap Metal/Drum Mountain – M. Redfield/R. Castaneda
Reactive Treatment Zones – Fact Sheet
ITRD

Presentation (20 minutes)
Waste Shipment – G. Shaia

Administrative Issues (15 minutes)
Review of the SSAB Draft Workplan
Financial Update

SSAB Subcommittee Reports (15 minutes)
Community Relations—Judy Ingram
Consultant—Bill Tanner
Membership—Nola Courtney

Public Comments and Questions (15 minutes)

Executive Session to consider applications

Adjourn

PADUCAH GASEOUS DIFFUSION PLANT

SITE SPECIFIC ADVISORY BOARD

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Agenda for the April 20, 2000, meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of minutes from March meeting

Site Manager's Comments — **60 minutes**
ES&H issues
Other
Board discussion
Public comments and questions

SSAB recommendations status — **5 minutes**

Project status updates — **20 minutes**
EM&EF Projects
Drum Mountain/Scrap Metal
Groundwater Operable Unit
Board discussion
Public comments and questions

Administrative issues — **15 minutes**
Review of SSAB Draft Workplan
Review Executive Session Guidelines
Financial update

SSAB Subcommittee Reports — **15 minutes**
On-Site Disposal Facility
Community Relations
Consultant
Membership

Adjourn

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SITE SPECIFIC ADVISORY BOARD

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Tentative agenda for the May 18, 2000 meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of minutes from April meeting

Site Manager's Comments — **60 minutes**
ES&H issues, investigation
Other
Board discussion
Public comments and questions

SSAB recommendations status — **5 minutes**

Project status updates — **20 minutes**
EM&EF Projects
Drum Mountain/Scrap Metal
Groundwater Operable Unit/Permeable Treatment Zone
Board discussion
Public comments and questions

Administrative issues — **15 minutes**
Review of SSAB Draft Workplan
Financial update

SSAB Subcommittee Reports — **15 minutes**
On-Site Disposal Facility
Monitoring program recommendation parameters
Community Relations
Consultant
Membership

Adjourn

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SITE SPECIFIC ADVISORY BOARD

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Tentative agenda for the June 15 meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of minutes from May regular meeting, June 1 special meeting

Site Manager's Comments **– 60 minutes**
- ES&H issues, investigation
- Other
  - Board discussion
  - Public comments and questions

SSAB Recommendation Status **– 5 minutes**

Project Status Updates **– 20 minutes**
- EM&EF Projects
- Drum Mountain/Scrap Metal
- Core Team
  - Board discussion
  - Public comments and questions

Presentations **– 60 minutes**
1. Groundwater Operable Unit FS/Permeable Treatment Zone
2. On-site Disposal Facility
   - Board discussion
   - Public comments and questions

Administrative Issues **– 15 minutes**
- Review of Workplan
- Review next agenda
- Financial update

SSAB Subcommittee Reports **– 15 minutes**
- On-site Disposal Facility
- Community Relations
- Consultant
- Membership

Adjourn

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Tentative agenda for the July 20 meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of minutes from June

Site Manager's Comments — **60 minutes**
- ES&H issues, investigation
- Other
  - Board discussion
  - Public comments and questions

SSAB Recommendation Status — **5 minutes**

Project Status Updates — **20 minutes**
- EM&EF Projects
- Drum Mountain/Balance of Scrap
  - Board discussion
  - Public comments and questions

Presentations — **60 minutes**
1. Groundwater Operable Unit Feasibility Study
2. Potential On-site CERCLA Disposal Facility
   - Board discussion
   - Public comments and questions

Administrative Issues — **15 minutes**
- Review of Workplan
- Review next agenda
- Financial update
- Retreat

SSAB Subcommittee Reports — **15 minutes**
- Potential On-site CERCLA Disposal Facility
- Community Relations
- Consultant
- Membership
- 2001 Budget

Adjourn

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Tentative agenda for the August 24 meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of minutes from July

Site Manager's Comments **– 60 minutes**
- ES&H issues, investigation, other
  - Board discussion
  - Public comments and questions

SSAB Recommendation Status **– 5 minutes**
- Discuss draft response to Huntoon letter

Project Status Updates **– 30 minutes**
- EM&EF Projects
- Drum Mountain update, mammal study/Balance of Scrap EE/CA
- Potential On-Site CERCLA Disposal Facility
  - Board discussion
  - Public comments and questions

Presentation **– 30 minutes**
- 6-Phase Heating and C-Sparge Technologies
  - Board discussion
  - Public comments and questions

Administrative Issues **– 15 minutes**
- Review of Workplan
- Review next agenda
- Financial update
- Retreat

SSAB Subcommittee Reports **– 15 minutes**
- Potential On-site CERCLA Disposal Facility
- Community Relations
- Consultant
- Membership
- 2001 Budget

Adjourn

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Agenda for the September 21 meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of minutes from August

Site Manager's Comments – 30 minutes
- ES&H issues, investigation, PACRO update, other
  - Board discussion
  - Public comments and questions

SSAB Recommendation Status – 5 minutes

Project Status Updates – 30 minutes
- EM&EF Project Updates
- Drum Mountain update/Scrap EE/CA
- Options for Disposal of PGDP CERCLA Wastes
  - Board discussion
  - Public comments and questions

Discussion – 30 minutes
- Board discussion on Groundwater FS

Presentation – 30 minutes
- North-South Diversion Ditch
- Board discussion
- Public comments and questions

Administrative Issues – 15 minutes
- Review of Workplan
- Review next agenda
- Financial update

SSAB Subcommittee Reports – 15 minutes
- Community Relations
- Membership
- Consultant
- 2001 Budget

Adjourn

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Tentative agenda for the October 19, 2000 meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of minutes from September

Site Manager's Comments **– 30 minutes**
- ES&H issues, investigation, other
  - Board discussion
  - Public comments and questions

SSAB Recommendation Status **– 5 minutes**

Project Status Updates **– 30 minutes**
- EM&EF Project Updates
- Drum Mountain update/Scrap EE/CA
- Options for Disposal of PGDP CERCLA Wastes
  - Board discussion
  - Public comments and questions

Community Discussion **– 45 minutes**

Discussion **– 30 minutes**
- Board discussion on Groundwater FS

Administrative Issues **– 15 minutes**
- Review of Workplan
- Review next agenda
- Financial update

SSAB Subcommittee Reports **– 15 minutes**
- Community Relations
- Consultant
- Membership
- Finance

Adjourn

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SITE SPECIFIC ADVISORY BOARD

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Tentative agenda for the November 16, 2000 meeting:

5:30
Informal discussion
6:00
Call to order, introductions
Review of agenda
Approval of minutes from October meeting

Site Manager's Comments – **30 minutes**
- ES&H issues, investigation, nickel ingots, other
  - Board discussion
  - Public comments and questions

SSAB Recommendation Status – **5 minutes**

Project Status Updates – **30 minutes**
- EM&EF Project Updates
- ITRD
- Drum Mountain update/Scrap EE/CA
  - Board discussion
  - Public comments and questions

Presentations – **40 minutes**
- FOIA Officer Amy Rothrock
- Waste Disposition Environmental Assessment
  - Board discussion
  - Public comments and questions

Discussion – **30 minutes**
- Core Team (Setting priorities/Ecological Assessment)

Administrative Issues – **15 minutes**
- Review of Workplan
- Review next agenda
- Financial update

SSAB Subcommittee Reports – **15 minutes**
- Community Relations
- Consultant
- Membership
- Finance
- Retreat

Adjourn

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SITE SPECIFIC ADVISORY BOARD

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Agenda for the January, 18, 2001 meeting:

5:30
Informal discussion
6:00
Call to order, introductions
Review of agenda
Approval of minutes from November meeting

Site Manager's Comments -- 30 minutes
- ES&H issues, investigation, other
  - Board discussion
  - Public comments and questions

SSAB Recommendation Status -- 5 minutes

Project Status Updates -- 30 minutes
- EM&EF Project Updates
- Drum Mountain update/Scrap EE/CA
  - Board discussion
  - Public comments and questions

Presentations -- 60 minutes
- Core Team Process, Team members
- USGS, Seismic Issues concerning CERCLA Cells
- North/South Diversion Ditch

Administrative Issues -- 15 minutes
- Review of Workplan
- Review next agenda
- Financial update
- Retreat

SSAB Subcommittee Reports -- 15 minutes
- Community Relations
- Consultant
- Membership
- Finance

Adjourn

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Working for the future

Paducah Gaseous Diffusion Plant CITIZENS ADVISORY BOARD

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CITIZENS ADVISORY BOARD

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Agenda for the February 15, 2001 meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of minutes from January meeting

Site Manager's Comments – **30 minutes**
- ES&H issues, investigation, other
  - Board discussion
  - Public comments and questions

SSAB Recommendation Status – **5 minutes**

Project Status Updates – **30 minutes**
- EM&EF Project Updates
- Scrap Metal EE/CA
  - Board discussion
  - Public comments and questions

Presentations – **60 minutes**
- Waste Disposition Environmental Assessment
- 746-U Environmental Assessment
- 6-Phase Heating
- Worker Health Protection Program
  - Board discussion
  - Public comments and questions

Administrative Issues – **15 minutes**
- Review of Workplan
- Review next agenda
- Chairs Meeting Update
- Retreat

SSAB Subcommittee Reports – **15 minutes**
- Community Concerns
- Community Relations
- Consultant
- Membership
- Finance

Adjourn

Chartered as a Site Specific Advisory Board under the Federal Advisory Committee Act

Working for the future

Paducah Gaseous Diffusion Plant

CITIZENS ADVISORY BOARD

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Tentative Agenda for the March 15, 2001 meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of minutes from February meeting

Site Manager's Comments – 30 minutes
- ES&H issues, investigation, other
  - Board discussion
  - Public comments and questions

SSAB Recommendation Status – 5 minutes

Project Status Updates – 30 minutes
- EM Projects
- Waste Disposition EA
- C-746-U Landfill EA
- Scrap Metal EE/CA
- North-South Diversion Ditch
  - Board discussion
  - Public comments and questions

Administrative Issues – 30 minutes
- Review of Workplan
- Review next agenda
- Retreat Follow-up

SSAB Subcommittee Reports – 30 minutes
- Community Concerns
- Community Relations
- Consultant
- Membership
- Finance

Adjourn

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Tentative Agenda for the April 19, 2001 meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of minutes from March meeting

Site Manager's Comments – 30 minutes
- ES&H issues, investigation, other
  - Board discussion
  - Public comments and questions

SSAB Recommendation Status -- 5 minutes

Project Status Updates – 30 minutes
- EM Projects
- Waste Disposition EA
- C-746-U Landfill EA
  - Board discussion
  - Public comments and questions

Presentations – 90 minutes
- Scrap Metal EE/CA
- North-South Diversion Ditch
- CERCLA Cell Siting Options
- Board evaluation – Bradbury/Branch report
  - Board discussion
  - Public comments and questions

Administrative Issues – 30 minutes
- Review of Workplan
- Review next agenda
- Possible NSDD Recommendations

SSAB Subcommittee Reports – 30 minutes
- Community Concerns
- Contracting Recommendation
- Membership
- Bylaws
- Community Relations
- Consultant
- Finance

Adjourn

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Tentative Agenda for the May 17, 2001 meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of minutes from April meeting

Site Manager's Comments -- 30 minutes
- ES&H issues, investigation, other
  - Board discussion
  - Public comments and questions

SSAB Recommendation Status -- 5 minutes

Project Status Updates -- 30 minutes
- EM Projects
- C-746-U Landfill EA
- Scrap Metal EE/CA
  - Board discussion
  - Public comments and questions

Discussion -- 30 minutes
- CERCLA Disposal Option
- ATSDR Report

Presentations -- 60 minutes
- North-South Diversion Ditch Remedial Action
- Lifecycle Baseline
- PACRO annual report
  - Board discussion
  - Public comments and questions

Administrative Issues -- 30 minutes
- Review of Workplan
- Review next agenda

SSAB Subcommittee & Task Force Reports -- 30 minutes
- Budget, Finance & Administration
- Public Involvement
- Training & Programs
- Nominations & Membership
- Community Concerns
- Bylaws
- Ground Water Task Force
- Surface Water Task Force
- Waste Operations Task Force
- Landfills Task Force

Adjourn

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Tentative agenda for the June 21, 2001 meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of minutes from May meeting

Site Manager's Comments -- **30 minutes**
- ES&H issues, investigation, other
  - Board discussion
  - Public comments and questions

SSAB Recommendation Status -- **5 minutes**

Project Status Updates -- **30 minutes**
- EM&EF Project Updates
- Scrap Metal EE/CA
- C-746-U Landfill and Waste Disposition Environmental Assessments
  - Board discussion
  - Public comments and questions

Presentations -- **60 minutes**
- Lifecycle Baseline
  - Board discussion
  - Public comments and questions

Administrative Issues -- **15 minutes**
- Review of Workplan
- Review next agenda

Task Force and Subcommittee Reports -- **15 minutes**
- Groundwater Operable Unit
- Surface Water Operable Unit
- Landfills Task Force
- Waste Operations Task Force
- Community Concerns
- Public Involvement
- Training and Programs
- Membership
- Budget, Finance & Administration

Adjourn

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Tentative agenda for the July 19, 2001 meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of minutes from June meeting

DDFO's Comments -- 20 minutes
- Action items
- ES&H issues
- EM Project Updates
- CAB Recommendation Status
- Other

Board comments and questions -- 10 minutes
Public comments and questions -- 10 minutes

Ex-officio comments -- 10 minutes

Break -- 5 minutes

Presentations -- 45 minutes
Sediment Controls Removal Action Project

Break -- 10 minutes

Task Force and Subcommittee Reports -- 45 minutes
- Groundwater Operable Unit
- Surface Water Operable Unit
- Waste Task Force
- Budget, Finance & Administration
- Community Concerns
- Public Involvement
- Training and Programs
- Membership

Administrative Issues -- 15 minutes
Review of Workplan
Review next agenda
Federal Coordinator comments

Adjourn

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Tentative agenda for the August 16, 2001 meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of minutes from July meeting

DDFO's Comments — 20 minutes
- Action items
- ES&H issues
- Budget Update
- EM Project Updates
- CAB Recommendation Status
- Other

Board comments and questions — 10 minutes
Public comments and questions — 10 minutes

Ex-officio comments -- 10 minutes

Break — 5 minutes

Presentations — 30 minutes
Waste Disposition EA
DOE Material Storage Areas

Break -- 10 minutes

Task Force and Subcommittee Reports — 45 minutes
- Groundwater Operable Unit
- Surface Water Operable Unit
- Waste Task Force
- Budget, Finance & Administration
- Community Concerns
- Public Involvement
- Training and Programs
- Membership

Administrative Issues — 15 minutes
Review of Workplan
Review next agenda
Federal Coordinator comments

Adjourn

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Tentative agenda for the September 20, 2001 meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of minutes from August meeting

DDFO's Comments – 20 minutes
- Action items
- ES&H issues
- Budget Update
- EM Project Updates
- CAB Recommendation Status
- Other

Ex-officio comments – 10 minutes

Public comments and questions – 10 minutes

Break – 5 minutes

Presentations – 30 minutes
- C-720 Proposed Plan
- Chairs meeting

Break – 10 minutes

Task Force and Subcommittee Reports – 45 minutes
- Groundwater Operable Unit
- Surface Water Operable Unit
- Waste Task Force
- Budget, Finance & Administration
- Community Concerns
- Public Involvement
- Training and Programs
- Membership

Administrative Issues – 15 minutes
- Elections
- Review of Workplan
- Review next agenda
- Federal Coordinator comments

Adjourn

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Tentative agenda for the October 18, 2001 meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of minutes from September meeting

DDFO's Comments -- 20 minutes
- Action items
- ES&H issues
- Budget Update
- EM Project Updates
- CAB Recommendation Status
- Other

Ex-officio comments -- 10 minutes

Public comments and questions -- 10 minutes

Break -- 5 minutes

Presentations -- 30 minutes
- 746-U Landfill

Discussion
- North-South Diversion Ditch -- 15 minutes

Break -- 10 minutes

Task Force and Subcommittee Reports -- 45 minutes

- Groundwater Operable Unit
- Surface Water Operable Unit
- Waste Task Force
- Budget, Finance & Administration
- Community Concerns
- Public Involvement
- Training and Programs
- Membership

Administrative Issues -- 15 minutes
- Review of Workplan
- Review next agenda
- Federal Coordinator comments

Adjourn

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Tentative agenda for the November 15, 2001 meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of minutes from September meeting

DDFO's Comments – 20 minutes

- Action items
- ES&H issues
- Budget Update
- EM Project Updates
- CAB Recommendation Status
- Other

Ex-officio comments – 10 minutes

Public comments and questions – 10 minutes

Break – 5 minutes

Presentations – 60 minutes

- C-410 Decontamination and Decommission
- C-746-U Landfill

Break – 10 minutes

Task Force and Subcommittee Reports – 45 minutes

- Groundwater Operable Unit
- Surface Water Operable Unit
- Waste Task Force
- Budget, Finance & Administration
- Community Concerns
- Public Involvement
- Training and Programs
- Membership

Administrative Issues – 15 minutes

- Review of Workplan
- Review next agenda
- Federal Coordinator comments

Adjourn

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Tentative agenda for the January 17, 2002 meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of minutes from November meeting

DDFO's Comments -- 20 minutes

- Action items
- ES&H issues
- Budget Update
- EM Project Updates
- CAB Recommendation Status
- Other

Ex-officio comments – 10 minutes

Public comments and questions – 10 minutes

Break – 5 minutes

Presentations – 30 minutes

- Waste Disposition Environmental Assessment

Break – 10 minutes

Task Force and Subcommittee Reports – 45 minutes

- Groundwater Operable Unit
- Surface Water Operable Unit
- Waste Task Force
- Budget, Finance & Administration

Administrative Issues -- 15 minutes

- Review of Workplan
- Review next agenda
- Federal Coordinator comments
- Community Concerns
- Public Involvement
- Training and Programs
- Membership

Adjourn

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Tentative agenda for the February 21, 2002 meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of minutes from January meeting

DDFO's Comments -- **20 minutes**
- Action items
- ES&H issues
- Budget Update
- EM Project Updates
- CAB Recommendation Status
- Other

Ex-officio comments -- **10 minutes**

Public comments and questions -- **10 minutes**

Break -- **5 minutes**

Presentations -- **45 minutes**
- C-746-U Landfill Update
- Surface Water Task Force Recommendation

Break -- **10 minutes**

Task Force and Subcommittee Reports -- **45 minutes**
- Groundwater Operable Unit
- Surface Water Operable Unit
- Waste Task Force
- Long Range Strategy
- Budget, Finance & Administration
- Community Concerns
- Public Involvement
- Nomination and Membership

Administrative Issues -- **15 minutes**
- Review of Workplan
- Review next agenda
- Federal Coordinator comments
- Retreat Plans

Adjourn

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Tentative agenda for the March 21, 2002 meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of minutes from February meeting

DDFO's Comments -- **20 minutes**

- Action items
- ES&H issues
- Budget Update
- EM Project Updates
- CAB Recommendation Status
- Other

Ex-officio comments – **10 minutes**

Public comments and questions – **10 minutes**

Task Force and Subcommittee Reports – **45 minutes**

- Groundwater Operable Unit
- Surface Water Operable Unit
- Waste Operations Task Force
- Long Range Strategy/Stewardship
- Budget, Finance & Administration
- Community Concerns
- Public Involvement
- Nomination and Membership

Break – **10 minutes**

Administrative Issues – **15 minutes**

- Review of Workplan
- Review next agenda
- Federal Coordinator comments
- Retreat Plans

Adjourn

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Tentative agenda for the April 18, 2002 meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of minutes from March meeting

DDFO's Comments – 20 minutes
- Action items
- ES&H issues
- Budget Update
- EM Project Updates
- CAB Recommendation Status
- Other

Ex-officio comments – 10 minutes

Public comments and questions – 10 minutes

Break – 5 minutes

Presentations -- 60 minutes
- Site-wide Sediment Controls
- Chairs Conference Follow-up
- North South Diversion Ditch

Break -- 10 minutes

Task Force and Subcommittee Reports -- 45 minutes

- Groundwater Operable Unit
- Surface Water Operable Unit
- Waste Operations Task Force
- Long Range Strategy/Stewardship
- Budget, Finance & Administration
- Community Concerns
- Public Involvement
- Nomination and Membership

Administrative Issues – 15 minutes

- Review of Workplan
- Review next agenda
- Federal Coordinator comments

Adjourn

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Tentative agenda for the May 16, 2002 meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of minutes from March meeting

DDFO's Comments -- **20 minutes**
- Budget Update
- ES&H issues
- EM Project Updates
- CAB Recommendation Status
- Other

Ex-officio comments – **10 minutes**

Public comments and questions – **10 minutes**

Action Item Review -- **15 minutes**

Break -- **5 minutes**

Presentations – **30 minutes**
- Letter to Roberson and Murphie (Long Range Strategy TF)

Break -- **10 minutes**

Task Force and Subcommittee Reports -- **45 minutes**

- Water Task Force
- Waste Operations Task Force
- Long Range Strategy/Stewardship
- Nomination and Membership/ Public Involvement

Administrative Issues – **15 minutes**

- Review of Workplan
- Review next agenda
- Federal Coordinator comments

Adjourn

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Tentative agenda for the June 20, 2002 meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of minutes from May meeting

DDFO's Comments -- 20 minutes

- Budget Update
- ES&H issues
- EM Project Updates
- CAB Recommendation Status
- Other

Ex-officio comments -- 10 minutes

Public comments and questions -- 10 minutes

Action Item Review -- 15 minutes

Break -- 5 minutes

Presentations -- 60 minutes

- Environmental Review by SIU Students

Break -- 10 minutes

Task Force and Subcommittee Reports -- 45 minutes

- Water Task Force
- Waste Operations Task Force
- Long Range Strategy/Stewardship
- Nomination and Membership/ Public Involvement

Administrative Issues -- 15 minutes

- Review of Workplan
- Review next agenda
- Federal Coordinator comments

Adjourn

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Tentative agenda for the July 18, 2002 meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of minutes from June meeting

DDFO's Comments -- 20 minutes
- ES&H issues
- Budget Update
- EM Project Updates
- CAB Recommendation Status
- Other

Ex-officio comments -- 10 minutes

Public comments and questions -- 10 minutes

Review of Action Items -- 15 minutes

Break -- 10 minutes

Discussion -- 30 minutes
- Resolution on Accelerated Clean Up Plan

Task Force and Subcommittee Reports -- 45 minutes
- Water Task Force
- Waste Operations Task Force
- Long Range Strategy/Stewardship
- Community Concerns
- Public Involvement/Membership

Administrative Issues -- 15 minutes
- Review of Workplan
- Review next agenda
- Federal Coordinator comments

Adjourn

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Tentative agenda for the August 15, 2002 meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of minutes from July meeting

DDFO's Comments -- 20 minutes
- ES&H issues
- Budget Update
- EM Project Updates
- CAB Recommendation Status
- Other

Ex-officio comments -- 10 minutes

Public comments and questions -- 10 minutes

Review of Action Items -- 15 minutes

Break -- 10 minutes

Presentation -- 45 minutes
- Seismic Study Report

Task Force and Subcommittee Reports -- 30 minutes

- ~~Water Task Force~~
- Waste Operations Task Force
- Long Range Strategy/Stewardship
- ~~Community Concerns~~
- ~~Public Involvement/Membership~~

