SECOND FIVE-YEAR REVIEW

MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Prepared For:
Battery Properties, Inc.

Prepared by:
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TABLE OF CONTENTS

Page

TABLE OF CONTENTS

Page

LIST OF FIGURES
(Following Text)

<u>LIST OF TABLES</u>
(Following Text)

LIST OF TABLES
(Following Text)

LIST OF APPENDICES

EPA FIVE-YEAR REVIEW SIGNATURE COVER

Preliminary Information:

Site Name: Mallory Capacitor Company Site	**EPA ID:** TND 07-545-3688
Region: 04 **State:** Tennessee	**City/County:** Waynesboro/Wayne County
LTRA: Yes	**Construction Completion Date:** November 30, 1993
Who conducted the review? (EPA Region, State, Federal Agency, Contractor) EPA Region 4, EPA's Contractor (North Wind Environmental Inc.), and PRP's Consultant (Conestoga-Rovers & Associates)	
Dates Review Conducted: 11/02 – 03/03	**Date of Site Visit:** November 7, 2002
Whether first or successive review: Second Review	
Type of Review: Statutory	**Due Date:** July 1, 2003
Trigger for this review: Last review signed July 1, 1998	
Recycling, reuse, redevelopment site: None	

Deficiencies:
None noted.

Recommendations:
Recommendations are listed in Section 10 of this report.

Protectiveness Statement:
The remedy at the Mallory Capacitor Company Site continues to protect human health and the environment. The groundwater extraction and treatment system continues to remain functional and well maintained. The system continues to provide effective source control and functions as an effective contaminant mass removal system. Contaminant mass removal continues to increase over time.

Other Comments:
None.

Signature of EPA Regional Administrator or Division Director, and Date:

Winston A. Smith

Winston A. Smith, Director
Waste Management Division
U.S. EPA, Region 4

July 1, 2003
Date

LIST OF ACRONYMS

1,2-DCE	1,2-Dichloroethene
ARAR	Applicable or Relevant and Appropriate Requirements
BPI	Battery Properties, Inc.
C&A	Crawford and Associates, Inc.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CRA	Conestoga-Rovers & Associates
CWM/ENRAC	Chemical Waste Management, Inc./ENRAC
DNAPL	Dense Non-Aqueous Phase Liquid
Duracell	Duracell International, Inc.
GAC	Granular Activated Carbon
GPM	Gallons Per Minute
Holley	Holley Electric Company
HRS	Hazard Ranking System
LCS/LCSD	Laboratory Control Sample/Laboratory Control Sample Duplicate
MCL	Maximum Contaminant Level
MNA	Monitored Natural Attenuation
NCP	National Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OMMP	Operations, Maintenance, and Monitoring Plan
OU	Operable Unit
PCB	Polychlorinated Biphenyl
PHE	Public Health Evaluation
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RA	Remedial Action
RAO	Remedial Action Objective
RD/RA	Remedial Design/Remedial Action
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPD	Relative Percent Differences
RPM	Remedial Project Manager

LIST OF ACRONYMS

SDWA	Safe Drinking Water Act
SPHEM	Superfund Public Health Evaluation
TCE	Trichloroethene
TBCs	To Be Considereds
TDHE	Tennessee Department of Health and Environment
TDSF	Tennessee Division of Superfund
UAO	Unilateral Administrative Order
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

The remedy chosen for the Mallory Capacitor Company Site (Site) in Waynesboro, Tennessee, included hydraulic containment of Site-related contaminated groundwater and on-Site contaminant mass removal utilizing groundwater extraction wells; treatment of the extracted groundwater by air stripping, bag filtration, and carbon adsorption; and discharge of treated groundwater to the Green River surface waters east of the Site. The trigger for this Five-Year Review was approval of the first Five-Year Review, which occurred on July 1, 1998.

The assessment of this Five-Year Review found that the remedy was constructed in accordance with the requirements of the Record of Decision (ROD). The remedy is functioning as designed.

The remedy at the Mallory Capacitor Company Site continues to protect human health and the environment. The groundwater extraction and treatment system continues to remain functional and well maintained. The system continues to provide effective source control and functions as an effective contaminant mass removal system. Contaminant mass removal continues to increase over time.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name *(from WasteLAN)*: Mallory Capacitor Company Site		
EPA ID *(from WasteLAN)*: TND 07-545-3688		
Region: IV	**State:** TN	**City/County:** Waynesboro / Wayne
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:** November 30, 1993	
Has site been put into reuse? ☐ YES ☒ NO		
REVIEW STATUS		
Lead Agency: ☒ EPA ☐ State ☐ Tribe ☐ Other Federal Agency		
Author Name: David Hill / Steve Harris		
Author Title: Project Manager / Project Hydrogeologist	**Author Affiliation:** Conestoga-Rovers & Associates (consultant to Battery Properties, Inc.)	
Review Period:** July 1998 – July 2003		
Date(s) of Site Inspection: November 7, 2002		
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)		
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)*: July 1, 1998		
Due Date *(five years after triggering action date)*: July 1, 2003		

Notes:
* ["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

Issues: Based on groundwater elevations measured at the overburden / bedrock interface monitoring well OW70-01 located on the west bank of the Green River northeast of the Site, which are greater than the surface water elevation measured in the Green River, the discharge of groundwater within the weathered and fractured upper bedrock may occur to the Green River. The groundwater samples collected from OW70-01 indicate that groundwater in the overburden / bedrock interface is impacted with low levels of polychlorinated biphenyls (PCBs), trichloroethene (TCE), and 1,2-dichloroethene (1,2-DCE), however the surface water samples collected from the Green River indicate no impact to surface water.
Recommendations and Follow-Up Actions: Based on the findings of this Five-Year Review, the following recommendations are made: • Continue to operate the groundwater extraction and treatment systems at the Site as a source control and mass removal mechanism; • Install a new off-Site shallow / deep / deeper bedrock monitoring well nest approximately mid-way between existing shallow bedrock wells OW58-90 and OW59-90 to assess mid-plume conditions; • Prepare and implement a monitored natural attenuation (MNA) remedy evaluation to address the off-Site groundwater plume. Following this evaluation, the feasibility of potentially adding nutrients and / or substrates to enhance the biodegradation already occurring on Site would be addressed; • Assess the applicability of incorporating the existing shallow bedrock monitoring wells OW47-89 or OW50-89, OW45-89, and OW23-86; deep bedrock monitoring wells OW42-89 or OW34-89, OW40-89, OW26-89, and OW52-89; and deeper bedrock monitoring well OW24-89 into the groundwater quality monitoring network. This assessment would be conducted concurrent with the MNA remedy evaluation. Following this assessment, for those additional wells where it is deemed suitable, one-time sampling is recommended during the next annual monitoring event followed by an evaluation of whether inclusion in the monitoring network is warranted; and • Assess the frequency that high water table conditions occur, and evaluate the significance that this situation may result in Site-related impacted shallow groundwater discharge to the Green River.
Protectiveness Statement: The remedy at the Mallory Capacitor Company Site continues to protect human health and the environment. The groundwater extraction and treatment system continues to remain functional and well maintained. The system continues to provide effective source control and functions as an effective contaminant mass removal system. Contaminant mass removal continues to increase over time.
Other Comments: None.

1.0 INTRODUCTION

The purpose of a Five-Year Review is to determine whether the remedy at a site is protective of human health and the environment. 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 reviews, if any, and identify recommendations to address them.

This Five-Year Review report was prepared pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §121 and the National Contingency Plan (NCP). CERCLA §121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgement of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The Agency interpreted this requirement further in the NCP; 40 CFR §300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

The United States Environmental Protection Agency (USEPA), Region IV, and technical experts from Conestoga-Rovers & Associates (CRA) on behalf of Battery Properties, Inc. (BPI), conducted a Five-Year Review of the remedial actions implemented at the Mallory Capacitor Company Site (Site) in Waynesboro, Tennessee. This review was conducted from November 2002 through March 2003. This report documents the results of the review.

This is the second Five-Year Review for the Site. The triggering action for this statutory review is approval of the first Five-Year Review, which occurred on July 1, 1998. The Five-Year Review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure.

2.0 SITE CHRONOLOGY

A chronology of significant Site events and dates is presented below.

Event	***Date***
• Polychlorinated biphenyls (PCBs) used as dielectric fluid and trichloroethene (TCE) used as a degreaser at the Site	1969-1978
• Remedial Actions taken to remove PCB-contaminated process equipment material, a waste liquids underground storage tank (UST), and PCB-contaminated soils adjacent to the UST	1976-1980
• Plant closure on July 27, 1984 • Preliminary Assessment of Site on August 1, 1984	1984
• Investigative programs conducted by CRA and others to identify the nature and extent of chemical presence at the Site • In 1985, the Tennessee Department of Health and Environment (TDHE) conducted an investigation and Hazard Ranking System (HRS) evaluation of the Site • The HRS score exceeded the threshold value for inclusion of the Site onto the National Priorities List (NPL) • In 1987, inclusion of the Site onto the NPL proposed	1984 to 1988
• Remedial actions were conducted by CRA on behalf of BPI to remove all equipment, stock, plant and ancillary buildings (except the warehouse), and impacted soils • February 18, 1988, Administrative Order on Consent becomes effective, allowing a Remedial Investigation/Feasibility Study (RI/FS) of the Site • Final listing on USEPA NPL, October 4, 1989	1988 to 1989
• CRA conducted additional Site investigations from February 1989 to June 1990 on behalf of BPI and submitted the RI/FS in January 1991 • In March 1990, the Site ranked 944 out of the 989 sites listed on the NPL • The RI/FS identified groundwater impacted by PCBs, TCE, and 1,2-dichloroethene (1,2-DCE) in the fractured bedrock beneath the Site (all other media were remediated prior to the RI/FS) • The RI/FS included a human health risk assessment, which concluded that risks above acceptable levels existed only for a potential hypothetical potable water well in the most contaminated groundwater areas in the immediate vicinity of the Site. • CRA submitted the Final Feasibility Study Report (Final FS) in May 1991 on behalf of BPI • Record of Decision (ROD) signed on August 29, 1991	1990 to 1991

Event	*Date*
• USEPA issued an Unilateral Administrative Order (UAO) for the Site on March 4, 1992 • In the ROD for the Site, USEPA selected the two phased approach to implementing the combined 2b/4b groundwater remediation alternative	1992
• CRA submitted the Phase I Design Report-Final (Phase I DR) in June 1993 for the Phase I Remedial Action (Phase I RA) • USEPA approved the Phase I RA in July 1993 • Construction of the Phase I RA occurred from August 16, 1993, to November 30, 1993, and included the installation of five on-Site groundwater extraction wells and a groundwater treatment system • The Phase I RA startup occurred on November 30, 1993	1993
• The Phase I RA was operated for a 1-year data collection period as specified in the Phase I RA Work Plan submitted in March 1993 • Hydraulic data collected throughout the Phase I RA indicated that the groundwater extraction system provided hydraulic containment of the majority of the off-Site impacted groundwater	1994
• CRA submitted the Technical Evaluation, Phase I RA, Groundwater Extraction and Treatment Systems Report (Phase I RA Technical Evaluation) in February 1995 • Based on the findings of the Phase I RA Technical Evaluation, a Phase II RA was proposed consisting of maximizing the on-Site extraction well pumping rates, deepening extraction well EW-2, and increasing the groundwater treatment system capacity to 120 gallons per minute (GPM) • The operation of the Phase II RA was proposed for a 6-month evaluation period • The recommended modifications for the Phase II RA occurred from October 9, 1995, to December 6, 1995 • Startup of the Phase II RA occurred on December 7, 1995	1995
• CRA submitted the Final Construction Report, Phase II Groundwater Extraction and Treatment Systems in February 1996 • The Phase II RA was operated until June 1996 in accordance with the revised Operations, Maintenance, and Monitoring Plan, Phase II RA (OMMP) submitted by CRA in May 1996 • In August 1996, CRA submitted the Technical Evaluation, Phase II RA, Groundwater Extraction and Treatment Systems (Phase II RA Technical Evaluation)	1996

Event	*Date*
• Hydraulic containment of the impacted groundwater beneath the Site in the shallow and deep bedrock was achieved by the Phase II RA • The Phase II RA Technical Evaluation also identified downward hydraulic head differentials from the deep to the deeper bedrock, resulting in the increase of Site-related chemistry in the deeper bedrock • The Phase II RA Technical Evaluation recommended modifications to the Phase II RA, which consisted of sealing the lower portions of the extraction wells to prevent downward hydraulic head differentials from the deep to the deeper bedrock, referred to as the Phase II RA Modifications • USEPA approved the proposed Phase II RA Modifications on August 16, 1996 • The Phase II RA Modifications were initiated on September 4, 1996	1996 (cont'd)
• The Phase II RA Modifications were completed on September 4, 1997 • CRA submitted the initial Technical Evaluation, Phase II RA Modifications, Groundwater Extraction and Treatment Systems (Phase II RA Modifications Technical Evaluation) in September 1997 • USEPA issued comments regarding the Phase II RA Modifications Technical Evaluation on December 2, 1997	1997
• In January 1998, the Tennessee Division of Superfund (TDSF) issued comments regarding the Phase II RA Modifications Technical Evaluation • In response to USEPA's and TDSF's comments, CRA on behalf of BPI submitted the Final Technical Evaluation, Phase II RA Modifications, Groundwater Extraction and Treatment Systems (Final Phase II RA Modifications Technical Evaluation) in March 1998 • A karst hydrogeologic assessment to be conducted by Crawford and Associates, Inc. (C&A) was proposed for the Site • Contingent on the findings of the karst hydrogeologic assessment, CRA proposed the installation of additional off-Site monitoring wells to better define the off-Site extent of contamination and the off-Site extent of hydraulic containment • Approval to proceed with the karst hydrogeologic assessment was provided by USEPA and TDSF on March 3, 1998 and March 6, 1998, respectively • On May 1, 1998, CRA submitted to USEPA the Phase I Karst Groundwater Investigation of the Mallory Capacitor Site (Phase I Karst Investigation) prepared by C&A	1998

Event	***Date***
• Sufficient karst features were identified at the Site and surrounding area to proceed with a dye tracer study which was proposed on May 11, 1998 and approved by USEPA and TDSF • In June 1998, USEPA Region IV prepared the first Five-Year Review (approved on July 1, 1998) • On October 23, 1998, CRA submitted the Dye Tracer Study of the Mallory Capacitor Site (Dye Tracer Study) prepared by C&A • The Dye Tracer Study concluded that karst features did not significantly influence groundwater flow at the Site	1998 (cont'd)
• In February 1999, CRA on behalf of BPI submitted the Technical Evaluation, Continued Phase II RA Operations, Groundwater Extraction and Treatment Systems (Continued Phase II RA Operations Technical Evaluation) • CRA proposed the installation of additional off-Site monitoring wells to better define the extent of contamination and the extent of hydraulic containment	1999
• CRA completed modifications to the treatment system to connect extraction wells EW-3 and EW-4 to the PCB treatment stream in September 2000	2000
• On February 13, 2001, a Site meeting was held between USEPA, TDSF, and CRA • As requested by USEPA, CRA proposed the installation of additional off-Site monitoring wells to the north of the Site in correspondence dated February 22, 2001 • From September 7, 2001 until October 1, 2001, six additional monitoring wells were installed at the Site (OW68-01, OW69-01, OW70-01, OW71-01, OW72-01, and OW73-01)	2001
• The Five-Year Review Site inspection was conducted on November 7, 2002 • On behalf of USEPA, North Wind Environmental Inc. (North Wind) prepared the report entitled, "Comments and Recommendations Regarding the Performance of Groundwater Remediation Activities at the Mallory Capacitor Site, Waynesboro, Tennessee" (North Wind Comments & Recommendations) dated November 14, 2002.	2002

3.0 BACKGROUND

3.1 PHYSICAL CHARACTERISTICS

The Site is located on Belew Circle, Waynesboro, Wayne County, Tennessee, on the western bank of the Green River. The Site encompasses 8.6 acres and is located in a residential/commercial/industrial/business area in the eastern section of Waynesboro. The estimated population of Waynesboro, based upon the 2000 census is 2,228 persons and that of Wayne County is 16,845 persons (United States Census Bureau, March 2003). The Site location is presented on Figure 3.1. A Site plan is presented on Figure 3.2.

There are no wetlands, endangered species, or critical habitats that are impacted by the Site, and there are also no historical landmarks or agricultural lands that have been or are being impacted by the Site (USEPA, June 1998).

3.2 LAND AND RESOURCE USE

The Site originally was developed in the late 1940s as a manufacturing facility for the footwear industry. In 1968, P.R. Mallory acquired the Site. Commencing in 1969, the Site was used in the manufacture of electrical capacitors, which continued until the manufacturing facility ceased operations on July 27, 1984.

The Site is currently located in a residential/commercial/industrial/business area in the eastern section of Waynesboro. The land to the north of the Site is zoned R-C, Multiple Residential/Commercial District. R-C zoning is designed to provide adequate suitable space for office and commercial uses mutually compatible with higher density residential areas. To the west and south of the Site, the land is primarily zoned R-2, Residential, Medium/High Density. R-2 zoning is designed to accommodate relatively large numbers of dwelling units close to public schools and other community facilities. The exception to the R-2 zoning is a lot situated adjacent to the west boundary of the northern section of the Site, which is zoned C-1, Central Business District and permits a wide range of services.

Following the 1988/1989 remedial actions, all areas of the Site became freely accessible to the public with the exception of the secured warehouse. It has been reported that the local residents occasionally use the portion of the Site between Cole Street and the Green River for picnics. The Green River itself, although too shallow for recreational activities such as boating or swimming, has reportedly supported occasional recreational fishing by local residents.

Residential properties in the immediate vicinity of the Site are serviced by municipally owned potable water and sanitary sewer services (CRA, January 1991). Within an approximate 1-mile radius of the Site, 54 private water sources have been identified, consisting of 27 drilled wells, 19 dug wells, and 8 springs (USEPA, June 1998). The groundwater flow is considered to be directed from south to north, and as a result, it is likely that only the water wells located north from (i.e., downgradient) the Site may potentially be exposed to impacted groundwater from the Site. A private water well survey was conducted in the Site vicinity at the time of the RI/FS. This water well survey identified one private well (DW18) and two springs (S2 and S3) located downgradient from the Site. The well and springs reportedly were utilized for drinking water sources. The two springs are located closest to the Site and were sampled in 1987 by CRA, and no Site related impact was detected at that time. In October 2001, a second private water well survey was conducted to identify whether additional private water wells are present downgradient from the Site. The findings from the second private water well survey are summarized on Figure 3.3 and in Table 3.1. The survey identified three private wells (18108023, 18108024, and 18109037) located downgradient from the Site (CRA, January 2002a). In November 2002, CRA contacted the property owners of the identified downgradient private wells and springs. Well 181008024 has been abandoned. Wells DW18, 18108023, and 18109037, and spring S2 are not in use. Spring S3 is used only for irrigation of a small garden.

3.3 HISTORY OF CONTAMINATION

Figure 3.4 presents the layout of the former Site manufacturing building (Plant). In the manufacturing process conducted within the Plant for specific types of electrical capacitors (wet capacitors), the capacitors were impregnated with a dielectric fluid. To impregnate the capacitors, unprocessed capacitors were placed in impregnation chambers where a vacuum was then created. Under vacuum conditions in the chambers, and hence in the capacitors, air and moisture contained within the capacitors were removed and the chambers were allowed to fill with the dielectric fluid. When the vacuum seals on the chambers were released, the dielectric fluid was drawn into the capacitors resulting in impregnated capacitors. After impregnation, the unused dielectric fluid was drained from the impregnation chambers, treated to remove impurities and then recycled for reuse in the impregnation process. After removal of the impregnated capacitors from the impregnation chambers, the capacitors were sent through a degreasing process to remove dielectric fluid adhering to the outside of the capacitors.

During removal of the fluid-filled capacitors from the impregnation chambers, some dielectric fluid typically dripped or spilled off the capacitors and from the chambers onto the floor. The spilled dielectric fluid was collected by troughs in the floor and transferred to an underground holding tank, adjacent to the south wall of the Plant, as waste fluid.

Prior to the USEPA ban on the use of PCBs, which became effective on April 18, 1978, dielectric fluids used in the wet capacitor manufacturing process at the Site contained PCBs. Degreasing operations at the Site are known to have used TCE. It is not known whether other degreasers were used.

The manufacturing facility ceased operations in July 1984, and remained abandoned with little maintenance effort until the Plant was removed during the 1988/1989 remedial actions implemented at the Site by Duracell International, Inc. (Duracell) (CRA, January 1991).

3.4 INITIAL RESPONSE

Plant personnel completed two cleanup programs at the Plant, the first during 1976 and 1977 and the second in 1978 and 1979. The cleanup programs included the following:

- disposal of still bottoms containing PCBs;
- drainage of vacuum pumps;
- disposal of pump oils containing PCBs; and
- implementation of a pilot program for cleaning Plant equipment.

In 1979, Duracell retained Holley Electric Company (Holley) to perform remedial measures at the Site associated with a below-grade storage room and an underground tank. Records indicated that the storage room, located adjacent to the boiler room, originally was constructed for coal storage when coal was used to fuel the Plant boilers. The underground tank, located adjacent to the south wall of the Plant, was used for storing waste fluids from the capacitor impregnation process.

During the period of September 1979 to November 1979, Holley filled and removed 80 drums of liquids and sludges from the below-grade storage room at the Site. Upon removal of the materials, the storage room was backfilled with cherty-clay to within one foot of the ceiling and then capped with a concrete slab. Holley also removed all stored

PCBs, PCB-contaminated liquids, and PCB solid wastes from the Site and disposed of the PCB wastes in accordance with State and Federal regulations.

During the same Site remediation program, Holley excavated a 4,000-gallon underground storage tank that was located exterior to and adjacent to the south wall of the Plant. The tank, used to store waste fluids from the capacitor manufacturing process, was discovered to have been leaking. Therefore, excavation of contaminated soils adjacent to the tank also was performed. Due to concern for the structural integrity of the Plant, a request was made to USEPA on January 22, 1980, to approve termination of excavation activities and to allow the excavation created by removal of the underground tank and adjacent soils to be backfilled. USEPA authorized backfilling of the excavation, provided that the excavation be lined with an impermeable material prior to backfilling and that the entire backfilled area then be capped with concrete. In addition, USEPA required that the groundwater at the Site be sampled to determine if groundwater contamination had occurred. The area subsequently was lined, backfilled, and capped with concrete.

To comply with USEPA's requirement to determine if groundwater contamination had occurred, Duracell retained Aware, Inc., to install a monitoring well. USEPA approved the proposed monitoring well installation procedures and location prior to the installation of the monitoring well in November 1980. The well was located adjacent to the northeast corner of the warehouse and completed at a depth of 68.5 feet below surface grade. The monitoring well was sampled by Stewart Laboratories, Inc. in November 1980, and the resulting analytical data for all six groundwater samples collected from the monitoring well did not identify the presence of PCBs at a detection limit of 0.1 micrograms per liter (µg/L). The analytical data were submitted to USEPA in December 1980 and it was concluded, based on the understanding of Site conditions at that time, that all corrective actions required as a result of the leaking underground PCB storage tank had been completed.

On July 24, 1985, approximately 1 year following closing of the Plant, an inspection of the Site was conducted by TDHE. The purpose of the Site inspection was to further categorize the nature of any releases and potential threats to public health and welfare and the environment, and to collect data as required to determine whether the Site should be included on the NPL.

On November 18, 1985, TDHE submitted a completed HRS package for the Site to USEPA Region IV. The aggregate HRS score derived for the Site by TDHE was 30.8, based upon a groundwater route score of 52.4 and a surface water route score of 9.7.

The air route, fire and explosion hazard, and direct contact hazard were not evaluated by TDHE.

The aggregate HRS score of 30.8 exceeded the threshold value of 28.5 for inclusion of the Site onto the NPL. The Site subsequently was proposed for inclusion onto the NPL on January 22, 1987 (52 F.R. 2492, 2498), and was included in the March 1990 NPL with one of the lowest rankings (944 of the 989 sites listed).

As a result of the proposed NPL listing of the Site in 1987, Duracell and USEPA entered into negotiations that culminated in a Consent Order dated February 18, 1988. The Consent Order allowed Duracell to conduct an RI/FS of the Site.

At a meeting with USEPA on April 5, 1988 to review the RI/FS Work Plan, it was agreed that several programs associated with remediation of the Site would be initiated in conjunction with the RI/FS process. The programs included the following:

- cleaning and disposition of equipment within the Plant, exclusive of equipment located within the impregnation room of the Plant;
- cleaning and disposition of stock within the Plant;
- demolition and removal of the impregnation room of the Plant, including annexed buildings and all equipment contained therein, and the Plant's air handling systems;
- excavation and disposal of soils contaminated with PCBs at concentrations of greater than 10 milligrams per kilogram (mg/kg); and
- cleaning of floor, wall, ceiling, and overhead surfaces within the remaining portions of the Plant.

Duracell retained CRA to manage the remedial programs.

To effect implementation of the disposition of equipment and stock, the following work plans were prepared by CRA and submitted to USEPA:

- "Equipment Disposition Work Plan - Mallory Capacitor Co. Site - Waynesboro, Tennessee", dated May 1988;
- "Stock Disposition Work Plan - Mallory Capacitor Co. Site - Waynesboro, Tennessee", dated June 1988; and
- "Equipment Decontamination and Disposition Detailed Work Plan - Mallory Capacitor Co. Site - Waynesboro, Tennessee", dated July 1988.