Administrative Issues -- 20 minutes

- Self Evaluation Survey
- Preparation/Discussion - October Chair's Meeting
- Review of Workplan
- Review next agenda
- Federal Coordinator comments
- Final Comments

Adjourn

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Tentative Agenda for the September 19, 2002 Meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of minutes from August meeting
Election of 2003 Officers

DDFO's Comments -- **20 minutes**
- ES&H issues
- Budget Update
- EM Project Updates
- CAB Recommendation Status
- Other

Ex-officio comments -- **10 minutes**

Public comments and questions -- **10 minutes**

Review of Action Items -- **15 minutes**

Break -- **10 minutes**

Presentation -- **45 minutes**
- Update Actions Underway as Part of Accelerated Cleanup
  - C-400 Source Removal
  - North-South Diversion Ditch
  - Scrap Metal Removal

Public comments and questions -- **10 minutes**

Task Force and Subcommittee Reports -- **30 minutes**

- Water Task Force
- Long Range Strategy/Stewardship
- Public Involvement/Membership
- Waste Operations Task Force
- Community Concerns

Administrative Issues -- **20 minutes**

- Self Evaluation Survey Discussion
- Preparation/Discussion - October Chair's Meeting
- Review of Workplan & Agenda Priority Setting
- Review Next Agenda
- Federal Coordinator Comments
- Final Comments

Adjourn

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Tentative Agenda for the October 15, 2002 Meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of minutes from September meeting

DDFO's Comments -- 20 minutes
- ES&H issues
- Budget Update
- EM Project Updates
- CAB Recommendation Status
- Other

Ex-officio comments -- 10 minutes

Public comments and questions -- 10 minutes

Review of Action Items -- 15 minutes

Break -- 10 minutes

Presentation -- 30 minutes
- Water Policy Box

Public comments and questions -- 10 minutes

Task Force and Subcommittee Reports -- 30 minutes

- Water Task Force
- Long Range Strategy/Stewardship
- Public Involvement/Membership
- Waste Operations Task Force
- Community Concerns

Administrative Issues -- 20 minutes

- October Chair's Meeting
- Review of Workplan
- Review Next Agenda
- Federal Coordinator Comments
- Final Comments

Adjourn

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Tentative Agenda for the November 21, 2002 Meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of minutes from October meeting

DDFO's Comments -- **20 minutes**
- ES&H issues
- Budget Update
- EM Project Updates
- CAB Recommendation Status
- Other

Ex-officio comments -- **10 minutes**

Public comments and questions -- **10 minutes**

Review of Action Items -- **15 minutes**

Break -- **10 minutes**

Presentation -- **75 minutes**
- Conflict of Interest
- Water Policy Box
- SSAB Chairs' Meeting in Oak Ridge, TN (October 17-19)

Public comments and questions -- **10 minutes**

Task Force and Subcommittee Reports -- **30 minutes**
- Water Task Force
- Long Range Strategy/Stewardship
- Public Involvement/Membership
- Waste Operations Task Force
- Community Concerns

Administrative Issues -- **20 minutes**
- Review of Workplan
- Review Next Agenda
- Federal Coordinator Comments
- Final Comments

Adjourn

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Tentative Agenda for the February 20, 2003 Meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of minutes from November meeting (January meeting cancelled due to severe weather)
Board Retreat

DDFO's Comments -- 20 minutes
- ES&H issues
- Budget Update
- EM Project Updates
- CAB Recommendation Status
- Other

Ex-officio comments -- 10 minutes

Public comments and questions -- 10 minutes

Review of Action Items -- 15 minutes

Break -- 10 minutes

Presentation -- 45 minutes
- KPDES Permit Discussion (Water Task Force)
- Request for Letter of Support from ACT (M. Kemp)

Public comments and questions -- 10 minutes

Task Force and Subcommittee Reports -- 30 minutes
- Water Task Force
- Long Range Strategy/Stewardship
- Public Involvement/Membership
- Waste Operations Task Force
- Community Concerns

Administrative Issues -- 20 minutes
- Review of Workplan
- Review Next Agenda
- Federal Coordinator Comments
- Final Comments

Adjourn

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Tentative Agenda for the March 20, 2003 Meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of February minutes

DDFO's Comments -- 20 minutes
- ES&H issues
- Budget Update
- EM Project Updates
- CAB Recommendation Status
- Other

Ex-officio comments -- 10 minutes

Public comments and questions -- 10 minutes

Review of Action Items -- 15 minutes

Break -- 10 minutes

Presentation -- 45 minutes
- Information to be presented at Chairs Meeting
- Sewer Rehabilitation Update

Public comments and questions -- 10 minutes

Task Force and Subcommittee Reports -- 30 minutes
- Water Task Force
- Long Range Strategy/Stewardship
- Public Involvement/Membership
- Waste Operations Task Force
- Community Concerns

Administrative Issues -- 20 minutes
- Review of Workplan
- Review Next Agenda
- Federal Coordinator Comments
- Final Comments

Adjourn

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Tentative Agenda for the April 17, 2003 Meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of March minutes

DDFO's Comments -- **20 minutes**
- ES&H issues
- Budget Update
- EM Project Updates
- CAB Recommendation Status
- Other

Ex-officio comments -- **10 minutes**

Public comments and questions -- **10 minutes**

Review of Action Items -- **15 minutes**

Break -- **10 minutes**

Presentation -- **60 minutes**
- Scrap Metal Removal Project Update
- C-410 Decontaminating and Decommissioning Update
- Denver Chairs' Meeting Report

Public comments and questions -- **10 minutes**

Task Force and Subcommittee Reports -- **30 minutes**

- Water Task Force
- Long Range Strategy/Stewardship
- Public Involvement/Membership
- Waste Operations Task Force
- Community Concerns

Administrative Issues -- **20 minutes**
- Review of Workplan
- Review Next Agenda
- Federal Coordinator Comments
- Final Comments

Adjourn

PADUCAH GASEOUS DIFFUSION PLANT
CITIZENS ADVISORY BOARD

111 Memorial Drive • Paducah, Kentucky 42001 • (270) 554-3004 • PaducahCAB@bellsouth.net • www.oakridge.doe.gov/pgdpssab

Tentative Agenda for the May 15, 2003 Meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of April minutes

DDFO's Comments – 20 minutes
- ES&H issues
- Budget Update
- EM Project Updates
- CAB Recommendation Status
- Other

Federal Coordinator Comments – 10 minutes

Ex-officio comments – 10 minutes

Public comments and questions – 10 minutes

Administrative Issues – 20 minutes
- Preparation for September Chairs' Meeting
- June Dinner Meeting
- Review of Workplan
- Review Next Agenda

Review of Action Items – 15 minutes

Break – 10 minutes

Presentation – 45 minutes
- FY04 Budget – Judy Penry (Oak Ridge CFO)
- Waste Disposition EA Addendum

Public comments and questions -- 10 minutes

Task Force and Subcommittee Reports -- 30 minutes

- Water Task Force
- Long Range Strategy/Stewardship
- Public Involvement/Membership
- Waste Operations Task Force
- Community Concerns

Final Comments – 10 minutes

Adjourn

Working for the future

Paducah Gaseous Diffusion Plant Citizens Advisory Board

PADUCAH GASEOUS DIFFUSION PLANT
CITIZENS ADVISORY BOARD

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Tentative Agenda for the June 19, 2003 Meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of May minutes

DDFO's Comments -- 20 minutes
- ES&H issues
- Budget Update
- EM Project Updates
- CAB Recommendation Status
- Other

Federal Coordinator Comments --10 minutes

Ex-officio comments -- 10 minutes

Public comments and questions -- 10 minutes

Administrative Issues -- 20 minutes
- June Dinner Meeting
- Review of Workplan
- Review Next Agenda

Review of Action Items -- 15 minutes

Break -- 10 minutes

Presentation -- 60 minutes
- Site Management Plan Dispute Resolution
- Cleanup Scope Discussion
- KPDES Permit Update

Public comments and questions -- 10 minutes

Task Force and Subcommittee Reports -- 30 minutes

- Water Task Force
- Long Range Strategy/Stewardship
- Public Involvement/Membership
- Waste Operations Task Force
- Community Concerns
- Chairs' Meeting Ad Hoc

Final Comments

Adjourn

Chartered as a Site Specific Advisory Board under the Federal Advisory Committee Act

Working for the future

Paducah Gaseous Diffusion Plant CITIZENS ADVISORY BOARD

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Tentative Agenda for the July 17, 2003 Meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of June minutes

DDFO's Comments -- 20 minutes
- ES&H issues
- Budget Update
- EM Project Updates
- CAB Recommendation Status
- Cleanup Scope Update
- Other

Federal Coordinator Comments --10 minutes

Ex-officio comments -- 10 minutes

Public comments and questions -- 10 minutes

Administrative Issues -- 20 minutes
- Review of Workplan
- Review Next Agenda

Review of Action Items -- 15 minutes

Break -- 10 minutes

Presentation -- 60 minutes
- CERCLA Five-Year Review
- Dr. Wes Birge, University of Kentucky
- KPDES Permit Presentation

Public comments and questions -- 10 minutes

Task Force and Subcommittee Reports -- 30 minutes

- Water Task Force
- Long Range Strategy/Stewardship
- Public Involvement/Membership
- Waste Operations Task Force
- Community Concerns
- Ad Hoc for Chairs' Meeting

Final Comments

Adiourn

Working for the future

Paducah Gaseous Diffusion Plant

CITIZENS ADVISORY BOARD

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Tentative Agenda for the August 21, 2003 Meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of July minutes

DDFO's Comments -- 20 minutes
- ES&H issues
- Budget Update
- EM Project Updates
- CAB Recommendation Status
- Cleanup Scope Update
- Other

Federal Coordinator Comments -- 10 minutes

Ex-Officio Comments -- 10 minutes

Public Comments and Questions -- 10 minutes

Administrative Issues -- 20 minutes
- Review of Workplan
- Review Next Agenda
- August 22 Dinner Meeting

Review of Action Items -- 15 minutes

Break -- 10 minutes

Presentation -- 45 minutes
- KPDES Permit Presentation
- Conflict of Interest

Public Comments and Questions -- 10 minutes

Task Force and Subcommittee Reports -- 30 minutes
- Water Task Force
- Long Range Strategy/Stewardship
- Public Involvement/Membership
- Waste Operations Task Force
- Community Concerns
- Ad Hoc for Chairs' Meeting

Final Comments

Adjourn

Chartered as a Site Specific Advisory Board under the Federal Advisory Committee Act

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CITIZENS ADVISORY BOARD

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Tentative Agenda for the September 18, 2003 Meeting:

5:30
Informal discussion

6:00
Call to order, introductions
Review of agenda
Approval of July and August minutes
Election of Chair and Vice-Chair

DDFO's Comments — **20 minutes**
- ES&H issues
- Budget Update
- EM Project Updates
- CAB Recommendation Status
- Cleanup Scope Update
- Other

Federal Coordinator Comments — **10 minutes**

Ex-Officio Comments — **10 minutes**

Public Comments and Questions — **10 minutes**

Administrative Issues — **20 minutes**
- Review of Workplan
- Review Next Agenda
- September Chairs Meeting

Review of Action Items — **15 minutes**

Break — **10 minutes**

Presentation — **35 minutes**
- S & T-Landfills Scoping Plan
- North-South Diversion Ditch Workplan

Public Comments and Questions — **10 minutes**

Task Force and Subcommittee Reports — **30 minutes**

- Water Task Force
- Long Range Strategy/Stewardship
- Public Involvement/Membership
- Waste Operations Task Force
- Community Concerns
- Ad Hoc for Chairs' Meeting

Final Comments

Adjourn

Chartered as a Site Specific Advisory Board under the Federal Advisory Committee Act

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APPENDIX C

APPENDIX C

APPLICABLE RELEVANT AND APPROPRIATE REQUIREMENTS

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NORTHWEST PLUME (GWOU)

Table C.1. ARARs and guidance for the hydraulic containment of off-site groundwater

Actions	Requirements	Prerequisites	Federal Citation	Title 401, KAR[a] Chapter
CHEMICAL-SPECIFIC				
Treatment of contaminated groundwater	Prevent creation of any new pollution.	Direct discharge of groundwater to a surface water body – **Applicable.**		5:029(2)
	Discharge must not exceed DCGs[e] for radionuclides; discharge of radionuclides must not exceed 1 rad/day for protection of aquatic organisms.	Direct discharge of groundwater to a surface water body – **TBC[f] guidance.**	DOE Order 5400.5	
Protection of the general public from all sources of radiation	The general public must not receive an effective dose equivalent greater than 100 mrem/year.	Dose received by the general public from all sources of radiation exposure at a DOE facility – **TBC guidance.**	DOE Order 5400.5	
	All releases of radioactive material must be ALARA.	Emissions of radionuclides to the ambient air from DOE facilities – **Applicable.**	DOE Order 5400.5	
Protection of the general public from all sources of air emissions	No member of the general public shall receive an effective dose equivalent greater than 10 mrem/year.	Emissions of radionuclides to the ambient air from DOE facilities – **Applicable.**	40 *CFR*[c] 61.92; DOE Order 5400.5	
Worker protection	Maintain worker exposures to ALARA.	Internal and external sources of continuous exposure to occupational workers at a DOE facility –**TBC guidance.**	DOE Order 5480.11	
	Maximum exposure to occupational workers: 5 rem/year (stochastic): 50 rem/year (nonstochastic) effective dose equivalent.	Internal and external sources of continuous exposure to occupational workers at a DOE facility - **TBC guidance.**	DOE Order 5480.11	
LOCATION-SPECIFIC				
Protection of the environment	Prepare an Environmental Impact Statement or Environmental Assessment or apply for a Categorical Exclusion from such requirements.	Any federal action that will have a significant impact on the quality of the environment – **Applicable.**	10 *CFR* 1021; 40 *CFR* 1500-1508; 57 *FR* 15122; DOE Order 5440.1D	

Table C.1. ARARs and guidance for the hydraulic containment of off-site groundwater (continued)

Actions	Requirements	Prerequisites	Federal Citation	Title 401, KAR[a] Chapter
ACTION SPECIFIC				
Site preparation	Reasonable precaution must be taken to prevent particulate matter from becoming airborne.	Handling, processing, construction, road grading, and land clearing activities – **Applicable.**		63:010
Surface water control	Implement good site planning and best management practices to control storm water discharges; comply with storm water runoff requirements of KPDES[b] Permit KY0004049.	Construction activities at industrial sites involving disturbance of 5 acres total land – **Applicable if over 5 acres disturbed; relevant and appropriate if less than 5 acres disturbed.**	40 *CFR* 122	5:080.1
Well construction	Construction by a certified driller required; construction report must be submitted to the Cabinet within 30 days after construction.	Commercial water well drilling – **Applicable.**		6:310.3(1); 6:310.3(2)
Pumping	Compliance with the substantive requirements of the water well withdrawal permitting process must be assured for a CERCLA[c] response.	Water withdrawal exceeding 10,000 gal/day - **Applicable.**		KRS[d] 151; 4:010
	Must apply for a water withdrawal permit.	Water withdrawal exceeding 10,000 gal/day – **While substantive requirements are applicable, procedural requirements are not applicable.**		KRS 151.140; 4:010
Air stripping	Must ensure that emissions do not exceed standards for control of emissions of volatile organics.	Emission from air contaminant source – **Applicable.**		63:022
	Air construction permit application required for an air contaminant source.	Construction of an air contaminant source – **While substantive requirements are applicable, procedural requirements are not applicable.**		50:035
	Must apply for a Wastewater Facility Construction Permit.	Construction of a water treatment facility – **While substantive requirements are applicable, procedural requirements are not applicable.**		KRS 151.140; 4:010

Table C.1. ARARs and guidance for the hydraulic containment of off-site groundwater (continued)

Actions	Requirements	Prerequisites	Federal Citation	Title 401, KAR[a] Chapter
Container Storage (on-site)	Containers of hazardous waste must be: • Maintained in good condition; • Compatible with hazardous waste to be stored; and • Closed during storage (except to add or remove waste). Inspect container storage areas weekly for deterioration.	Storage of RCRA[b] hazardous waste (listed or characteristic) not meeting small quantity generator criteria held for a temporary period before treatment, disposal, or storage elsewhere in a container (i.e., any portable device in which material is stored, transported, disposed of, or handled). A generator who accumulates or stores hazardous waste on-site for 90 days or less in compliance with 40 CFR 262.34(a)(1-4) is not subject to full RCRA storage requirements – **Applicable.**	40 *CFR* 264 (Subpart I) 40 *CFR* 264.171 40 *CFR* 264.172 40 *CFR* 264.173 40 *CFR* 264.174	34:180 34:180.2 34:180.3 34:180.4 34.180.5
	Place containers on a sloped, crack-free base, and protect from contact with accumulated liquid. Provide containment system with a capacity of 10% of the volume containers. Remove spilled or leaked waste in a timely manner to prevent overflow to the containment system.		40 *CFR* 264.175	34:180.6
	At closure, remove all hazardous waste and residues from the containment system and decontaminate or remove all containers, liners.		40 *CFR* 264.178	34:180.9
	Storage of banned wastes must be in accordance with 40 CFR 268. When such storage occurs beyond one year, the owner/operator bears the burden of providing that such storage is solely for the purpose of accumulating sufficient quantities to allow for proper recover, treatment, and disposal.		40 *CFR* 268.50	37:050.2
Transportation of treatment residuals	Waste must be manifested.	Treatment residuals exhibit a RCRA hazardous waste characteristic as defined by Subpart C of 40 CFR § 261 and off-site transportation occurs.	40 *CFR* 262	

Table C.1. ARARs and guidance for the hydraulic containment of off-site groundwater (continued)

Actions	Requirements	Prerequisites	Federal Citation	Title 401, KAR[a] Chapter
	Waste must be packaged and transported in accordance with DOT[i] requirements.	The treatment residuals are considered a RCRA hazardous waste by characteristic, or a hazardous substance that equals or exceeds a reportable quantity; and transportation in commerce occurs. **Applicable if DOE does not close off the road to public use during transport; if the transport does not occur in a DOE operated government vehicle; or if access to the roads is not controlled by the use of gates and guards.**	49 CFR 172, 173, 178, and 179	
	Waste must be packaged and transported according to DOE requirements.	Transportation of hazardous materials – **TBC guidance.**	DOE Order 5480.3	
Direct discharge of treatment system effluent	The discharge must comply with the KPDES effluent limitations of KY0004049 for Outfall 001.	Point-source discharge to waters of the United States[j] – **Applicable.**	40 CFR 122.44(a)	5:080.1
	Must apply for a KPDES permit modification for increased discharge to Outfall 001.	Point-source discharge to waters of the United States- **Applicable.**		5:055

[a]KAR = Kentucky Administrative Record.
[b]KPDES = Kentucky Pollutant Discharge Elimination System.
[c]*CFR* = *Code of Federal Regulations*.
[d]KRS = Kentucky Revised Statute.
[e]DCG = Derived concentration guide.
[f]TBC = "to be considered."
[g]CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980.
[h]RCRA = Resource Conservation and Recovery Act.
[i]DOT = Department of Transportation.
[j] The term "Water of the United States" is defined broadly in 40 *CFR* 122.2 and includes essentially any water body and wetland.

NORTHWEST PLUME (GWOU)

Table C.2. ARARs and guidance for the Northeast Plume hydraulic plume control

Actions	Requirements	Prerequisites	Federal Citation	Title 401, KAR[a] Chapter
CHEMICAL-SPECIFIC				
Antidegradation	Waters of the Commonwealth must be safeguarded against the creation of any new pollution.	Discharges into water of the Commonwealth – **Applicable.**		5:029 § 2
Treatment and discharge of the groundwater into a surface water body	Must apply for KPDES permit modification for increased discharge to an outfall or to discharge a chemical not regulated by the permit.	Point-source discharge to waters of the Commonwealth – **Applicable.**		5:055
	The discharge must comply with the KPDES effluent limitations of KY0004049 for an outfall. Specifically, the discharge must not exceed the permit limit for TCE of 0.081 mg/L at the outfall.	Point-source discharge to waters of the Commonwealth – **Applicable.**		5:080 § 1; 5:029 § 3
LOCATION-SPECIFIC				
Protection of wetlands	Avoid or minimize adverse impacts on wetlands to preserve and enhance their natural and beneficial values.	Any federal action that will have an impact on wetlands – **Applicable.**	10 *CFR* § 1022; Executive Order 11990	
	Avoid degradation or destruction of wetlands to the extent possible.	Any action involving discharge of dredge or fill material into wetlands – **Applicable.**	10 *CFR* § 230.10; 13 USC § 1022.3(b)	
	Incorporate considerations about protection of wetlands into planning, regulating, and decision-making.	Any federal action that will have an impact on wetlands – **Applicable.**	10 *CFR* § 1022.3(b) 33 *CFR* § 330	
Discharge of dredged or fill material into navigable water	Discharges for which there are practicable alternatives with fewer adverse impacts or those, which would cause or contribute to significant degradation, are prohibited.	Any action involving discharge of dredged or fill material into wetlands – **Applicable.**	40 *CFR* § 230.10(a)	
Discharge of dredged or fill material into navigable water (continued)	Significant degradation is also prohibited unless there are practicable alternatives and practicable, appropriate mitigation methods are available.	Any action involving discharge of dredged or fill material into wetlands – **Applicable.**	40 *CFR* § 230.10(c); 40 *CFR* § 230.10(d)	

Table C.2. (continued)

Actions	Requirements	Prerequisites	Federal Citation	Title 401, KAR[a] Chapter
	Discharges, which cause or contribute to violations of state water quality standards, violate toxic effluent standards or discharge prohibitions or jeopardize threatened and endangered species under the Endangered Species Act.	Any federal action within a 100-year floodplain – **Applicable.**	40 *CFR* § 230.10(b)	
Protection of floodplains	Avoid siting or construction in any 100-year floodplains.	Any federal action within a 100-year floodplain – **Applicable.**	10 *CFR* 1022 Executive Order 11988	
Protection of threatened and endangered species	Avoid actions, which jeopardize threatened or endangered species or take appropriate mitigation measures.	Any action with jeopardizes threatened or endangered species or their critical habitats – **Applicable.**	16 USC § 1531-1544; 50 *CFR* § 402; 40 *CFR* § 6.302(h)	
Protection of cultural resources	Ensure that no properties that may qualify as cultural or historic be inadvertently demolished, altered, or destroyed.	Any federal action that will have an impact on cultural resources – **Applicable.**	16 USCA § 470	
	Avoid or minimize impacts to cultural resources by following the Section 106 process, including consultation with the State Historic Preservation Officer.	Any federal action that will have an impact on cultural resources – **Applicable.**	36 *CFR* § 800	
Protection of prime Farmland	Take into account agency action impacts on prime farmland and consider alternatives.	Conversion of prime farmland soils to non-farmable areas – **Applicable.**	7 *CFR* § 658	
ACTION SPECIFIC				
Site preparation and construction activities	Reasonable precaution must be taken to prevent particulate matter from becoming airborne.	Handling, processing, construction, road grading, and land clearing activities – **Applicable.**		63:010 § 3
Surface water control	Implement good site planning and Best Management Practices to control storm water discharges; comply with storm water runoff requirements of KPDES Permit KY0004049.	Construction activities at industrial sites involving disturbance of 5 acres or more land – **Applicable if over five acres disturbed; relevant and appropriate if less than five acres disturbed.**	40 *CFR* § 122; 57 Fed. Reg. 41176 (Sept. 9, 1992)	
Wastewater treatment facility	Exempt from RCRA under 401 KAR 38:010 § 1(2)(b)(5).			38:010 § 1 (2)(b)(5)
	Designed according to specific criteria and controlled through current engineering practices.	Construction of a wastewater treatment facility – **Applicable.**		5:005 § 7