Following revisions and resubmittals to USEPA, all three work plans were approved by USEPA on September 9, 1988.

Duracell retained Sevenson Environmental Services to implement the equipment and stock disposition work plans, under the supervision of CRA. During the period of July 26 to September 10, 1988, all equipment and stock within the Plant were remediated in accordance with the approved work plans. Select items of equipment were cleaned for reuse at other facilities or for return to Emhart. All remaining equipment items and all stock were cleaned as scrap for recycle or as refuse for disposal in a sanitary landfill.

Details of the equipment and stock disposition activities were summarized in a report prepared by CRA entitled: "Summary Report - Equipment and Stock Disposition - Mallory Capacitor Co. Site - Waynesboro, Tennessee", dated September 1988. Following revisions and resubmittals to USEPA, the report was approved by USEPA on November 9, 1988, and concluded that all equipment and stock had been removed from the Site in accordance with the approved work plans.

To effect implementation of the partial Plant demolition and soil removal remedial actions, the following work plans were prepared by CRA and submitted to USEPA:

- "Impregnation Room and Adjacent Areas Removal and Dismantling Work Plan - Mallory Capacitor Co. Site - Waynesboro, Tennessee", dated August 1988; and
- "Interim Removal Action Work Plan - Mallory Capacitor Co. Site - Waynesboro, Tennessee", dated August 1988.

Following revisions and resubmittals to USEPA, both work plans were approved by USEPA on October 7, 1988.

Duracell retained Chemical Waste Management, Inc./ENRAC (CWM/ENRAC) to implement the partial Plant demolition and soil removal work plans, under the supervision of CRA. During the period of October 1988 to January 1989, the partial Plant demolition and soil removal remedial actions were completed in accordance with the approved work plans. The remedial actions resulted in the demolition and off-Site disposal of the wet capacitor manufacturing areas of the Plant and the excavation and removal of soils south of the Plant to the depth of bedrock. For seven of the final confirmatory soil samples collected from the sides of the excavations, the concentrations of PCBs were in the range of 12 to 270 mg/kg and exceeded the on-Site removal action criterion of 10 mg/kg. Five of the soil samples exceeding the removal action criterion were located in the vicinity of the former boiler and impregnation rooms of the Plant and two samples were located south of the southeast corner of the Plant. All samples were collected at a depth coincident with the zone of groundwater saturation found above the bedrock. Since the contamination at bedrock was below water present in the excavation and/or overlain by as much as 10 feet of clean soils, the contaminated soils were left in place as reported in a letter to USEPA from CRA dated December 28, 1988.

Coincident with the partial Plant demolition and soil removal remedial actions, the potential value and usage of the remaining portions of the Plant were evaluated. Based on the results of the evaluation, Duracell determined that the Plant, with the exception of the warehouse, should be dismantled and removed from the Site. Therefore, CRA prepared a work plan for the dismantling of the remaining portions of the Plant and the cleaning of the warehouse. Additional investigations within the Plant were undertaken, which identified that the majority of the Plant structural materials contained concentrations of PCBs of less than 50 mg/kg and that surfaces within the warehouse contained concentrations of PCBs of less than 10 micrograms per 100 square centimeters (10 µg/100 cm^2). However, as disposal of the Plant on Site or at a sanitary landfill became an issue, Duracell decided to dispose of the Plant off Site at a secure landfill as non-hazardous debris. Therefore, the work plan was superseded by a letter dated January 9, 1989, from CRA to USEPA, which concluded that the remaining portions of the Plant would be dismantled and disposed of off Site at a secure landfill, and that the warehouse would not require cleaning since all surface concentrations of PCBs were below the cleanup criterion of 10 µg/100 cm^2 for high contact surfaces approved by USEPA. The remaining portions of the Plant subsequently were dismantled and removed from the Site by CWM/ENRAC during the period of January 12 to February 3, 1989 under the supervision of CRA.

Following completion of the removal of the Plant from the Site and the removal of soils contaminated with PCBs at concentrations of greater than 10 mg/kg, the Site was restored by backfilling all excavations, placing topsoil, and seeding. Soils beneath the Plant satisfying the removal criterion of 10 mg/kg for PCBs were regraded and used as backfill. Excavation backfilling was completed with clean imported soils. Restoration activities were completed in April 1989.

Sampling and analyses of soils and sediments as required by the RI were completed in June 1989. The resulting analytical data identified the presence of PCBs at concentrations in excess of 10 mg/kg at one isolated location in the grass area between Cole Street and the Green River, and in the sediments in one sanitary sewer manhole located on Site. Duracell proposed removal and disposal of the additional soils and sewer sediments, as detailed in a letter from CRA to USEPA dated August 4, 1989. USEPA approved of the proposed activities on August 15, 1989, and the additional materials then were removed and disposed of during the period of September 5 to 10, 1989, by CWM / ENRAC under the supervision of CRA.

Implementation of the Plant dismantling and removal actions and the soil excavation and removal action resulted in the disposal of approximately 18,700 tons of soils and concrete contaminated with PCBs, 410 tons of equipment contaminated with PCBs, 330 cubic yards of non-hazardous equipment and 3,540 cubic yards of non-hazardous building concrete and debris at the Chemical Waste Management facility in Emelle, Alabama. Other miscellaneous equipment and structures were removed from the Site for reuse, or as scrap for remelt, in accordance with the approved work plans. In addition, the excavation and removal of contaminated soils resulted in the removal of most of the sanitary and storm sewer systems on Site and regrading of the Site allowed elimination of all point source discharges of stormwater runoff to the Green River.

The activities conducted during implementation of the 1988 / 1989 soil removal and Plant demolition programs, as well as the analytical data for all samples collected and analyzed during the remedial actions, were summarized in the report prepared by CRA and submitted to USEPA entitled: "Summary Report - Soil Removal and Plant Demolition - Mallory Capacitor Co. Site - Waynesboro, Tennessee", dated November 1989. USEPA approved this report on June 15, 1990, which concluded that the Plant, warehouse, and on-Site soils, sewers, and sediments had been remediated in accordance with the respective work plans and cleanup criteria approved by USEPA (CRA, January 1991).

3.5 BASIS FOR TAKING ACTION

Hazardous substances that have been released at the Site include PCBs in soil and PCBs and TCE in groundwater.

The primary contaminant of concern is PCBs, mostly Aroclor 1242 and Aroclor 1248. All free flowing PCB bearing fluids (i.e., capacitor dielectrics) have been removed from the Site in remedial actions described in Section 3.4. PCBs are readily adsorbed onto soil particles and do not leach readily from soil. Adsorption of PCBs onto soil is related to the organic content of a particular soil, and PCBs recovered from soil are found to be concentrated in the organic fraction of the soil media. The low water solubility and low volatility of PCBs also suggest that it is partitioned most heavily in the organic fraction of a soil. The rate of PCB movement in saturated soil had been found to be between one-tenth and one-hundredth the rate of groundwater movement (USEPA, August 1991).

PCBs have been demonstrated to cause a variety of adverse health effects. PCBs have been shown to cause cancer in animals. PCBs have also been shown to cause a number of serious non-cancer health effects in animals, including effects on the immune system, reproductive system, nervous system, endocrine system, and other health effects. Studies in humans provide supportive evidence for potential carcinogenic and non-carcinogenic effects of PCBs. The different health effects of PCBs may be interrelated, as alterations in one system may have significant implications for the other systems of the body (USEPA, March 2003a; and USEPA, March 2003b).

The other contaminants of concern at the Site are 1,2-DCE and TCE. 1,2-DCE and TCE are volatile organic compounds (VOCs) with high vapor pressures and will readily volatilize from surface soils. The half-life of these compounds in surface water bodies, such as the Green River, is 15 days. The nature of these compounds leads to them being concentrated in groundwater and in deep soils where aeration does not occur to the extent that it does in surface soils and surface waters (USEPA, August 1991).

USEPA has found TCE to potentially cause vomiting and abdominal pain from acute exposures at levels above the maximum contaminant level (MCL) for TCE. TCE has the potential to cause liver damage from a lifetime exposure at levels above its MCL. There is some evidence that TCE may also have the potential to cause cancer from a lifetime exposure at levels above its MCL (USEPA, March 2003a; and USEPA, March 2003b).

A Public Health Evaluation (PHE) was conducted to determine the present and potential threat to human health and the environment attributable to past operations at the Site. The PHE evaluated exposure from the warehouse, air, on-Site surface soils, on-Site subsurface soils, off-Site soils, groundwater, and surface water. Of the media evaluated, only exposure to contaminated groundwater presented an estimated additional lifetime risk of cancer in excess of the USEPA acceptable target range of 10^{-4} to 10^{-6}, the upper bound lifetime cancer risk range presented in the NCP and the Superfund Public Health Evaluation Manual (SPHEM) (CRA, January 1991). The population at greatest risk of potential adverse health effects are those people who potentially may use the groundwater in the areas immediately north and east of the Site. The primary routes of exposure to contaminants in groundwater are ingestion of the water, dermal absorption, and inhalation of VOCs (USEPA, August 1991).

4.0 REMEDIAL ACTIONS

4.1 REMEDY SELECTION

USEPA signed the ROD for the Site on August 29, 1991. The ROD selected a remedy to treat groundwater contamination at the Site. In September 1991, BPI and USEPA entered into negotiations to conduct the groundwater Remedial Design/Remedial Action (RD/RA) for the Site for remediation of groundwater. BPI and USEPA did not agree on cleanup levels for Site-specific contaminants, hence on March 4, 1992, USEPA issued a UAO to BPI requiring BPI to undertake the groundwater remediation at the Site as presented in the ROD.

The objectives of the RA are to:

- Eliminate or minimize the threat posed to public health and the environment from current and potential migration of hazardous substances in groundwater beneath the Site;
- Reduce concentrations of hazardous substances, pollutants, and contaminants in groundwater beneath the Site to Performance Standard levels of at or below the following MCLs:

Groundwater Contaminant	*MCL (μg/L)*
PCBs	0.5
cis-1,2-DCE	70
trans-1,2-DCE	100
TCE	5.0
vinyl chloride	2.0

- Reduce the volume, toxicity, and mobility of hazardous substances, pollutants, or contaminants in groundwater beneath the Site; and
- Maintain the air quality at protective levels for on-Site workers and the public during the long-term operation of the on-Site groundwater treatment system (USEPA, June 1998).

4.2 REMEDY IMPLEMENTATION

In June 1993, BPI submitted the Phase I Design Report (DR) to USEPA. The Phase I DR presented the engineering details for the proposed Phase I RA. As stated in the Phase I DR, the purpose of the Phase I RA was:

- *"to collect sufficient hydraulic and analytical data to assess the performance of the on-Site extraction wells over a period of approximately one year; and*
- *to finalize the design of the hydraulic containment extraction well array, if it is determined to be technically practicable to do so. If it is determined not to be technically possible to achieve total hydraulic containment, the Phase II extraction wells will be designed and located to effect mass removal of off-Site Site-related contaminated groundwater".*

In July 1993, USEPA granted approval to commence construction of the Phase I RA. CRA was retained by BPI to manage the construction, which commenced on August 16, 1993, and was substantially completed by November 11, 1993. The Phase I RA included the installation and operation of five on-Site groundwater extraction wells, the construction and operation of an on-Site groundwater treatment facility, and the implementation of an effectiveness monitoring program. The effluent from the groundwater treatment system was discharged to the Green River. The effectiveness monitoring program, in part, consisted of: hydraulic monitoring in the shallow, deep, and deeper bedrock aquifers; groundwater quality monitoring in the shallow, deep, and deeper bedrock aquifers; and surface water quality monitoring in the Green River and Cold Water Creek. The location of the effectiveness monitoring networks for surface water and the shallow, deep, and deeper bedrock aquifers are presented on Figure 3.2. Startup of the Phase I RA occurred on November 30, 1993.

Following operation of the Phase I RA groundwater extraction and treatment systems at the Site for the 1-year data collection period, as specified in the Phase I RA Work Plan, BPI submitted to USEPA the Phase I RA Technical Evaluation. The Phase I RA Technical Evaluation presented a technical evaluation of the hydraulic and chemical data collected during the Phase I RA and proposed a conceptual Phase II Remedial Design (Phase II RD).

The conceptual Phase II RD included several modifications to the existing Phase I RA groundwater extraction and treatment systems, which included maximizing the pumping rates at two of the five on-Site extraction wells (EW-1 and EW-2 located along the northern Site boundary), increasing the capacity of the existing on-Site groundwater treatment system (from 20 GPM to 110 GPM), and providing pretreatment to groundwater extracted from extraction well EW-5. The EW-5 pretreatment was required to address elevated PCB concentrations attributed to the dense non-aqueous phase liquid (DNAPL) observed in EW-5 during operation of the Phase I RA. In addition, extraction well EW-2 was deepened from 35 feet to 100 feet below ground surface, which increased the drawdown potential at this extraction well allowing for an increased EW-2 pumping rate. The increased groundwater treatment system capacity allowed for the treatment of the additional groundwater extracted under the Phase II RA design pumping rates. The groundwater extracted from EW-5 and directed through the PCB pre-treatment process was referred to as the PCB Stream. Following this pretreatment, the PCB Stream was combined with the groundwater extracted from extraction wells EW-1, EW-2, EW3, and EW-4, referred to as the General Stream.

In USEPA's March 13, 1995 comments regarding the Phase I RA Technical Evaluation, USEPA required that pumping from the five existing on-Site extraction wells be maximized, and that two contingency off-Site extraction wells be considered following an evaluation of the Phase II RA. USEPA also required that two additional off-Site shallow bedrock piezometers be installed to the north of the Site to better define hydraulic containment in this region. These requirements were incorporated into the Phase II DR and the Phase II RA Work Plan.

As described in the Final Construction Report, Phase II Groundwater Extraction and Treatment Systems, the modifications to the Phase I RA groundwater extraction and treatment systems were conducted from October 9, 1995 to December 6, 1995. Startup of the Phase II RA groundwater extraction and treatment systems occurred on December 7, 1995. In accordance with the OMMP, the Phase II RA operation consisted of maximizing the pumping rates from all existing on-Site extraction wells. CRA monitored the effectiveness of the Phase II RA groundwater extraction and treatment systems in relation to: meeting USEPA discharge criteria in the Green River; maximizing hydraulic containment; and optimizing the operational and maintenance procedures and requirements for the groundwater extraction and treatment systems at the Site.

In June 1996, BPI had operated the Phase II RA groundwater extraction and treatment systems at the Site for a 6-month technical evaluation period. In accordance with the OMMP, groundwater elevation, chemistry, extraction, and treatment effectiveness data were obtained during that time period. BPI submitted to USEPA the Phase II RA Technical Evaluation which presented a technical evaluation of the hydraulic containment and groundwater chemistry based on data collected during the operation of the Phase II RA from December 1995 to June 1996. The operation and effectiveness of the Phase II RA groundwater extraction and treatment systems also were evaluated.

The Phase II RA Technical Evaluation identified that the upward hydraulic head differentials from the deeper bedrock to the deep bedrock, which existed under non-pumping conditions, were reversed during the Phase II RA groundwater extraction activities. The resulting downward hydraulic head differentials likely caused the increased concentrations of Site-related chemistry in the deeper bedrock observed during the Phase II RA. The downward hydraulic head differentials were attributed to the extraction well depths, which extended approximately 10 to 15 feet into the deeper bedrock. In the RI/FS, the deeper bedrock was identified as being more fractured than the deep bedrock. The greater extent of fracturing in the deeper bedrock causes the deeper bedrock to be more hydraulically transmissive than the deep bedrock. As a result, the extraction well pumping drew more groundwater from the deeper bedrock than from the deep bedrock reducing the hydraulic head in the deeper bedrock to below that in the deep bedrock. This created downward hydraulic head differentials resulting in downward groundwater flow from the deep to the deeper bedrock. The downward groundwater flow resulted in the downward migration of Site-related chemistry from the deep to the deeper bedrock during the Phase II RA.

It was recommended in the Phase II RA Technical Evaluation that the bottom portions of the extraction wells be temporarily sealed using inflatable packers to investigate whether the downward hydraulic head differentials from the deep to the deeper bedrock could be reduced, or reversed, during the extraction well pumping. It was anticipated that sealing the bottoms of the extraction wells with the packers would reduce the amount of groundwater drawn from the deeper bedrock by the extraction well pumping and increase the hydraulic head in the deeper bedrock. It was considered that this may reduce, or reverse, the downward hydraulic head differentials from the deep to the deeper bedrock and therefore, reduce, or reverse, downward groundwater flow from the deep to the deeper bedrock. It also was considered that these modifications may prevent a further increase, or possibly reduce, the Site-related chemistry observed during the Phase II RA in the deeper bedrock monitoring wells. In the event that these modifications were observed to reduce, or reverse, the downward hydraulic head differentials, it was recommended in the Phase II RA Technical Evaluation that the bottom portions of the extraction wells be permanently grouted. In addition to the groundwater extraction system modifications, three alternative modifications to the groundwater treatment system were proposed in the Phase II RA Technical Evaluation. It was recommended that data be collected to evaluate whether the implementation of the alternative treatment system modifications would improve the operation of the treatment system. The recommendations in the Phase II RA Technical Evaluation were referred to as the Phase II RA Modifications.

On August 16, 1996, CRA received approval from USEPA of the Phase II RA Technical Evaluation. The Phase II RA Modifications were initiated by BPI on September 4, 1996. The Phase II RA Modifications to the groundwater extraction system consisted of temporarily sealing the bottoms of the extraction wells with inflatable packers and optimizing the extraction well pumping rates to reduce, or reverse, the downward vertical hydraulic gradients from the deep to the deeper bedrock that existed during the Phase II RA groundwater extraction activities. The Phase II RA Modifications were completed in two stages. Stage I consisted of evaluating the impacts of installing inflatable packers in the bottom portions of extraction wells EW-2, EW-3, and EW-5 and evaluating the feasibility of permanently grouting the bottom portions of these extraction wells. Stage II consisted of evaluating the impacts of installing inflatable packers in EW-1 and EW-4 and evaluating the feasibility of grouting the bottom portions of these extraction wells after completing Stage I. The Stage I modifications were conducted from September 1996 to mid-February 1997 and the Stage II modifications were conducted from mid-February to September 1997. The bottoms of extraction wells EW-2, EW-3, and EW-5 were grouted on February 10, 1997 (approximately the bottom 24 feet, 16 feet, and 26 feet of EW-2, EW-3, and EW-5, respectively, were grouted). The bottoms of extraction wells EW-1 and EW-4 were grouted on September 4, 1997 (approximately the bottom 3 feet of both EW-1 and EW-4 were grouted).

The Phase II RA Modifications initially were documented and submitted to USEPA by BPI in the Phase II RA Modifications Technical Evaluation. The Phase II RA Modifications Technical Evaluation demonstrated that the groundwater extraction system modifications were effective in mitigating further contaminant migration laterally outward from the Site and vertically downward to the deeper bedrock. Since solids accumulation or biological influences did not impact the operation of the groundwater treatment system over the duration of the Phase II RA Modifications, the treatment system modifications proposed in the Phase II RA Technical Evaluation were not implemented.

USEPA provided comments regarding the Phase II RA Modifications Technical Evaluation in correspondence dated December 2, 1997. In general, USEPA's concerns pertained to the delineation of the extent of groundwater contamination at the Site, and the evaluation of the extent of hydraulic containment achieved by the groundwater extraction system. On behalf of BPI, CRA submitted responses to USEPA's comments in correspondence dated January 13, 1998. To address USEPA's concern regarding the extent of groundwater contamination, BPI/CRA proposed the installation of two monitoring wells (OW68 in the deep bedrock and OW69 in the deeper bedrock north of the Site), and confirmatory groundwater quality sampling to evaluate the need for additional monitoring wells. To address USEPA's concern regarding the extent of hydraulic containment, BPI/CRA prepared a quasi-three-dimensional analysis of the groundwater elevations measured at the Site. This analysis demonstrated that the extent of impacted groundwater was hydraulically contained by the groundwater extraction system.

On January 22, 1998, a telephone conversation occurred between TDSF, USEPA, and CRA, to discuss TDSF's comments regarding the Phase II RA Modifications Technical Evaluation. TDSF's main concern was related to the potential influence that karst features in the bedrock beneath the Site may have on groundwater flow and contaminant migration at the Site. To address TDSF's concern, BPI/CRA proposed to conduct a karst hydrogeologic assessment at the Site. BPI proposed to retain C&A to conduct this assessment. A scope of work for a preliminary karst hydrogeologic assessment proposed by C&A was submitted to USEPA and TDSF in CRA correspondence to USEPA dated February 23, 1998. In this correspondence, BPI/CRA indicated that additional karst investigations (e.g., dye tracer study) would be proposed during wet conditions should significant karst features be identified that potentially may influence contaminant migration in groundwater beneath the Site. Considering the potential impact that karst features may have on contaminant migration, BPI/CRA also indicated that the decision to install the two monitoring wells OW68 and OW69, proposed in BPI/CRA's January 13, 1998 responses, should be deferred until the completion of the karst hydrogeologic assessment.

USEPA issued comments dated February 24, 1998 regarding BPI/CRA's January 13, 1998 responses. Regarding TDSF's concern, USEPA incorporated an additional comment that a karst hydrogeologic assessment be completed at the Site. Regarding the need for additional monitoring wells, USEPA approved deferral to install monitoring wells OW68 and OW69, although a requirement for downgradient monitoring wells where groundwater contamination previously has not been detected was emphasized. Regarding BPI/CRA's quasi-three-dimensional groundwater elevation evaluation, USEPA agreed with the approach, but indicated a requirement for additional piezometers to complete the analysis. However, considering the potential impact that karst features may have on groundwater flow and contaminant migration, USEPA acknowledged that the decision to install any additional monitoring wells and/or piezometers at the Site would be contingent upon the results of the karst hydrogeologic assessment.

On March 3, 1998, CRA received verbal approval from USEPA of the preliminary karst hydrogeologic assessment proposed by C&A. USEPA's approval was contingent on TSDF's acceptance of this proposal. TDSF issued approval of the karst hydrogeologic assessment on March 6, 1998. On March 11, 1998, USEPA subsequently provided approval of the BPI/CRA January 13, 1998, responses with the following revisions:

- incorporate the recommendation that a karst hydrogeologic assessment be conducted within the Site vicinity; and
- defer the recommendation to install monitoring wells OW68 and OW69 until the completion of the karst hydrogeologic assessment.

USEPA also agreed that the confirmatory groundwater quality sampling recommended in BPI/CRA's January 13, 1998, responses could be initiated at the time of the karst hydrogeologic assessment. These revisions/recommendations were incorporated into the Final Phase II RA Modifications Technical Evaluation submitted to USEPA in March 1998.

The karst hydrogeologic assessment was conducted in two components. BPI retained C&A to conduct both components of the karst hydrogeologic assessment. The first component of the karst hydrogeologic assessment was documented in the Phase I Karst Investigation. The Phase I Karst Investigation was submitted to USEPA on May 1, 1998. The second component of the karst hydrogeologic assessment was documented in the Dye Tracer Study. The Dye Tracer Study was submitted to USEPA on October 23, 1998.

The Phase I Karst Investigation consisted of a review of relevant published geologic and hydrogeologic studies conducted within the Site vicinity, and a field survey of the Site and the surrounding area to identify any surficial evidence of karst features. A limited number of karst features, in the form of groundwater seepage and/or springs, were identified along the Green River adjacent to the Site, and karst features associated with cave springs were identified approximately 4 miles southwest from the Site. Although significant karst features were not identified in the immediate Site vicinity, it could not be concluded with certainty that karst features did not influence groundwater flow beneath the Site. As a result, the Dye Tracer Study was proposed by BPI/CRA and was subsequently approved by USEPA and TDSF.

The Dye Tracer Study consisted of injecting four different dyes at on- and off-Site monitoring wells. Dye receptors were placed in selected on- and off-Site monitoring wells, in the extraction wells, and in the karst features that were inventoried during the Phase I Karst Investigation. Two of the injected dyes were detected in the extraction wells. The remaining two dyes were not detected in the extraction wells, or in the dye receptor monitoring network. None of the injected dyes were detected in the inventoried karst features. Since two of the injected dyes were not detected in the monitoring network or in the inventoried karst features, C&A indicated that the results of the Dye Tracer Study were not entirely conclusive. However, C&A did conclude that the Dye Tracer Study demonstrated that the "*bedrock beneath the Site is not highly karstic and that karst features may not significantly influence groundwater flow*" at the Site.

In February 1999, CRA/BPI submitted to USEPA the Continued Phase II RA Operations Technical Evaluation. Since the results of the Dye Tracer Study indicated that karst features did not dominate groundwater flow beneath the Site, evaluating the Site-related impacts to groundwater using monitoring wells remains appropriate for the Site and the installation of the previously proposed additional monitoring wells OW68 and OW69 was recommended.

On February 13, 2001, a Site meeting was held between USEPA, TDSF, and CRA to update both USEPA and TDSF regarding the Site remedial action. The Site meeting also was conducted to discuss comments presented in USEPA's December 15, 1998 Internal Memorandum regarding the Dye Tracer Study, which were provided to CRA on January 10, 2001. CRA prepared responses to these comments in the February 6, 2001 correspondence submitted to USEPA as 'draft for discussion'. Following a discussion of the responses, USEPA requested the installation of the additional off-Site monitoring wells to the north of the Site, which were proposed in the CRA correspondence dated February 22, 2001. From September 7, 2001 until October 1, 2001, six additional monitoring wells were installed at the Site (OW68-01, OW69-01, OW70-01, OW71-01, OW72-01, and OW73-01). The results of the additional monitoring well installations were presented in the CRA correspondence to USEPA dated January 9, 2002.

4.3 SYSTEM OPERATION/OPERATION AND MAINTENANCE (O&M)

The OMMP was approved by USEPA on June 7, 1996. The primary objectives for the groundwater remedy at the Site, including the long-term operation, maintenance, and monitoring requirements, are as follows:

- to protect and enhance the quality of the groundwater in the vicinity of the Site;
- to protect the quality of surface waters in the vicinity of the Site; and
- to protect the public from exposure to Site-related contaminants through air emissions from the groundwater treatment system.

Remedial construction activities at the Site to date have resulted in the construction and commissioning of three main systems, which working collectively, are designed to accomplish the above objectives. As with all systems, the systems constructed at the Site require long-term operation and maintenance.

The three systems constructed at the Site during the Phase I RA implemented at the Site include:

- groundwater extraction system;
- groundwater treatment system; and
- treated water discharge system.

During the Phase I RA, groundwater extraction was accomplished by a system of pneumatic submersible pumps located in five extraction wells strategically located at the Site. The submersible pumps pumped groundwater at controlled rates through individual forcemains to an on-Site groundwater treatment system located in the warehouse, where the groundwater was treated by oil/water separation, air stripping, media (bag) filtration, and granular activated carbon (GAC) adsorption. The treated water was then discharged to the Green River located along the eastern boundary of the Site.

During the Phase II RA, groundwater extraction was accomplished by a system of electric submersible pumps located in the five extraction wells described above. The groundwater is divided into two treatment process streams which are treated either: 1) by air stripping, oil/water separation, bag filtration, polymeric resin adsorption, and activated carbon adsorption (PCB Stream); or 2) air stripping, bag filtration, and activated carbon adsorption (General Stream). The off-gas emissions from the air strippers are treated by activated carbon adsorption prior to being released to the atmosphere. The treated water continues to be discharged to the Green River located along the eastern Site boundary.

The annual system operations and O&M costs for this review period are summarized below.

Dates		***Total Cost rounded to Nearest $1,000***
From	***To***	
January 1998	December 1998	$394,000 [1]
January 1999	December 1999	$290,000
January 2000	December 2000	$296,000
January 2001	December 2001	$464,000 [2]
January 2002	December 2002	$339,000

Notes:

1) Includes dye tracer study costs.
2) Includes additional monitoring well installation costs.

5.0 INDEPENDENT REMEDIAL ACTION PERFORMANCE REVIEW AND INNOVATIVE TECHNOLOGY EVALUATION

North Wind prepared the North Wind Comments & Recommendations on behalf of USEPA. The North Wind Comments & Recommendations report is presented in Appendix A. The North Wind Comments & Recommendations evaluates the overall effectiveness of the Site groundwater extraction and treatment systems, provides options to address off-Site migration of contaminants, and evaluates the adequacy of the monitoring well network/program for characterizing Site conditions and monitoring remedy performance. The North Wind Comments & Recommendations also presents potential options for applying innovative technologies at the Site. The North Wind Comments & Recommendations present six primary recommendations. These primary recommendations are identified below, and a response to each of these recommendations is presented. These recommendations and responses were discussed during the Five-Year Review Site inspection (see Section 7.5) and USEPA's concurrence with the responses is indicated (as presented in the Five-Year Review Site inspection meeting minutes prepared by CRA, which are included in Appendix D).

Recommendation 1) Application of Pulse-Pumping:

North Wind states that "*As the historical data show, when the system was not operating for some period of time (in 1994 when the Phase II system was being installed and then in 1997 when the bottoms of the extraction wells were grouted back up), mass removal increased, particularly in wells EW-2 and EW-3, the wells that produce the most contaminant mass*". North Wind then recommends that the "*cycling of the extraction system on and off may improve the mass removal compared to continuous operation, especially in wells EW-2 and EW-3, as was shown during previous periods of downtime*".

In response to this recommendation, CRA identified that the observed increase in mass removal following the implementation of the Phase II RA is a result of the significant increase in the pumping rates at all extraction wells that occurred as part of the Phase II RA. CRA further identified that the observed increase in mass removal following the grouting of the bottom portions of the extraction wells is a result of re-focussing the pumping to the shallow and deep bedrock where groundwater concentrations are highest. As a result, the potential implementation of pulse-pumping is not supported by historical data and is not warranted at the Site.

USEPA concurred with this response.

Recommendation 2) Delineating Increased Fracture Zones:

North Wind recommended delineating increased fracture zones on Site with the intent of locating additional on-Site extraction wells in these zones to increase source area mass removal.

In response to this recommendation, CRA identified that the delineation of highly fractured zones on Site would be accompanied by significant uncertainty. It is not likely that fracture correlation/connectivity could be defined with a high degree of confidence. In this regard, and considering that the existing groundwater extraction system presently is achieving good mass removal, pursuing the delineation of highly fractured zones is not warranted at the Site.

USEPA concurred with this response, recommending that some investigation into methods to increase mass removal/mass destruction on Site should be considered since this would increase the feasibility of implementing a MNA remedy at the Site to address the off-Site plume. During the Site inspection meeting, North Wind suggested the concept of potentially adding nutrients and/or substrates to enhance the biodegradation already occurring on Site. North Wind identified that the introduction of nutrients and/or substrates into the deeper bedrock at OW62-90 might be a possible initial field pilot study. North Wind's suggestions are addressed below in the response to Recommendation 4).

Recommendation 3) Hydraulic Fracturing:

North Wind recommended using a hydraulic fracturing technique to increase the permeability of the bedrock formation surrounding the extraction wells with the intent of improving aquifer transmissivity and potentially contaminant mass removal.

In response to this recommendation, CRA identified that hydraulic fracturing would be accompanied with significant risk of mobilizing DNAPL, particularly to the deeper bedrock, and is not appropriate for the Site.

USEPA concurred with this response.

Recommendation 4) MNA Remedy to Address Off-Site Groundwater Plume:

Based on their review of the Site data, North Wind concluded that there is sufficient evidence to suggest that natural attenuation via anaerobic reductive dechlorination is occurring at the Site. North Wind recommended that a MNA remedy could be applied to address the off-Site groundwater plume.

In response to this recommendation, CRA identified that a MNA remedy evaluation conducted consistent with existing USEPA guidance (e.g., USEPA, April 1999; and USEPA, September 1998) would need to be conducted to assess the feasibility of a MNA remedy. Following this evaluation, the feasibility of potentially adding nutrients and/or substrates to enhance the biodegradation already occurring on Site would be addressed, and North Wind's suggestion of introducing nutrients and/or substrates into the deeper bedrock at OW62-90 as a possible initial field pilot study would be considered.

USEPA concurred with this response adding that applicable Region IV MNA guidance would need to be followed.

Recommendation 5) Incorporating Existing Monitoring Wells Into Monitoring Network:

North Wind recommended including the following existing monitoring wells in the groundwater quality monitoring network:

- Shallow Bedrock – OW47-89 or OW50-89, OW45-89, and OW23-86;
- Deep Bedrock – OW42-89 or OW34-89, OW40-89, OW26-89, and OW52-89; and
- Deeper Bedrock – OW24-89.

In response to this recommendation, CRA indicated that a review of historical groundwater quality data would be required to assess whether sampling these additional wells would provide meaningful data. Following this assessment, for those additional wells where it is deemed suitable, CRA recommended one-time sampling during the next annual monitoring event followed by an evaluation of whether inclusion in the monitoring network is warranted.

USEPA concurred with this response.

Recommendation 6) New Monitoring Wells:

North Wind recommended installing a new off-Site shallow/deep/deeper bedrock monitoring well nest approximately mid-way between the existing shallow wells OW58-90 and OW59-90 to assess mid-plume conditions. North Wind also recommended installing a new on-Site deeper bedrock monitoring well southwest and upgradient of the existing deeper bedrock well OW63-90.

In response to these recommendations, CRA concurred with installing a new off-Site shallow / deep / deeper bedrock monitoring well nest approximately mid-way between the existing shallow wells OW58-90 and OW59-90, considering that this monitoring well nest will improve the understanding of off-Site plume behavior and will aid in the MNA remedy evaluation for the off-Site plume. CRA indicated that, since only low VOC concentrations are detected at OW63-90, installing an additional well upgradient of OW63-90 is not warranted.

USEPA concurred with this response.

6.0 PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

The first Five-Year Review determined that activities at the Site were consistent with the ROD and UAO RD/RA statement of work issued to BPI for design and construction, including sampling and analysis. The RD Report, including a Quality Assurance Project Plan (QAPP), incorporated USEPA and TDSF quality assurance and quality control (QA/QC) procedures and protocol. USEPA analytical methods were used for the sample analyses and validations during RA activities. The sampling activities were conducted consistent with the USEPA protocol entitled, "*Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods*". In the first Five-Year Review, USEPA concurred that sample collection and analyses were performed utilizing USEPA approved methods and instrumentation (USEPA, June 1998). Since the first Five-Year Review, sample collection and analyses have continued to be performed in accordance with the OMMP and QAPP and have been conducted consistent with USEPA protocols and approved methods.

In 1998, the karst hydrogeologic assessment was conducted at the Site, which included the Phase I Karst Investigation and the Dye Tracer Study. The Dye Tracer Study indicated that karst features did not dominate groundwater flow beneath the Site, and therefore evaluating the Site-related impacts to groundwater using monitoring wells remains appropriate for Site.

Due to the observed presence of non-aqueous phase liquids in the sampling port of extraction well EW-3 and the detected PCB concentrations in water samples collected from extraction well EW-4, the treatment system was modified in September 2000. The system modifications included connecting extraction wells EW-3 and EW-4 to the PCB Stream, and adding to the PCB Stream two additional primary resin filtration units and two secondary resin filtration units.

In October 2001, CRA completed the installation of six additional monitoring wells at the Site. Five of the additional monitoring wells were installed in accordance with the CRA correspondence to USEPA dated February 22, 2001, which proposed the installation of monitoring wells OW68-01, OW69-01, OW70-01, OW71-01, and OW72-01. One further additional monitoring well (OW73-01) was installed as requested by USEPA in USEPA's e-mail correspondence to CRA dated March 15, 2001, which provided approval of the five additional monitoring wells proposed in CRA's February 22, 2001 correspondence with the inclusion of OW73-01.

Drilling activities were initiated on September 7, 2001 and were completed on October 1, 2001. The six additional monitoring wells installed at the Site consist of two overburden/bedrock interface monitoring wells (OW70-01 and OW73-01), three deep bedrock monitoring wells (OW68-01, OW71-01, and OW72-01), and one deeper bedrock monitoring well (OW69-01). The additional monitoring wells are located north of the Site (see Figure 3.2). The purpose of the additional monitoring wells was to improve the definition of the extent of the aqueous phase PCB and VOC impact to groundwater north of the Site (CRA, January 2002a).

7.0 FIVE-YEAR REVIEW PROCESS

7.1 ADMINISTRATIVE COMPONENTS

The Mallory Capacitor Company Site Five-Year Review team, which included North Wind, was led by Mr. Loften Carr of USEPA, Remedial Project Manager (RPM) for the Mallory Capacitor Company Site. On behalf of BPI, technical experts from CRA (including Messrs. Jack Michels, Steven M. Harris, and David S. Hill), and other resources, as designated by USEPA, assisted in the Five-Year Review.

7.2 COMMUNITY NOTIFICATION AND INVOLVEMENT

The initial community notification that the Five-Year Review was to be conducted was performed by USEPA. On June 12, 2002, USEPA placed a notice in The Wayne County News notifying the community of the impending start of the Five-Year Review. A copy of the notice is presented in Appendix B.

Following approval of this Five-Year Review, USEPA will notify the community that the Five-Year Review report for the Mallory Capacitor Company Site is complete, and that the results of the review and the report are available to the public at the Site information repository located at the Wayne County Public Library, Waynesboro, Tennessee.

7.3 DOCUMENT REVIEW

Documents associated with the Site were reviewed to obtain relevant information and data concerning the response action at the Site in order to assess its performance. The list of documents reviewed is presented in Appendix C.

7.4 DATA REVIEW

Significant monitoring activities have been conducted at the Site to evaluate the performance of the groundwater extraction and treatment systems. These activities have involved hydraulic monitoring, groundwater quality monitoring, surface water quality monitoring, sediment quality monitoring, extraction well pumping rate monitoring, and extraction well influent quality monitoring. A review of the data collected during these monitoring activities conducted since the first Five-Year Review during is presented in the following subsections.

7.4.1 HYDRAULIC MONITORING RESULTS

In accordance with the OMMP, hydraulic monitoring is conducted at the Site on a monthly basis. The hydraulic monitoring consists of measuring groundwater elevations at the monitoring wells included in the hydraulic monitoring network (see Figure 3.2). The construction details of the monitoring wells are summarized in Table 7.1. The results of the hydraulic monitoring are presented in the quarterly monitoring reports prepared for the Site and submitted to USEPA. A description of the groundwater elevation data and contours, and water quality monitoring results for the overburden/bedrock interface, shallow bedrock, deep bedrock, and deeper bedrock monitoring wells is presented below.

7.4.1.1 OVERBURDEN/BEDROCK INTERFACE

The groundwater elevations measured at OW70-01 consistently are greater than the surface water elevation measured in the Green River. This demonstrates that groundwater within the weathered and fractured upper bedrock at OW70-01 likely discharges to the Green River. The groundwater elevation measured at OW73-01 is at or slightly below the surface water elevation measured in the Green River. However, the location of OW73-01 is approximately 800 feet downstream from the Green River surface water gauge location (see Figure 3.2), and considering the amount of topographic relief that occurs north of the Site, it is likely that the groundwater elevation measured at OW73-01 also is greater than the surface water elevation in the Green River adjacent to OW73-01.

The shallow bedrock monitoring well OW65-92 is adjacent to OW73-01 and the groundwater elevations measured at OW65-92 consistently are lower than the groundwater elevations measured at OW73-01. This indicates that the vertical hydraulic gradient, and thus vertical groundwater flow, is downward from the weathered and fractured upper bedrock to the shallow bedrock.

7.4.1.2 SHALLOW BEDROCK

The July 2002 shallow bedrock groundwater elevation contours are presented on Figure 7.1 and are typical of the groundwater flow conditions observed at the Site in the shallow bedrock. Figure 7.1 demonstrates that the ambient groundwater flow direction in the shallow bedrock is from the southwest to the northeast. The operation of the groundwater extraction wells creates a depression in the shallow bedrock groundwater elevation contours surrounding the Site. The groundwater elevation contour depression indicates that hydraulic containment is achieved on Site where the greatest impact to groundwater quality is observed within the shallow bedrock.

7.4.1.3 DEEP BEDROCK

The July 2002 deep bedrock groundwater elevation contours are presented on Figure 7.2 and are typical of the groundwater flow conditions observed at the Site in the deep bedrock. Figure 7.2 demonstrates that the ambient groundwater flow direction in the deep bedrock is from the southwest to the northeast. The operation of the groundwater extraction wells creates a depression in the deep bedrock groundwater elevation contours surrounding the Site. The groundwater elevation contour depression indicates that hydraulic containment is achieved on Site where the greatest impact to groundwater quality is observed within the deep bedrock.

7.4.1.4 DEEPER BEDROCK

The July 2002 deeper bedrock groundwater elevation contours are presented on Figure 7.3. Due to the limited number (five) of deeper bedrock groundwater monitoring wells, the July 2002 deeper bedrock groundwater elevation contours are considered approximate and are presented for demonstrational purposes. The limited number of monitoring wells leads to variable observed groundwater flow directions at the deeper bedrock, however, the observed horizontal hydraulic gradients are minor. The variations in groundwater flow directions and the minor horizontal hydraulic gradients demonstrated by the measured deeper bedrock groundwater elevations indicate that groundwater flow velocities, and thus potential contaminant migration rates, within the deeper bedrock are not rapid.

Comparison of the groundwater elevation contours between the deep and deeper bedrock demonstrates that the groundwater elevations on Site and north of the Site are greater in the deeper than in the deep bedrock. This demonstrates that vertical hydraulic gradients, and thus vertical groundwater flow, is directed upward from the deeper to the deep bedrock.

The operation of the groundwater extraction system does not produce an identifiable impact on groundwater elevations in the deeper bedrock. As described in Section 4.2, the bottom portions of the extraction wells have been sealed to prevent lowering of the deeper bedrock groundwater elevations. As observed during the Phase II RA, lowering of the deeper bedrock groundwater elevations creates downward vertical hydraulic gradients, and thus downward vertical groundwater flow, from the deep to the deeper bedrock. Maintaining upward vertical hydraulic gradients from the deeper to the deep bedrock mitigates the potential for vertical migration of contaminants to the deeper bedrock from the deep bedrock.

7.4.2 GROUNDWATER/SURFACE WATER QUALITY MONITORING RESULTS

In accordance with the OMMP, chemical analyses were conducted on groundwater samples obtained from the monitoring wells included in the groundwater quality monitoring network on an annual basis. From 1998 until 2000, the groundwater quality monitoring network included nine shallow bedrock monitoring wells (three on Site and six off Site), seven deep bedrock monitoring wells (three on Site and four off Site), and two on-Site deeper bedrock monitoring wells. In 2001, the groundwater quality monitoring network gained additional monitoring wells, which included two off-Site shallow bedrock monitoring wells, three off-Site deep bedrock monitoring wells, and two off-Site deeper bedrock monitoring wells (of which OW60-01 was formerly a deep bedrock monitoring well). Surface water quality samples also were collected at three locations along Cold Water Creek and three locations along the Green River on an annual basis. The monitoring wells included in the groundwater quality monitoring network and the surface water sampling locations are presented on Figure 3.2.

The annual groundwater and surface water samples were collected in accordance with the sample collection procedures presented in the OMMP and analyzed for PCBs and the VOCs TCE, cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride. The data resulting from the analyses of the annual groundwater and surface water samples were then validated according to the requirements of the QAPP. The precision and accuracy of the analyses were assessed based on surrogate spike percent recoveries, matrix spike/matrix spike duplicate percent recoveries and relative percent differences (RPDs), laboratory control sample/laboratory control sample duplicate (LCS/LCSD) percent recoveries and RPDs, and method blank results. Cross-contamination of VOCs through the septum seal of the sample vials during shipment and storage was monitored by trip blank samples. In addition, the overall field and laboratory precision of the sampling and analytical effort was evaluated by an assessment of the results of two field duplicate sample sets.

The analytical results for the annual groundwater and surface water sampling conducted from October 1998 to October 2002 are presented in Tables 7.2a to 7.2e and Tables 7.3a to 7.3e, respectively. As is described further below, the groundwater sampling analytical data demonstrate that the extent of Site-related groundwater contamination in the shallow, deep, and deeper bedrock essentially has remained similar to that which existed following completion of the Phase II RA Modifications. In addition, the surface water sampling analytical data demonstrate that insignificant levels of Site-related chemistry has discharged to the Green River.

7.4.2.1 OVERBURDEN/BEDROCK INTERFACE MONITORING WELLS

The analytical data for the overburden/bedrock interface monitoring wells OW70-01 and OW73-01 are presented in Tables 7.2d and 7.2e for October 2001 and October 2002, respectively, and these data are summarized on Figure 7.4. These monitoring wells are screened across the interface between the overburden and the weathered and fractured upper bedrock surface. Low levels of PCBs and TCE were detected at OW70-01, and PCBs and VOCs were not detected at OW73-01. The absence of PCBs and VOCs at OW73-01 demonstrates that the low levels of PCBs and TCE detected at OW70-01 do not migrate beneath the Green River within the weathered and fractured upper bedrock surface.

Groundwater elevations measured at OW70-01 are greater than the surface water elevations measured in the Green River indicating that groundwater at OW70-01 containing low levels of PCBs and TCE potentially discharges to the Green River. However, as is described further in Section 7.4.2.5, PCBs and significant levels of VOCs were not detected in the surface water samples collected from the Green River immediately adjacent to OW70-01 (i.e., Green River sampling location G3 shown on Figure 3.2). Therefore, in the event that the low concentrations of PCBs and TCE detected at OW70-01 discharge to the Green River, these concentrations are attenuated by the surface water flow within the Green River.

7.4.2.2 SHALLOW BEDROCK MONITORING WELLS

A summary of the analytical data for the shallow bedrock monitoring wells collected since the startup of the Phase I RA is presented on Figure 7.4 and includes the data collected from October 1998 to October 2002. In general, the concentrations of PCBs and VOCs detected in the shallow bedrock are similar from 1998 to 2002 and these concentrations demonstrate a declining trend relative to historical levels. From 1998 to

2002, low concentrations of cis-1,2-DCE have been detected at the shallow bedrock monitoring well OW65-92 on the east side of the Green River north of the Site. These concentrations are below the MCL of 70 µg/L for cis-1,2-DCE. In 2001 and 2002, low concentrations of TCE also were detected at OW65-92 and the TCE concentration detected in 2002 is above the MCL of 5 µg/L for TCE. In 2001 and 2002, low concentrations of cis-1,2-DCE below its MCL were detected at the shallow bedrock monitoring well OW64-92 north of the Site. PCBs were not detected at either OW64-92 or OW65-92 in 1998 to 2002. The analytical data for OW64-92 and OW55-92 demonstrate that the PCB impacts to groundwater above the MCL for PCBs does not extend to these monitoring well locations. However, the VOC impact to groundwater above MCLs may extend to the location of OW65-92.

7.4.2.3 DEEP BEDROCK MONITORING WELLS

A summary of the analytical data for the deep bedrock monitoring wells collected since the startup of the Phase I RA is presented on Figure 7.5 and includes the data collected from October 1998 to October 2002. In general, the concentrations of PCBs and VOCs detected in the deep bedrock are similar from 1998 to 2002 and these concentrations demonstrate a declining trend relative to historical levels. The reported PCB concentration of 1,700 µg/L for the October 2000 groundwater sample from the deep bedrock monitoring well OW57-90 is not consistent with historical data and is considered anomalous. Low concentrations of PCBs and cis-1,2-DCE were detected in 2002 at the deep bedrock monitoring well OW68-01 below MCLs. In 2001, PCBs were not detected at OW68-01 and cis-1,2-DCE was detected at a low concentration below its MCL. The analytical data for OW68-01 demonstrate that PCB and VOC impacts to groundwater above MCLs within the deep bedrock north of the Site do not extend to the location of OW68-01. TCE, cis-1,2-DCE, and vinyl chloride are detected in 2002 at the deep bedrock monitoring well OW72-01 above MCLs, however, PCBs were not detected at this location. The analytical data for OW72-01 indicated that the VOC impacts to groundwater above MCLs within the deep bedrock northwest of the Site extends to the location of OW72-01. PCBs were detected in 2002 at the deep bedrock monitoring well OW71-01 at an estimated concentration marginally above the MCL for PCBs, and PCBs were not previously detected at this location in 2001. The analytical data for OW71-01 are considered to support that PCB impacts to groundwater above MCLs west of the Site do not extend to the location of OW71-01.

7.4.2.4 DEEPER BEDROCK MONITORING WELLS

A summary of the analytical data for the deeper bedrock monitoring wells collected since the startup of the Phase I RA is presented on Figure 7.6 and includes the data collected from October 1998 to October 2002. In general, the concentrations of PCBs and VOCs detected in the deeper bedrock are similar from 1998 to 2002 and these concentrations demonstrate a declining trend relative to historical levels. PCBs (in 2001) and cis-1,2-DCE (in 2001 and 2002) were detected at the additional deeper bedrock monitoring well OW69-01 above MCLs. The analytical data for OW69-01 indicated that the PCB and VOC impacts to groundwater above MCLs within the deeper bedrock north of the Site extends to the location of OW69-01.

7.4.2.5 SURFACE WATER

With the exception of one minor detection of TCE in October 2000 at the downstream Green River sampling location below the State of Tennessee Surface Water Criteria for TCE, the analytical data for the surface water samples presented in Tables 7.3a through 7.3e indicate that PCBs and VOCs are not present in surface water at or above laboratory detection limits. Based on groundwater elevations measured at OW70-01, which are greater than the surface water elevation in Green River, the discharge of groundwater within the weathered and fractured upper bedrock potentially may occur to the Green River. The groundwater samples collected from OW70-01 indicate that groundwater in the overburden/bedrock interface is impacted with low levels of PCBs, TCE, and cis-1,2-DCE. Although these low levels of PCBs, TCE, and cis-1,2-DCE potentially may discharge to the Green River, the surface water sample collected from the Green River immediately downstream from OW70-01 (i.e., Green River sampling location G3 shown on Figure 3.2) demonstrate that the low levels of PCBs and VOCs are attenuated such that no adverse impact has occurred to the Green River.