Table C.2. (continued)

Actions	Requirements	Prerequisites	Federal Citation	Title 401, KAR[a] Chapter
	Protect those minimum conditions applicable to all waters of the Commonwealth.			
	Install a recording measuring device at each large facility.			
Water treatment facility (modified source)	No owner or operator shall allow any source to exceed the allowable emission levels determined in Appendix A of 401 KAR 63:022.	Emissions from a treatment facility – **Applicable.**		63:022
Protection of aquatic organisms	Water criteria of 401 KAR 5:031 must be maintained as well as appropriate criteria for other designated use classifications in 401 KAR 5:026.	Action affection the existing water quality – **Applicable.**		5:031
Construction of water wells	Constructed by a certified driller under specified design criteria.	Construction of water withdrawal wells – **Applicable.**		6:310 § 1
Waste management	Generators of waste shall determine if it is hazardous.	Generation of waste material – **Applicable.**	40 *CFR* § 262.11	32:010 § 2
	Storage in containers for less than 90 days.	On-site storage of hazardous waste – **Applicable.**	40 *CFR* § 262.34(a)	32:030 § 5(1)
	Containers must be in good condition and lined.	Storage of hazardous waste less than 90 days – **Applicable.**	40 *CFR* § 265 Subpart I	35:180 § 4
Container storage (on-site)	Containers must always be closed during storage except when necessary to add or remove waste; containers must not be handled in any manner, which may rupture the container or cause it to leak; and must be labeled with the notation "hazardous waste."			
	Inspect container storage areas weekly for deterioration.		40 *CFR* § 265.174	35:180 § 5

Table C.2. (continued)

Actions	Requirements	Prerequisites	Federal Citation	Title 401, KAR[a] Chapter
	Closure of 90-day accumulation areas shall minimize the need for further maintenance; control, minimize, or eliminate postclosure escape of hazardous waste; and comply with other closure requirements in 401 KAR Chapter 35.		40 *CFR* § 262.34	35:070 § 2
	All contaminated equipment, structures, and soil shall be properly disposed or decontaminated.		40 *CFR* § 262.37	35:070 § 5
Container storage (on-site) (continued)	Storage in containers for more than 90 days.	On-site storage – **Applicable.**	40 *CFR* § 264	34:180
	Containers of hazardous waste must be: • Maintained in good condition;	Storage of containerized RCRA hazardous waste (listed or characteristic) not meeting small quantity generator criteria held for a temporary period before treatment, disposal, or storage elsewhere in a container [i.e., any portable device (in) which a material is stored, transported, disposed or, or handled].– **Applicable to treatment residuals or wastes which are RCRA hazardous wastes.**	40 *CFR* § 264.171	34:180 § 2
	• Compatible with hazardous waste to be stored; and		40 *CFR* § 264.172	34:180 § 3
	• Closed during storage (except to add or remove waste).		40 *CFR* § 264.173	34:180 § 4
	Inspect container storage areas weekly for deterioration.		40 *CFR* § 264.174	34.180 § 5
	Place containers on a sloped, crack-free base, and protect from contact with accumulated liquid. Provide containment system with a capacity of 10% of the volume of the containers, or for liquids, the volume of the largest container, whichever is greater. Remove spilled or leaked waste in a timely manner to prevent overflow to the containment system.		40 *CFR* § 264.175	34:180 § 6
	At closure, remove all hazardous waste and residues from the containment system and decontaminate or remove all containers, liners.		40 *CFR* § 264.178	34:180 § 9

Table C.2. (continued)

Actions	Requirements	Prerequisites	Federal Citation	Title 401, KAR[a] Chapter
	Storage in tanks for less than 90 days.	On-site storage of hazardous waste – **Applicable.**	40 *CFR* § 262.34(a)	32:030 § 5(1)
	Storage in tanks for less than 90 days.	On-site storage – **Applicable.**	40 *CFR* § 265 Subpart J	35:190
Tank storage (on-site)	Tanks for storage of hazardous waste must: • Tank integrity assessment; • Meet design and construction standards; • Meet containment and release detection requirements; • Meet operating procedures; • Be routinely inspected; • Response to leaks or spills, • Disposition of unfit tanks; and • Meet closure requirements.		40 *CFR* § 265.191 40 *CFR* § 265.192 40 *CFR* § 265.193 40 *CFR* § 265.194 40 *CFR* § 265.1956 40 *CFR* § 265.197 [except § 265.197(c)]	35:190 § 2 35:190 § 3 35:190 § 4 35:190 § 5 35:190 § 6 35:190 § 7 35:190 § 8 [except § 8(3)]
Disposal of treatment residuals	Land disposal restrictions for RCRA hazardous waste may be triggered.	Disposal of RCRA restricted waste – **Applicable.**	40 *CFR* § 268	Chapter 37
	Hazardous waste determinations are to be performed on treatment plant residuals.	Determination if a waste is RCRA hazardous waste – **Applicable.**	40 *CFR* § 262.11	32:010 § 2
	Transporters of waste must follow detailed standards.	Waste exhibits a RCRA hazardous waste characteristic as defined by Subpart C of 40 *CFR* 261 and off-site transportation occurs – **Applicable.**	40 *CFR* § 263	Chapter 33
Transportation of hazardous waste (off-site)	Waste must be packaged and transported in accordance with DOT requirements including: shipping requirements, package marking, labeling, vehicle placarding, and shipping papers.	Hazardous waste is transported off-site – **Applicable.**	40 *CFR* § 263 Subparts A&B	
		The waste is considered a RCRA hazardous waste by characteristic or a hazardous substance that equals or exceeds a reportable quantity and transportation occurs in commerce – **Applicable.**	40 *CFR* §§ 172, 173, 178, and 179	

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Table C.2. (continued)

Actions	Requirements	Prerequisites	Federal Citation	Title 401, KAR[a] Chapter
Transportation of hazardous waste (off-site) (continued)	Emergency response information and employee HAZMAT are required.		40 *CFR* § 172	
	Transporter must have EPA identification number issued by the KNREPC.	Transportation of hazardous materials in the Commonwealth of Kentucky – **Applicable.**		33:010

[a]RCRA listed as an ARAR is a requirement of CERCLA in ROD documentation. By doing this, it in no way limits, takes away, or negates the Commonwealth of Kentucky's RCRA authority at the site.

DOT = U.S. Department of Transportation
HAZMAT = hazardous materials

SOLID WASTE MANAGEMENT UNIT 91 (GWOU)

Table C.3. ARARs and TBC information for the remedial action (Lasagna™ with *in situ* enhanced soil mixing contingency)

Regulatory Triggers	Requirements	Prerequisites	Federal Citation	KAR Citation
CHEMICAL-SPECIFIC				
Protection of drinking water	Treatment to MCLs: TCE 0.005 mg/L.	Contaminants that have leached into potential sources of drinking water - **Relevant and appropriate to ground-water remediation, applicable at the "tap."**	40 *CFR* § 141.60	401 KAR 8:420 § 3
Remedial Action Outcome: By meeting the cleanup levels, drinking water has been protected.				
LOCATION-SPECIFIC				
Protection of wetlands	Avoid or minimize adverse impacts to wetlands to preserve and enhance their natural and beneficial values.	Any federal action that will have an impact on wetlands - **Applicable if avoidance is not achieved.**	10 *CFR* § 1022 and Executive Order 11990	
	Avoid degradation or destruction of wetlands to the extent possible.	Any action involving discharge of dredged or fill material into wetlands - **Applicable if avoidance is not achieved.**	40 *CFR* § 230.10 and 13 *USC* § 1022.3(b)	
	Incorporate considerations about protection of wetlands into regulating and decision-making. Follow substantive requirements of general Nationwide Permit conditions.	Any federal action that will have an impact on wetlands - **Applicable if avoidance is not achieved.**	10 *CFR* § 1022.3(b) and 33 *CFR* § 330	
Remedial Action Outcome: Avoidance of wetlands was achieved.				
Protection of floodplains	Avoid siting or construction in any 100-year floodplains.	Any federal action within a 100-year floodplain - **Applicable if avoidance is not achieved.**	10 *CFR* § 1022 and Executive Order 11988	
Remedial Action Outcome: Avoidance of floodplains was achieved.				

NORTH-SOUTH DIVERSION DITCH SOURCE CONTROL (SWOU)

Table C.4. ARARs and TBC guidance
for the NSDD project area to be covered from Virginia Avenue to C-616-C Lift Station ROD

Actions	Requirements	Prerequisites	Federal Citation	Title 401, KAR Chapter
CHEMICAL-SPECIFIC				
Treatment of contaminated surface water	Prevent creation of any new pollution.	Direct discharge to a surface water body – **Applicable.**		5:029(2)
	Treatment of KPDES permit limitation for Outfall 001 – 0.000079 µg/L for PCB.	Direct discharge to a surface water body – **Relevant and appropriate.**		5:055
	Treatment to SDWA MCLs for Outfall 001 – 0.5 µg/L for PCB and 4 mrem/yr for ^{99}Tc.	Direct discharge to a surface water body that feeds into a drinking water aquifer – **TBC guidance.**	40 *CFR* §§ 141.15; 141.16; & 141.61 40 *CFR* 141-143	8:550
	Discharge must not exceed DCGs for radionuclides; discharge of 0.71% of ^{235}U should not exceed 0.87 mg/L and discharge for ^{99}Tc should not exceed 100,000 pCi/L for protection of aquatic organisms.	Direct discharge to a surface water body – **TBC guidance.**	DOE Order 5400.5	
Protection of warm water aquatic habitat	Prevent toxicity contribution to aquatic life.	Discharge impacting productive warm water aquatic communities – **Applicable.**		5:031(4)
Protection of the general public from all sources of radiation	The general public must not receive an effective dose equivalent greater than 100 mrem/year.	Dose received by the general public from all sources of radiation exposure at a DOE facility – **TBC guidance.**	DOE Order 5400.5	
	All releases of radioactive material must be ALARA.	Releases of radioactive material from DOE activities – **TBC guidance.**	DOE Order 5400.5	
ACTION-SPECIFIC				
Site preparation	Precaution must be taken to prevent particulate matter from becoming airborne.	Handling, processing, construction, road grading, and land clearing activities – **Applicable.**		63:010

Table C.4. (continued)

Actions	Requirements	Prerequisites	Federal Citation	Title 401, KAR Chapter
	A responsible party must: • Use water or a chemical to control dust; • Place asphalt or concrete on roads and materials stockpile to control dust; • Ensure that no visible fugitive dust is emitted beyond the property line; or • Ensure that all open bodied trucks are covered if any materials in truck could become airborne.			63:010
Container Storage (on-site)*	Containers of hazardous waste must be:	Storage of RCRA hazardous waste (listed or characteristic) not meeting small quantity generator criteria held for a temporary period before treatment, disposal, or storage elsewhere, in a container (i.e., any portable device in which a material is stored, transported, disposed of, or handled). A generator who accumulates or stores hazardous waste on-site for 90 days or less in compliance with 40 *CFR* 262.34(a)(1-4) is not subject to RCRA interim or final status storage requirements – **Applicable.**	40 *CFR* 264 (Subpart I)	34:180
	• Maintained in good condition;		40 *CFR* 264.171	34:180.2
	• Compatible with hazardous waste to be stored; and		40 *CFR* 264.172	34:180.3
	• Closed during storage (except to add or remove waste).		40 *CFR* 264.173	34:180.4
	Inspect storage areas weekly for deterioration of containers and the containment system.		40 *CFR* 264.174	34:180.5
	Container storage areas must have a crack and gap free base sufficiently impervious to contain leaks or spills; a base that is sloped or a containment system designed/operated to drain and remove liquids resulting from spills, leaks, or precipitation unless containers are elevated or protected from exposure to accumulated liquids.		40 *CFR* 264.175	34:180.6

Table C.4. (continued)

Actions	Requirements	Prerequisites	Federal Citation	Title 401, KAR Chapter
	Containment system with a capacity of 10% of container volume. Run-on into containment system must be prevented unless sufficient excess capacity exists. Remove spilled/leaked waste in a timely manner to prevent overflow to the containment system and manage such material appropriately under RCRA or CWA.		40 *CFR* 264.178	34:180.9
	At closure, remove all hazardous waste and residues from the containment system and decontaminate or remove all containers, liners, bases, or soils containing hazardous waste or hazardous waste residues, and manage such materials as appropriate under RCRA			
	An owner or operator of any facilities used for the storage of PCBs and PCB items must comply with the following requirements: • the facilities must meet the following criteria: – adequate roof and walls to prevent rain water from reaching PCBs storage containers; – an adequate floor that has continuous curbing with a minimum six-inch high curb; – no drain valves, floor drains, expansion joints, sewer lines, or other opening that would permit liquids to flow from the curbed area;	PCBs concentrations > 50 mg/L in liquid waste that is stored on-site – **Applicable.**	40 *CFR* 761.65(b)	37:050.2(6)

Table C.4. (continued)

Actions	Requirements	Prerequisites	Federal Citation	Title 401, KAR Chapter
	– floors and curbing constructed of continuous smooth and impervious material to prevent or minimize penetration of PCBs; – none located at a site that is below the 100-year flood water elevation; and – containment volume at two times internal volume of largest PCB article or 25% of total internal volume of all PCB articles and containers.		40 *CFR* 761.65(b)	37:050.2(b)
Waste Management	Must handle and dispose of radioactive waste in a manner that is protective of public health and the environment.		DOE Order 5820.2A (TBC guidance)	
	Land disposal restrictions must be addressed.	If individuals generate or transport hazardous waste – **Applicable.**	40 *CFR* 268	
Transportation of hazardous waste	Waste must be manifested.	Waste exhibits a RCRA hazardous waste characteristic as defined by Subpart C of 40 *CFR* § 261 and off-site transportation occurs.	40 *CFR* 262	
	Transporters of hazardous waste must follow detailed standards.	If hazardous waste is transported – **Applicable.**	40 *CFR* 263 40 *CFR* 260.10	

Table C.4. (continued)

Actions	Requirements	Prerequisites	Federal Citation	Title 401, KAR Chapter
	Waste must be packaged and transported in accordance with DOT requirements.	The waste is considered a RCRA hazardous waste by characteristic, or a hazardous substance that equals or exceeds a reportable quantity and transportation in commerce occurs. If DOE does no close off road to public use during transport; if the transport does not occur in a DOE-operated government vehicle; or if access to the roads is not controlled by the use of gates and guards – **Applicable.**	49 *CFR* §§ 172, 173, 178, and 179	
Worker Protection	Comply with the provisions for response action worker safety and health in 29 *CFR* 1910.120 and any other applicable worker safety standards (29 *CFR* 1910; 29 *CFR* 1926).	Response actions carried out under the National Contingency Plan – not generally considered an ARAR as it is a requirement of the NCP.	40 *CFR* 300.150	
	Maintain worker exposures to ALARA.	Internal and external sources of continuous exposure to occupational workers at a DOE facility – **TBC guidance.**	DOE Order 5480.11	
	Maximum exposure to occupational workers: 5 rem/year (stochastic); 50 rem/year (nonstochastic) effective dose equivalent.	Internal and external sources of continuous exposure to occupational workers at a DOE facility – **TBC guidance.**	DOE Order 5480.11	
	Comply with provisions for worker safety in confined spaces in ANSI Z117.1.	Response actions at DOE facilities that require workers to enter confined spaces – **TBC guidance.**	DOE Order 5480.4	
LOCATION-SPECIFIC	None.			

Table C.4. (continued)

Actions	Requirements	Prerequisites	Federal Citation	Title 401, KAR Chapter
Wetlands protection	Avoid, to the extent possible, adverse impacts to wetlands including occupancy, destruction, or modification of such resource.	Remedial activity impacting swamps, marshes, bogs, sloughs, wet meadows, natural ponds, and other areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions - **Applicable.**	10 *CFR* § 1022; Executive Order 11990	
	If avoidance of wetlands is not possible, DOE must take measures to mitigate adverse effects to wetlands, such as minimum grading requirements, runoff controls, design and construction consultation, and consideration of ecologically sensitive areas.	Remedial activity that is unable to avoid wetlands - **Applicable.**	10 *CFR* § 1022.12	
Wetlands protection	The location of a new or expanded solid waste facility in a wetland is prohibited.	Siting of new or expanded solid waste facility within the Commonwealth of Kentucky - **Applicable.**		47:030 § 13
	The location of any waste site or facility in a wetland is prohibited.	Siting of a waste site or facility within the Commonwealth of Kentucky - **Applicable.**		30:031 § 12

*RCRA listed as an ARAR is a requirement of CERCLA in ROD documentation. By doing this, it in no way limits, takes away, or negates the Commonwealth of Kentucky's independent RCRA authority at the site.

ALARA	=	as low as reasonably achievable
CWA	=	Clean Water Act
DCG	=	Derived Concentration Goals
DOT	=	U.S. Department of Transportation
PCB	=	polychlorinated biphenyl
SDWA	=	Safe Drinking Water Act of 1974

SOLID WASTE MANAGEMENT UNIT 8 (SWOU)

Table C.5. Chemical-specific ARARs and TBC information for SWMU 8 of WAG 7

Medium	Requirements	Prerequisites	Federal Citation	Kentucky Citation 401 KAR
Leachate discharges	Current uses of surface water must be protected.	Discharges or releases into waters of the Commonwealth - **Applicable.**		5:029 § 1
	Discharges must not exceed discharge limits set pursuant to the KPDES program.	Discharges or releases into waters of the Commonwealth - **Applicable.**		5:031 §§ 2 and 4(1) 5:065 § 2(4)
	Discharges must be monitored to document compliance with the KPDES program.	Discharges or releases into waters of the Commonwealth - **Applicable.**		5:065 § 1(12)(d) 5:070 § 3
Radionuclides—all exposure pathways	General public must not receive an effective dose equivalent greater than 100 mrem/yr, or 5 mrem/yr to any organ from all exposure modes.	Exposure of the general public from any source of radiation exposure at a DOE facility - **TBC on a facility-wide basis.**	DOE Order 5400.5	
	All releases of radioactive material must be ALARA.	Release of radioactive material from DOE activities - **TBC.**	DOE Order 5400.5	
	Emissions from DOE facilities shall not cause members of the public to receive, in any year, an effective dose equivalent greater than 10 mrem/yr.	Emissions of radionuclides other than radon from DOE facilities - **Applicable on a facility-wide basis.**	40 *CFR* § 61.92	

SOLID WASTE MANAGEMENT UNITS 2 AND 3 (BGOU)

Table C.6. ARARs and TBC guidance for the IRA at SWMUs 2 and 3

Actions	Requirements	Prerequisites	Federal Citation	Title 401 KAR, Citation
CHEMICAL-SPECIFIC				
Protection of the general public from all sources of radiation	General public must not receive an effective dose equivalent greater than 100 mrem/yr or 5 mrem/yr to any organ from all exposure modes.	Dose received by the general public from all sources of radiation exposure at a DOE facility – **TBC guidance for the waste left in place.**	DOE Order 5400.5	
	All releases of radioactive material must be ALARA.	Release of radioactive material from all DOE activities – **TBC guidance for the waste left in place.**	DOE Order 5400.5	
Emission Standards	Emissions from DOE facilities shall not cause members of the public to receive, in any year, an effective dose equivalent of 10 mrem/yr.	Emissions of radionuclides other than radon from DOE facilities – **Applicable if construction activities at the site produce airborne pollutants – Applicable if construction activities at the site produce airborne pollutants - DOE Orders 5820.24A and 5400.5 would also be TBC guidance for this requirement.**	40 *CFR* § 61.92	
LOCATION-SPECIFIC				
Protection of wetlands	Avoid or minimize adverse impacts on wetlands to preserve and enhance their natural and beneficial values.	Any federal action that will have an impact on wetlands – **Applicable if avoidance is not accomplished.**	10 *CFR* § 1022; Executive Order 11990; 40 *CFR* § 6.302 (a)	
	Avoid degradation or destruction of wetlands to the extent possible.	Any action involving discharge of dredged or fill material into wetlands – **Applicable if avoidance is not accomplished.**	40 *CFR* § 230.10; 33 USCA § 1344 (b)(1)	
	Incorporate considerations about protection of wetlands into planning, regulation, and decision-making.	Any federal action that will have an impact on wetlands - Applicable if avoidance is not accomplished.	10 *CFR* § 1022.3(b)	
Discharge of dredged or fill material into waters of the United States	Discharges for which there are practicable alternatives with fewer adverse impact or those which would cause or contribute to significant degradation are prohibited.	Any action involving discharge of dredged or fill material into wetlands – **Applicable if avoidance is not accomplished.**	40 *CFR* § 230.10(a)	

Table C.6. (continued)

Actions	Requirements	Prerequisites	Federal Citation	Title 401 KAR, Citation
	Significant degradation is also prohibited unless there are practicable alternatives and practicable, appropriate mitigation methods are available.	Any action involving discharge of dredged or fill material into wetlands – **Applicable if avoidance is not accomplished.**	40 *CFR* § 230.10(d)	
	Discharges which cause or contribute to violations of state water quality standards, violate toxic effluent standards or discharge prohibitions, or jeopardize threatened and endangered species under the Endangered Species Act.	Any action involving discharge of dredged or fill material into wetlands – **Applicable if avoidance is not accomplished.**	40 *CFR* § 230.10(b); 33 USCA § 1317; 16 USCA § 1531	
	Unavoidable discharges can be permitted with a general or nationwide Section 404 Permit.	Any action involving discharge of dredged or fill material into wetlands – **Applicable if avoidance is not accomplished.**	33 USCA § 1344; 33 *CFR* § 330; 33 *CFR* § 325	
ACTION-SPECIFIC				
Site preparation	Although SWMU 2 is well within the plant boundary, precautions must be taken to prevent particulate matter from becoming airborne.	Handling, processing, construction, road grading, stockpiles, and land clearing activities – **Applicable if it is determined that airborne dust will reach the plant fence.**		63:010 § 3
	A responsible party must do these things:			
	Use water or chemical to control dust from construction activities and place asphalt, oil, water, or suitable chemicals on roads and material stockpiles to control dust;			63:010 § 3(1)(a); 63:010 § 3(1)(b)
	Ensure that no visible fugitive dust is emitted beyond the property line; and			63:010 § 3 (2)
	Ensure that all open bodied trucks are covered if any materials in truck could become airborne.			63:010 § 4 (1)
Surface water control	Implement good site planning and best management practices to control storm water discharge; comply with storm water runoff requirements of KPDES Permit KY0004049.	Construction activities at industrial sites where stormwater runoff would occur – **Applicable.**		5:055

Table C.6. (continued)

Actions	Requirements	Prerequisites	Federal Citation	Title 401 KAR, Citation
Well installation	Wells must be installed to:	Construction or modification of a MW – **Applicable.**		
	Maintain the existing natural protection against pollutants into the aquifer;			6:310 § 13 (2)
	Prevent the entry of pollutants through the bore-hole; and			6:310 § 13 (2)
	Prevent the intermingling of groundwater from different aquifers.			6:310 § 13 (2)
	Certain construction requirements shall be followed, such as:	Construction or modification of a MW – **Applicable.**		
	The annular space shall be sealed with cement grout or bentonite;			6:310 § 13 (3)
	Completed at least 4 inches above the ground or have a waterproof mount device; and			6:310 § 13 (3)
	Have a locking well cap within 30 days of its construction.			6:310 § 13 (3)
	Wells should be properly abandoned within 30 days of the last sampling date or the determination is made that the well is unsuitable for use as a monitoring well.			6:310 § 13 (6)
Waste management*	Generators of waste shall determine if it is RCRA hazardous.	Generation of waste material – **Applicable.**	40 *CFR* § 262.11	
Container storage (on-site) – for less than 90 days*	Containers of hazardous waste must be:	Storage of RCRA hazardous waste (listed or characteristic) not meeting small quantity		
	Maintained in good condition;	generator criteria held for a temporary period before treatment, disposal, or storage	40 *CFR* § 265.171	35:180 § 2
	Compatible with hazardous waste to be stored; and	elsewhere, in a container (i.e., any portable device in which a material is stored,	40 *CFR* § 265.172	35:180 § 3
	Closed during storage (except to add or remove waste).	transported, disposed, or handled). A generator who accumulates or stores	40 *CFR* § 265.173(a)	35:180 § 4(1)
	Containers must not be handled, opened, or stored in any manner in which may rupture the container or cause it to leak.	hazardous waste on-site for 90 days or less in compliance with 40 *CFR* § 262.34 (a) (1-4) is not subject to RCRA interim or final status	40 *CFR* § 265.173(b)	35:180 § 4(2)

Table C.6. (continued)

Actions	Requirements	Prerequisites	Federal Citation	Title 401 KAR, Citation
	Inspections must be conducted at least weekly to determine leaks or deterioration.	storage requirements – **Applicable to any excavated soil and PPE identified as RCRA hazardous waste.**	40 *CFR* § 265.174	35:180 § 5
	Containers must be labeled with the notation "Hazardous Waste."			35:180 § 4(3)
Container storage (on-site) of ignitable, reactive or incompatible waste for less than 90 days*	Containers holding hazardous waste must be managed so that:	Management of ignitable, reactive or incompatible waste – **Applicable if any excavated soil or PPE is determined to be ignitable, reactive, or incompatible waste.**		
	Containers are located at least 15 meters from the property boundary; and		40 *CFR* § 265.176	35:180 § 6
	Incompatible wastes are not placed in the same container or placed in an unwashed container that previously held an incompatible waste.		40 *CFR* § 265.177(a) 40 *CFR* § 265.177(b)	35:180 § 7(1) 35:180 § 7(2)
Waste management*	Must follow the RCRA permit for on-site storage more than 90 days.	Storage of hazardous waste in RCRA-permitted storage area.	HSWA Permit KY 8-890-008-982	Kentucky Permit KY 8-890-008-982 32:030 § 5(3)(a)
	Hazardous waste may be accumulated for more than 90 days for as much as 55 gal of hazardous waste or one quart of acutely hazardous waste.	Accumulation of hazardous waste.		
	Radioactive and mixed waste shall be managed in a manner that assures the health and safety of the public, the DOE, contractor employees, and the environment.	Management of LLW – **TBC Guidance if excavated soil and PPE is determined to be radioactively contaminated.**	DOE Order 5820.2A	
	External exposure to the waste and concentrations of radioactive material, which may be released into surface water, groundwater, soil, plants, and animals, shall not result in an effective dose equivalent that exceeds 25 mrem/yr to any member of the public.	Management of LLW – **TBC Guidance if excavated soil and PPE is determined to be radioactively contaminated.**	DOE Order 5820.2A	
	Pyrophoric materials contained in waste shall be treated, prepared, and packaged to be nonflammable.	Management of LLW – **TBC Guidance if excavated soil and PPE is determined to be pyrophoric.**	DOE Order 5820.2A	

Table C.6. (continued)

Actions	Requirements	Prerequisites	Federal Citation	Title 401 KAR, Citation
	Movement of residuals containing RCRA characteristic waste and radionuclides to another unit will trigger LDRs.	Movement of LDR waste from one land disposal unit to another – **Applicable if LDR restricted waste is excavated from the unit.**	40 *CFR* § 268	37:030
	The storage of hazardous waste restricted from land disposal is prohibited, unless the generator stores such wastes in tanks, containers, or containment buildings on-site solely for the purpose of accumulating such quantities of hazardous waste as necessary to facilitate proper recovery, treatment, or disposal.	Storage of RCRA restricted hazardous waste on-site – **Applicable to any excavated soil or PPE that is determined to be land disposal restricted hazardous waste.**	40 *CFR* § 268.50	37:050
	Containers of land disposal restricted waste must meet other RCRA storage requirements in addition to being clearly marked with the identification of its contents, the date the accumulation began, and the quantity of each waste.	Container storage of LDR waste – **Applicable if any of the excavated soil or PPE is determined to be an LDR waste.**	40 *CFR* § 268.50	37:050
	Continued storage of radioactive mixed waste containing an LDR prohibited hazardous waste component is allowed while treatment capacity is being developed.	Storage of radioactive mixed waste on-site – **Applicable if excavated soil or PPE is determined to be mixed waste.**	FFCA Docket No. 92-03-FFR	

*These ARARS will only apply if PPE is determined to be RCRA hazardous or excess soil is not managed within the unit.

Note: RCRA listed as an ARAR is a requirement of CERCLA in ROD documentation. By doing this, it in no way limits, takes away, or negates the Commonwealth of Kentucky's RCRA authority at the site.

LDR = Land Disposal Restriction
MW = monitoring well

WATER POLICY

Table C.7. ARARs and TBC information for Water Policy

Actions	Requirements	Prerequisites	Federal Citation	Kentucky Citation
LOCATION-SPECIFIC				
Drainage of material for backfill or bedding for utility lines	Nationwide Permit 12 allows discharge of material for backfill or bedding of utility lines, provided there is no change in preconstruction bottom contours.	Dredge drainage ditch for placement of utility line – **Applicable.**	33 *CFR* § 330.5 (a) (12); 33 *CFR* § 330.5 (b); 33 *CFR* § 330.7	
ACTION-SPECIFIC				
Site preparation	Reasonable precaution must be taken to prevent particulate mater from becoming airborne.	Handling, processing, construction, road grading, and land- clearing activities – **Applicable.**		401 KAR § 63:010
Operation of public water system	Operate public water system in accordance with health standards of 401 KAR 8:010-8:700.	Operation of a public water system – **Applicable.**		401 KAR § 8:030
Extension of existing public water system	Avoid locating at site that has significant risk of earthquakes, floods, fires, or other disasters that could cause a breakdown; also avoid one-hundred-year floodplain sites.	Extension to a public water system – **Applicable.**		401 KAR § 8:100(1)
Disinfect new water main	Disinfect with chlorine or chlorine compounds and flush. Bacteriological samples must be taken and demonstrated negative before the system can be used.	Disinfection of new water main – **Applicable.**		401 KAR § 8:150(4)
Surface water control	Implement good site planning and best management practices to control storm water discharges; comply with storm water runoff requirements of KPDES Permit KY 100000.	Construction activities at industrial sites involving disturbance of 5 acres total land. **Applicable** if more than 5 acres disturbed; **Relevant and appropriate** if less than 5 acres disturbed.	40 *CFR* Part 122; 57 *Fed. Reg.* 41176	

APPENDIX D

GROUNDWATER MODELING

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FINAL

A Letter Report on Northeast Plume and Northwest Plume Groundwater Modeling

May 2003

FINAL

CONTENTS

FIGURES

TABLES

ACRONYMS

HU	Hydrogeologic Unit
NEP	Northeast Plume
NWP	Northwest Plume
NWP-N	Northwest Plume-North
NWP-S	Northwest Plume-South
PDGP	Paducah Gaseous Diffusion Plant
RGA	Regional Gravel Aquifer
TMR	telescopic mesh refinement
UCRS	Upper Continental Recharge System

FINAL

A Letter Report on Northeast Plume and Northwest Plume Groundwater Modeling

1. INTRODUCTION

This report provides a summary of the tasks performed for northeast plume (NEP) and northwest plume (NWP) groundwater modeling. The NWP is modeled as two distinct parts, and they are referred to as NWP north (NWP-N) and NWP south (NWP-S). The plumes are contained by three well field systems. The primary objective of this modeling effort is to evaluate the performances of these well field systems with regard to containment of the high concentration cores of the groundwater plumes.

This report documents the approach and result of the tasks related to the well field groundwater models. As part of the tasks, design- and operation-related data of each extraction system were reviewed, and a conceptual model for the system was developed. The conceptual models were incorporated into the existing site numerical model to develop well field-specific models using the telescopic mesh refinement (TMR) technique. The resulting models are smaller than the existing site model and, hence, allow greater model resolution (accuracy) near the extraction wells for a given computational effort. The well field models, in conjunction with particle tracking, were used to define capture zones for the extraction systems. In this study, the starting site model is the regional groundwater flow and transport model for the Paducah Gaseous Diffusion Plant (PGDP). The model was first developed in 1994 (DOE 1994) and revised in 1996 (DOE 1996), 1997 (DOE 1997a, 1997b), and finally in 1998 (DOE 1998). The 1998 model was calibrated to 1992 flow conditions at the site. The current site-wide groundwater flow model last revised in 1998 is used in this study.

2. CONCEPTUAL MODEL

Development of a conceptual model is necessary prior to developing a numerical model. The conceptual model is a consolidation of known site conditions that serves as the framework for building the numerical model. The data for the extraction systems were organized, and conceptual models for the systems were developed. The components of the conceptual models are presented here.

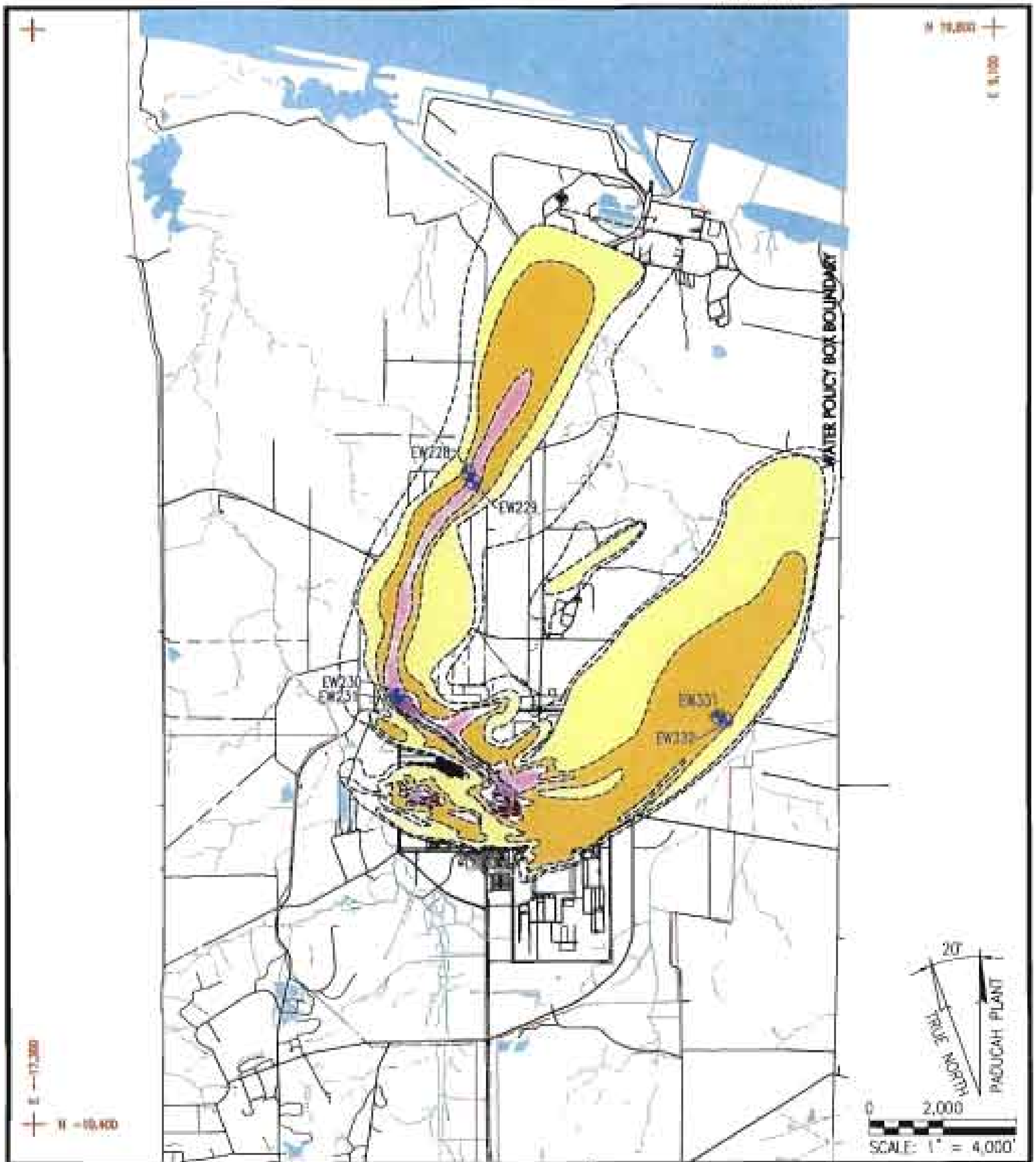
2.1 BACKGROUND

- The three containment systems are shown in Fig. 1: (1) NEP well field with EW-331 and EW-332 operating since February 1997, (2) NWP-N well field with EW-228 and EW-229 operating since August 1995, and (3) NWP-S well field with EW-230 and EW-231 operating since August 1995.

- The current site-wide groundwater flow model, last revised in June 1998, *Groundwater Flow Model Recalibration and Transport Model Construction at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/07-1742&D0, is a vital component of the conceptual model.

- The groundwater flow model is calibrated to both hydraulic potential (observed depth-to-water in plant wells) and particle tracks (groundwater flow as evidenced by the main off-site plumes).

DOCUMENT No.



LEGEND:

- ...... WATER POLICY BOX BOUNDARY
- ...... POND
- ...... ASPHALT ROAD
- ...... STREAM
- ADMINISTRATIVE CONSENT ORDER LIMIT=1 ug/L
- ...... WELL
- ...... TCE > 100,000 ug/L
- ...... TCE = 10,000–100,000 ug/L
- ...... TCE = 1,000–10,000 ug/L
- ...... TCE = 100–1,000 ug/L
- ...... TCE = 5–100 ug/L

U.S. DEPARTMENT OF ENERGY
DOE OAK RIDGE OPERATIONS
PADUCAH GASEOUS DIFFUSION PLANT

BECHTEL JACOBS
BECHTEL JACOBS COMPANY, LLC
Oak Ridge, Tennessee • Paducah, Kentucky • Portsmouth, Ohio

Science Applications International Corporation
P.O. Box 2502
Oak Ridge, Tennessee 37831

Figure 1. Domain of the Site-Wide Model and the TCE Plumes

Figure No. /99049/DWGS/R80SITE

DATE 053-27-03

- The current site groundwater transport model, last revised in April 1999, Transport Modeling Results for the Northeast Plume Interim Remedial Action and the Northwest Plume at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, DOE/OR/07-1803&D1 (DOE 1999), is a vital component of the conceptual model.

2.2 SETTING

- The current groundwater flow model contains four model layers. Model Layers 1 and 2 are upper and lower saturated sand horizons in the Upper Continental Recharge System (UCRS). Model Layer 3 is the Regional Gravel Aquifer (RGA). Model Layer 4 is the upper McNairy Formation.
- In the current modeling study, the primary importance of Model Layers 1 and 2 is to transmit areal recharge to Model Layer 3.
- Model Layer 3 (RGA) is the zone of water withdrawal. Tracking of particles in this layer will be used to define the zones of capture for the three well fields. In the existing site-wide model, the RGA is modeled with variable thickness, averaging approximately 30 ft, and variable hydraulic conductivity ranging between 200 and 1500 ft/day.
- Each well field is modeled separately, using results of the 1998 site-wide model, to assign boundary conditions to each of the smaller well field models.
- The model grid spacing in each of the three well field models is refined from that of the site-wide model to provide greater resolution.

2.3 DATABASE - WELL FIELD OPERATION

- CDM supplied records of daily flow meter readings for each of the six extraction wells.
- The near-continuous record for the NWP-N and NWP-S Containment Systems extends from August 29, through September 30, 1995, and from January 1, 1996, through October 31, 2002. Pumping periods for January 1, 1996, through October 31, 2002, are modeled.
- The near-continuous record for the NEP Containment System extends from February 25, 1997, through October 31, 2002. Pumping periods for March 19, 1997, through October 31, 2002, are modeled.
- The conceptual model task converted the records of daily flow meter readings to daily average pumping rates (gal/min) for each well and plotted the data to identify trends. In general, the pumping rates remain consistent, and periods of downtime are insignificant. There are very few periods of prolonged downtime.
- For the NWP-N Containment System, there were three periods of over 8 continuous days of downtime for one or more wells (periods of 22, 26, and 39 days).
- For the NWP-S Containment System, there were three periods of over 8 continuous days of downtime for one or more wells (periods of 10, 13, and 39 days).

- For the NEP Containment System, there were nine periods of over 8 continuous days of downtime for one or more wells (periods of 10, 11, 15, 18, 20, 69, 102, 122, and 264 days).

- Visually divided pumping rate data into periods of distinct average pumping rates.

- Pumping rates were averaged for each period and modeled. The beginning and ending dates of periods were adjusted to better match the modeled pumping rates to the actual pumping rates. A good match between modeled and actual pumping rates was achieved using 13 pumping periods for the NEP containment system (Fig. 2), 10 pumping periods for the NWP-N containment system (Fig. 3), and 10 pumping periods for the NWP-S containment system (Fig. 4). In addition, these figures show the maximum and average pumping rates for the wells in the systems. The average is obtained as

$$Q_{average} = \frac{\sum_{j=1}^{T} Q_j \Delta t_j}{\sum_{j=1}^{T} \Delta t_j} = \frac{\textit{Total volume of water extracted over a period}}{\textit{Duration of the period}} \qquad \text{(Eq. 1)}$$

where

$Q_{average}$ = average pumping rate over the total time period,
T = total number of stress periods in the total time period,
j = index for the stress periods,
Q_j = pumping rate over the j-th stress period,
Δt_j = duration of the j-th stress period.

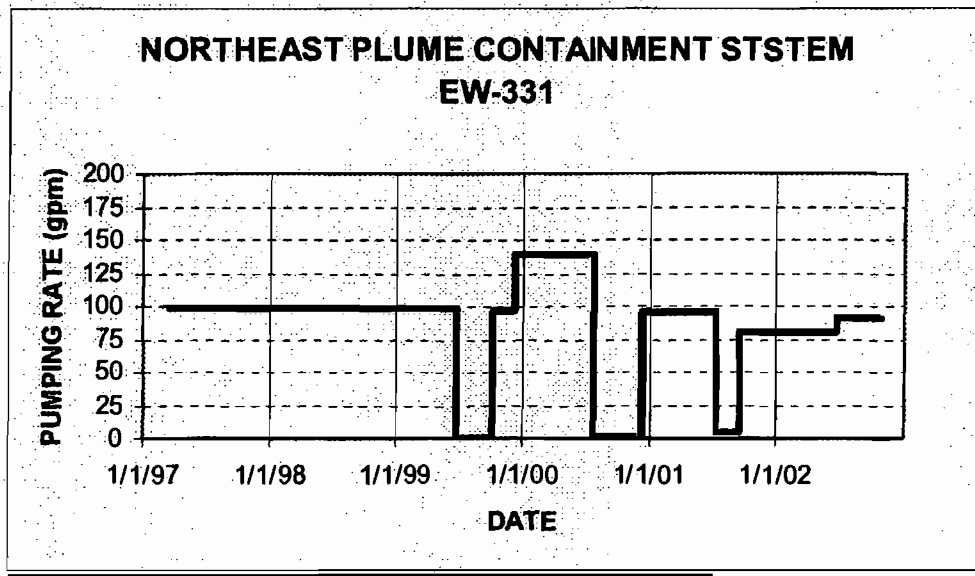
- All the pumping periods were converted to stress periods in the respective well field flow and transport models.

3. NUMERICAL MODEL

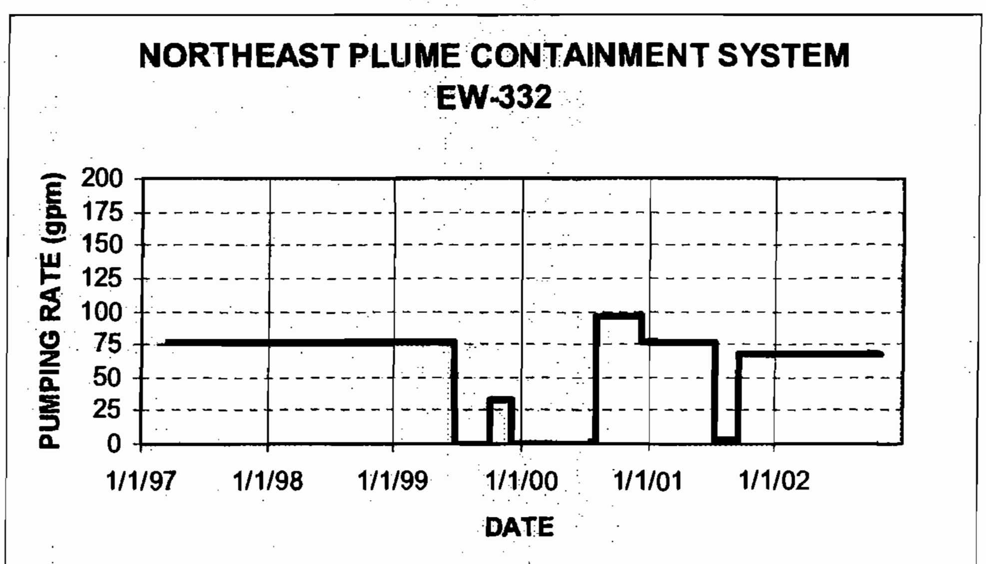
The conceptual model for a containment system was incorporated in the existing site numerical model to develop a model more suited for this assessment using the TMR technique. The resulting model is smaller than the existing model and, hence, allows greater resolution near the well system for a given computational effort. The model, in conjunction with particle tracking, was used to define the capture zone and, hence, to assess the performance of the system. Below, the development of the well field model and the simulation to define the capture zone are described system-by-system for the three containment systems.

3.1 REGIONAL FLOW AND TRANSPORT MODEL

The regional groundwater flow and transport model for PGDP (DOE 1998) was developed using MODFLOWT (Duffield 1996). This model covers nearly 38.60 miles^2 (Fig. 1). It simulates groundwater flow on a regional scale in the principal water-bearing units beneath the site: the sand and gravel lenses of the UCRS [Hydrogeologic Unit (HU) 2], the RGA (HU 4/HU 5), and the McNairy Formation (HU 6).