7.4.3 EVIDENCE OF NATURAL ATTENUATION PROCESSES

The presence of the TCE daughter products cis-1,2-DCE and vinyl chloride at the most downgradient monitoring wells provides evidence that TCE biodegradation is occurring via reductive dechlorination. This evidence indicates that natural attenuation processes (specifically biodegradation), in conjunction with the groundwater extraction system, prevents significant contaminant migration further downgradient from the Site. The groundwater extraction system serves as a mass removal and source control mechanism, while natural attenuation processes address the downgradient portion of the groundwater impact.

7.4.4 SEDIMENT MONITORING

In accordance with the OMMP, from August 1997 to December 2002, sediment samples were collected on a monthly basis from the Green River at the former sediment sample location 272. Additionally, sediment samples were periodically collected at the former sediment sampling locations 270, 271, and 274, and at the additional sediment sampling locations 881 and 882, upstream and downstream, respectively, from the former sediment sampling location 270. The sediment sampling locations are presented on Figure 7.7. The sediment samples were analyzed for PCBs and the sediment sample analytical results are presented in Table 7.4. The PCBs concentration detected in the sediment samples are relatively minor.

7.4.5 EXTRACTION WELL CONTAMINANT MASS REMOVAL ESTIMATES

The contaminant mass removal achieved by the extraction wells is estimated on an annual basis using the average annual contaminant concentrations detected in extraction well influent samples and the average annual extraction well flow rates. Mass removal estimates are conducted for PCBs and TCE.

The monthly hydraulic monitoring conducted at the Site in accordance with the OMMP includes the collection of influent samples from each extraction well and the measurement of the extraction well flow rates. The results of the monthly extraction well influent sampling and extraction well flow rate measurements are presented in the quarterly monitoring reports prepared for the Site and submitted to USEPA. The results of the monthly extraction well flow rate measurements for the years 1998 through 2002 are summarized in Tables 7.5a through 7.5e for extraction wells EW-1 to EW-5, respectively. The results of the monthly extraction well influent sampling for the years 1998 through 2002 are summarized in Tables 7.6a through 7.6e for extraction wells EW-1 to EW-5, respectively. For PCBs, elevated concentrations were detected in some extraction well influent samples (particularly EW-3) that reflect the presence of free product and are not representative of aqueous phase concentrations. In the calculation of the average annual extraction well influent concentrations, these elevated extraction well influent concentrations were not included. The average of the PCB and TCE concentrations detected in the monthly extraction well influent samples presented in

Tables 7.6a through 7.6e and the average of the monthly extraction well flow rates presented in Tables 7.5a through 7.5e were applied to estimate the PCB and TCE mass removal achieved by the extraction wells in the years 1998 through 2002, as presented in Table 7.7.

Table 7.8 presents a summary of the estimated TCE and PCB mass removal since startup of the Phase I RA groundwater extraction and treatment system in November 1993. As described in Section 4.2, the Phase I RA groundwater extraction and treatment system was operated through 1994 for a 1-year data collection period. The Phase II RA groundwater extraction and treatment system currently in operation at the Site was modified from the Phase I RA groundwater extraction and treatment system. The startup of the Phase II RA groundwater extraction and treatment system was initiated in December 1995. Table 7.8 presents a summary of the estimated mass removal throughout the operation of both the Phase I RA and Phase II RA.

As presented in Table 7.8, it is estimated that approximately 609 kilograms (1,341 pounds) of PCBs and 5,391 kilograms (11,881 pounds) of TCE have been removed from groundwater beneath the Site since the startup of the Phase I RA. This estimated mass removal is based on average annual extraction well flow rates and average annual extraction well influent chemical concentrations. As a result, the estimated mass removal is considered to be approximate. However, the estimated mass removal is significant and demonstrates that the groundwater extraction system is operating as an effective mass removal mechanism.

7.4.6 AIR EMISSION MONITORING

In accordance with the OMMP, vapor-phase carbon air emissions quality monitoring is performed on a monthly basis. The results of the monitoring are reported in the quarterly progress reports. The vapor-phase carbon emissions monitoring consists of collecting TCE air emission measurements using a Sensidyne® detector tube system at locations before, between, and after the two vapor-phase carbon units. Since startup of the Phase II RA, these results indicate that the vapor-phase carbon is effective in the removal of the TCE from the off-gas of both air strippers, and that the final air emissions are meeting the allowable discharge of 2 tons per year.

7.5 SITE INSPECTION

A Site inspection was conducted on November 7, 2002. The purpose of the inspection was to assess the protectiveness of the remedy. The inspection team consisted of Mr. Loften Carr of USEPA, Mr. Robert Gibbs of TDSF, Ms. Jennifer P. Martin of North Wind, and Messrs. Steven M. Harris, David S. Hill, and George W. (Chip) Cole of CRA. The completed Five-Year Review Site Inspection Checklist is presented in Appendix D. CRA prepared meeting minutes for the Site inspection and the meeting minutes also are presented in Appendix D. USEPA concurred with the meeting minutes.

7.6 INTERVIEWS

Interviews were conducted by USEPA with various parties connected to the Site. The USEPA Community Involvement Coordinator conducted 12 interviews via telephone in March 2003. Seven area residents, the Wayne County Public Library Director, the Waynesboro City Manager, the Wayne County Health Department Director for Groundwater Protection, and two CRA employees were interviewed. A summary of the comments received during the interviews is presented below.

- Nine of the 12 respondents stated that they are pleased with the way USEPA has handled the cleanup at the Site.
- Four of the respondents stated that they are not adequately informed of the status of the Site. Three respondents stated that they are adequately informed. Six respondents suggested that Site information be published in the local newspaper on a regular basis. Two respondents suggested that USEPA hold regular public meetings. Two respondents suggested that status update letters or progress reports be periodically provided to residents.
- Three of the respondents stated that they are concerned about the Site and/or adjacent properties. Six of the respondents stated that they have no concerns.
- Three of the respondents stated they are concerned about cancer occurrence rate of the area. One respondent asked if USEPA has conducted a cancer study of the area.
- One respondent questioned the information on geology and hydrology presented in previous plans. Another respondent stated that he believes contamination is still present at the Site and that it has not been contained.

8.0 TECHNICAL ASSESSMENT

8.1 QUESTION A: IS THE REMEDY FUNCTIONING AS INTENDED BY THE DECISION DOCUMENTS?

8.1.1 REMEDIAL ACTION PERFORMANCE

The review of documents, risk assumptions, and the results of the Site inspection indicate that the remedy is functioning as intended by the ROD. The effective implementation of the remedy has prevented exposure to, or ingestion of, contaminated groundwater.

8.1.2 SYSTEMS OPERATIONS/O&M

Operation and maintenance of the groundwater pump and treat system has been in accordance with the OMMP and has been effective.

8.1.3 OPPORTUNITIES FOR OPTIMIZATION

As described in Section 6.0, treatment system modifications were completed in September 2000 to optimize the treatment of PCBs from the groundwater recovered from extraction wells EW-3 and EW-4. As described in Section 4.2, the bottom portions of the extraction wells were grouted to prevent drawing groundwater from the deeper bedrock and creating downward groundwater flow, and thus contaminant migration, from the deep bedrock to the deeper bedrock. These are significant modifications that have been conducted to optimize and improve the effectiveness of the groundwater extraction and treatment systems.

8.1.4 EARLY INDICATORS OF POTENTIAL ISSUES

Based on groundwater elevations measured at OW70-01, which are greater than the surface water elevation in the Green River, the discharge of groundwater within the weathered and fractured upper bedrock may occur to the Green River. The groundwater samples collected from OW70-01 indicate that groundwater in the overburden / bedrock interface is impacted with low levels of PCBs, TCE, and 1,2-DCE. However, sampling of the surface water in the Green River confirms no adverse impact to the Green River.

8.1.5 IMPLEMENTATION OF INSTITUTIONAL CONTROLS AND OTHER MEASURES

The institutional controls that are in place include prohibitions on the installation and use of groundwater extraction wells within the contaminant plume, and any other activities or actions that might interfere with the implemented remedy. No activities were observed that would have violated the institutional controls.

8.2 QUESTION B: ARE THE EXPOSURE ASSUMPTIONS, TOXICITY DATA, CLEANUP LEVELS, AND REMEDIAL ACTION OBJECTIVES (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 protectiveness of the remedy.

8.2.1 CHANGES IN STANDARDS AND "TO BE CONSIDEREDS" (TBCs)

As the remedial work has been completed, the Applicable or Relevant and Appropriate Requirements (ARARs) for soil contamination cited in the ROD have been met. ARARs that still must be met at this time and that have been evaluated include: the Safe Drinking Water Act (SDWA) (40 CFR 141.11-141.16) from which many of the groundwater cleanup levels were derived (i.e., the MCLs). There have been no changes in these MCLs that would affect the protectiveness of the remedy.

8.2.2 CHANGES IN EXPOSURE PATHWAYS

There have been no changes to the exposure assumptions or pathways used to develop the Human Health Risk Assessment that would affect the protectiveness of the remedy.

8.2.3 CHANGES IN TOXICITY AND OTHER CONTAMINANT CHARACTERISTICS

There have been no changes to the MCLs for the contaminants of concern at the Site. A comparison of the toxicological data for the contaminants of concern from the 1991 RI and currently for 2003 is presented in Table 8.1. Although there are minor differences in the toxicological data, there are no known complete exposure pathways to groundwater that would affect the protectiveness of the remedy.

8.2.4 EXPECTED PROGRESS TOWARDS MEETING REMEDIAL ACTION OBJECTIVES

The findings of this Five-Year Review indicate that the RA objectives are being met, namely:

- eliminate or minimize the threat posed to public health and the environment from current and potential migration of hazardous substances in groundwater beneath the Site;
- reduce the volume, toxicity, and mobility of hazardous substances, pollutants, or contaminants in groundwater beneath the Site; and
- maintain the air quality at protective levels for on-Site workers and the public during the long-term operation of the on-Site groundwater treatment system.

Continued operation of the remedy will maintain this compliance and further reduce the mass and concentration of contaminants in groundwater.

8.3 QUESTION C: HAS ANY OTHER INFORMATION COME TO LIGHT THAT COULD CALL INTO QUESTION THE PROTECTIVENESS OF THE REMEDY?

There is no other information that calls into question the protectiveness of the remedy.

8.4 TECHNICAL ASSESSMENT SUMMARY

Based on the data review, the Site inspection, and the interviews, the remedy is functioning 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. There is no other information that calls into question the protectiveness of the remedy.

9.0 ISSUES

Based on groundwater elevations measured at OW70-01, which are greater than the surface water elevation in Green River, the discharge of groundwater within the weathered and fractured upper bedrock potentially may occur to the Green River. The groundwater samples collected from OW70-01 indicate that groundwater in the overburden/bedrock interface is impacted with low levels of PCBs, TCE, and 1,2-DCE. However, sampling of the surface water in the Green River confirms no adverse impact to the Green River.

10.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

Based on the findings of this Five-Year Review, the following recommendations are made:

- continue to operate the groundwater extraction and treatment systems at the Site as a source control and mass removal mechanism;
- install a new off-Site shallow/deep/deeper bedrock monitoring well nest approximately mid-way between existing shallow bedrock wells OW58-90 and OW59-90 to assess mid-plume conditions;
- prepare and implement a MNA remedy evaluation to address the off-Site groundwater plume. Following this evaluation, the feasibility of potentially adding nutrients and/or substrates to enhance the biodegradation already occurring on Site would be addressed;
- assess the applicability of incorporating the existing shallow bedrock monitoring wells OW47-89 or OW50-89, OW45-89, and OW23-86; deep bedrock monitoring wells OW42-89 or OW34-89, OW40-89, OW26-89, and OW52-89; and deeper bedrock monitoring well OW24-89 into the groundwater quality monitoring network one time sampling. This assessment would be conducted concurrent with the MNA remedy evaluation. Following this assessment, for those additional wells where it is deemed suitable, one-time sampling is recommended during the next annual monitoring event followed by an evaluation of whether inclusion in the monitoring network is warranted; and
- assess the frequency that high water table conditions occur and evaluate the significance that this situation may result in Site-related impacts in shallow groundwater to discharge to the Green River. Once this is resolved, it is recommended that the frequency of hydraulic monitoring events be reduced from monthly to quarterly. Considering the similarity in the groundwater elevations obtained during the monthly hydraulic monitoring events, it is proposed that the hydraulic monitoring events be conducted on a quarterly basis in the months of January, April, July, and October. The months of October and April correspond to relatively wet conditions in the Fall and Spring when groundwater elevations at the Site typically increase in conjunction with the increase precipitation in the Site vicinity. The months of July and January correspond to relatively dry conditions in the Summer and Winter when groundwater elevations at the Site typically decrease in conjunction with the decrease in precipitation in the Site vicinity.

11.0 PROTECTIVENESS STATEMENT

The remedy at the Mallory Capacitor Company Site continues to protect human health and the environment. The groundwater extraction and treatment system continues to remain functional and well maintained. The system continues to provide effective source control and functions as an effective contaminant mass removal system. Contaminant mass removal continues to increase over time.

12.0 NEXT REVIEW

The next Five-Year Review for the Mallory Capacitor Co. Site is required by July 1, 2008, five years from the approval date of this review.

13.0 REFERENCES

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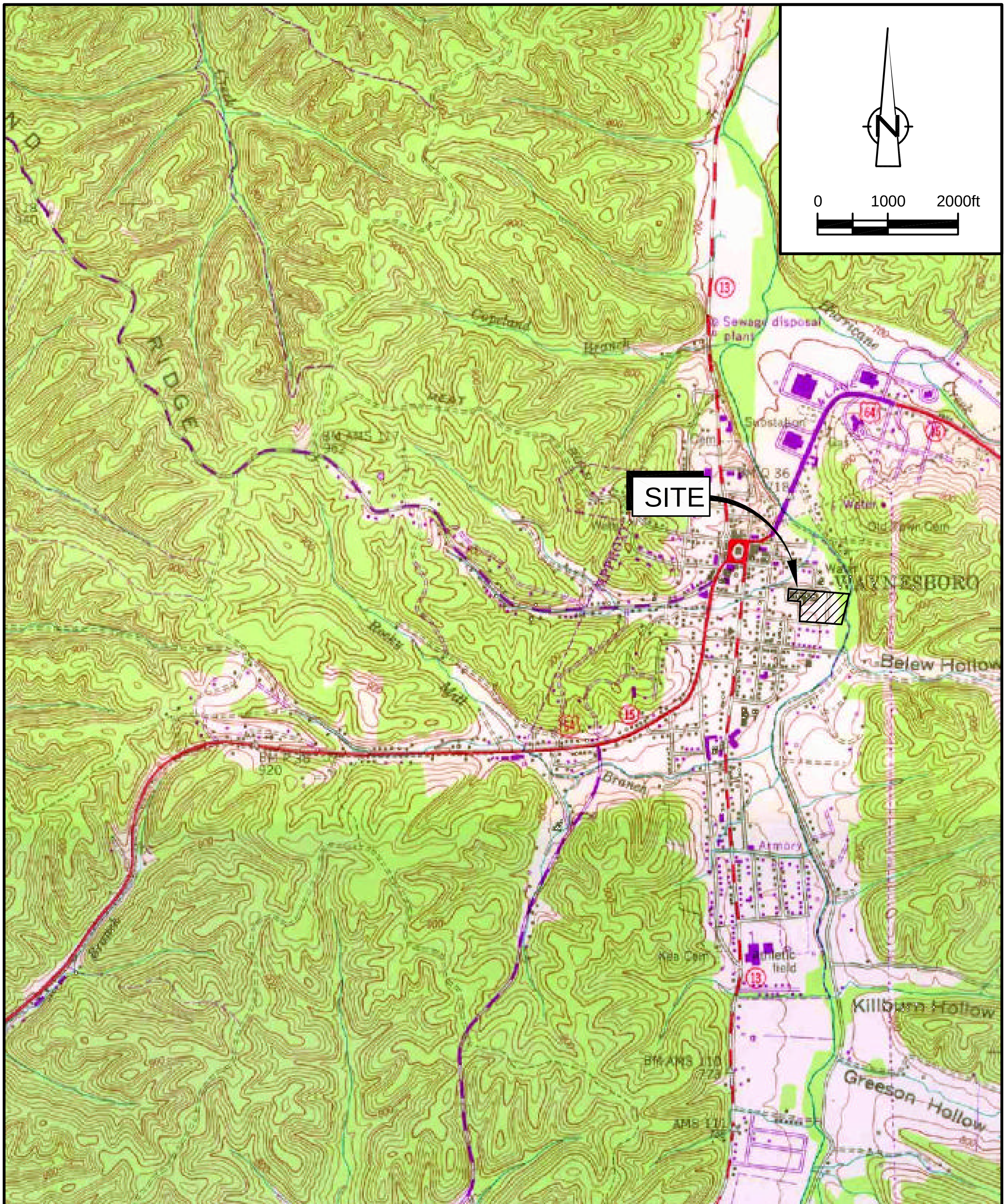


SOURCE: USGS QUADRANGLE MAP;
WAYNESBORO, TENNESSEE

MEMPHIS
WAYNESBORO
TENNESSEE

figure 3.1

SITE LOCATION
MALLORY CAPACITOR CO. SITE
Waynesboro, Tennessee

02319-00(048)GN-WA001 MAR 11/2003

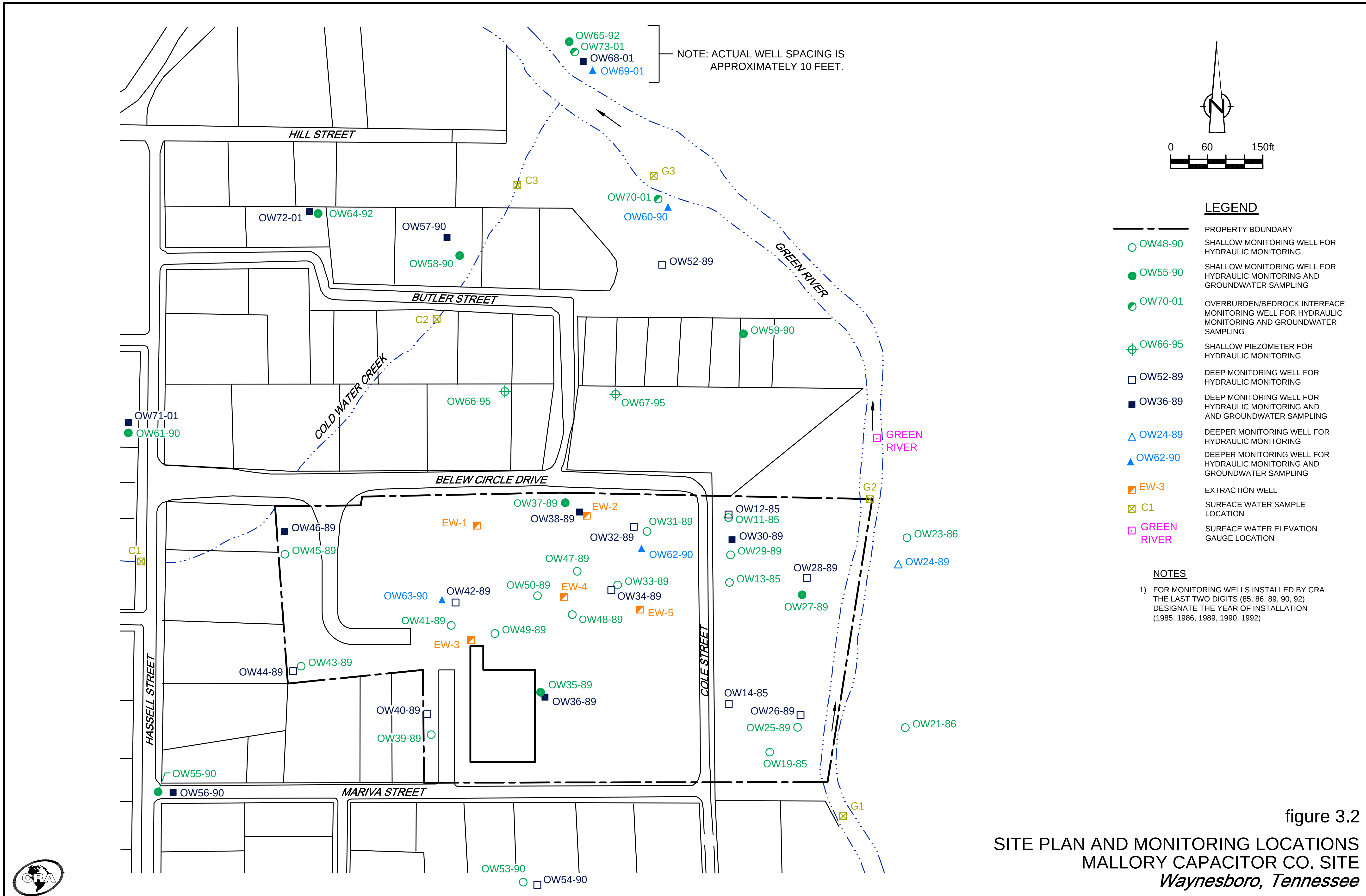
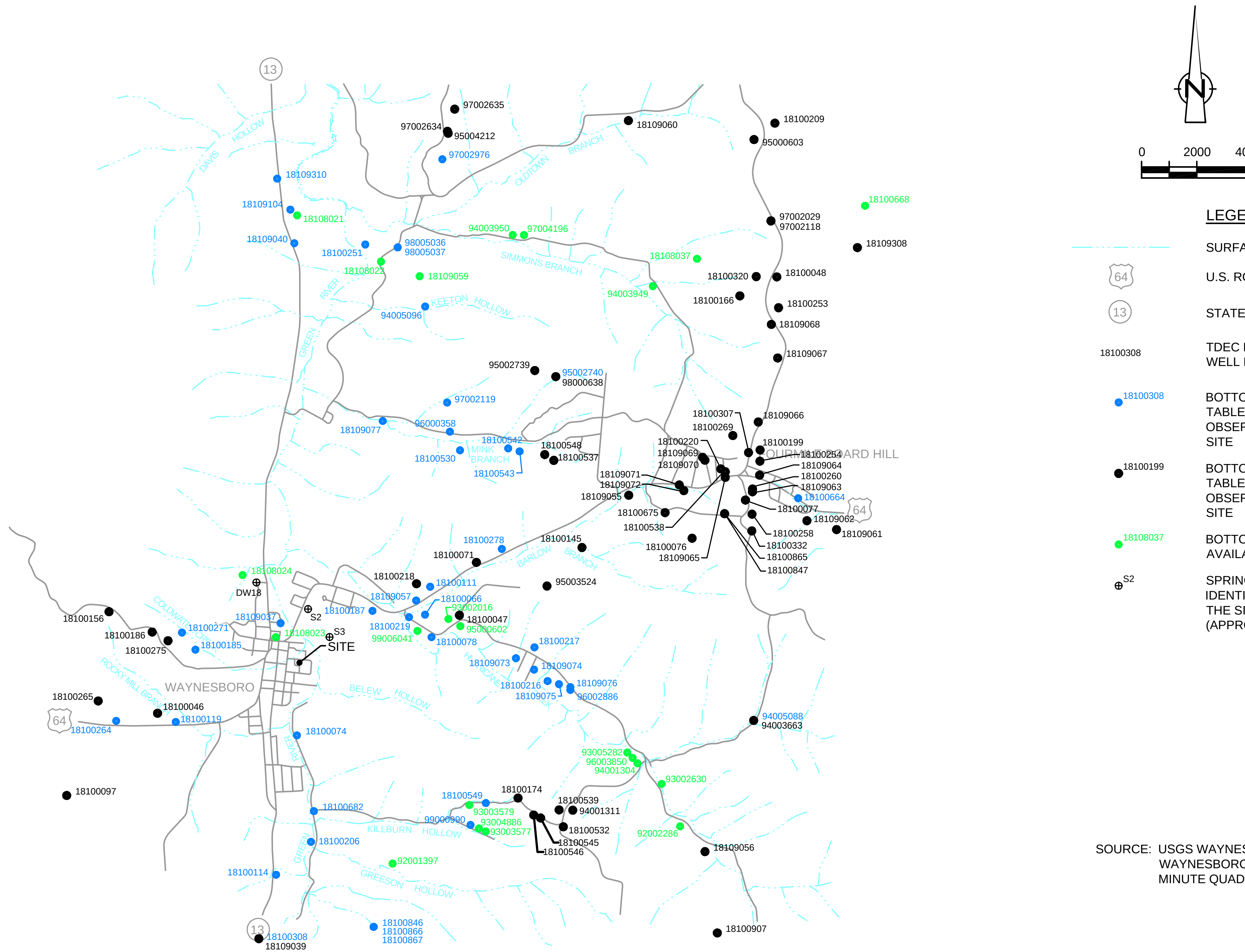


figure 3.2

SITE PLAN AND MONITORING LOCATIONS
MALLORY CAPACITOR CO. SITE
Waynesboro, Tennessee