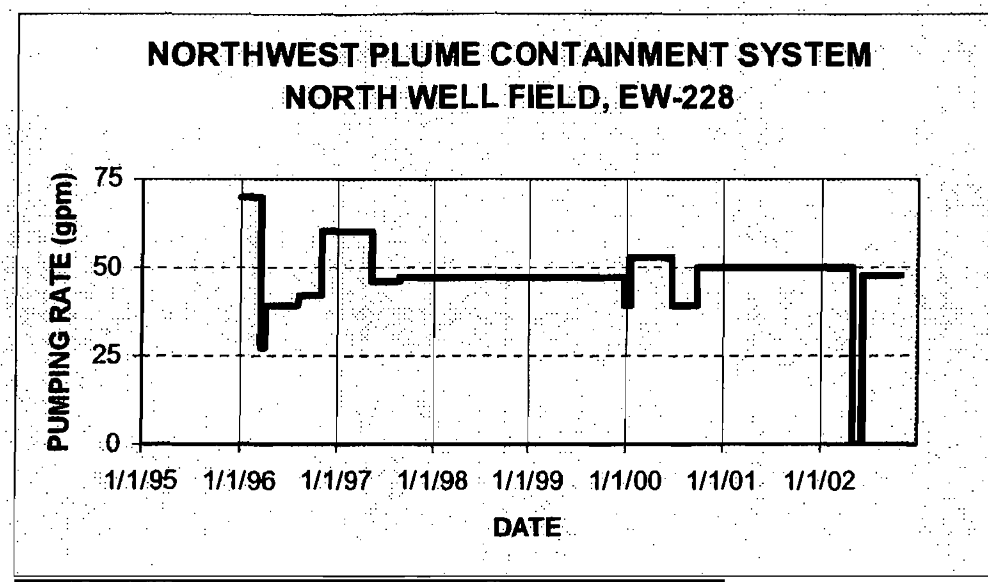



```
Number of Stress Periods =  10
Average Extraction Rate  =  85 gpm
Maximum Extraction Rate  = 139 gpm
```

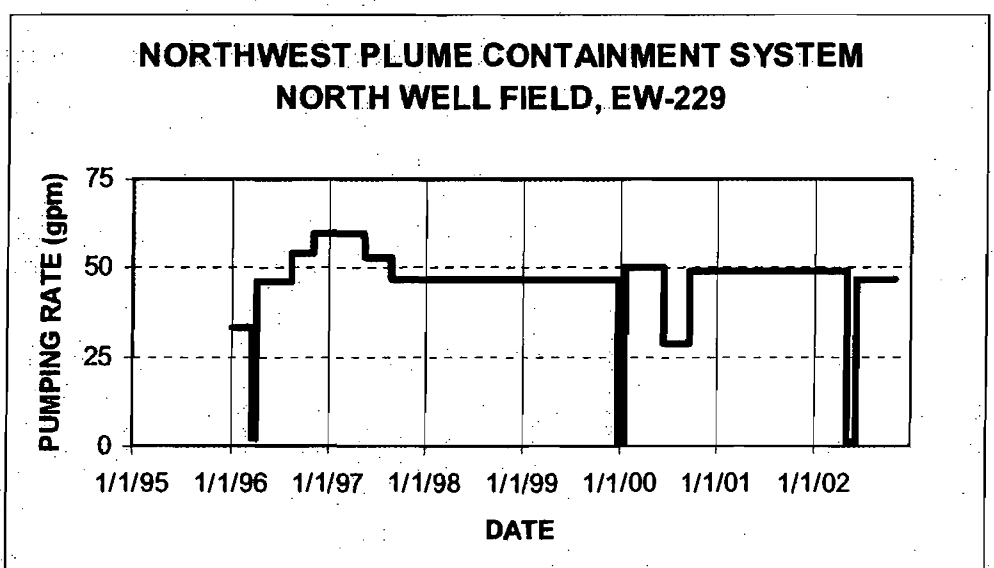



```
Number of Stress Periods = 10
Average Extraction Rate  = 60 gpm
Maximum Extraction Rate  = 96 gpm
```

Fig. 2. Stress period for the NEP containment system.

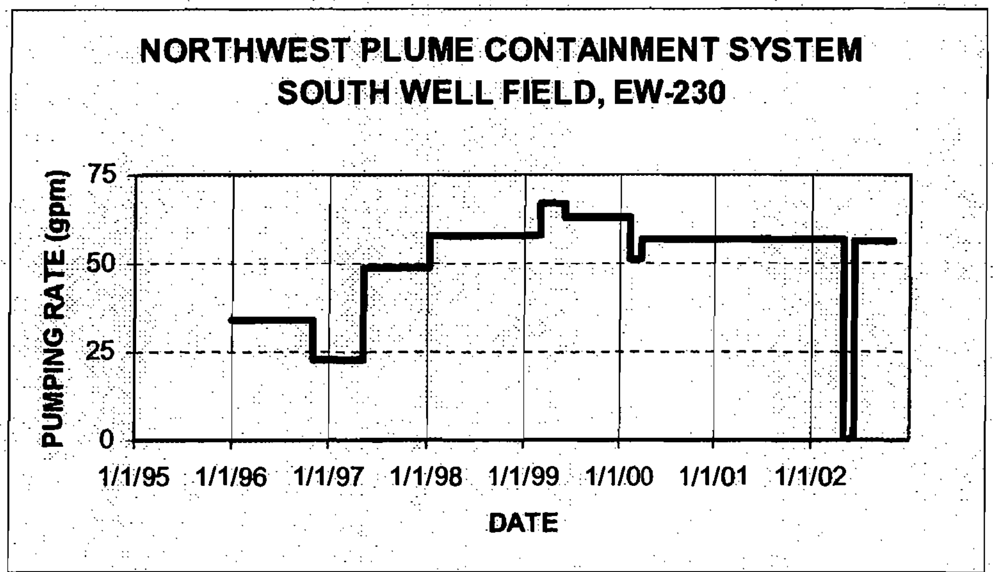


Number of Stress Periods	=	13
Average Extraction Rate	=	48 gpm
Maximum Extraction Rate	=	70 gpm

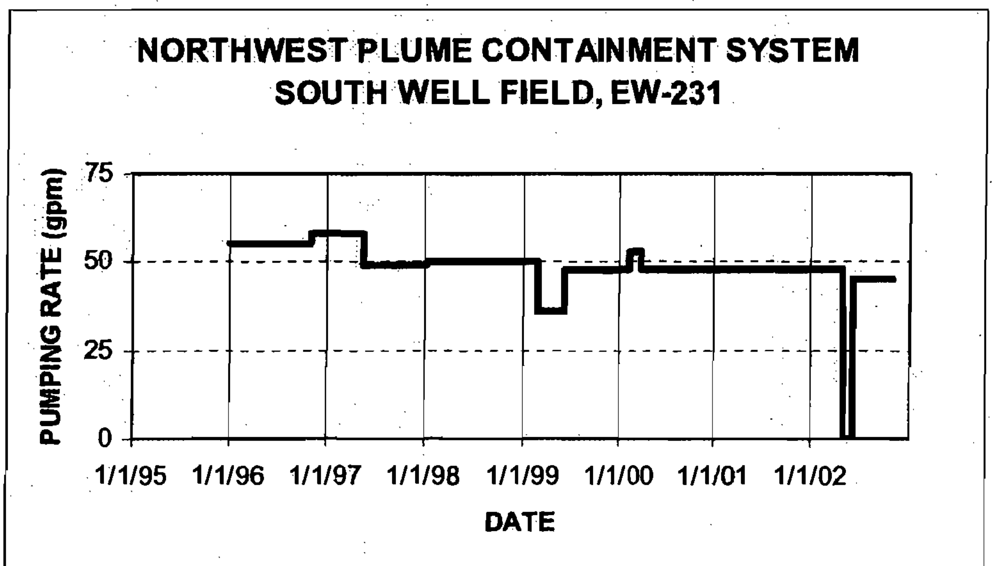


Number of Stress Periods	=	13
Average Extraction Rate	=	46 gpm
Maximum Extraction Rate	=	60 gpm

Fig. 3. Stress period for the NWP-N containment system.




```
Number of Stress Periods = 10
Average Extraction Rate  = 51 gpm
Maximum Extraction Rate  = 67 gpm
```




```
Number of Stress Periods = 10
Average Extraction Rate  = 49 gpm
Maximum Extraction Rate  = 58 gpm
```

Fig. 4. Stress period for the NWP-S containment system.

The boundaries of the regional model coincide with natural boundaries, where possible, and minimize the influence of model boundaries on simulation results at the site. The model domain extends well beyond PGDP to approximately 4.86 miles from the east to the west boundaries and 6.86 miles from the north to south boundaries. The finite-difference grid consists of 190 columns, 167 rows, and 4 layers for a total of 126,920 grid cells or nodes. The model grid uses a uniform, 50-ft areal grid spacing in the vicinity of the plant to provide increased computational detail for the plant area and grades to larger grid spacing at greater distances from the site. A complete description of the conceptual model, overall construction of the numerical model, and summary results of the model calibration can be found in several modeling reports (DOE 1997a, 1997b, 1998). The model can simulate both far-field and near-field flow phenomena and transport phenomena. In addition, it can support simulation of particle tracks. Since the model was developed, refinement has remained an ongoing process.

3.2 CAPTURE ZONE

The site-wide model, last revised June 1998 (*Groundwater Flow Model Recalibration and Transport Model Construction at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/07-1742&D0), was evaluated for use in defining the capture zones (Fig. 1). The six wells of the three extraction systems were installed in the domain, and they were assigned pumping rates as defined in Table 1. These rates are close to the maximum extraction rates shown in Figs. 2, 3, and 4.

Table 1. Pump-and-treat wells of the containment systems

Well ID	Coordinates		Screen elevations		Pumping rate[a]	
	Easting (ft)	Northing (ft)	Top (ft AMSL)	Base (ft AMSL)	gpm	ft^3/day
EW-331	1574.41	837.77	311.07	274.57	150.00	-28800.00
EW-332	1765.15	753.20	302.94	271.44	100.00	-19200.00
EW-228	-5347.31	7599.57	307.06	280.06	75.00	-14400.00
EW-229	-5196.91	7337.24	315.36	287.36	60.00	-11520.00
EW-230	-7301.49	1405.81	312.41	273.41	75.00	-14400.00
EW-231	-7439.94	1351.92	307.13	280.13	60.00	-11520.00

[a]Pumping rate = representative pumping rate used to assess site groundwater flow model for capture zone modeling.
AMSL = above mean sea level.
gpm = gal per min.

3.2.1 Northeast Plume (NEP)

A sub-regional model containing the NEP containment system was developed for this task using the TMR technique (Figs. 1 and 5). Hereafter, the sub-regional model will be referred to as the NEP TMR model for clarity. Boundary conditions were assigned to the sub-regional model using the TMR technique. The NEP TMR model is independent of the site-wide model, while the technique attempts to conserve the site-wide model conditions at the boundaries of the NEP TMR model. Essentially, the technique helps to achieve greater resolution within a sub-domain of the site-wide model for a given computational effort. In this study, the sub-domain covered an area of 15,000 by 14,000 ft, and it was discretized using 208 rows, 243 columns, and 4 layers (Fig. 5). The row and column widths varied from 10 to 82 ft with the smaller widths closer to the extraction wells. The sub-model was run under steady-state condition. The area of interest in the sub-domain was kept active, while the remainder was made inactive. The area measured about 12,500 by 4,500 ft. As shown in Fig. 5, the northern boundary of

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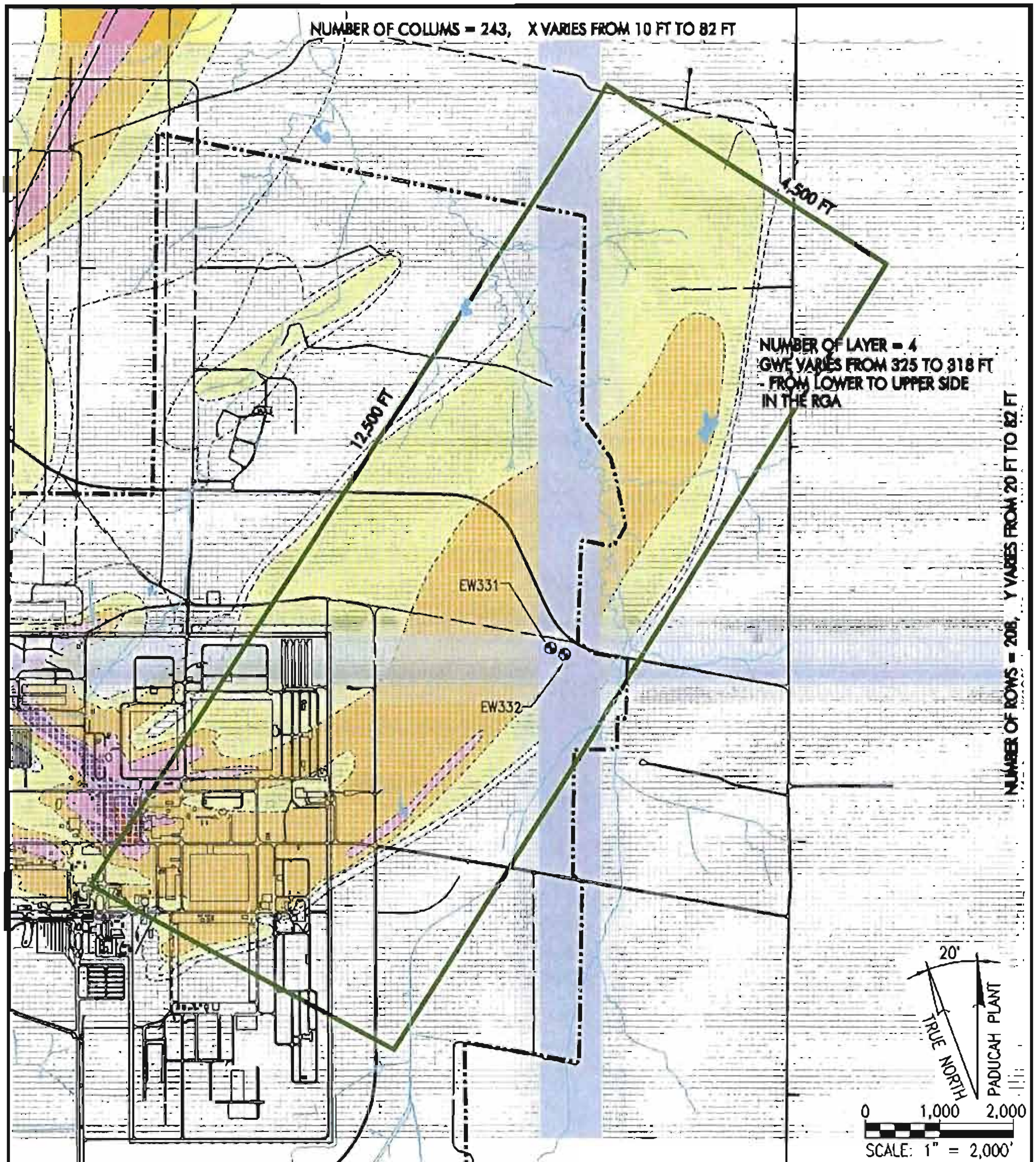

LEGEND:

NEP BOUNDARY BOUNDARY	WELL
POND	TCE > 100,000 ug/L
ASPHALT ROAD	TCE - 10,000-100,000 ug/L
STREAM	TCE - 1,000-10,000 ug/L
ADMINISTRATIVE CONSENT ORDER LIMIT=1 ug/L	TCE - 100-1,000 ug/L
	TCE - 5-100 ug/L

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Figure 5. Discretization of the Telescopic Mesh Refinement (TMR) Model for NEP

Figure No. /99049/DWGS/R80NEPS

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the model is located near the extreme northern property boundary of the U.S. Department of Energy, perpendicular to the Metropolis Lake Road, while the southern boundary is located near the C-400 area. The eastern and the western boundaries of the model lie approximately 2250 ft east and west of the extraction wells, respectively. Constant head conditions are specified for the boundaries, and the hydraulic heads at these locations are specified based on the water levels simulated using the PGDP site-wide model.

Figure 6 shows the groundwater elevations in the RGA predicted by the site-wide model and the NEP TMR model. The predictions are in agreement, and the NEP TMR model was considered suitable for defining the capture zone of the system.

Ten simulated particles were placed around each well, and three simulations were performed to define the capture zone under three different conditions. First, particle tracks were simulated to define the capture zone for a transient condition (Fig. 7). The pumps were assumed to operate under a transient condition according to the schedule provided in Fig. 2. The width of the zone was estimated to be 806 ft (Fig. 7). Apparently, the capture zone overlaps the core completely. The core of the plume is contained by the extraction well system. Second, the tracks were simulated to define the zone for an average steady-state condition (Fig. 8). The pumps were assumed to operate under a steady condition according to the average rates provided in Fig. 2. The width of the zone was estimated to be 867 ft (Fig. 8). The core of the plume is contained by the extraction well system under this assumption also. Third, the tracks were simulated to define the zone for a maximum steady-state condition (Fig. 9). The pumps were assumed to operate under a steady condition according to the maximum rates provided in Fig. 2. The width of the zone was estimated to be 1599 ft (Fig. 9). The core of the plume is contained by the extraction system under this assumption.

3.2.2 Northwest Plume North (NWP-N)

Similar to the NEP, the TMR model for the NWP-N was developed (Figs. 1 and 10). The sub-domain model is referred to as the NWP-N TMR model. In this study, the NWP-N TMR model covered an area of 11,375 by 9,450 ft, and it was discretized using 150 rows, 140 columns, and 4 layers (Fig. 10). The row and column widths varied from 10 to 82 ft with the smaller widths closer to the wells of the system. The sub-model was run under steady-state condition. The area of interest in the sub-domain was kept active, while the remainder was made inactive. The area measured about 9650 by 3450 ft. As shown in Fig. 10, the northern boundary of the refined model is located near the Tennessee Valley Authority Plant, while the southern boundary is located approximately 3000 ft north of the northern fence line. The eastern and the western boundaries of the model occur approximately 1500 ft east and west of the wells of the system, respectively. Constant head conditions are specified throughout the boundaries, and the hydraulic heads at these locations are specified based on the water levels simulated using the PGDP site-wide model.

Figure 11 shows the groundwater elevations in the RGA predicted by the site-wide model and the NWP-N TMR model. The predictions are in agreement, and the NWP-N TMR model was considered suitable for defining the capture zone of the well system.

Ten simulated particles were placed around each well, and three simulations were performed. First, the tracks were simulated to define the zone for a transient condition (Fig. 12). The width of the zone was estimated to be 636 ft (Fig. 12). Apparently, the capture zone does not overlap the core completely. The core of the plume is partially contained by the extraction system. However, an almost complete capture of the core of the high concentration plume upgradient of the well field may be noted. Any deviations may be attributed to uncertainties in contouring the plume or localized hydrogeologic changes impacting the

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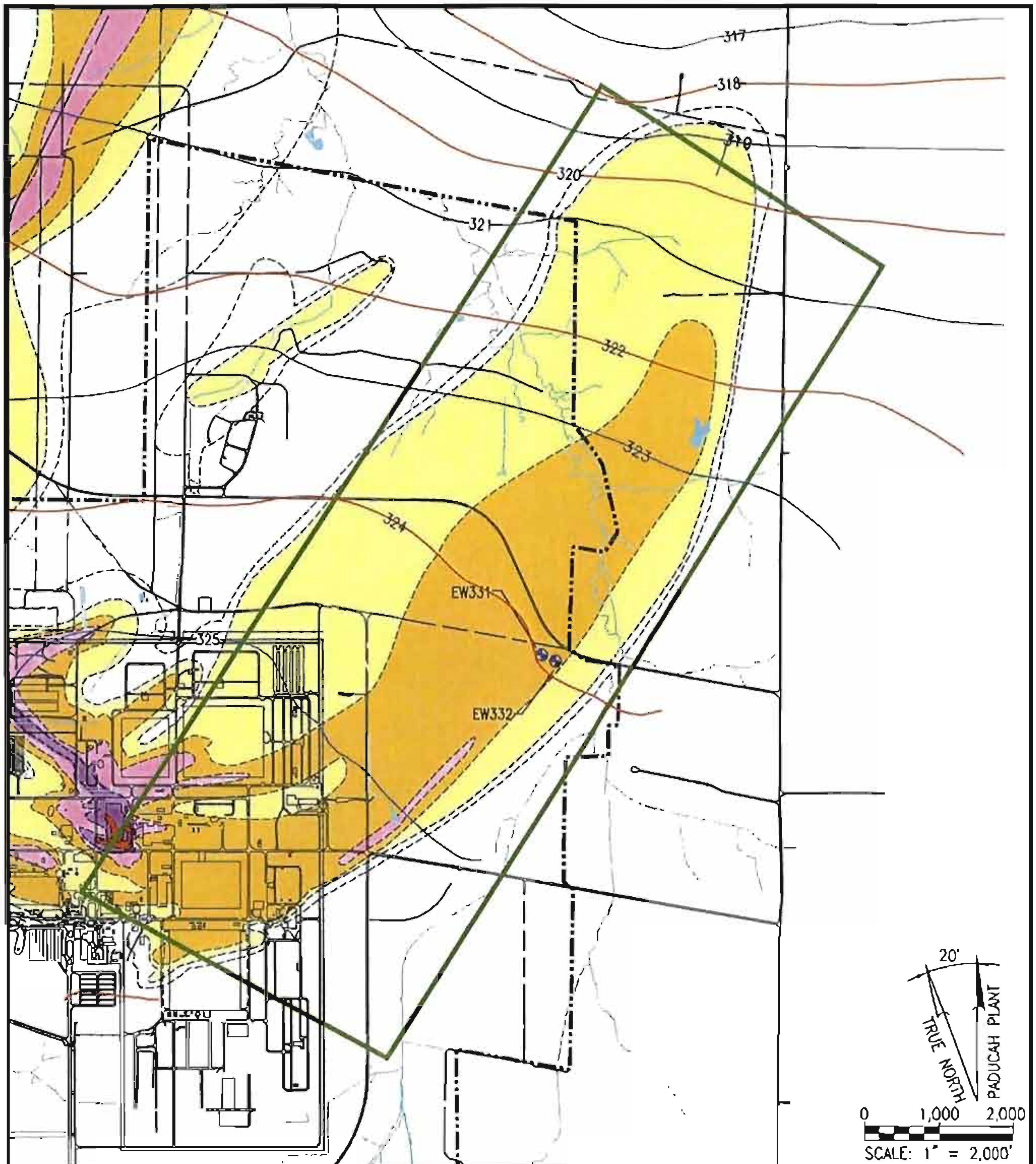

LEGEND:

.....WATER POLICY BOX BOUNDARY	.....WELL
.....ASPHALT ROAD	.....TCE > 100,000 ug/L
.....STREAM	...TCE – 10,000–100,000 ug/L
ADMINISTRATIVE CONSENT ORDER LIMIT=1 ug/L	......TCE – 1,000–10,000 ug/L
.....SITE WIDE	.....TCE – 100–1,000 ug/L
.....TMR	.....TCE – 5–100 ug/L

Figure 6. Comparison of Site-Wide and TMR Simulations for NEP

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Figure No. /99049/DWGS/R80NEP6

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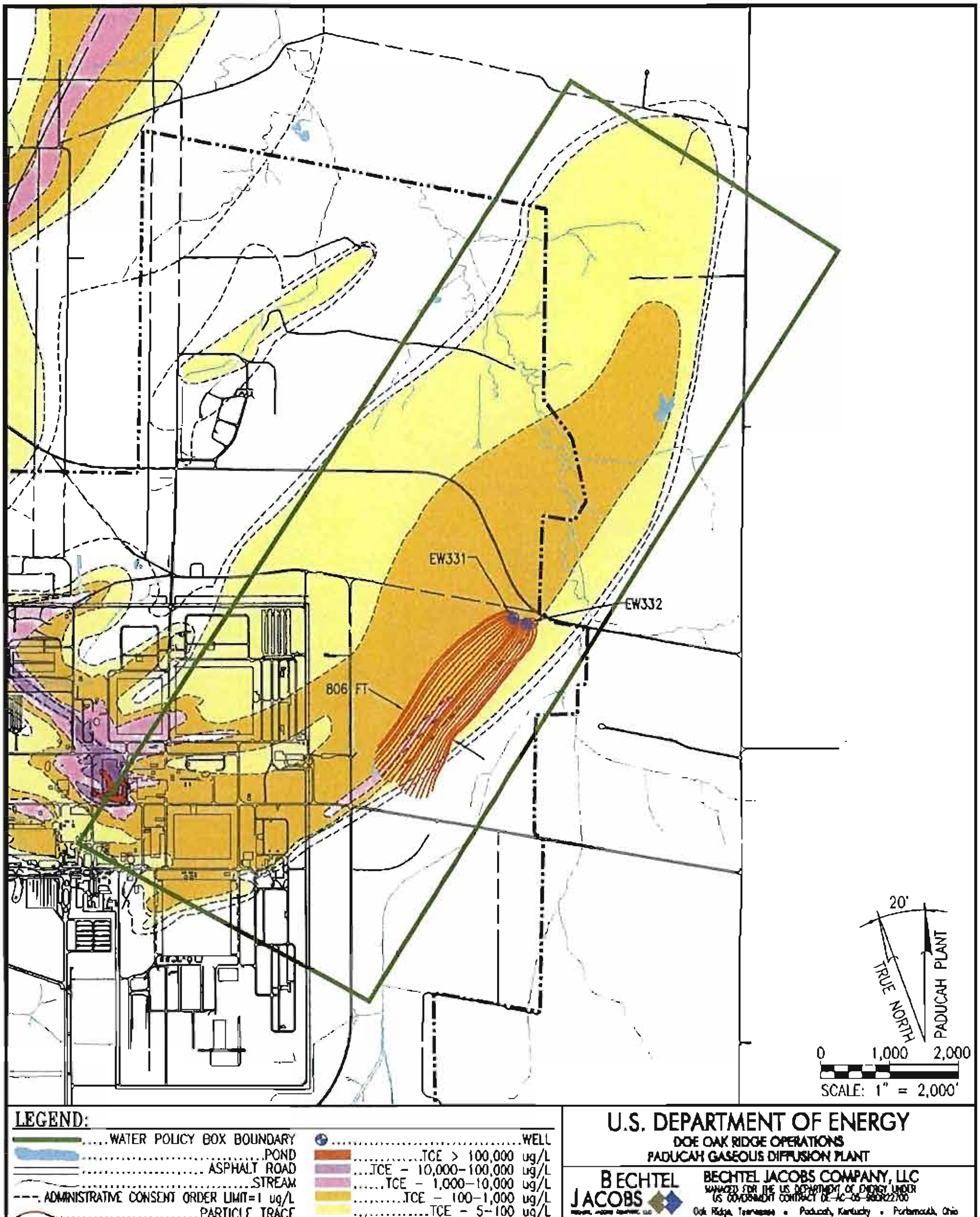

Fig. 7. Capture zone of NEP containment system under observed transient condition.

Figure No. /99049/DWGS/RB0NEP7

DATE 06-27-03

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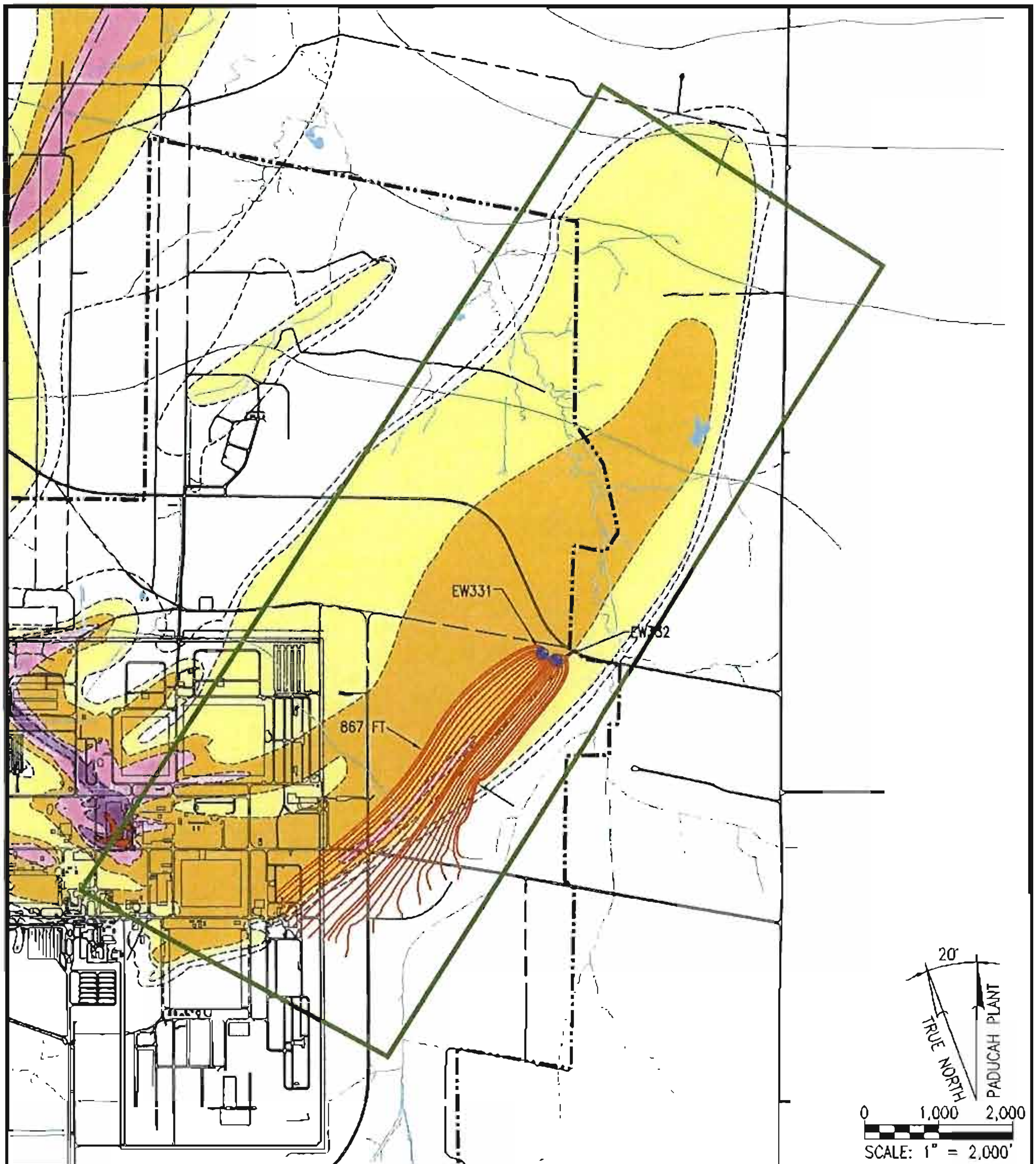

LEGEND:

	..... WATER POLICY BOX BOUNDARY		..... WELL
	..... POND		..... TCE > 100,000 ug/L
	..... ASPHALT ROAD		... TCE - 10,000-100,000 ug/L
	..... STREAM		..... TCE - 1,000-10,000 ug/L
	ADMINISTRATIVE CONSENT ORDER LIMIT=1 ug/L		..... TCE - 100-1,000 ug/L
	..... PARTICLE TRACE		..... TCE - 5-100 ug/L

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Fig. 8. Capture zone of NEP containment stystem under average steady condition.

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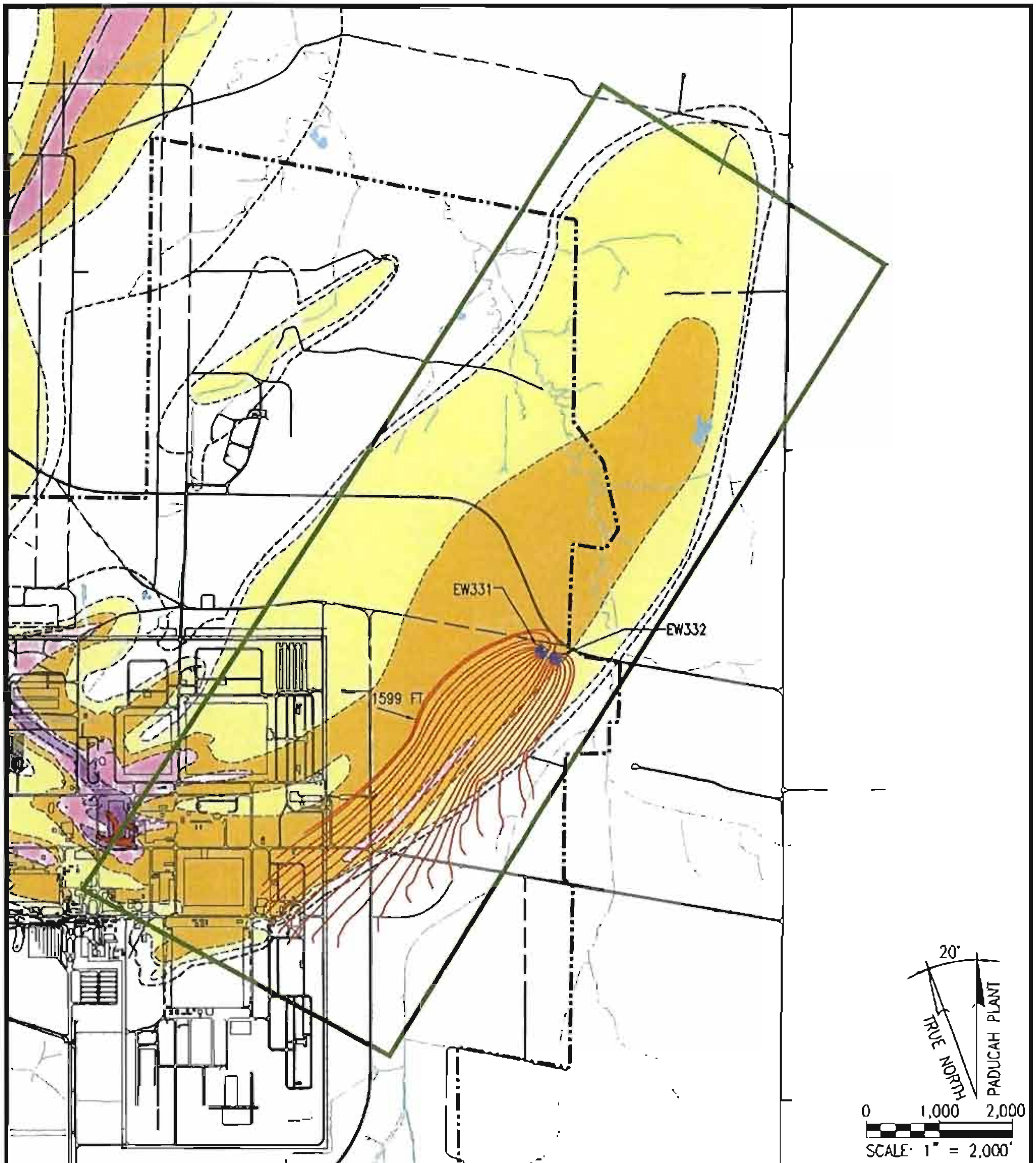

LEGEND:

	WATER POLICY BOX BOUNDARY		WELL
	POND		TCE > 100,000 ug/L
	ASPHALT ROAD		TCE – 10,000–100,000 ug/L
	STREAM		TCE – 1,000–10,000 ug/L
	ADMINISTRATIVE CONSENT ORDER LIMIT=1 ug/L		TCE – 100–1,000 ug/L
	PARTICLE TRACE		TCE – 5–100 ug/L

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Fig. 9. Capture zone of NEP containment system under maximum steady condition.

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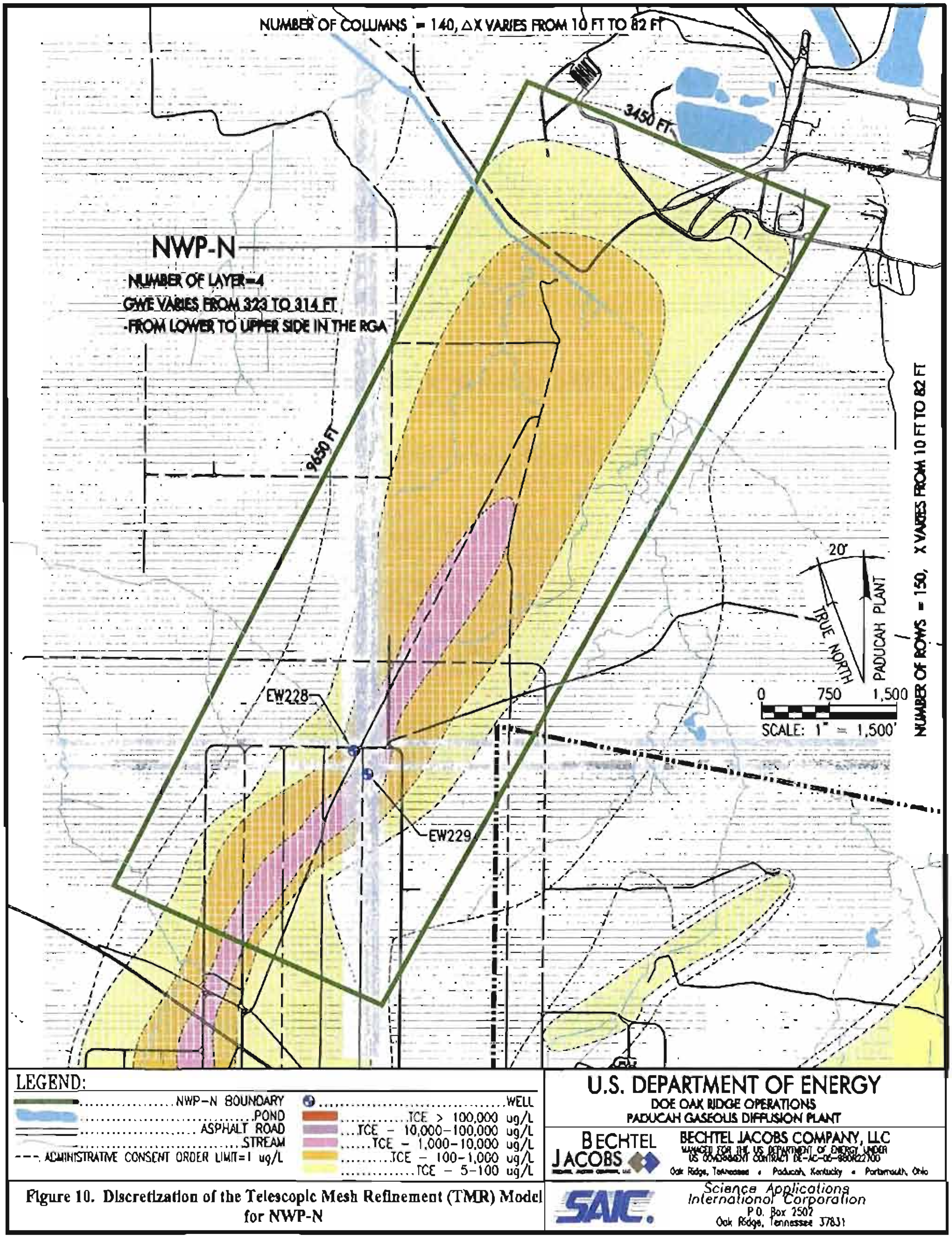

Figure 10. Discretization of the Telescopic Mesh Refinement (TMR) Model for NWP-N

Figure No. /99049/DWGS/R80NWP10

DATE 06-28-03

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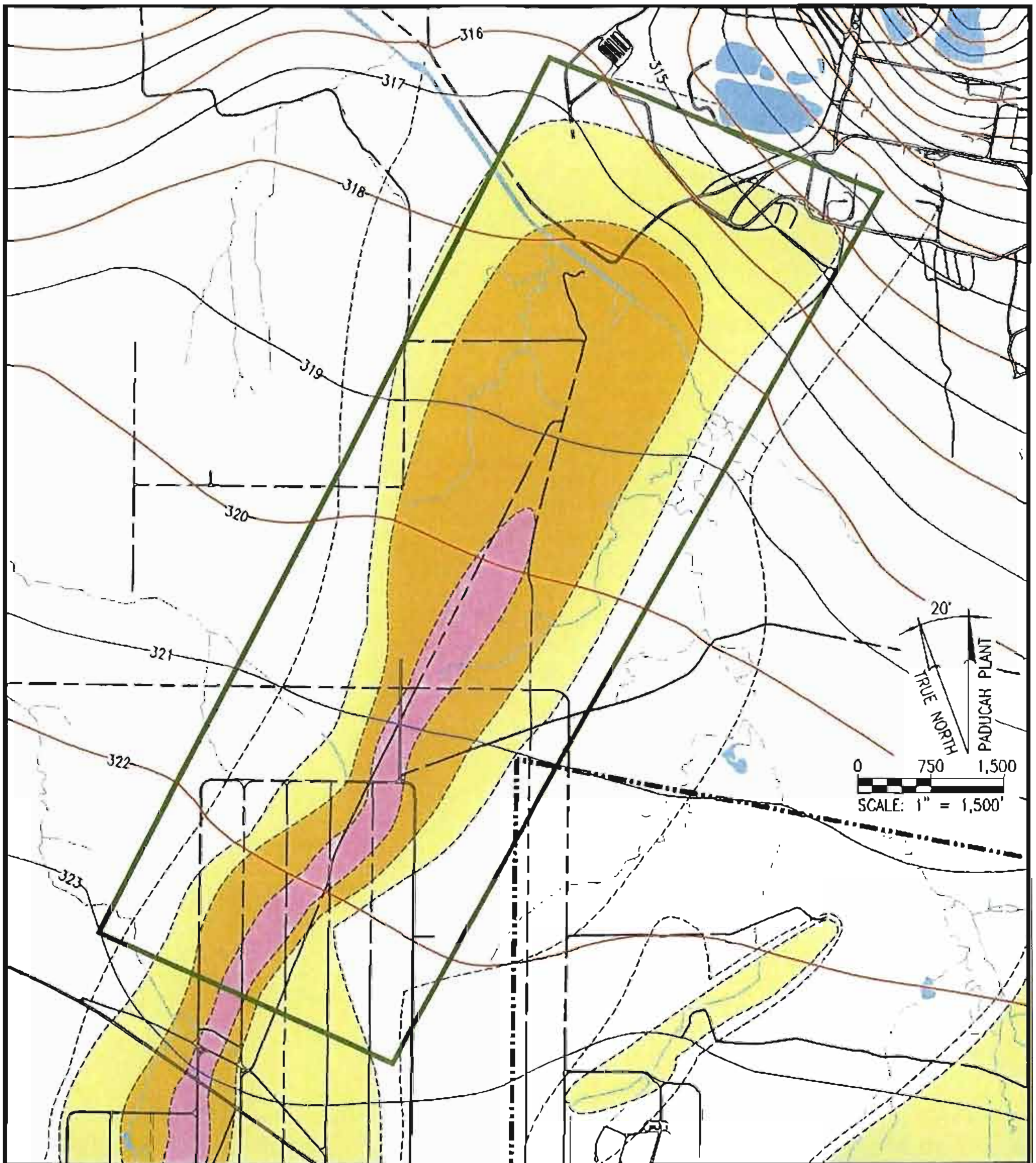

LEGEND:

- NWP-N BOUNDARY
- ASPHALT ROAD
- STREAM
- ADMINISTRATIVE CONSENT ORDER LIMIT=1 ug/L
- SITE WIDE
- TMR
- WELL
- TCE > 100,000 ug/L
- TCE - 10,000-100,000 ug/L
- TCE - 1,000-10,000 ug/L
- TCE - 100-1,000 ug/L
- TCE - 5-100 ug/L

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Figure 11. Comparison of Site-Wide and TMR Simulations for NWP-N

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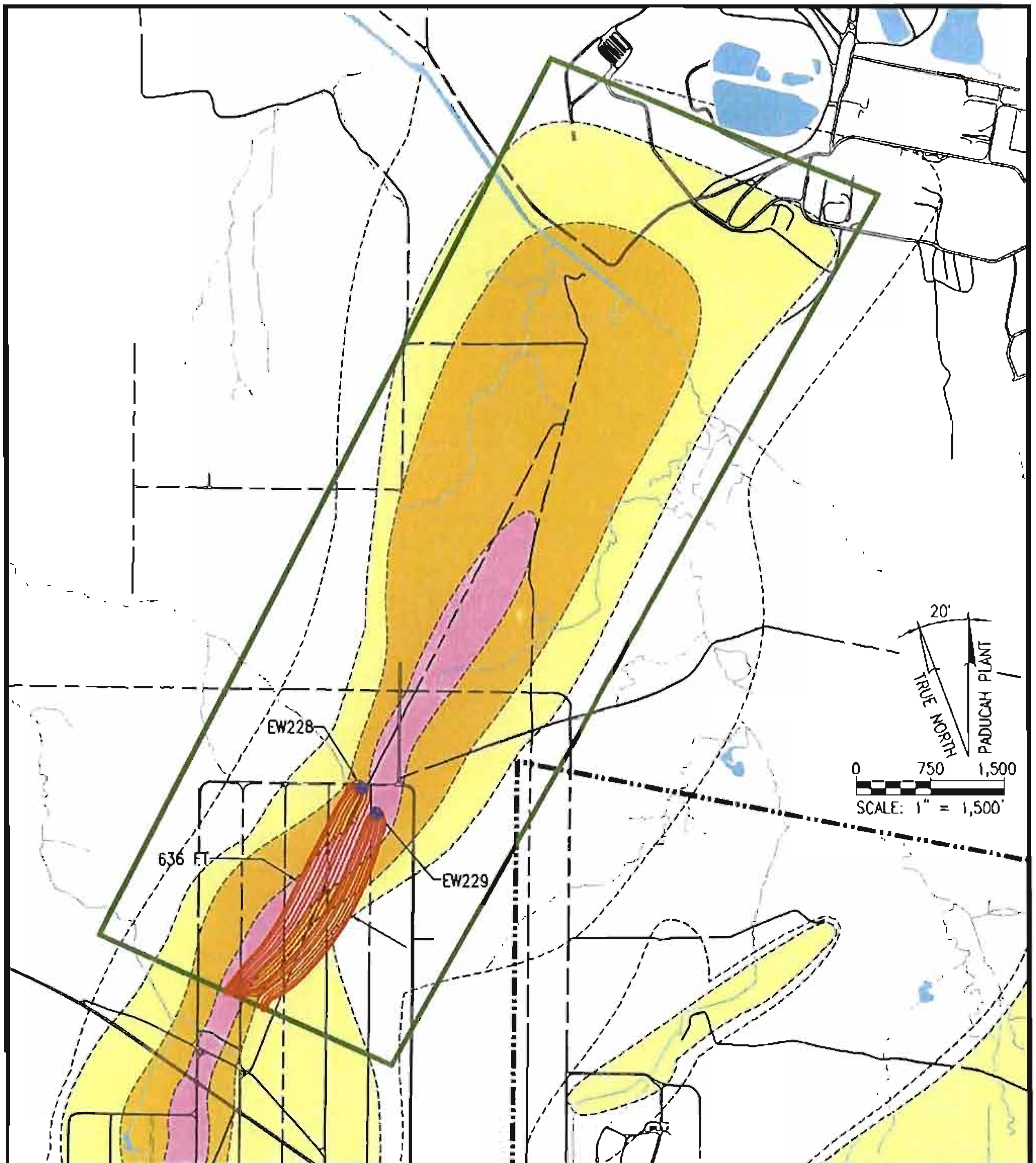

LEGEND:

NWP-N BOUNDARY
ASPHALT ROAD
STREAM
ADMINISTRATIVE CONSENT ORDER LIMIT=1 ug/L
PARTICLE TRACE
WELL
TCE > 100,000 ug/L
TCE - 10,000-100,000 ug/L
TCE - 1,000-10,000 ug/L
TCE - 100-1,000 ug/L
TCE - 5-100 ug/L

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Figure 12. Capture Zone of NWP-N Containment System Under Observed Transient Condition

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flow field. Second, the tracks were simulated to define the zone for an average steady-state condition (Fig. 13). The width of the zone was estimated to be 718 ft (Fig. 13). Apparently, the core of the plume is partially contained by the extraction system under this assumption. The presence of a gap between the two capture zones may be noted. The capture zones of the two wells do not overlap completely. The portion of the plume in the gap is not contained. However, the containment under the transient condition is less than that under this assumption. Third, the tracks were simulated to define the zone for a maximum steady-state condition (Fig. 14). The width of the zone was estimated to be 859 ft (Fig. 14). Apparently, the core of the plume is partially contained by the extraction system under this assumption. However, a complete capture of the high concentration core of the plume may be noted.