02319-00(048)GN-WA002 MAR 11/2003



LEGEND

SURFACE WATER COURSE

64 U.S. ROUTE

13 STATE ROUTE

18100308 TDEC DIVISION OF WATER SUPPLY WELL NUMBER

18100308 BOTTOM OF WELL BELOW A WATER TABLE ELEVATION OF 700 ft AMSL OBSERVED TO THE NORTH OF THE SITE

18100199 BOTTOM OF WELL ABOVE A WATER TABLE ELEVATION OF 700 ft AMSL OBSERVED TO THE NORTH OF THE SITE

18108037 BOTTOM OF WELL ELEVATION NOT AVAILABLE

S2 SPRINGS AND WATERWELL IDENTIFIED DOWNGRADIENT FROM THE SITE IN THE RI/FS (APPROXIMATE LOCATIONS)

SOURCE: USGS WAYNESBORO, TENNESSEE AND WAYNESBORO EAST, TENNESSEE 7.5 MINUTE QUADRANGLE MAPS

figure 3.3

PRIVATE WELL LOCATIONS
MALLORY CAPACITOR CO. SITE
Waynesboro, Tennessee

CRA

02319-00(048)GN-WA003 MAR 11/2003

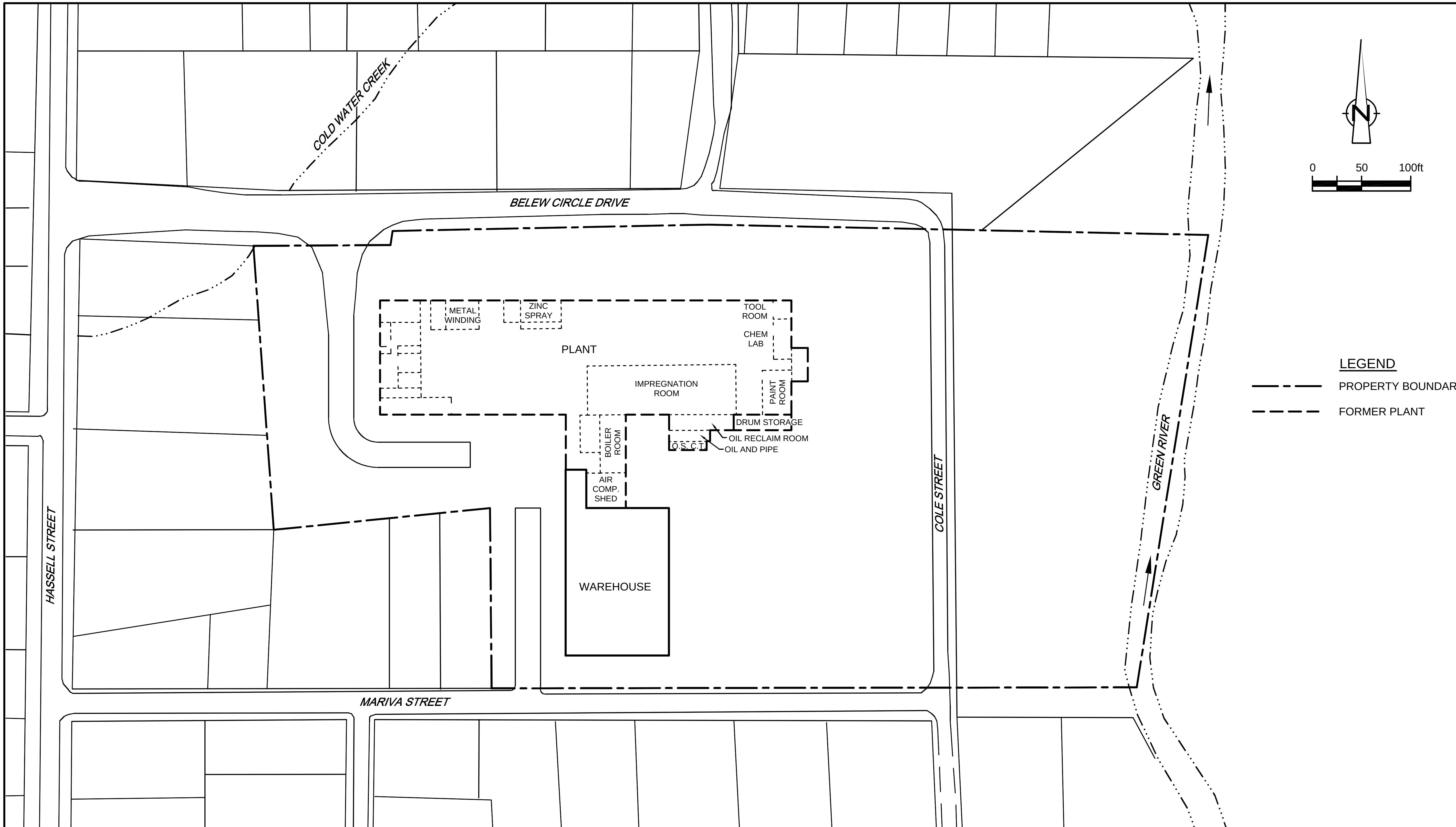
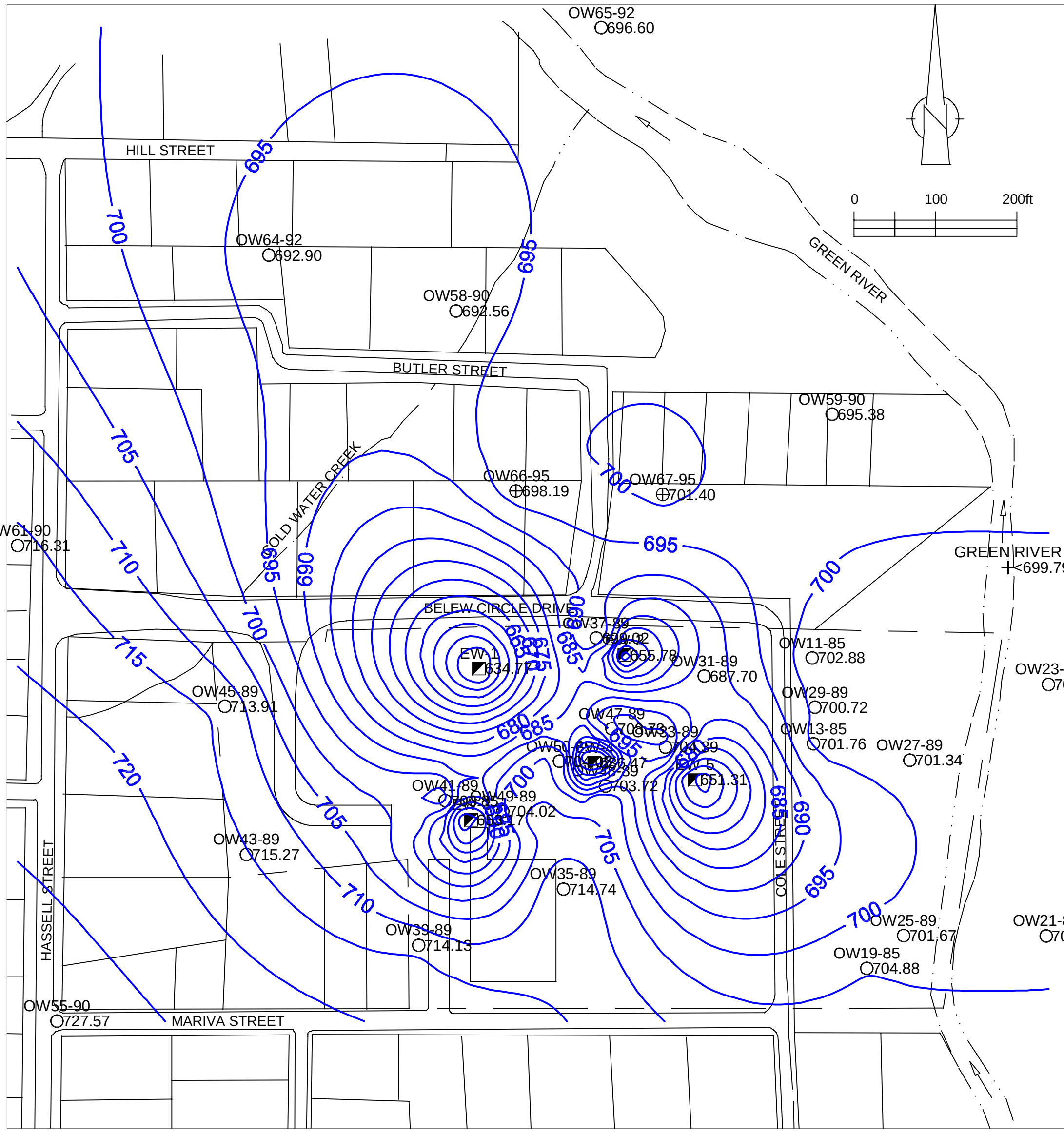


figure 3.4

FORMER PLANT LAYOUT
MALLORY CAPACITOR CO. SITE
Waynesboro, Tennessee

02319-00(048)GN-WA008 APR 28/2003



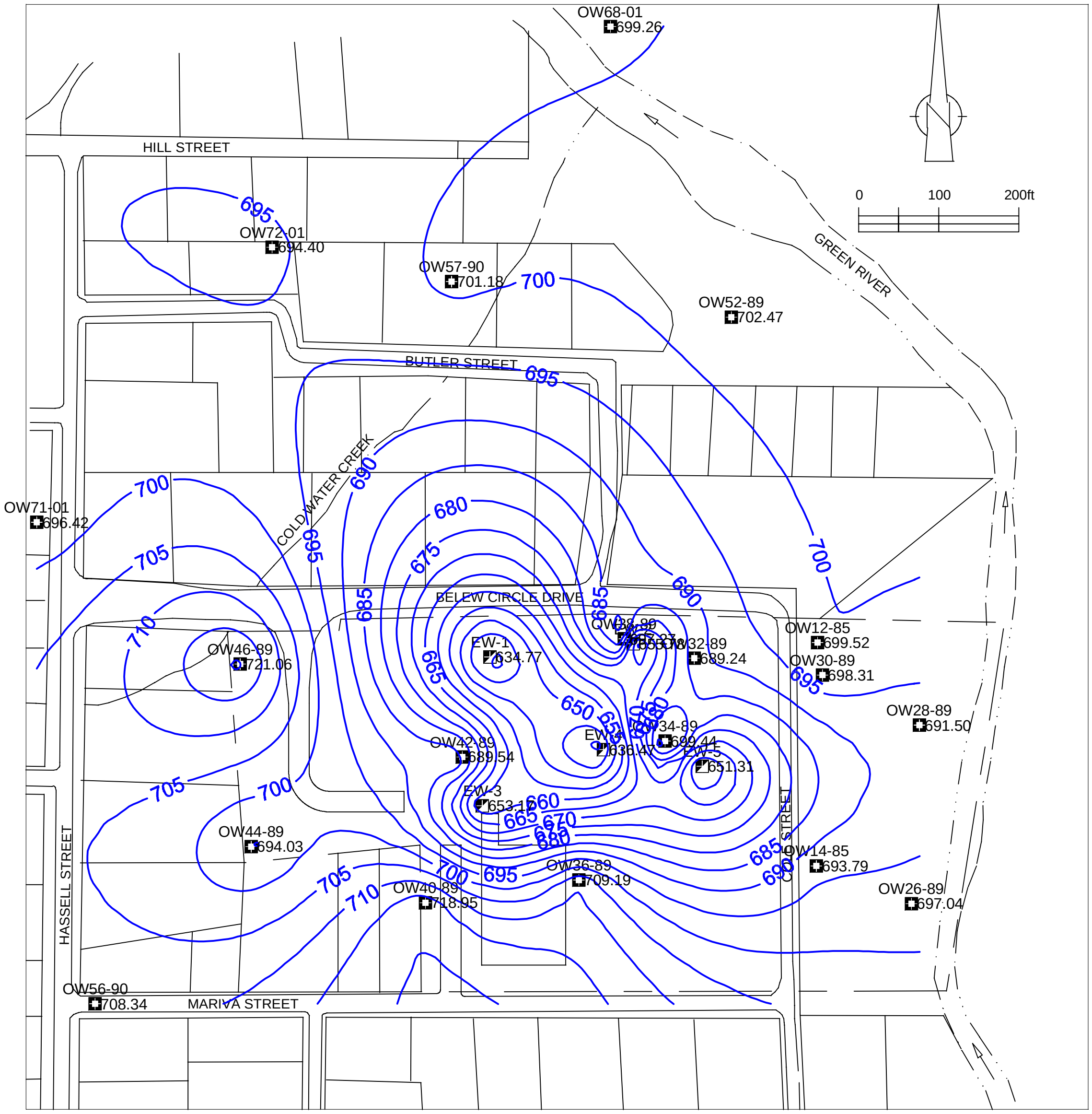
LEGEND

OW64-92 ○ 701.18	SHALLOW MONITORING WELL AND OBSERVED GROUNDWATER ELEVATION (FT AMSL).	OW57-90 ■ 695.52	DEEP MONITORING WELL AND OBSERVED GROUNDWATER ELEVATION (FT AMSL)
OW66-95 ⊕ 702.20	SHALLOW PIEZOMETER AND OBSERVED GROUNDWATER ELEVATION (FT AMSL).	OW63-90 ▲ 703.31	DEEPER BEDROCK MONITORING WELL AND OBSERVED GROUNDWATER ELEVATION (FT AMSL)
EW1 ◩ 650.52	EXTRACTION WELL AND OBSERVED GROUNDWATER ELEVATION (FT AMSL)	—700—	GROUNDWATER ELEVATION CONTOUR DETERMINED USING LINEAR KRIGING (FT AMSL)
GREEN RIVER + <699.79	GREEN RIVER SURFACE WATER ELEVATION (FT AMSL) (NOT INCLUDED IN CONTOUR GENERATION)		

figure 7.1
SHALLOW BEDROCK
GROUNDWATER ELEVATION CONTOURS - JULY 11, 2002
MALLORY CAPACITOR CO. SITE
Waynesboro, Tennessee

CRA

02319-00(045)GN-AT(SHAL_JUL2002.SRF) MAR 12/2003



LEGEND

OW64-92 ○ 701.18 — SHALLOW MONITORING WELL AND OBSERVED GROUNDWATER ELEVATION (FT AMSL).

OW66-95 ⊕ 702.20 — SHALLOW PIEZOMETER AND OBSERVED GROUNDWATER ELEVATION (FT AMSL).

EW1 ◩ 650.52 — EXTRACTION WELL AND OBSERVED GROUNDWATER ELEVATION (FT AMSL)

GREEN RIVER + <699.79 — GREEN RIVER SURFACE WATER ELEVATION (FT AMSL) (NOT INCLUDED IN CONTOUR GENERATION)

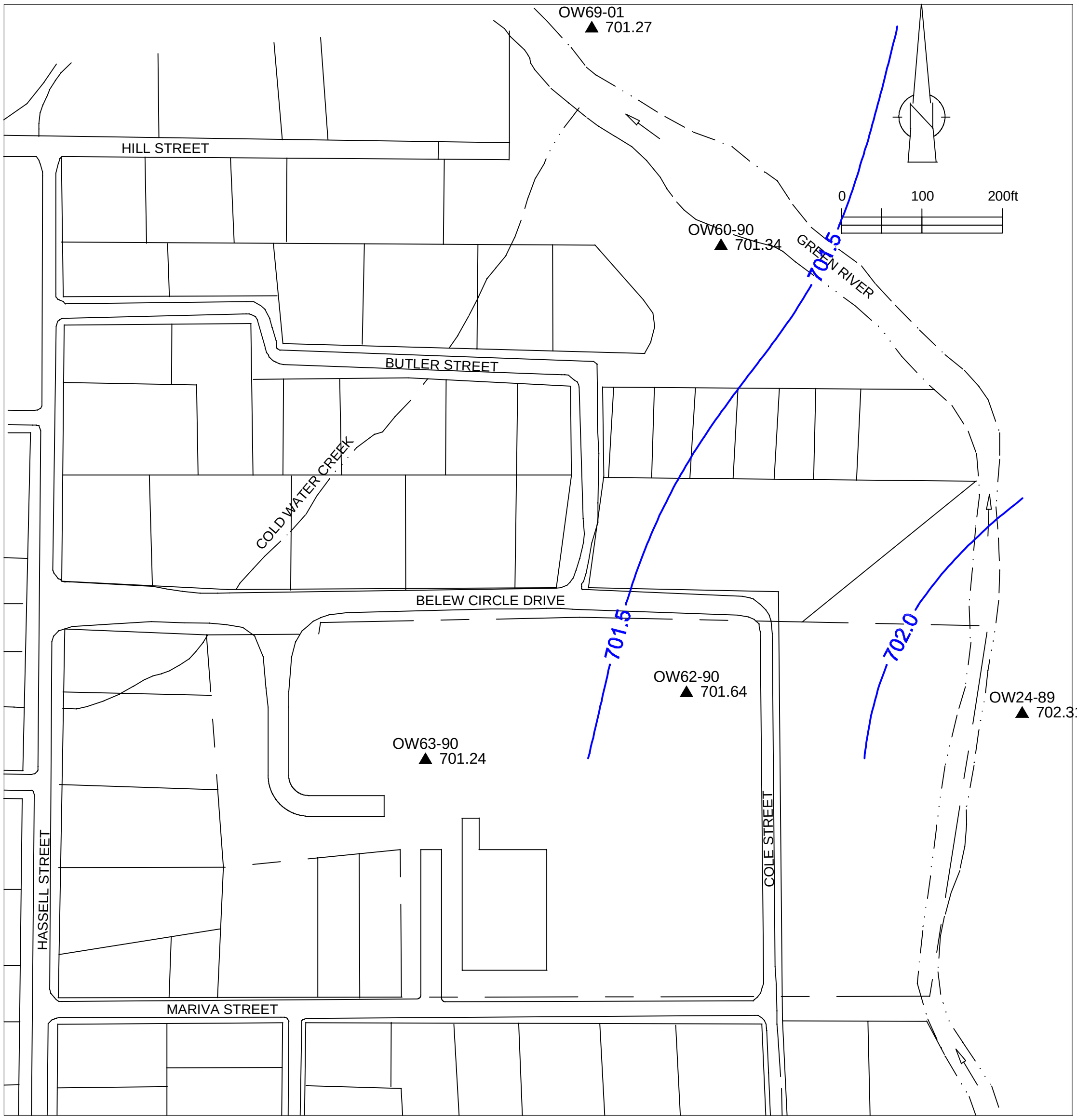
OW57-90 ■ 695.52 — DEEP MONITORING WELL AND OBSERVED GROUNDWATER ELEVATION (FT AMSL)

OW63-90 ▲ 703.31 — DEEPER BEDROCK MONITORING WELL AND OBSERVED GROUNDWATER ELEVATION (FT AMSL)

—700— GROUNDWATER ELEVATION CONTOUR DETERMINED USING LINEAR KRIGING (FT AMSL)

figure 7.2
DEEP BEDROCK
GROUNDWATER ELEVATION CONTOURS - JULY 11, 2002
MALLORY CAPACITOR CO. SITE
Waynesboro, Tennessee

02319-00(045)GN-AT(DEEP_JUL2002.SRF) MAR 12/2003



LEGEND

OW64-92 ○ 701.18	SHALLOW MONITORING WELL AND OBSERVED GROUNDWATER ELEVATION (FT AMSL).	OW57-90 ■ 695.52	DEEP MONITORING WELL AND OBSERVED GROUNDWATER ELEVATION (FT AMSL)
OW66-95 ⊕ 702.20	SHALLOW PIEZOMETER AND OBSERVED GROUNDWATER ELEVATION (FT AMSL).	OW63-90 ▲ 703.31	DEEPER BEDROCK MONITORING WELL AND OBSERVED GROUNDWATER ELEVATION (FT AMSL)
EW1 ◪ 650.52	EXTRACTION WELL AND OBSERVED GROUNDWATER ELEVATION (FT AMSL)	— 701.25 —	GROUNDWATER ELEVATION CONTOUR DETERMINED USING LINEAR KRIGING (FT AMSL)
GREEN RIVER + <699.79	GREEN RIVER SURFACE WATER ELEVATION (FT AMSL) (NOT INCLUDED IN CONTOUR GENERATION)		

figure 7.3
DEEPER BEDROCK
GROUNDWATER ELEVATION CONTOURS - JULY 11, 2002
MALLORY CAPACITOR CO. SITE
Waynesboro, Tennessee

02319-00(045)GN-AT(DEEPER_JUL2002.SRF) mar 12/2003

OW61-90	12/22/93	12/07/94	03/14/96	04/13/96	06/19/96 UNFILTERED	06/19/96 FILTERED	12/18/96	01/23/97	07/16/97	08/11/97	10/07/98	10/05/99	10/03/00	10/09/01	10/08/02
PCBs	ND(0.5)	.63	8.4	54	1.3	ND(0.5)	U(7.4) /5.8R/5.1R	1.1	0.99/1.3	1.6	ND(0.5)	ND(0.5)	ND(0.5)	6.1J/2.5J	ND (0.5)
TCE	ND(1.0)	ND(1.0)	ND(1.0)	NA	ND(1.0)	NA	NA	NA	ND(1.0)	NA	ND(1.0)	ND(1.0)	ND(1.0)	ND (1.0)/ND (1.0)	ND (1.0)
Cis-1,2-DCE	ND(1.0)	ND(1.0)	ND(1.0)	NA	ND(1.0)	NA	NA	NA	ND(1.0)	NA	ND(1.0)	ND(1.0)	ND(1.0)	ND (1.0)/ND (1.0)	ND (1.0)
Trans-1,2-DCE	ND(1.0)	ND(1.0)	ND(1.0)	NA	ND(1.0)	NA	NA	NA	ND(1.0)	NA	ND(1.0)	ND(1.0)	ND(1.0)	ND (1.0)/ND (1.0)	ND (1.0)
VC	ND(1.0)	ND(1.0)	ND(1.0)	NA	ND(1.0)	NA	NA	NA	ND(1.0)	NA	ND(1.0)	ND(1.0)	ND(1.0)	ND (1.0)/ND (1.0)	ND (1.0)

OW65-92	12/22/93	12/07/94	03/14/96	04/04/96	06/20/96 UNFILTERED	06/20/96 FILTERED	12/18/96	01/23/97	07/16/97	08/11/97	3/19/98	4/14/98	10/07/98	10/05/99	10/04/00	10/09/01	10/09/02
PCBs	2.1/ND(0.5)	.78/.89	27	1.7	3.2	ND(0.5)	ND(0.5)	2.5	ND(0.5)	NA	1.8	ND(0.5)/ND(0.5)	ND(0.5)	ND(0.5)/ND(0.5)	ND(0.5)	ND (0.5)	ND (0.5)
TCE	ND(1.0)	ND(1.0)	1.7	ND(1.0)	ND(1.0)	NA	NA	NA	ND(1.0)	NA	ND(1)	ND(1.0)/ND(1.0)	ND(1.0)	ND(1.0)/ND(1.0)	ND(1.0)	3.1	14
Cis-1,2-DCE	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	NA	NA	NA	17	7.4	2.6	4.8/4.5	34	34J/5.5	41	55	48
Trans-1,2-DCE	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	NA	NA	NA	ND(1.0)	NA	ND(1)	ND(1.0)/ND(1.0)	ND(1.0)	ND(1.0)/ND(1.0)	ND(1.0)	ND (2.5)	ND (1.0)
VC	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	NA	NA	NA	ND(1.0)	NA	ND(1)	ND(1.0)/ND(1.0)	ND(1.0)	ND(1.0)/ND(1.0)	ND(1.0)	ND (2.5)	ND (1.0)

OW64-92	12/22/93	12/07/94	03/14/96	04/04/96	06/20/96	12/18/96	01/23/97	07/16/97	10/06/98	10/05/99	10/03/00	10/09/01	10/08/02
PCBs	.54	ND(0.5)	5.6	ND(0.5)	0.12J	U(1.0)/ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)/ND(0.5)	ND (0.5)	ND (0.5)/ND (0.5)
TCE	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	NA	NA	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)/ND(1.0)	ND (1.0)	ND (1.0)/ND (1.0)
Cis-1,2-DCE	ND(1.0)	ND(1.0)	2.0	ND(1.0)	ND(1.0)	NA	NA	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)/ND(1.0)	2.9	4.2/4.2
Trans-1,2-DCE	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	NA	NA	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)/ND(1.0)	ND (1.0)	ND (1.0)/ND (1.0)
VC	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	NA	NA	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)/ND(1.0)	ND (1.0)	ND (1.0)/ND (1.0)

OW73-01	10/09/01	10/09/02
PCBs	ND (0.5)	ND (0.5)
TCE	ND (1.0)	ND (1.0)
Cis-1,2-DCE	ND (1.0)	1.2
Trans-1,2-DCE	ND (1.0)	ND (1.0)
VC	ND (1.0)	ND (1.0)

OW70-01	10/09/01	10/08/02
PCBs	3.8	3.3
TCE	9.8	230
Cis-1,2-DCE	ND (1.0)	21
Trans-1,2-DCE	ND (1.0)	ND (5.0)
VC	ND (1.0)	ND (5.0)

OW58-90	12/22/93	12/08/94	03/14/96	06/20/96	07/16/96	10/07/98	10/07/99	10/05/00	10/10/01	10/10/02
PCBs	ND(1.0)	2.7	8.3	1.4	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5 UJ)	ND (0.5)	ND (0.5)
TCE	55000	3800	1800	930	1700	560	240	190	130	120
Cis-1,2-DCE	ND(5000)	3800	3700	1200	2100	730	860	760	820	520
Trans-1,2-DCE	ND(5000)	ND(170)	120	ND(67)	ND(50)	ND(50)	ND(50)	ND(20)	ND (33)	ND (10)
VC	ND(5000)	ND(170)	1100	ND(67)	ND(50)	ND(50)	ND(50)	42	ND (33)	15

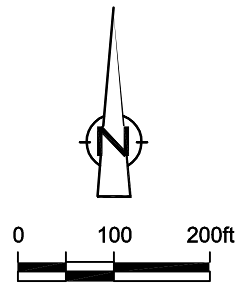
OW59-90	12/22/93	12/08/94	03/14/96	06/20/96	07/16/97	10/07/98	10/07/99	10/05/00	10/10/01	10/10/02
PCBs	2.3	1.8	9.1J/5.7J	0.55	140	U(1.0)	ND(0.5)	ND(0.5 UJ)	2.2	ND (0.5)/ND (0.5)
TCE	2200	ND(500)	ND(330)/ND(330)	ND(250)	380	ND(50)	ND(200)	ND(50)	ND (100)	ND (50)/ND (50)
Cis-1,2-DCE	7300	9700	7400/7800	3400	310	1700	2500	2600	2700	2800/2600
Trans-1,2-DCE	ND(1000)	ND(500)	ND(330)/ND(330)	ND(250)	ND(20)	ND(50)	ND(200)	ND(50)	ND (100)	ND (50)/ND (50)
VC	ND(1000)	ND(500)	ND(330)/ND(330)	ND(250)	35	ND(50)	ND(200)	310	110	170/110

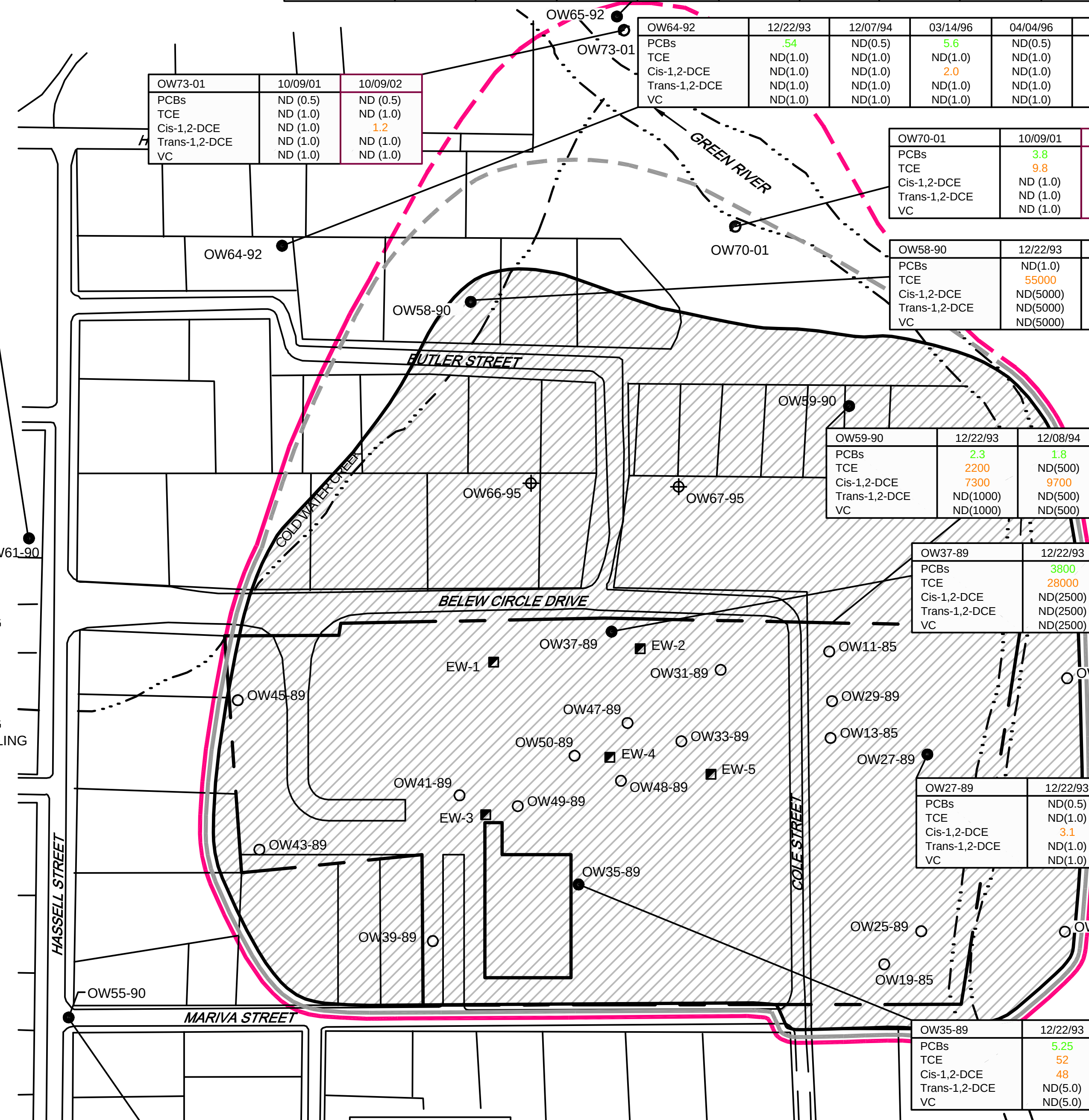
OW37-89	12/22/93	12/08/94	03/13/96	06/20/96	07/16/97	10/09/98	10/07/99	10/05/00	10/10/01	10/10/02
PCBs	3800	11900	4400	26000	2600	U(40000)	110000	48000 J	25000000	14000
TCE	28000	110000	610000	95000	29000	21000	23000	8400	26000	12000
Cis-1,2-DCE	ND(2500)	25000	290000	24000	11000	29000	41000	29000	38000	28000
Trans-1,2-DCE	ND(2500)	ND(2500)	ND(50000)	ND(10000)	ND(5000)	ND(1000)	ND(1000)	ND(1000)	ND (1400)	ND (500)
VC	ND(2500)	ND(2500)	ND(50000)	ND(10000)	ND(5000)	ND(1000)	ND(1000)	ND(1000)	ND (1400)	ND (500)

OW27-89	12/22/93	12/08/94	03/14/96	06/20/96	07/16/97	10/07/98	10/05/99	10/03/00	10/09/01	10/09/02
PCBs	ND(0.5)	0.54	5.8	ND(0.5)	16	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	1.4
TCE	ND(1.0)	ND(1.0)	8.4	14	1	ND(1.0)	ND(1.0)	1.3	ND (1.0)	2.8
Cis-1,2-DCE	3.1	5	1.4	1.3	1	ND(1.0)	ND(1.0)	ND(1.0)	ND (1.0)	2.4
Trans-1,2-DCE	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND (1.0)	ND (1.0)
VC	ND(1.0)	2.2	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND (1.0)	ND (1.0)

OW35-89	12/22/93	12/06/94	03/13/96	06/20/96	07/16/97	10/07/98	10/06/99	10/04/00	10/10/01	10/09/02
PCBs	5.25	1.3	7.9	19	8.4	6.04	4.0	3.8	2.7/1.1J	4.5 J
TCE	52	110	8.9	4.9	8.2	8.4	48	9.1	9.2/9.2	8.8
Cis-1,2-DCE	48	280	28	34	8.2	43	81	29	31/31	25
Trans-1,2-DCE	ND(5.0)	ND(50)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(5.0)	ND(1.0)	ND (1.0)/ND (1.0)	ND (1.0)
VC	ND(5.0)	ND(50)	ND(1.0)	ND(1.0)	3.7	2.1	ND(5.0)	ND(1.0)	ND (1.0)/ND (1.0)	ND (1.0)

OW55-90	12/22/93	12/08/94	03/14/96	04/03/96	06/19/96 UNFILTERED	06/19/96 FILTERED	07/16/97	10/06/98	10/05/99	10/03/00	10/09/01	10/08/02
PCBs	1.5	1.6	12	3.4	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	1.1	ND (0.5)	0.86
TCE	ND(1.0)	ND(1.0)	ND(1.0)	NA	ND(1.0)	NA	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND (1.0)	ND (1.0)
Cis-1,2-DCE	ND(1.0)	ND(1.0)	ND(1.0)	NA	ND(1.0)	NA	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND (1.0)	ND (1.0)
Trans-1,2-DCE	ND(1.0)	ND(1.0)	ND(1.0)	NA	ND(1.0)	NA	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND (1.0)	ND (1.0)
VC	ND(1.0)	ND(1.0)	ND(1.0)	NA	ND(1.0)	NA	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND (1.0)	ND (1.0)





LEGEND

	PROPERTY BOUNDARY
OW48-90	SHALLOW MONITORING WELL FOR HYDRAULIC MONITORING
OW55-90	SHALLOW MONITORING WELL FOR HYDRAULIC MONITORING AND GROUNDWATER SAMPLING
OW66-95	SHALLOW PIEZOMETER FOR HYDRAULIC MONITORING
EW-3	EXTRACTION WELL
OW70-01	OVERBURDEN/BEDROCK INTERFACE FOR HYDRAULIC MONITORING AND GROUNDWATER SAMPLING
	APPROXIMATE EXTENT OF AQUEOUS PHASE PCBs, 1,2-DCE AND/OR TCE IN SHALLOW BEDROCK (DECEMBER 1994)
	APPROXIMATE EXTENT OF AQUEOUS PHASE PCBs, 1,2-DCE AND/OR TCE IN SHALLOW BEDROCK FOLLOWING SIX MONTHS OF THE PHASE II RA (JUNE 1996)
	APPROXIMATE EXTENT OF AQUEOUS PHASE PCBs, 1,2-DCE AND/OR TCE IN SHALLOW BEDROCK FOLLOWING THE PHASE II RA MODIFICATIONS (JULY 1997) AND FOLLOWING THE OCTOBER 1998 AND OCTOBER 1999 ANNUAL GROUNDWATER QUALITY SAMPLING
	APPROXIMATE EXTENT OF AQUEOUS PHASE PCBs, 1,2-DCE AND/OR TCE IN SHALLOW BEDROCK FOLLOWING OCTOBER 2002 ANNUAL GROUNDWATER QUALITY SAMPLING
NA	NOT ANALYZED
J	ANALYTE WAS POSITIVELY IDENTIFIED. NUMERICAL VALUE INDICATED IS APPROXIMATE.
R	THE REPORTED VALUE FOR THE ANALYTE IS QUALIFIED AS UNUSABLE
U	ANALYTE WAS DETECTED ABOVE THE INDICATED SAMPLE QUANTIFICATON LIMIT
27	PCBs DETECTION
280	VOCs DETECTION
	RESULTS OF OCTOBER 2002 ANNUAL GROUNDWATER SAMPLING

NOTE

FOR MONITORING WELLS/PIEZOMETERS INSTALLED BY CRA THE LAST TWO DIGITS (85, 86, 89, 90, 92, 95, 01) DESIGNATE THE YEAR OF INSTALLATION (1985, 1986, 1989, 1990, 1992, 1995, 2001)

figure 7.4

SUMMARY OF ANALYTICAL DATA SHALLOW BEDROCK MONITORING WELLS MALLORY CAPACITOR CO. SITE

Waynesboro, Tennessee

02319-00(048)GN-WA004 MAR 11/2003

OW46-89	12/23/93	12/7/94	03/13/96	04/04/96	06/20/96 UNFILTERED	06/20/96 FILTERED	12/18/96	01/23/97	07/16/97	3/19/98	4/14/98	10/07/98	10/06/99	10/04/00	10/10/01	10/09/02
PCBs	0.69	ND(0.5)	9.6	35	3.1	ND(0.5)	U(17)/1.8R	ND(0.5)	ND(0.5)	1.0	ND(0.5)	ND(0.5)	1.1	ND(5.0)	ND (0.5)	ND (0.5)
TCE	ND(1.0)	ND(1.0)	40	2.2	ND(1.0)	NA	NA	NA	23	1.5	6.4	32	16	59	34	41
Cis-1,2-DCE	ND(1.0)	ND(1.0)	8.9	1.6	1.0	NA	NA	NA	21	48	26	79	63	190	130	200
Trans-1,2-DCE	ND(1.0)	ND(1.0)	ND(5.0)	ND(1.0)	ND(1.0)	NA	NA	NA	ND(10)	ND(1.0)	ND(1.0)	ND(20)	ND(5.0)	ND(5.0)	ND (5.0)	ND (2.5)
VC	ND(1.0)	ND(1.0)	ND(5.0)	ND(1.0)	ND(1.0)	NA	NA	NA	ND(10)	ND(1.0)	ND(1.0)	ND(20)	ND(5.0)	ND(5.0)	ND (5.0)	ND (2.5)

OW68-01	10/09/01	10/09/02
PCBs	ND (0.5)	0.73
TCE	ND (1.0)	ND (1.0)
Cis-1,2-DCE	8.2	4.7
Trans-1,2-DCE	ND (1.0)	ND (1.0)
VC	ND (1.0)	ND (1.0)

OW71-01	10/09/01	10/08/02
PCBs	ND (0.5)	1.1 J
TCE	ND (1.0)	ND (1.0)
Cis-1,2-DCE	ND (1.0)	ND (1.0)
Trans-1,2-DCE	ND (1.0)	ND (1.0)
VC	ND (1.0)	ND (1.0)

OW72-01	10/09/01	10/08/02
PCBs	ND (0.5)	ND (0.5)
TCE	ND (25)	13
Cis-1,2-DCE	520	320
Trans-1,2-DCE	ND (25)	ND (5.0)
VC	ND (25)	14

OW57-90	12/23/93	12/7/94	1/16/95	03/14/96	06/20/96	07/16/97	10/09/98	10/07/99	10/05/00	01/04/01	10/10/01	10/09/02
PCBs	ND(0.5)	ND(0.5)	ND(0.5)	110	0.77	ND(0.5)	ND(0.5)	ND(0.5)	1700	3.4	1.4	3.8
TCE	ND(10)	1000	1500	1400	2600	400	160	75	34	ND(10)	ND (10)	2.3
Cis-1,2-DCE	82	1600	1000	1200	2400	650	560	410	ND(1.0)	450	220	150
Trans-1,2-DCE	ND(10)	ND(50)	ND(200)	ND(100)	ND(200)	ND(20)	ND(20)	ND(20)	ND(1.0)	ND(10)	ND (10)	ND (2.0)
VC	ND(10)	ND(50)	ND(200)	ND(100)	ND(200)	ND(20)	ND(20)	ND(20)	ND(1.0)	28	ND (10)	10

OW38-89	12/22/93	12/8/94	03/13/96	06/20/96	07/16/97	10/09/98	10/07/99	10/05/00	10/10/01	10/10/02
PCBs	40000	40000	4400	710000	4200	36000000J	240000	12000 J	2100000	28000
TCE	77000	100000	24000	150000	17000	300000	340000	170000	160000	140000
Cis-1,2-DCE	20000	5100	3500	ND(10000)	12000	ND(25000)	ND(10000)	ND(10000)	ND (10000)	4000
Trans-1,2-DCE	ND(10000)	ND(2500)	ND(1000)	ND(10000)	ND(10000)	ND(25000)	ND(10000)	ND(10000)	ND (10000)	ND (2500)
VC	ND(10000)	ND(2500)	ND(1000)	ND(10000)	ND(10000)	ND(25000)	ND(10000)	ND(10000)	ND (10000)	ND (2500)

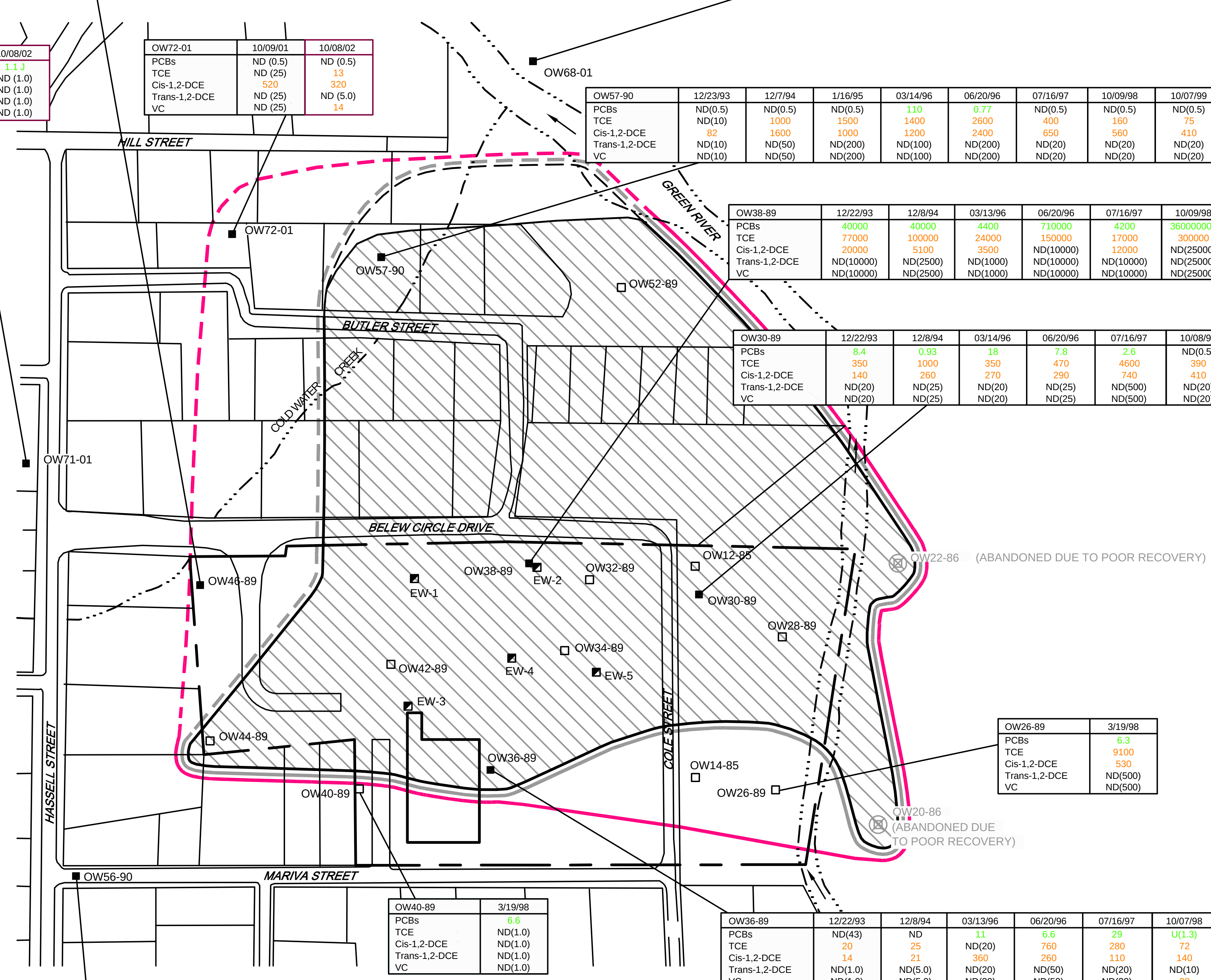
OW30-89	12/22/93	12/8/94	03/14/96	06/20/96	07/16/97	10/08/98	10/06/99	10/05/00	10/10/01	10/09/02
PCBs	8.4	0.93	18	7.8	2.6	ND(0.5)	ND(0.5)	2.1	5.4	12
TCE	350	1000	350	470	4600	390	770	410	1,600	110
Cis-1,2-DCE	140	260	270	290	740	410	360	330	160	16
Trans-1,2-DCE	ND(20)	ND(25)	ND(20)	ND(25)	ND(500)	ND(20)	ND(100)	ND(10)	ND (50)	ND (5.0)
VC	ND(20)	ND(25)	ND(20)	ND(25)	ND(500)	ND(20)	ND(100)	ND(10)	ND (50)	ND (5.0)

OW26-89	3/19/98
PCBs	6.3
TCE	9100
Cis-1,2-DCE	530
Trans-1,2-DCE	ND(500)
VC	ND(500)

OW40-89	3/19/98
PCBs	6.6
TCE	ND(1.0)
Cis-1,2-DCE	ND(1.0)
Trans-1,2-DCE	ND(1.0)
VC	ND(1.0)

OW36-89	12/22/93	12/8/94	03/13/96	06/20/96	07/16/97	10/07/98	10/06/99	10/04/00	10/10/01	10/09/02
PCBs	ND(43)	ND	11	6.6	29	U(1.3)	0.94	0.94	0.74	0.86/0.62
TCE	20	25	ND(20)	760	280	72	250	59	140	280/250
Cis-1,2-DCE	14	21	360	260	110	140	460	680	470	420/370
Trans-1,2-DCE	ND(1.0)	ND(5.0)	ND(20)	ND(50)	ND(20)	ND(10)	ND(20)	ND(20)	ND (20)	9.9/8.6
VC	ND(1.0)	ND(5.0)	ND(20)	ND(50)	ND(20)	28	ND(20)	ND(20)	ND (20)	16/18

OW56-90	1/5/94	12/6/94	03/14/96	04/03/96	06/19/96 UNFILTERED	06/19/96 FILTERED	12/18/96	01/23/97	07/16/97	10/07/98	10/05/99	10/03/00	10/09/01	10/08/02
PCBs	ND(0.5)	ND(0.51)	5.4	65	2.1	ND(0.5)	U(1.4)/ND(1.0)R	ND(0.5)	ND(0.5)	ND(0.5)/ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	1.3
TCE	ND(1.0)	ND(1.0)	4.0	ND(1.0)	ND(1.0)	NA	NA	NA	ND(1.0)	ND(1.0)/ND(1.0)	ND(1.0)	ND(1.0)	ND (1.0)	ND (1.0)
Cis-1,2-DCE	ND(1.0)	ND(1.0)	2.5	ND(1.0)	ND(1.0)	NA	NA	NA	ND(1.0)	ND(1.0)/ND(1.0)	ND(1.0)	ND(1.0)	ND (1.0)	ND (1.0)
Trans-1,2-DCE	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	NA	NA	NA	ND(1.0)	ND(1.0)/ND(1.0)	ND(1.0)	ND(1.0)	ND (1.0)	ND (1.0)
VC	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	NA	NA	NA	ND(1.0)	ND(1.0)/ND(1.0)	ND(1.0)	ND(1.0)	ND (1.0)	ND (1.0)



LEGEND

PROPERTY BOUNDARY

OW52-89 DEEP MONITORING WELL FOR HYDRAULIC MONITORING

OW36-89 DEEP MONITORING WELL FOR HYDRAULIC MONITORING AND GROUNDWATER SAMPLING

EW-3 EXTRACTION WELL

OW22-86 DEEP MONITORING WELL ABANDONED DUE TO POOR RECOVERY

APPROXIMATE EXTENT OF AQUEOUS PHASE PCBs, 1,2-DCE AND/OR TCE IN DEEP BEDROCK (DECEMBER 1994)

APPROXIMATE EXTENT OF AQUEOUS PHASE PCBs, 1,2-DCE AND/OR TCE IN DEEP BEDROCK FOLLOWING SIX MONTHS OF THE PHASE II RA (JUNE 1996)

APPROXIMATE EXTENT OF AQUEOUS PHASE PCBs, 1,2-DCE AND/OR TCE IN DEEP BEDROCK FOLLOWING THE PHASE II RA MODIFICATIONS (JULY 1997) AND FOLLOWING THE OCTOBER 1998 AND OCTOBER 1999 ANNUAL GROUNDWATER QUALITY SAMPLING

APPROXIMATE EXTENT OF AQUEOUS PHASE PCBs, 1,2-DCE AND/OR TCE IN DEEP BEDROCK FOLLOWING THE OCTOBER 2002 ANNUAL GROUNDWATER QUALITY SAMPLING

NA NOT ANALYZED

J ANALYTE WAS POSITIVELY IDENTIFIED. NUMERICAL VALUE INDICATED IS APPROXIMATE.