3.2.3 Northwest Plume South (NWP-S)

Similar to the NWP-N model, the TMR model for the NWP-S was developed (Figs. 1 and 15). The sub-domain model is referred as the NWP-S TMR model. In this study, the sub-domain covered an area of 10,800 by 9,450 ft, and it was discretized using 147 rows, 160 columns, and 4 layers (Fig. 15). The row and column widths varied from 10 to 82 ft with the smaller widths closer to the extraction wells of the system. The sub-model was run under steady-state condition. The area of interest in the sub-domain was kept active, while the remainder was made inactive. The area measured about 3800 by 7750 ft. As shown in Fig. 15, the northern boundary of the model is located approximately 3000 ft north of northern fence line, while the southern boundary is located 500 ft north of the C-400 area. The eastern and the western boundaries of the model lie approximately 2000 ft east and west of the wells of the system, respectively. Constant head conditions are specified over the boundaries, and the hydraulic heads at these locations are specified based on the water levels simulated using the PGDP site-wide model.

Figure 16 shows the groundwater elevations in the RGA predicted by the site-wide model and the NWP-S TMR model. The predictions are in agreement, and the NWP-S TMR model was considered suitable for defining the capture zone of the well system.

Ten simulated particles were placed around each well, and three simulations were performed. First, the tracks were simulated to define the capture zone for a transient condition (Fig. 17). The width of the capture zone was estimated to be 1240 ft (Fig. 17). Apparently, the capture zone does not overlap the core completely. The core of the plume is partially contained by the extraction system. Second, the tracks were simulated to define the capture zone for an average steady-state condition (Fig. 18). The core of the plume is partially contained by the extraction system under this assumption also. The width of the capture zone was estimated to be 1478 ft (Fig. 18). Third, the tracks were simulated to define the capture zone for a maximum steady-state condition. The width of the zone was estimated to be 1600 ft (Fig. 19). Even under the maximum steady-state condition, the core of the plume was predicted not to be completely contained by the extraction system. For all three scenarios, it was observed that groundwater flow direction predicted by the model significantly differed with contaminant transport direction (see Figs. 17 through 19).

3.3 LIMITATIONS

The present effort is subjected to the following limitations:

- simplification of hydrogeology,
- simplification of boundary conditions,
- simplification of extraction rates over time of the extraction systems, and

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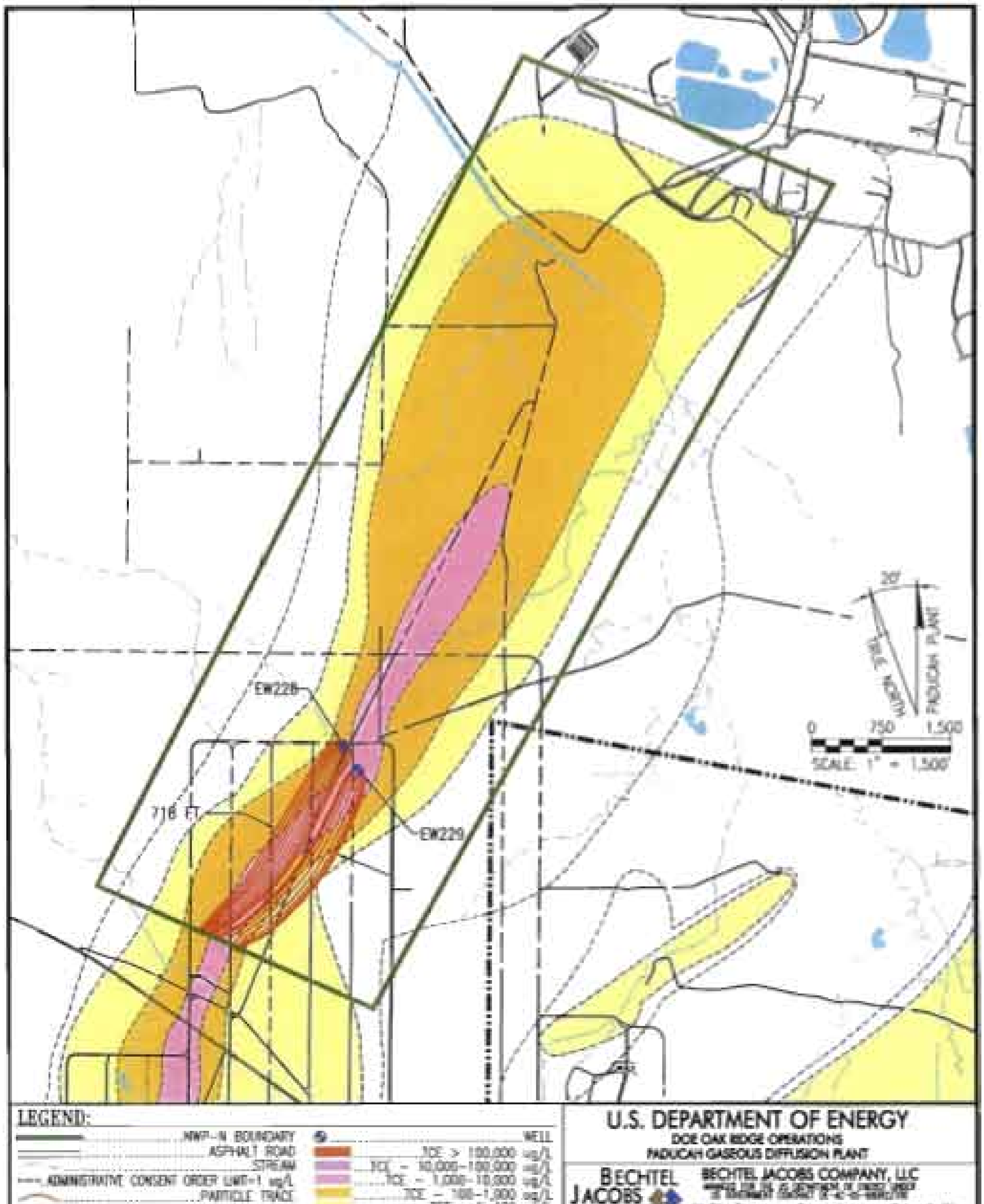

Figure 13. Capture Zone of NWP-N Containment System Under Average Steady Condition

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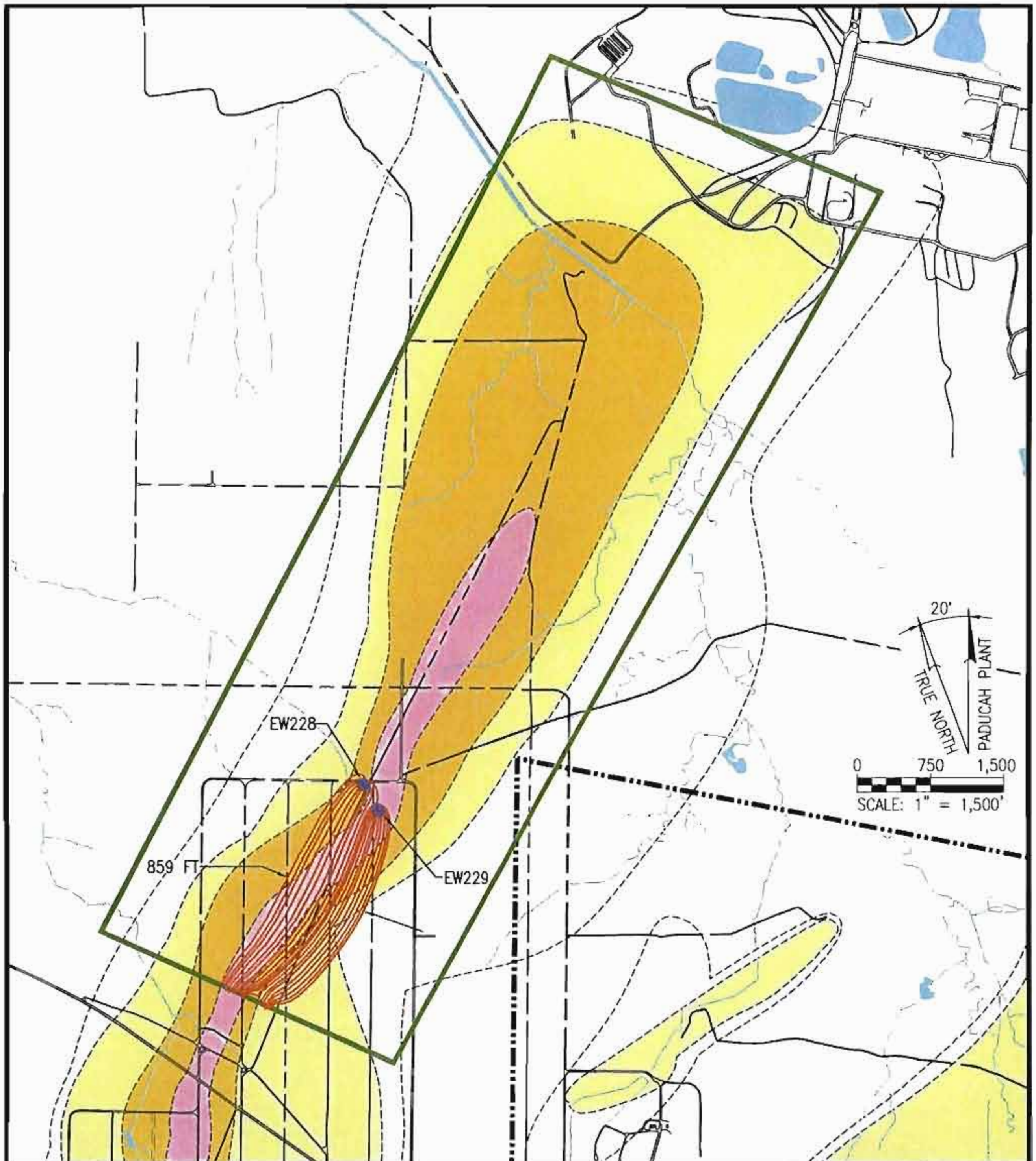

LEGEND:
NWP-N BOUNDARY
ASPHALT ROAD
STREAM
ADMINISTRATIVE CONSENT ORDER LIMIT=1 ug/L
PARTICLE TRACE
WELL
TCE > 100,000 ug/L
TCE - 10,000-100,000 ug/L
TCE - 1,000-10,000 ug/L
TCE - 100-1,000 ug/L
TCE - 5-100 ug/L

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Figure 14. Capture Zone of NWP-N Containment System Under Maximum Steady Condition

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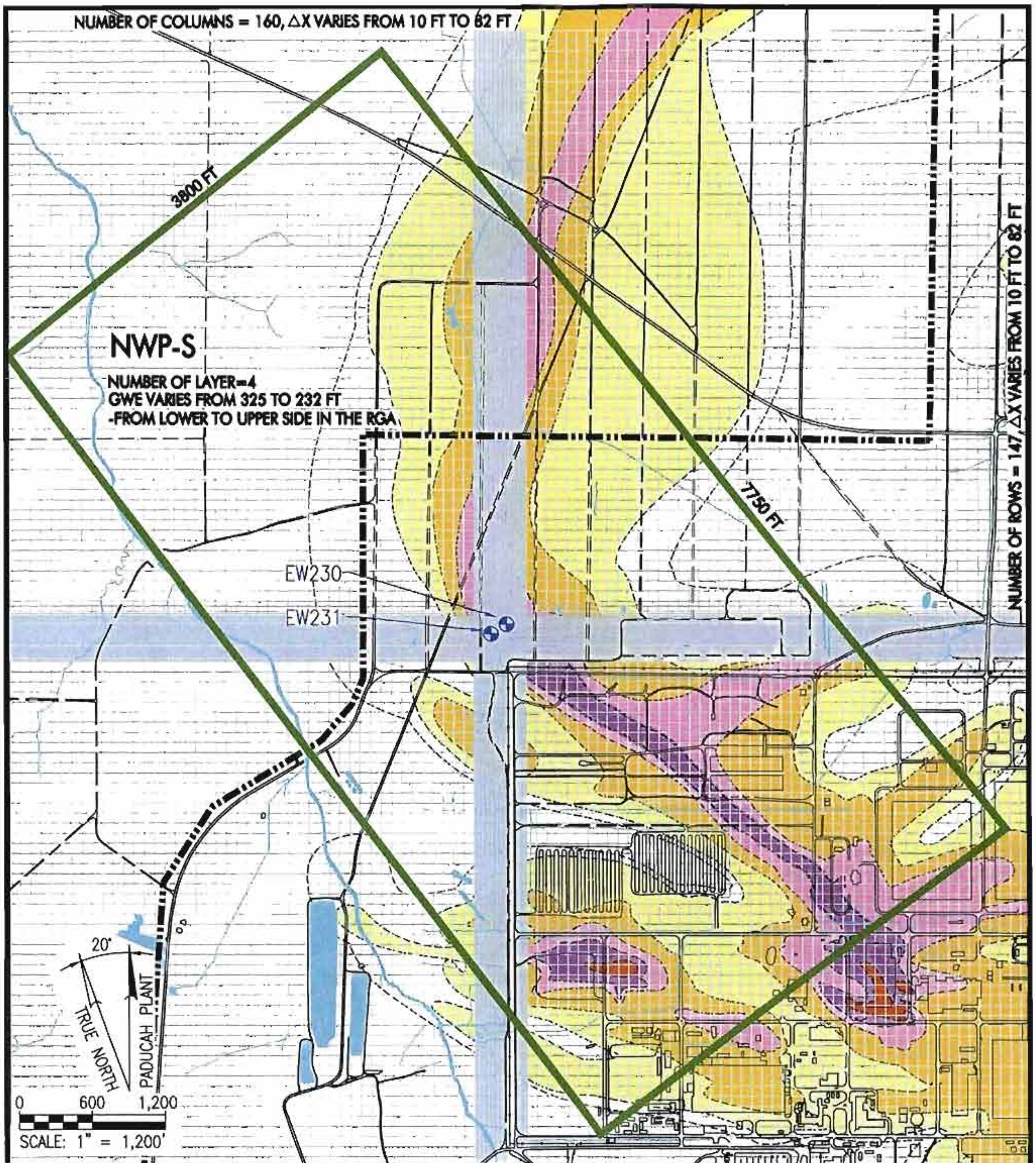

LEGEND:

- ....NWP-S BOUNDARY
- ....ASPHALT ROAD
- ....STREAM
- ADMINISTRATIVE CONSENT ORDER LIMIT=1 ug/L
- ....WELL
- ....TCE > 100,000 ug/L
- ...TCE - 10,000-100,000 ug/L
- ......TCE - 1,000-10,000 ug/L
- ....TCE - 100-1,000 ug/L
- ....TCE - 5-100 ug/L

Figure 15. Discretization of the Telescopic Mesh Refinement (TMR) Model for NWP-S

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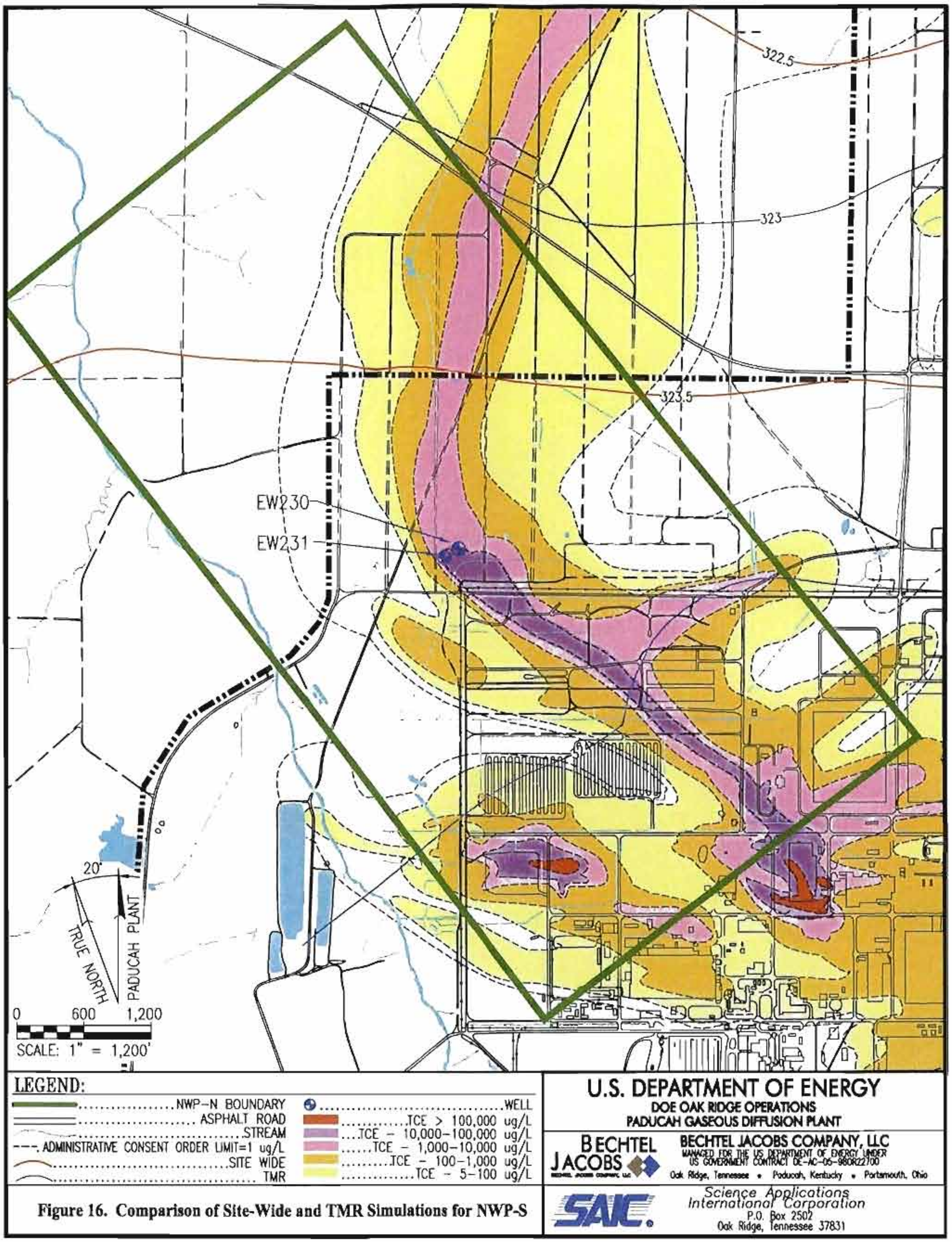

Figure 16. Comparison of Site-Wide and TMR Simulations for NWP-S

Figure No. /99049/DWGS/R80NWP16

DATE 05-28-03

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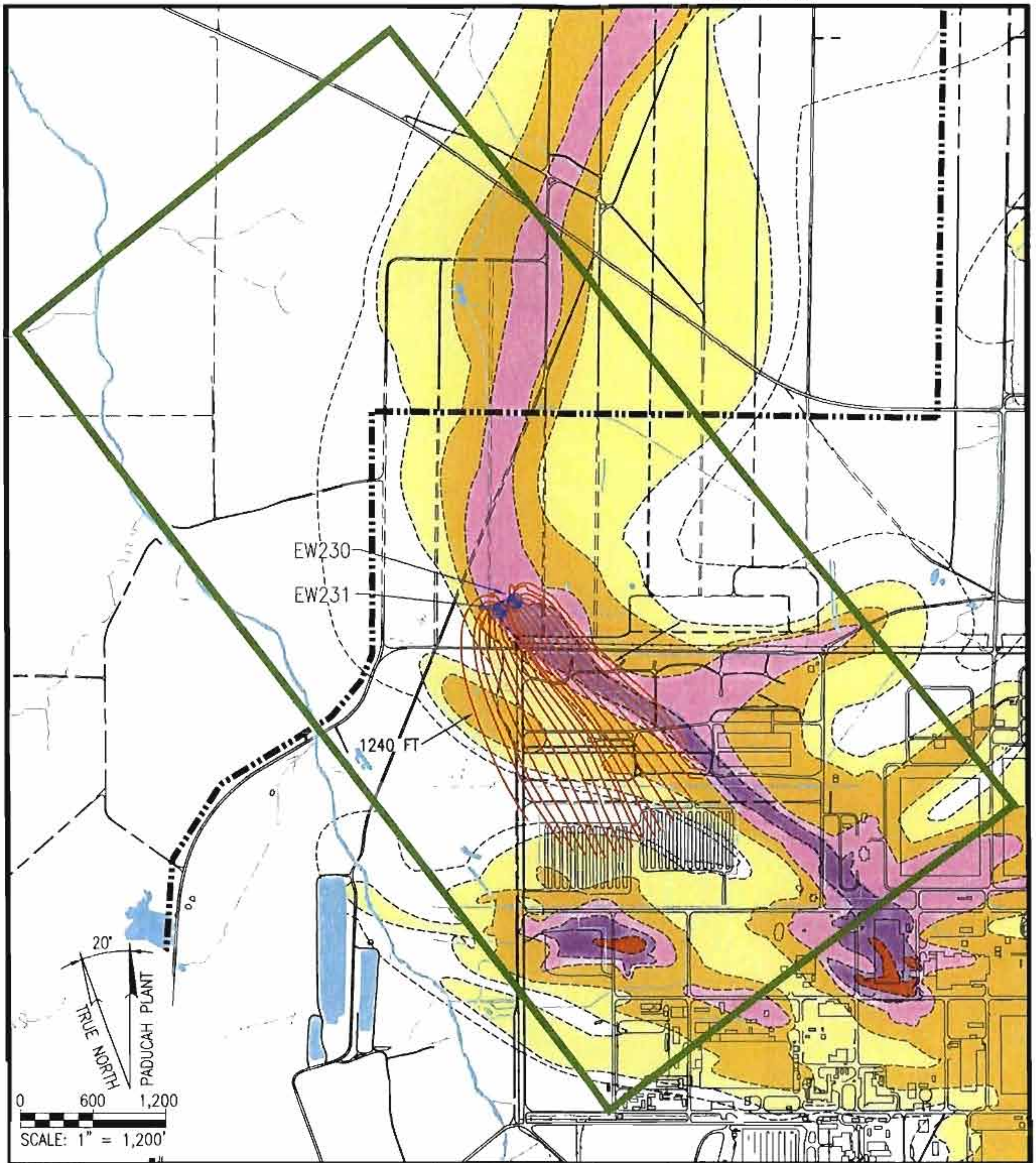