R THE REPORTED VALUE FOR THE ANALYTE IS QUALIFIED AS UNUSABLE

U ANALYTE WAS DETECTED ABOVE THE INDICATED SAMPLE QUANTIFICATON LIMIT

65 PCBs DETECTION

140 VOCs DETECTION

RESULTS OF OCTOBER 2002 ANNUAL GROUNDWATER SAMPLING

NOTE

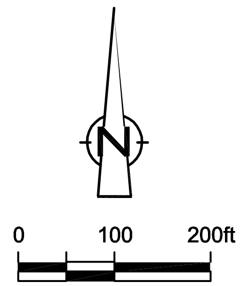
FOR MONITORING WELLS INSTALLED BY CRA THE LAST TWO DIGITS (85, 86, 89, 90, 92, 95, 01) DESIGNATE THE YEAR OF INSTALLATION (1985, 1986, 1989, 1990, 1992, 1995, 2002)

figure 7.5

SUMMARY OF ANALYTICAL DATA
DEEP BEDROCK MONITORING WELLS
MALLORY CAPACITOR CO. SITE
Waynesboro, Tennessee

CRA

02319-00(048)GN-WA005 MAR 11/2003



OW62-90	1/5/94	12/06/94	1/16/94	03/13/96	06/21/96	12/18/96	01/23/97	07/16/97	10/09/98	10/06/99	10/04/00	10/10/01	10/09/02
PCBs	ND(0.5)	3.9	2.6	99	180J/94J	U(140)/46R	12	9.2	6.4J/8.4	6.6	6.1	9.1	6.2 J
TCE	U(3.8)	4700	2000	8000	2300J/1700J	1800	NA	750	300/270	1200	570	500	540
Cis-1,2-DCE	ND(1.0)	610	5100	9000	4700J/3800J	2700	NA	1300	140/140	340	650	540	790
Trans-1,2-DCE	ND(1.0)	ND(250)	ND(500)	ND(500)	ND(200)/ND(100)	ND(100)	NA	ND(20)	ND(10)/ND(50)	ND(100)	ND(20)	ND (20)	ND (20)
VC	ND(1.0)	ND(250)	ND(5.0)	ND(500)	ND(200)/ND(100)	ND(100)	NA	160	16/ND(50)	ND(100)	110	37	80

OW69-01	10/09/01	10/09/02
PCBs	7.9	ND (0.5)
TCE	ND (7.7)	3.0
Cis-1,2-DCE	170	120
Trans-1,2-DCE	ND (7.7)	ND (1.0)
VC	ND (7.7)	ND (1.0)

OW60-90	1/5/94	12/6/94	01/16/95	06/19/96	07/16/97	10/09/98	10/05/99	10/03/00	10/09/01	10/08/02
PCBs	ND(0.5)	2.2	ND(0.5)	4.2	3.9	U(1.1)	ND(0.5)	ND(0.5)	1.2	ND (0.5)
TCE	ND(1.0)	2700	2200	4400	ND(20)	ND(2.0)	ND(1.0)	ND(1.0)	1300	1200
Cis-1,2-DCE	ND(1.0)	1700	2200	4000	390	2.1	1.1	ND(1.0)	310	390
Trans-1,2-DCE	ND(1.0)	ND(170)	ND(250)	ND(250)	ND(20)	ND(2.0)	ND(1.0)	ND(1.0)	ND (50)	ND (50)
VC	ND(1.0)	ND(170)	ND(250)	ND(250)	88	ND(2.0)	ND(1.0)	ND(1.0)	ND (50)	ND (50)

LEGEND

PROPERTY BOUNDARY

OW24-89 DEEPER MONITORING WELL FOR HYDRAULIC MONITORING

OW62-90 DEEPER MONITORING WELL FOR HYDRAULIC MONITORING AND GROUNDWATER SAMPLING

APPROXIMATE EXTENT OF AQUEOUS PHASE PCBs, 1,2-DCE AND/OR TCE IN DEEPER BEDROCK (DECEMBER 1994)

APPROXIMATE EXTENT OF AQUEOUS PHASE PCBs, 1,2-DCE AND/OR TCE IN DEEPER BEDROCK FOLLOWING SIX MONTHS OF THE PHASE II RA (JUNE 1996)

APPROXIMATE EXTENT OF AQUEOUS PHASE PCBs, 1,2-DCE AND/OR TCE IN DEEPER BEDROCK FOLLOWING THE PHASE II RA MODIFICATIONS (JULY 1997) AND FOLLOWING THE OCTOBER 1998 AND OCTOBER 1999 ANNUAL GROUNDWATER QUALITY SAMPLING

APPROXIMATE EXTENT OF AQUEOUS PHASE PCBs, 1,2-DCE AND/OR TCE IN DEEPER BEDROCK FOLLOWING THE OCTOBER 2002 ANNUAL GROUNDWATER QUALITY SAMPLING

NA NOT ANALYZED

J ANALYTE WAS POSITIVELY IDENTIFIED. NUMERICAL VALUE INDICATED IS APPROXIMATE

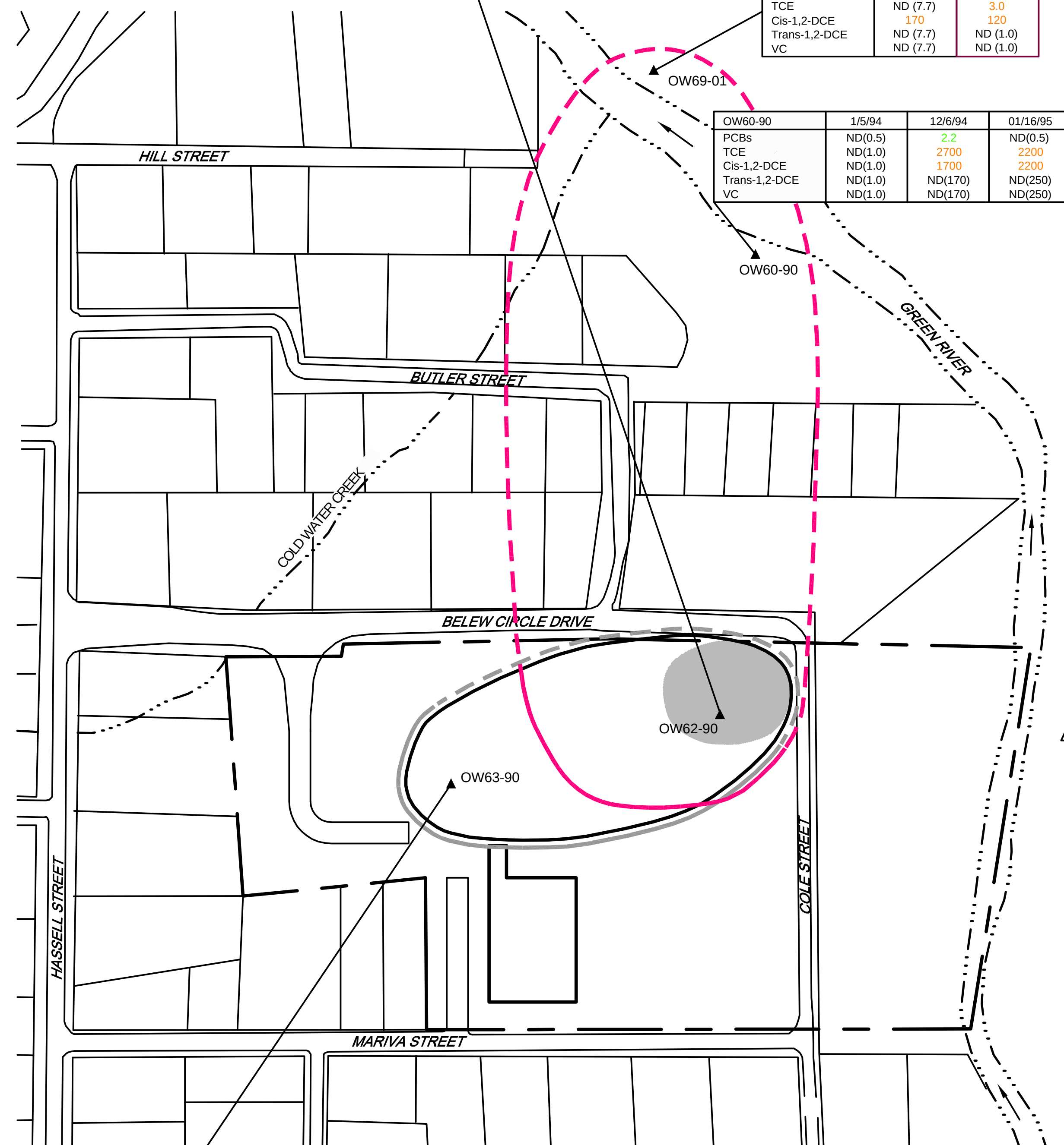
R THE REPORTED VALUE FOR THE ANALYTE IS QUALIFIED AS UNUSABLE

U ANALYTE WAS NOT DETECTED ABOVE THE INDICATED SAMPLE QUANTIFICATION LIMIT

27 PCBs DETECTION

280 VOCs DETECTION

RESULTS OF OCTOBER 2002 ANNUAL GROUNDWATER SAMPLING



OW24-89	3/19/98
PCBs	ND(0.5)
TCE	ND(1.0)
Cis-1,2-DCE	24
Trans-1,2-DCE	ND(1.0)
VC	ND(1.0)

OW63-90	1/5/94	12/06/94	03/13/96	04/04/96	06/21/96	12/18/96	01/23/97	07/16/97	10/06/98	10/06/99	10/04/00	10/09/01	10/09/02
PCBs	ND(0.5)	ND(0.52)	25	110/130	280	U(65)/35R	6.4	35	1.9	1.3/1.2	1.1 J/1.4	2.3	ND (0.5)
TCE	U(7.4)	ND(1.0)	6	35/38	29	4.6	NA	5.8	5.5	3.4/3.4	ND(1.0)/ND(1.0)	ND (1.0)	ND (1.0)
Cis-1,2-DCE	ND(1.0)	ND(1.0)	14	2.5/2.9	ND(2.5)	4.6	NA	2.6	2.7	2.3/2.3	2.3/2.5	1.5	1.4
Trans-1,2-DCE	ND(1.0)	ND(1.0)	ND(5.0)	ND(2.0)/ND(2.5)	ND(2.5)	ND(1.0)	NA	ND(1.0)	ND(1.0)	ND(1.0)/ND(1.0)	ND(1.0)/ND(1.0)	ND (1.0)	ND (1.0)
VC	ND(1.0)	ND(1.0)	ND(5.0)	ND(2.0)/ND(2.5)	ND(2.5)	ND(1.0)	NA	ND(1.0)	ND(1.0)	ND(1.0)/ND(1.0)	ND(1.0)/ND(1.0)	ND (1.0)	ND (1.0)

NOTE

FOR MONITORING WELLS INSTALLED BY CRA THE LAST TWO DIGITS (85, 86, 89, 90, 92, 01) DESIGNATE THE YEAR OF INSTALLATION (1985, 1986, 1989, 1990, 1992, 2001)

figure 7.6

SUMMARY OF ANALYTICAL DATA DEEPER BEDROCK MONITORING WELLS MALLORY CAPACITOR CO. SITE

Waynesboro, Tennessee

02319-00(048)GN-WA006 MAR 11/2003

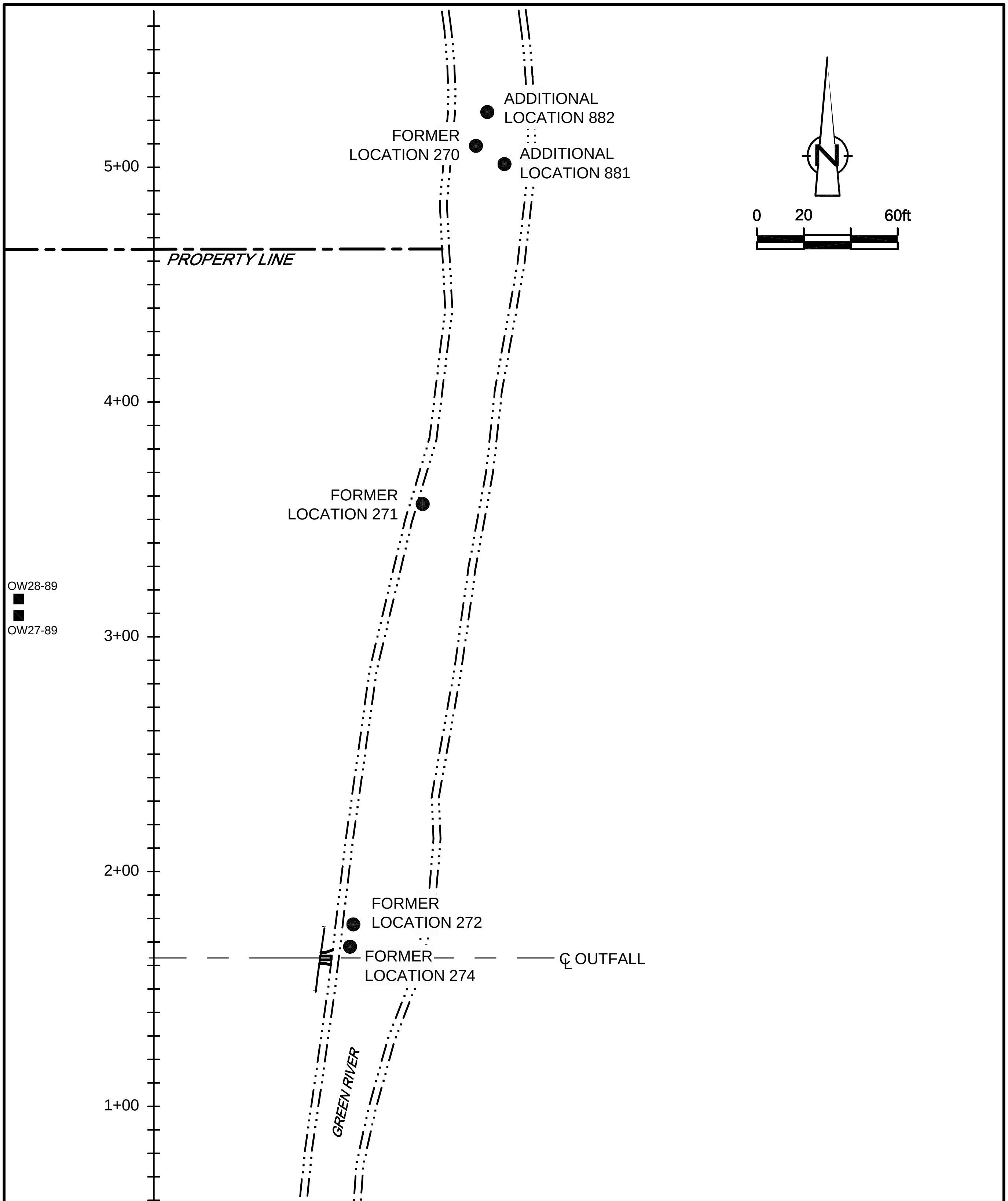


figure 7.7

GREEN RIVER SEDIMENT SAMPLING LOCATIONS
MALLORY CAPACITOR CO. SITE
Waynesboro, Tennessee

02319-00(048)GN-WA007 MAR 11/2003

TABLE 3.1

SUMMARY OF PRIVATE WATER WELL LOCATIONS
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

TDEC Division of Water Supply Well Number	*Well Installation Date*	*Total Well Depth (ft. bgs)*	*Well Location [(1)] Latitude (deg min sec)*	*Well Location [(1)] Longitude (deg min sec)*	*Well Location [(1)] Easting (feet)*	*Well Location [(1)] Northing (feet)*	*Well Location [(2)] Easting (feet)*	*Well Location [(2)] Northing (feet)*	*Well Location Within Limits Of Figure 6.1*	*Estimated Ground Surface Elevation [(3)] (ft AMSL)*	*Estimated Bottom of Well Elevation (ft AMSL)*	*Bottom of Well Below Site Water Table [(4)]*
Private Water Wells Located in Waynesboro, Tennessee USGS 7.5 Minute Quadrangle Map												
18100262	09 / 02 / 1963	84	35 21 04	87 50 47	1,449,406	354,324	-	-	NO		-	UNKNOWN
18100777	04 / 26 / 1985	75	35 20 00	87 50 00	1,453,177	347,781	-	-	NO		-	UNKNOWN
18100808	09 / 27 / 1985	150	35 20 00	87 50 00	1,453,177	347,781	-	-	NO		-	UNKNOWN
18109043	NR	30	35 21 02	87 50 50	1,449,153	354,127	-	-	NO		-	UNKNOWN
96005368	11 / 12 / 1996	100	NR	NR	-	-	-	-	NO		-	UNKNOWN
20004530	08 / 24 / 2000	85	NR	NR	-	-	-	-	NO		-	UNKNOWN
91003586	09 / 20 / 1991	100	35 21 31	87 47 54	1,463,784	356,787	-	-	NO		-	UNKNOWN
92004146	11 / 20 / 1992	100	NR	NR	-	-	-	-	NO		-	UNKNOWN
98005038	10 / 21 / 1998	150	NR	NR	-	-	-	-	NO		-	UNKNOWN
98005458	11 / 19 / 1998	200	NR	NR	-	-	-	-	NO		-	UNKNOWN
18100251	05 / 20 / 1968	125	35 21 34	87 45 09	1,477,455	356,842	-	-	YES	670	545	YES
18108021	NR	NR	35 21 44	87 45 39	1,474,988	357,898	-	-	YES	740	-	UNKNOWN
18108022	NR	NR	35 21 28	87 45 02	1,478,023	356,225	-	-	YES	720	-	UNKNOWN
18109040	NR	60	35 21 34	87 45 40	1,474,887	356,888	-	-	YES	740	680	YES
18109044	NR	82	35 25 29	87 42 39	1,490,292	380,379	-	-	NO		-	UNKNOWN
18109104	NR	82	35 21 46	87 45 42	1,474,743	358,104	-	-	YES	740	658	YES
18109310	05 / 22 / 1980	100	35 21 57	87 45 48	1,474,267	359,225	-	-	YES	740	640	YES
20010901	02 / 26 / 2001	100	NR	NR	-	-	-	-	NO		-	UNKNOWN
93001370	03 / 29 / 1993	275	NR	NR	-	-	-	-	NO		-	UNKNOWN
93004263	09 / 27 / 1993	140	NR	NR	-	-	-	-	NO		-	UNKNOWN
98005036	10 / 16 / 1998	350	NR	NR	-	-	1,478,628	356,740	YES	760	410	YES
98005037	10 / 19 / 1998	350	NR	NR	-	-	1,478,628	356,740	YES	760	410	YES
99002315	05 / 17 / 1999	455	NR	NR	-	-	-	-	NO		-	UNKNOWN
99003567	07 / 29 / 1999	100	NR	NR	-	-	-	-	NO		-	UNKNOWN
99003788	07 / 13 / 1999	102	NR	NR	-	-	-	-	NO		-	UNKNOWN
20000456	12 / 28 / 1999	150	NR	NR	-	-	-	-	NO		-	UNKNOWN
93001810	05 / 04 / 1993	144	NR	NR	-	-	-	-	NO		-	UNKNOWN
95000361	01 / 11 / 1995	50	NR	NR	-	-	-	-	NO		-	UNKNOWN
98003181	08 / 07 / 1998	150	NR	NR	-	-	-	-	NO		-	UNKNOWN
99000990	03 / 12 / 1999	85	NR	NR	-	-	1,481,264	335,849	YES	750	665	YES
18100069	11 / 13 / 1964	100	35 17 47	87 49 21	1,456,157	334,276	-	-	NO		-	UNKNOWN
18100159	10 / 15 / 1966	120	35 17 58	87 48 21	1,461,151	335,296	-	-	NO		-	UNKNOWN
18109046	NR	118	35 26 11	87 40 02	1,503,356	384,400	-	-	NO		-	UNKNOWN
18109047	NR	135	35 17 42	87 49 48	1,453,910	333,812	-	-	NO		-	UNKNOWN
18109106	NR	118	35 18 07	87 47 49	1,463,820	336,157	-	-	NO		-	UNKNOWN
91003587	09 / 23 / 1991	200	NR	NR	-	-	-	-	NO		-	UNKNOWN
93004878	11 / 02 / 1992	250	NR	NR	-	-	-	-	NO		-	UNKNOWN
94000397	02 / 18 / 1994	150	NR	NR	-	-	-	-	NO		-	UNKNOWN
98000640	02 / 20 / 1998	185	NR	NR	-	-	-	-	NO		-	UNKNOWN
18100046	05 / 23 / 1964	40	35 18 45	87 46 36	1,469,939	339,888	-	-	YES	880	840	NO
18100074	02 / 17 / 1965	185	35 18 38	87 45 35	1,474,981	339,089	-	-	YES	720	535	YES
18100097	NR	176	35 18 15	87 47 15	1,466,652	336,914	-	-	YES	920	744	NO

TABLE 3.1

SUMMARY OF PRIVATE WATER WELL LOCATIONS
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

TDEC Division of Water Supply Well Number	*Well Installation Date*	*Total Well Depth (ft. bgs)*	*Well Location [(1)]*				*Well Location [(2)]*		*Well Location Within Limits Of Figure 6.1*	*Estimated Ground Surface Elevation [(3)] (ft AMSL)*	*Estimated Bottom of Well Elevation (ft AMSL)*	*Bottom of Well Below Site Water Table [(4)]*
			Latitude (deg min sec)	*Longitude (deg min sec)*	*Easting (feet)*	*Northing (feet)*	*Easting (feet)*	*Northing (feet)*				
18100114	09 / 10 / 1965	75	35 17 48	87 45 43	1,474,227	334,046	-	-	YES	755	680	YES
18100119	06 / 11 / 1965	167	35 18 42	87 46 28	1,470,597	339,573	-	-	YES	790	623	YES
18100156	09 / 21 / 1966	182	35 19 21	87 46 58	1,468,183	343,560	-	-	YES	950	768	NO
18100185	03 / 29 / 1967	116	35 19 08	87 46 20	1,471,307	342,189	-	-	YES	800	684	YES
18100186	04 / 05 / 1967	77	35 19 14	87 46 39	1,469,744	342,824	-	-	YES	920	843	NO
18100187	04 / 11 / 1967	41	35 19 23	87 45 03	1,477,714	343,590	-	-	YES	740	699	YES
18100206	07 / 28 / 1967	75	35 18 00	87 45 28	1,475,492	335,237	-	-	YES	730	655	YES
18100264	08 / 08 / 1968	150	35 18 42	87 46 54	1,468,442	339,612	-	-	YES	840	690	YES
18100265	08 / 03 / 1968	71	35 18 49	87 47 02	1,467,792	340,331	-	-	YES	920	849	NO
18100271	11 / 04 / 1968	150	35 19 14	87 46 26	1,470,821	342,804	-	-	YES	820	670	YES
18100275	11 / 27 / 1968	182	35 19 11	87 46 32	1,470,318	342,510	-	-	YES	900	718	NO
18100682	NR	128	35 18 11	87 45 27	1,475,595	336,348	-	-	YES	730	602	YES
18100846	04 / 24 / 1987	144	35 17 30	87 45 00	1,477,759	332,163	-	-	YES	800	656	YES
18100866	05 / 31 / 1988	205	35 17 30	87 45 00	1,477,759	332,163	-	-	YES	800	595	YES
18100867	05 / 31 / 1988	144	35 17 30	87 45 00	1,477,759	332,163	-	-	YES	800	656	YES
18108023	NR	NR	35 19 13	87 45 45	1,474,216	342,642	-	-	YES	740	-	UNKNOWN
18108024	NR	NR	35 19 35	87 46 00	1,473,014	344,888	-	-	YES	740	-	UNKNOWN
18109037	NR	325	35 19 18	87 45 43	1,474,391	343,144	-	-	YES	760	435	YES
20004535	09 / 08 / 2000	60	NR	NR	-	-	-	-	NO		-	UNKNOWN
20011271	03 / 14 / 2001	220	NR	NR	-	-	-	-	NO		-	UNKNOWN
91002994	06 / 22 / 1991	50	NR	NR	-	-	-	-	NO		-	UNKNOWN
93000564	02 / 02 / 1993	205	NR	NR	-	-	-	-	NO		-	UNKNOWN
95004213	09 / 13 / 1995	160	NR	NR	-	-	-	-	NO		-	UNKNOWN
97000249	12 / 17 / 1996	100	NR	NR	-	-	-	-	NO		-	UNKNOWN
18100309	05 / 21 / 1968	92	35 17 27	87 51 26	1,445,759	332,449	-	-	NO		-	UNKNOWN
18100923	07 / 03 / 1988	51	35 15 00	87 50 00	1,452,609	317,455	-	-	NO		-	UNKNOWN
98003215	07 / 21 / 1998	150	NR	NR	-	-	-	-	NO		-	UNKNOWN
98003216	07 / 21 / 1998	125	NR	NR	-	-	-	-	NO		-	UNKNOWN
98004162	08 / 19 / 1998	225	NR	NR	-	-	-	-	NO		-	UNKNOWN
18100261	08 / 29 / 1968	94	35 16 22	87 49 20	1,456,080	325,682	-	-	NO		-	UNKNOWN
18100662	06 / 12 / 1980	100	35 16 31	87 47 52	1,463,393	326,457	-	-	NO		-	UNKNOWN
18100811	09 / 13 / 1985	160	35 15 00	87 47 30	1,465,048	317,224	-	-	NO		-	UNKNOWN
18108020	NR	NR	35 16 31	87 49 29	1,455,351	326,606	-	-	NO		-	UNKNOWN
95002738	06 / 12 / 1995	125	NR	NR	-	-	-	-	NO		-	UNKNOWN
95005115	10 / 26 / 1995	75	NR	NR	-	-	-	-	NO		-	UNKNOWN
97001420	04 / 29 / 1997	250	NR	NR	-	-	-	-	NO		-	UNKNOWN
98000174	12 / 21 / 1997	275	NR	NR	-	-	-	-	NO		-	UNKNOWN
18100088	08 / 01 / 1965	175	35 17 10	87 45 52	1,473,412	330,218	-	-	NO		-	UNKNOWN
18100252	05 / 28 / 1968	56	35 16 34	87 46 00	1,472,683	326,591	-	-	NO		-	UNKNOWN
18100308	06 / 07 / 1968	221	35 17 25	87 45 50	1,473,605	331,732	-	-	YES	755	534	YES
18100327	11 / 24 / 1969	53	35 17 03	87 45 33	1,474,974	329,482	-	-	NO		-	UNKNOWN
18100620	08 / 15 / 1978	57	NR	NR	-	-	-	-	NO		-	UNKNOWN
18100621	08 / 25 / 1978	50	NR	NR	-	-	-	-	NO		-	UNKNOWN
18100752	06 / 06 / 1984	150	35 15 00	87 45 00	1,477,488	316,999	-	-	NO		-	UNKNOWN