LEGEND:

- .... NWP-N BOUNDARY
- .... ASPHALT ROAD
- .... STREAM
- ADMINISTRATIVE CONSENT ORDER LIMIT=1 ug/L
- .... PARTICLE TRACE
- .... WELL
- .... TCE > 100,000 ug/L
- ... TCE – 10,000–100,000 ug/L
- ...... TCE – 1,000–10,000 ug/L
- .... TCE – 100–1,000 ug/L
- .... TCE – 5–100 ug/L

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MANAGED FOR THE US DEPARTMENT OF ENERGY UNDER US GOVERNMENT CONTRACT DE-AC-05-98OR22700
Oak Ridge, Tennessee • Paducah, Kentucky • Portsmouth, Ohio

Figure 17. Capture Zone of NWP-S Containment System Under Observed Transient Condition

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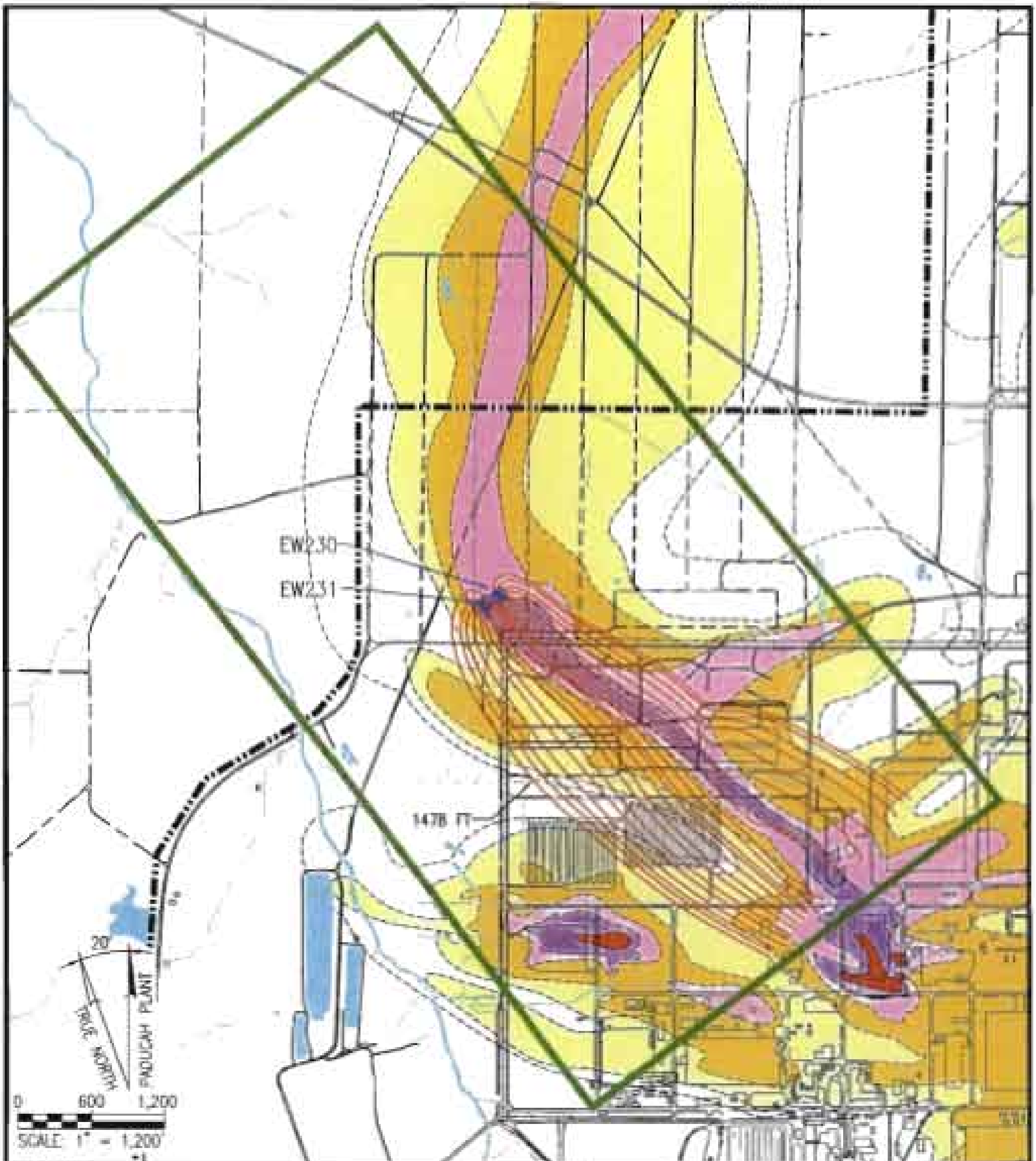
Figure No. /99049/DWGS/RB0NWP17

DATE 05-28-03

DOCUMENT No.



LEGEND:

NWP-N BOUNDARY
ASPHALT ROAD
STREAM
ADMINISTRATIVE CONSENT ORDER LIMIT-1 ug/L
PARTICLE TRACE
WELL
TCE > 100,000 ug/L
TCE - 10,000-100,000 ug/L
TCE - 1,000-10,000 ug/L
TCE - 100-1,000 ug/L
TCE - 5-100 ug/L

U.S. DEPARTMENT OF ENERGY
DOE OAK RIDGE OPERATIONS
PADUCAH GASEOUS DIFFUSION PLANT

BECHTEL JACOBS
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Figure 18. Capture Zone of NWP-S Containment System Under Average Steady Condition

Figure No. /99049/DWGS/880NWP18
DATE

DOCUMENT No.

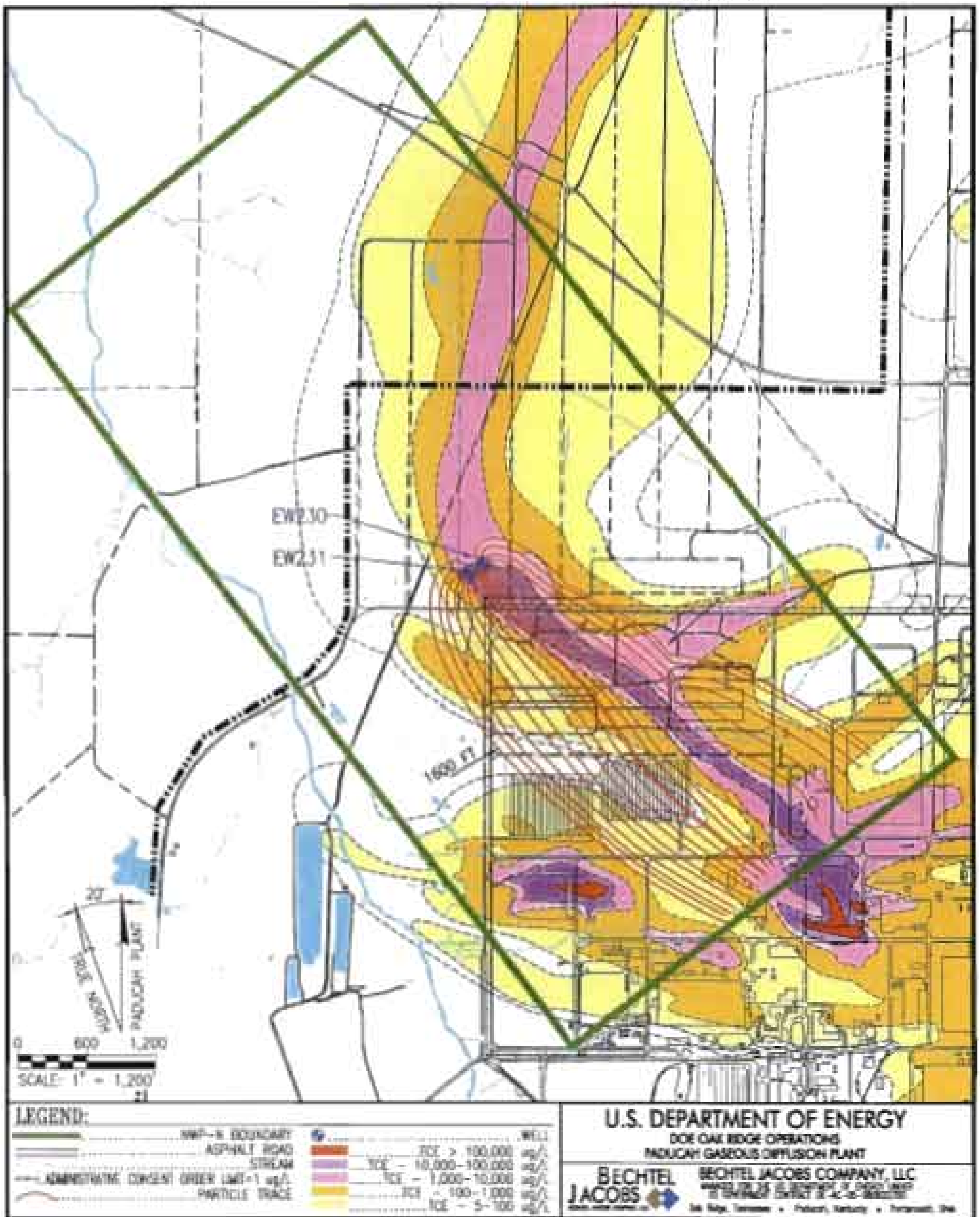

Figure 19. Capture Zone of NWP-S Containment System Under Maximum Steady Condition

Figure No. /99049/DWGS/RBONWP19

DATE ________

- simplification of screen lengths of the extraction wells:
  - assumed these wells are to fully penetrate the RGA.

3.4 CONCLUSIONS

This study leads to the following conclusions:

- the NEP system contains the core of its plume,
- the NWP-N system does not completely contain the core of its plume,
- the NWP-S system does not completely contain the core of its plume,
- simplification of extraction rates over time for the extraction systems appears workable:
  - the capture zones under the transient, average, and maximum condition are comparable
- the NEP and NWP-S systems are close to the south boundary:
  - their capture zones may be impacted by the boundary.

3.5 RECOMMENDATIONS

In the future, the study may be advanced considering the following recommendations:

- Sensitivity analysis and/or stochastic analysis.
  - For example, the capture zones are expected to be strongly sensitive to hydraulic conductivity and thickness of the RGA. Therefore, the sensitivity of the capture zones to these properties of the RGA may be studied. The result of the study may be used to rank the significance of different regions in influencing the capture zones and, hence, towards improving the efficiency of resource allocation and system management. In addition, the study is expected to improve water budget analysis.
- Assimilate site data collected subsequent to development of the site-wide model, upgrade the model, and repeat the study. The study may improve the accuracy of the model in predicting the response of the system to a stress. It is expected to improve flow and transport models as predictive tools for evaluating the remedial alternatives related to source area and fence line actions. It may improve the understanding of the capture zones and the containment systems and, hence, contribute towards improving the management efficiency. In addition, an improved flow model may be considered a prime entry for the GMS web site, and the study is expected to help address the consideration.
- Re-configure the containment systems to improve performance for a given constraint.
  - For example, re-configuration of a well system to maximize its capture zone, given a total pumpage limited by the capacity of the treatment system, may be attempted (see Figs. 17 through 19). The re-configuration may help optimize the containment systems. It may assess the potential of a given pumpage in containing all the plumes, including the southwest plume. It may

help to attain multiple objectives such as: (1) reducing the pumping rate and improving containment, (2) assessing the benefits of alternative methods like re-injection, (3) assessing the potential for eliminating the need for routine sampling and analysis of some of the monitoring wells, and (4) improving the basis for the early technetium-99 warning system for NEP. Therefore, the re-configuration is expected to reduce the cost of operation and maintenance by improving the efficiency of resource allocation.

- The impact of assuming the extraction wells fully penetrate the RGA may be studied.
  - For example, the models may simulate the impact of well plugging on the extent of the well field capture zones. The simulation may help assess the efficiency of the containment system and, hence, provide decision support towards improving the efficiency.

4. REFERENCES

DOE (U.S. Department of Energy) 1994. *Feasibility Study for Solid Waste Management Units 2 and 3 of Waste Area Group 22 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/06-1246&D1, U.S. Department of Energy, Paducah, KY, October.

DOE 1996. *Feasibility Study for Waste Area Groups 1 and 7 and Kentucky Ordnance Works Solid Waste Management Units 94, 95, and 157 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/06-1416&D2, U.S. Department of Energy, Paducah, KY, August.

DOE 1997a. *Groundwater Flow Model Recalibration and Evaluation of the Northwest Plume Interim Remedial Action Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, JE/PAD/97-0185, U. S. Department of Energy, Paducah, KY, July.

DOE 1997b. *Groundwater Flow Model Recalibration and Interim Remedial Action Evaluation of the Northeast Plume at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, JE/PAD/97-0238, U. S. Department of Energy, Paducah, KY, September.

DOE 1998. *Groundwater Flow Model Recalibration and Transport Model Construction at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/07-1742&D0, U. S. Department of Energy, Paducah, KY, June.

DOE 1999. *Transport Modeling Results for the Northeast Plume Interim Remedial Action and the Northwest Plume at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/07-1803&D1, U.S. Department of Energy, Paducah, KY.

Duffield, G. M. 1996. MODFLOWT: A Modular Three-Dimensional Groundwater Flow and Transport Model, HydroSOLVE, Inc., and GeoTrans, Inc., Sterling, VA.

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Comment Response Summary

for the

Five-Year Review for Remedial Actions at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

(DOE/OR/07-2067&D1 issued July 2003)

Prepared for
U.S. Department of Energy
Office of Environmental Management

COMMENT RESPONSE SUMMARY
for the
Five-Year Review for Remedial Actions at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky
(DOE/OR/07-2067&D1 issued July 2003)

Comment Number	Sect. Page/Para.	Reviewer and Comment	Response
1.	General	Kentucky Division of Waste Management (KDWM):	
		"The Division of Waste Management (Division) has completed its review of the above referenced Five-Year Review dated July 2003. One item conspicuously missing from this review but present in prior reviews is a discussion of the Water Policy. This should be included in a revised version of the document to be submitted to the Division in a timely manner. With the exception of this oversight, the document appears to adequately address all actions that currently require CERCLA five-year reviews.	Agree. A thorough review of the Water Policy removal action has been conducted, and the documentation has been added to the D2 Five-Year Review report.
		The document raises several issues that require some form of resolution. In order to better clarify these issues and how they might be resolved DOE should provide the Division with a written response describing; 1) how it intends to insure that the C-746-K Landfill cap is protected from unauthorized vehicular traffic; and 2) whether problems (extraction well bypass) associated with the NW-Plume Containment System will be addressed in the future, and if so, how."	Agree. The DOE will attempt to determine the best option to address these two issues and coordinate plans for resolution with the KDWM and EPA. The following text has been added to Chapter 9 of the D2 report: "The DOE's M&I contractor has a program for tracking and resolving issues that arise from facility inspections (BJC 2003d). The issues identified in Table 9.1 will be entered into the tracking system for this program and addressed in a timely manner. The DOE will interface with the EPA and Commonwealth of Kentucky as necessary to implement these recommendations."

COMMENT RESPONSE SUMMARY for the *Five-Year Review for Remedial Actions at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE/OR/07-2067&D1 issued July 2003)			
Comment Number	**Sect. Page/Para.**	**Reviewer and Comment**	**Response**
2.	General	U.S. Environmental Protection Agency (EPA)/C. Froede: "The preparation and submission of all CERCLA documentation should follow EPA guidance. This allows a consistency between documents nationally covering similar topics whether they are caused by a federal facility or industry. EPA encourages the DOE to review the Five-Year Review guidance to ensure consistency in the revised document. The guidance document can be found on the internet at the following address: http://www.epa.gov/superfund/resources/5year/index.htm."	Agree. The current review was conducted and the report was prepared using the referenced guidance.
3.	Title Page	EPA/C. Froede: "According to EPA Five-Year Review guidance (OSWER No. 9355.7-03B-P, dated June 2001), the Five-Year Review should, as part of the general format, contain a title page with signature and date. Although the Five-Year Review document for the PGDP does contain a title page with date, this page does not include the required signature. This document should be revised to include the signature of the properly identified Department of Energy (DOE) official on the title page."	Agree. A DOE signature has been added to the title page.

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Comment Number	Sect. Page/Para.	Reviewer and Comment	Response
4.	Sect. 1; Page 1	EPA/C. Froede: "In following the EPA Five-Year Review guidance provided in OSWER No. 9355.7-03B-P (June 2001), the Introduction section of the Five-Year Review Reports should include the following information: a. When the five-year review was conducted, b. Identification of all organizations that provided analyses in support of the review, c. The number, description, and status of all operable units at the site, d. Definition of which areas of the site are covered in the five-year review, e. Summary of the status of site areas/units that are no covered in the present five-year review. The Five-Year Review document submitted by DOE for the PGDP does not adequately address the required information listed above. Section 1 of this document should be revised to include all of the required information identified within this comment in order to be consistent with the guidance designed to standardize Five-Year Reviews nationally."	Agree. The suggested information has been added to the report in summary form. (The description and status of units that are not included in this review are beyond the scope of this project and sufficiently documented elsewhere.)

COMMENT RESPONSE SUMMARY
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Comment Number	Sect. Page/Para.	Reviewer and Comment	Response
5.	Sect. 5; Page 26	EPA/C. Froede: "According to the EPA Five-Year Review guidance document, the section titled 'Progress Since Last Five-Year Review' should include the following information: a. Protectiveness statements from last review, b. Status of recommendations and follow-up actions from last review, and c. Status of any other issues. The Five Year Review document submitted by DOE for the PGDP does not adequately address the required information listed above. Section 5 of this document should be revised to include all of the required information."	Agree. The suggested information has been added to the current report.
6.	Sect. 5.3; Page 27; Sent. 2	EPA/C. Froede: "This sentence states that 'The April verification, resampling, and analysis …confirmed that the average level of TCE had been reduced to far below the ROD RAO.' Please provide a detailed and complete explanation as to why verification, resampling, and analysis of the SWMU 91 remedial action sampling was conducted. This explanation should address the reason(s) for this activity and the impact of the apparent data uncertainty on the SWMU 91 technical assessment of remedy function."	Agree. Additional details have been added to the referenced description.

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Comment Number	Sect. Page/Para.	Reviewer and Comment	Response
7.	Sect. 6; Page 29	EPA/C. Froede: "According to EPA Five-Year Review guidance, the Five-Year Review Process section of Five-Year Review Reports should include the following information: a. Identification of five-year review team members, b. Outline of components <u>and schedule</u> of the five-year review, c. Confirmation of community notification both prior to initiation of the review and upon completion of the review, d. Details regarding site inspection(s) conducted for the review including inspection participants; inspection scope and procedures; and inspection results and conclusions, and e. Summaries of interview conducted as part of the review. The Five-Year Review document submitted by DOE for the PGDP does not adequately address the required information listed above. Section 6 of this document should be revised to include all of the required information identified within this comment."	Agree. Although much of the referenced information is included elsewhere in the report, it has been added to Section 6 for clarification.

COMMENT RESPONSE SUMMARY for the *Five-Year Review for Remedial Actions at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE/OR/07-2067&D1 issued July 2003)			
Comment Number	**Sect. Page/Para.**	**Reviewer and Comment**	**Response**
8.	Sect. 6.6; Page 30	EPA/C. Froede: "It is stated in this section that 'issues noted during site inspections were discussed with personnel associated with the individual remedial actions.' However, the Five-Year Review Site Inspection Checklists presented in Appendix A are for the most part incomplete and contain no information in the overall observations (Section XI) portion of the checklists. Furthermore, the interview records presented in Appendix A do not contain any information indication that 'issues' were ever discussed with interviewed personnel. Based on the absence of written documentation, please provide clarification as to how 'issues' were discussed with personnel associated with the individual remedial actions."	Agree. Clarification has been added to the referenced section. (As indicated in the text, the issues were presented to the appropriate site personnel and discussed with them.)
9.	Sect. 7; Page 31; Para. 3	EPA/C. Froede: "This paragraph discusses issues related to data generated at the C-743-T17 Field Laboratory. It is specifically noted that a draft evaluation report addressing the quality issues reviewed was issued on June 20, 2003. However, no details regarding the issues addressed in this draft evaluation report are provided in this document. Since this issue is directly related to units covered under the current Five-Year Review for the PGDP, results of the data quality evaluation should be summarized in the Five-Year Review document."	Agree. Clarification has been added to the referenced section.

Comment Number	Sect. Page/Para.	Reviewer and Comment	Response
10.	Sect. 7.1.1; Page 39; Para. 7	EPA/C. Froede: "Within this paragraph, it is noted that the high concentration core of the Northwest Plume moved eastward beginning in 1998. Movement of a groundwater contamination plume perpendicular to the overall groundwater flow direction within an aquifer over a time span of less that a year is quite unusual. Please provide a detailed and complete explanation as to what hydrogeologic conditions have changed north of the PGDP in the RGA to cause the sudden eastward migration of the Northwest Plume. As part of this explanation, include plots of TCE and ^{99}Tc concentrations detected in groundwater samples collected from all monitoring wells in the Northwest Plume area for all sampling events conducted since the discovery of the Northwest Plume."	Agree. Clarification has been added to the referenced section.
11.	Sect. 7.3.3; Page 55; Para. 1	EPA/C. Froede: "This paragraph discussed the fact that the subcontractor in charge of the remedial action at SWMU 91 has conducted a re-verification of the final sampling. However, no details regarding the reason for the re-verification of the final sampling are provided in the document. Provide a detailed and complete explanation regarding the circumstances that resulted in the need to re-verify final sampling conducted at SWMU-91. This explanation should address the reason(s) for the re-verification, the manner in which the re-verification was conducted, and the results of the re-verification compared to the original verification results."	Agree. Clarification has been added to the referenced section.

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Comment Number	Sect. Page/Para.	Reviewer and Comment	Response
12.	Sect. 9; Page 69	EPA/C. Froede: "According to the EPA Five-Year Review guidance, the section titled 'Recommendations and Follow-up Actions' should include the following information: a. Identification of parties responsible for actions, b. Identification of agency with oversight authority, and c. Schedule for completion of actions related to resolution of issues. The Five-Year Review document submitted by DOE for the PGDP does not adequately address the required information listed above. Section 9 of this document should be revised to include all of the required information identified within this comment."	Agree. The suggested information has been added to the report.
13.	Sect. 10; Page 69; Para. 2	EPA/C. Froede: "This paragraph notes that because the remedial action at SWMU 91 is protective of human health and the environment. However, the results of the re-verification of the final sampling at this unit have yet to be reported. Based on this issue, the actual performance of the remedial action conducted at SWMU 91 appears to be in question at this time. Therefore, the protectiveness statement for SWMU 91 in Section 10 should be revised to account for the data usability issues associated with this unit."	Agree. However, the final results are now available and indicate that the action is protective.

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Comment Number	Sect. Page/Para.	Reviewer and Comment	Response
14.	Appendix A; Pages A-15 through A-98	EPA/C. Froede: "The Five-Year Review Site Inspection Checklists presented in this appendix are all incomplete. All information required in the checklist template must be inserted, or must be indicated as not applicable. All of the inspection checklist should be re-examined and filled out completely with all required information."	Agree. The checklists have been completed.