TABLE 3.1

SUMMARY OF PRIVATE WATER WELL LOCATIONS
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

TDEC Division of Water Supply Well Number	*Well Installation Date*	*Total Well Depth (ft. bgs)*	*Well Location (1)* Latitude (deg min sec)	*Well Location (1)* Longitude (deg min sec)	*Well Location (1)* Easting (feet)	*Well Location (1)* Northing (feet)	*Well Location (2)* Easting (feet)	*Well Location (2)* Northing (feet)	*Well Location Within Limits Of Figure 6.1*	*Estimated Ground Surface Elevation (3) (ft AMSL)*	*Estimated Bottom of Well Elevation (ft AMSL)*	*Bottom of Well Below Site Water Table (4)*
18100763	10 / 08 / 1984	70	35 15 00	87 45 00	1,477,488	316,999	-	-	NO		-	UNKNOWN
18100770	01 / 16 / 1985	60	35 15 00	87 45 00	1,477,488	316,999	-	-	NO		-	UNKNOWN
18100856	10 / 30 / 1987	83	35 15 00	87 45 00	1,477,488	316,999	-	-	NO		-	UNKNOWN
18109038	NR	40	35 15 41	87 46 04	1,472,255	321,239	-	-	NO		-	UNKNOWN
18109039	NR	13	35 17 25	87 45 50	1,473,605	331,732	-	-	YES	755	742	NO
20005874	11 / 11 / 2000	45	NR	NR	-	-	-	-	NO		-	UNKNOWN
20011320	04 / 12 / 2001	185	NR	NR	-	-	-	-	NO		-	UNKNOWN
94001312	05 / 09 / 1994	80	NR	NR	-	-	-	-	NO		-	UNKNOWN
94003661	09 / 13 / 1994	175	NR	NR	-	-	-	-	NO		-	UNKNOWN
96000812	03 / 01 / 1996	81	NR	NR	-	-	-	-	NO		-	UNKNOWN
96003755	08 / 13 / 1996	63	NR	NR	-	-	-	-	NO		-	UNKNOWN
Private Water Wells Located in Waynesboro East, Tennessee USGS 7.5 Minute Quadrangle Map												
18109115	NR	3003	NR	NR	-	-	-	-	NO		-	UNKNOWN
18109118	NR	1808	NR	NR	-	-	-	-	NO		-	UNKNOWN
18108059	NR	NR	35 15 36	87 40 09	1,501,682	320,217	-	-	NO		-	UNKNOWN
18100220	12 / 02 / 1967	148	35 20 16	87 42 32	1,490,319	348,727	-	-	YES	940	792	NO
18100530	06 / 10 / 1974	150	35 20 21	87 44 26	1,480,884	349,399	-	-	YES	750	600	YES
18100537	11 / 01 / 1974	100	35 20 18	87 43 45	1,484,275	349,035	-	-	YES	840	740	NO
18100538	10 / 03 / 1974	153	35 20 15	87 42 30	1,490,483	348,623	-	-	YES	920	767	NO
18100542	06 / 01 / 1975	140	35 20 22	87 44 05	1,482,626	349,469	-	-	YES	780	640	YES
18100543	05 / 30 / 1975	146	35 20 21	87 44 00	1,483,038	349,361	-	-	YES	790	644	YES
18100548	06 / 20 / 1975	85	35 20 20	87 43 49	1,483,948	349,244	-	-	YES	820	735	NO
18100675	06 / 26 / 1981	158	35 20 00	87 42 56	1,488,303	347,144	-	-	YES	900	742	NO
18100847	06 / 03 / 1987	40	35 20 00	87 42 30	1,490,456	347,107	-	-	YES	920	880	NO
18100865	04 / 09 / 1988	125	35 20 00	87 42 30	1,490,456	347,107	-	-	YES	920	795	NO
18108037	NR	NR	35 21 31	87 42 44	1,489,458	356,326	-	-	YES	840	-	UNKNOWN
18109055	NR	12	35 20 06	87 43 12	1,486,988	347,774	-	-	YES	840	828	NO
18109059	NR	NR	35 21 23	87 44 45	1,479,422	355,695	-	-	YES	755	-	UNKNOWN
18109060	NR	23	35 22 20	87 43 15	1,486,977	361,325	-	-	YES	795	772	NO
18109069	NR	160	35 20 20	87 42 40	1,489,663	349,143	-	-	YES	950	790	NO
18109070	NR	164	35 20 19	87 42 39	1,489,744	349,040	-	-	YES	940	776	NO
18109071	NR	47	35 20 10	87 42 50	1,488,817	348,147	-	-	YES	880	833	NO
18109072	NR	52	35 20 08	87 42 48	1,488,979	347,942	-	-	YES	870	818	NO
18109077	NR	90	35 20 31	87 45 00	1,478,086	350,460	-	-	YES	710	620	YES
94003949	09 / 20 / 1994	60	NR	NR	-	-	-	-	YES		-	UNKNOWN
94003950	09 / 19 / 1994	205	NR	NR	-	-	-	-	YES		-	UNKNOWN
94005096	12 / 16 / 1994	160	NR	NR	-	-	1,479,621	354,600	YES	750	590	YES
95002739	06 / 13 / 1995	165	35 20 50	87 43 54	1,483,587	352,284	-	-	YES	880	715	NO
95004212	08 / 28 / 1995	142	NR	NR	-	-	1,480,453	360,867	YES	880	738	NO
96000358	01 / 17 / 1996	160	NR	NR	-	-	1,480,518	350,074	YES	770	610	YES
97002029	05 / 06 / 1997	195	NR	NR	-	-	1,492,132	357,695	YES	940	745	NO
97002119	06 / 09 / 1997	160	35 20 38	87 44 32	1,480,418	351,126	-	-	YES	780	620	YES

TABLE 3.1

SUMMARY OF PRIVATE WATER WELL LOCATIONS
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

TDEC Division of Water Supply Well Number	*Well Installation Date*	*Total Well Depth (ft. bgs)*	*Well Location [(1)]*				*Well Location [(2)]*		*Well Location Within Limits Of Figure 6.1*	*Estimated Ground Surface Elevation [(3)] (ft AMSL)*	*Estimated Bottom of Well Elevation (ft AMSL)*	*Bottom of Well Below Site Water Table [(4)]*
			Latitude (deg min sec)	*Longitude (deg min sec)*	*Easting (feet)*	*Northing (feet)*	*Easting (feet)*	*Northing (feet)*				
97002214	05 / 15 / 1997	317	NR	NR	-	-	-	-	NO		-	UNKNOWN
97002634	06 / 26 / 1997	175	35 22 15	87 44 34	1,480,427	360,935	-	-	YES	880	705	NO
97002635	06 / 28 / 1997	190	35 22 23	87 44 31	1,480,690	361,739	-	-	YES	900	710	NO
97002976	06 / 24 / 1997	164	35 22 05	87 44 36	1,480,243	359,927	-	-	YES	860	696	YES
98001986	06 / 08 / 1998	185	NR	NR	-	-	-	-	NO		-	UNKNOWN
99002941	07 / 06 / 1999	160	NR	NR	-	-	-	-	NO		-	UNKNOWN
18100048	05 / 28 / 1964	150	35 21 25	87 42 09	1,492,346	355,669	-	-	YES	950	800	NO
18100077	04 / 06 / 1965	165	35 20 05	87 42 21	1,491,211	347,599	-	-	YES	960	795	NO
18100113	09 / 20 / 1965	60	35 20 00	87 41 10	1,497,084	346,992	-	-	NO		-	UNKNOWN
18100166	04 / 14 / 1966	180	35 21 18	87 42 25	1,491,008	354,985	-	-	YES	940	760	NO
18100198	06 / 21 / 1967	52	35 20 30	87 40 05	1,502,521	349,932	-	-	NO		-	UNKNOWN
18100199	06 / 10 / 1967	152	35 20 23	87 42 15	1,491,740	349,410	-	-	YES	965	813	NO
18100209	06 / 15 / 1967	176	35 22 20	87 42 11	1,492,277	361,232	-	-	YES	890	714	NO
18100253	06 / 20 / 1968	170	35 21 14	87 42 08	1,492,409	354,556	-	-	YES	945	775	NO
18100254	06 / 21 / 1968	140	35 20 19	87 42 15	1,491,733	349,006	-	-	YES	930	790	NO
18100260	08 / 07 / 1968	106	35 20 09	87 42 18	1,491,466	347,999	-	-	YES	980	874	NO
18100269	11 / 14 / 1968	146	35 20 28	87 42 27	1,490,754	349,933	-	-	YES	900	754	NO
18100307	06 / 27 / 1968	125	35 20 22	87 42 20	1,491,324	349,316	-	-	YES	965	840	NO
18100320	09 / 12 / 1969	165	35 21 25	87 42 18	1,491,600	355,682	-	-	YES	950	785	NO
18100547	06 / 06 / 1975	65	35 20 33	87 40 48	1,498,964	350,296	-	-	NO		-	UNKNOWN
18100664	08 / 22 / 1980	185	35 20 06	87 41 58	1,493,118	347,667	-	-	YES	870	685	YES
18100668	10 / 16 / 1980	140	35 21 51	87 41 31	1,495,538	358,243	-	-	YES		-	UNKNOWN
18100910	02 / 10 / 1989	100	35 20 00	87 40 00	1,502,883	346,892	-	-	NO		-	UNKNOWN
18108034	NR	NR	35 20 26	87 40 26	1,500,774	349,558	-	-	NO		-	UNKNOWN
18108035	NR	NR	35 20 03	87 41 18	1,496,427	347,306	-	-	NO		-	UNKNOWN
18109063	NR	120	35 20 08	87 42 18	1,491,465	347,898	-	-	YES	980	860	NO
18109064	NR	137	35 20 14	87 42 15	1,491,724	348,500	-	-	YES	940	803	NO
18109065	NR	149	35 20 13	87 42 30	1,490,479	348,421	-	-	YES	920	771	NO
18109066	NR	142	35 20 33	87 42 16	1,491,674	350,422	-	-	YES	960	818	NO
18109067	NR	135	35 20 56	87 42 08	1,492,378	352,736	-	-	YES	960	825	NO
18109068	NR	153	35 21 08	87 42 11	1,492,150	353,953	-	-	YES	935	782	NO
18109110	NR	67	35 22 19	87 40 10	1,502,294	360,958	-	-	NO		-	UNKNOWN
18109113	NR	71	35 20 09	87 40 59	1,498,011	347,886	-	-	NO		-	UNKNOWN
18109308	NR	70	35 21 36	87 41 34	1,495,264	356,731	-	-	YES	820	750	NO
91003583	09 / 29 / 1991	85	NR	NR	-	-	-	-	NO		-	UNKNOWN
93001368	04 / 12 / 1993	135	NR	NR	-	-	-	-	NO		-	UNKNOWN
95000603	02 / 03 / 1995	177	35 22 14	87 42 20	1,491,521	360,638	-	-	YES	900	723	NO
95002740	06 / 14 / 1995	141	NR	NR	-	-	1,484,346	352,064	YES	840	699	YES
96000619	02 / 05 / 1996	125	NR	NR	-	-	-	-	NO		-	UNKNOWN
97002117	06 / 04 / 1997	80	NR	NR	-	-	-	-	NO		-	UNKNOWN
97002118	06 / 07 / 1997	145	35 21 45	87 42 12	1,492,132	357,695	-	-	YES	940	795	NO
97004196	08 / 29 / 1997	90	NR	NR	-	-	-	-	YES		-	UNKNOWN
98000638	02 / 09 / 1998	135	NR	NR	-	-	1,484,346	352,064	YES	840	705	NO
18100105	10 / 08 / 1964	50	35 20 22	87 38 55	1,508,306	349,025	-	-	NO		-	UNKNOWN

TABLE 3.1

SUMMARY OF PRIVATE WATER WELL LOCATIONS
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

TDEC Division of Water Supply Well Number	Well Installation Date	Total Well Depth (ft. bgs)	Well Location [(1)] Latitude (deg min sec)	Well Location [(1)] Longitude (deg min sec)	Well Location [(1)] Easting (feet)	Well Location [(1)] Northing (feet)	Well Location [(2)] Easting (feet)	Well Location [(2)] Northing (feet)	Well Location Within Limits Of Figure 6.1	Estimated Ground Surface Elevation [(3)] (ft AMSL)	Estimated Bottom of Well Elevation (ft AMSL)	Bottom of Well Below Site Water Table [(4)]
18100120	10/28/1965	75	35 22 12	87 39 33	1,505,346	360,199	-	-	NO		-	UNKNOWN
18100197	06/26/1967	125	35 20 30	87 40 00	1,502,935	349,925	-	-	NO		-	UNKNOWN
18100794	07/17/1984	156	35 20 00	87 37 30	1,515,310	346,683	-	-	NO		-	UNKNOWN
18108029	NR	NR	35 22 06	87 39 09	1,507,323	359,558	-	-	NO		-	UNKNOWN
18108030	NR	NR	35 21 58	87 38 37	1,509,960	358,705	-	-	NO		-	UNKNOWN
18108031	NR	NR	35 21 50	87 38 15	1,511,768	357,866	-	-	NO		-	UNKNOWN
18109049	NR	1803	35 26 12	87 40 00	1,503,524	384,499	-	-	NO		-	UNKNOWN
18109109	NR	1803	35 20 04	87 38 11	1,511,920	347,144	-	-	NO		-	UNKNOWN
18109112	NR	90	35 20 13	87 39 39	1,504,645	348,177	-	-	NO		-	UNKNOWN
90001110	03/06/1990	175	NR	NR	-	-	-	-	NO		-	UNKNOWN
92002797	09/26/1991	140	NR	NR	-	-	-	-	NO		-	UNKNOWN
93003408	07/13/1993	200	NR	NR	-	-	-	-	NO		-	UNKNOWN
96002153	05/29/1996	275	NR	NR	-	-	-	-	NO		-	UNKNOWN
97002422	06/27/1997	152	NR	NR	-	-	-	-	NO		-	UNKNOWN
98003738	08/28/1998	100	NR	NR	-	-	-	-	NO		-	UNKNOWN
18100047	05/19/1964	76	35 19 22	87 44 25	1,480,861	343,433	-	-	YES	800	724	NO
18100066	11/20/1964	70	35 19 22	87 44 40	1,479,618	343,455	-	-	YES	740	670	YES
18100071	01/09/1965	48	35 19 41	87 44 18	1,481,475	345,344	-	-	YES	780	732	NO
18100076	04/10/1965	133	35 19 51	87 42 44	1,489,281	346,217	-	-	YES	990	857	NO
18100078	04/07/1965	97	35 19 14	87 44 37	1,479,852	342,642	-	-	YES	760	663	YES
18100111	11/15/1965	113	35 19 32	87 44 38	1,479,802	344,463	-	-	YES	790	677	YES
18100174	12/31/1965	72	35 18 17	87 43 58	1,482,982	336,823	-	-	YES	840	768	NO
18100216	09/12/1967	66	35 18 59	87 43 46	1,484,051	341,051	-	-	YES	750	684	YES
18100217	10/15/1967	150	35 19 11	87 43 52	1,483,576	342,273	-	-	YES	810	660	YES
18100218	1 1/27/1967	69	35 19 33	87 44 44	1,479,307	344,573	-	-	YES	770	701	NO
18100219	12/10/1967	115	35 19 21	87 44 47	1,479,037	343,365	-	-	YES	710	595	YES
18100278	01/28/1969	150	35 19 46	87 44 07	1,482,396	345,833	-	-	YES	790	640	YES
18100532	07/01/1974	132	35 18 07	87 43 38	1,484,621	335,782	-	-	YES	855	723	NO
18100539	08/20/1974	126	35 18 13	87 43 40	1,484,466	336,392	-	-	YES	860	734	NO
18100545	05/10/1975	136	35 18 10	87 43 48	1,483,798	336,100	-	-	YES	850	714	NO
18100546	05/01/1975	130	35 18 11	87 43 51	1,483,551	336,206	-	-	YES	840	710	NO
18100549	08/10/1975	155	35 18 15	87 44 12	1,481,818	336,641	-	-	YES	780	625	YES
18100907	12/02/1988	125	35 17 30	87 42 30	1,490,192	331,943	-	-	YES	860	735	NO
18100935	08/21/1989	65	35 17 30	87 02 30	1,689,131	329,148	-	-	NO		-	UNKNOWN
18109056	NR	38	35 17 59	87 42 36	1,489,746	334,883	-	-	YES	810	772	NO
18109057	NR	85	35 19 27	87 44 44	1,479,296	343,967	-	-	YES	750	665	YES
18109073	08/25/1963	85	35 19 07	87 44 00	1,482,906	341,880	-	-	YES	770	685	YES
18109074	09/19/1963	95	35 19 03	87 43 52	1,483,561	341,464	-	-	YES	760	665	YES
18109075	NR	117	35 18 58	87 43 41	1,484,464	340,942	-	-	YES	775	658	YES
18109076	NR	164	35 18 57	87 43 36	1,484,876	340,834	-	-	YES	790	626	YES
91002989	08/22/1991	225	NR	NR	-	-	-	-	NO		-	UNKNOWN
91002993	08/14/1991	200	NR	NR	-	-	-	-	NO		-	UNKNOWN
92001397	03/23/1992	87	NR	NR	-	-	-	-	YES		-	UNKNOWN
93001375	04/06/1993	138	NR	NR	-	-	-	-	NO		-	UNKNOWN

TABLE 3.1

SUMMARY OF PRIVATE WATER WELL LOCATIONS
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

TDEC Division of Water Supply Well Number	Well Installation Date	Total Well Depth (ft. bgs)	Well Location [(1)] Latitude (deg min sec)	Well Location [(1)] Longitude (deg min sec)	Well Location [(1)] Easting (feet)	Well Location [(1)] Northing (feet)	Well Location [(2)] Easting (feet)	Well Location [(2)] Northing (feet)	Well Location Within Limits Of Figure 6.1	Estimated Ground Surface Elevation [(3)] (ft AMSL)	Estimated Bottom of Well Elevation (ft AMSL)	Bottom of Well Below Site Water Table [(4)]
93002016	05/28/1993	185	NR	NR	-	-	-	-	YES		-	UNKNOWN
93002630	07/20/1993	100	NR	NR	-	-	-	-	YES		-	UNKNOWN
93005282	12/20/1993	125	NR	NR	-	-	-	-	YES		-	UNKNOWN
93005284	12/22/1993	135	NR	NR	-	-	-	-	NO		-	UNKNOWN
94000906	03/18/1994	125	NR	NR	-	-	-	-	NO		-	UNKNOWN
94001304	04/27/1994	250	NR	NR	-	-	-	-	YES		-	UNKNOWN
94001308	05/03/1994	200	NR	NR	-	-	-	-	NO		-	UNKNOWN
94001309	05/04/1994	200	NR	NR	-	-	-	-	NO		-	UNKNOWN
94001311	05/06/1994	125	35 18 13	87 43 34	1,484,964	336,383	-	-	YES	860	735	NO
94003662	09/15/1994	225	NR	NR	-	-	-	-	NO		-	UNKNOWN
94005088	11/30/1994	250	NR	NR	-	-	1,491,509	339,628	YES	825	575	YES
95000602	02/01/1995	150	NR	NR	-	-	-	-	YES		-	UNKNOWN
95003524	08/04/1995	160	35 19 33	87 43 47	1,484,029	344,489	-	-	YES	920	760	NO
96002886	07/03/1996	100	35 18 56	87 43 36	1,484,875	340,733	-	-	YES	785	685	YES
96003850	08/28/1996	225	NR	NR	-	-	-	-	YES		-	UNKNOWN
99006041	11/24/1999	57	NR	NR	-	-	-	-	YES		-	UNKNOWN
18100145	09/06/1966	49	35 19 47	87 43 32	1,485,297	345,883	-	-	YES	820	771	NO
18100258	08/27/1968	130	35 20 00	87 42 18	1,491,451	347,089	-	-	YES	970	840	NO
18100332	10/24/1969	118	35 19 54	87 42 18	1,491,440	346,483	-	-	YES	980	862	NO
18100941	08/17/1989	350	35 26 11	87 42 02	1,493,428	384,571	-	-	NO		-	UNKNOWN
18109061	NR	63	35 19 55	87 41 41	1,494,507	346,531	-	-	YES	825	762	NO
18109062	NR	68	35 19 58	87 41 54	1,493,435	346,853	-	-	YES	840	772	NO
20004531	08/28/2000	165	NR	NR	-	-	-	-	NO		-	UNKNOWN
93003577	08/02/1993	135	NR	NR	-	-	-	-	YES		-	UNKNOWN
93003579	08/06/1993	100	NR	NR	-	-	-	-	YES		-	UNKNOWN
93004886	11/29/1993	110	NR	NR	-	-	-	-	YES		-	UNKNOWN
94003663	09/20/1994	108	NR	NR	-	-	1,491,509	339,628	YES	825	717	NO
96000615	02/22/1996	85	NR	NR	-	-	-	-	NO		-	UNKNOWN
96001167	03/29/1996	52	NR	NR	-	-	-	-	NO		-	UNKNOWN
97004198	09/08/1997	180	NR	NR	-	-	-	-	NO		-	UNKNOWN
99005663	09/16/1999	46	NR	NR	-	-	-	-	NO		-	UNKNOWN
99006042	11/26/1999	41	NR	NR	-	-	-	-	NO		-	UNKNOWN
18100784	09/21/1984	144	35 17 30	87 37 30	1,515,058	331,520	-	-	NO		-	UNKNOWN
18108032	NR	NR	35 17 44	87 39 23	1,505,716	333,092	-	-	NO		-	UNKNOWN
20005486	10/16/2000	120	NR	NR	-	-	-	-	NO		-	UNKNOWN
93004885	11/13/1993	140	NR	NR	-	-	-	-	NO		-	UNKNOWN
96005370	11/18/1996	157	NR	NR	-	-	-	-	NO		-	UNKNOWN
99000991	03/16/1999	145	NR	NR	-	-	-	-	NO		-	UNKNOWN
99002938	06/23/1999	110	NR	NR	-	-	-	-	NO		-	UNKNOWN
99003561	07/12/1999	115	NR	NR	-	-	-	-	NO		-	UNKNOWN
18100768	12/03/1984	60	35 15 00	87 42 30	1,489,927	316,779	-	-	NO		-	UNKNOWN
18100823	NR	185	35 15 00	87 40 00	1,502,367	316,565	-	-	NO		-	UNKNOWN
20004532	08/30/2000	170	NR	NR	-	-	-	-	NO		-	UNKNOWN
92002286	06/23/1992	150	NR	NR	-	-	-	-	YES		-	UNKNOWN

TABLE 3.1

SUMMARY OF PRIVATE WATER WELL LOCATIONS
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

TDEC Division of Water Supply Well Number	*Well Installation Date*	*Total Well Depth (ft. bgs)*	*Well Location [(1)] Latitude (deg min sec)*	*Well Location [(1)] Longitude (deg min sec)*	*Well Location [(1)] Easting (feet)*	*Well Location [(1)] Northing (feet)*	*Well Location [(2)] Easting (feet)*	*Well Location [(2)] Northing (feet)*	*Well Location Within Limits Of Figure 6.1*	*Estimated Ground Surface Elevation [(3)] (ft AMSL)*	*Estimated Bottom of Well Elevation (ft AMSL)*	*Bottom of Well Below Site Water Table [(4)]*
93002631	07 / 22 / 1993	150	NR	NR	-	-	-	-	NO		-	UNKNOWN
94001313	05 / 10 / 1994	160	NR	NR	-	-	-	-	NO		-	UNKNOWN
96002154	05 / 20 / 1996	160	35 17 19	87 42 56	1,488,017	330,869	-	-	NO		-	UNKNOWN
96005375	11 / 29 / 1996	87	NR	NR	-	-	-	-	NO		-	UNKNOWN
18100778	04 / 18 / 1985	207	35 15 00	87 40 00	1,502,367	316,565	-	-	NO		-	UNKNOWN
18100912	04 / 13 / 1989	200	35 15 00	87 40 00	1,502,367	316,565	-	-	NO		-	UNKNOWN
18100913	04 / 12 / 1989	286	35 15 00	87 40 00	1,502,367	316,565	-	-	NO		-	UNKNOWN
18100914	05 / 29 / 1989	38	35 15 00	87 40 00	1,502,367	316,565	-	-	NO		-	UNKNOWN
18109058	NR	20	35 15 46	87 44 53	1,478,151	321,639	-	-	NO		-	UNKNOWN
20006042	11 / 28 / 2000	210	35 05 16	87 43 29	1,483,994	257,828	-	-	NO		-	UNKNOWN
95001644	04 / 07 / 1995	135	NR	NR	-	-	-	-	NO		-	UNKNOWN
97004428	09 / 30 / 1997	100	NR	NR	-	-	-	-	NO		-	UNKNOWN
18100296	01 / 02 / 1969	84	35 16 32	87 39 42	1,504,017	325,840	-	-	NO		-	UNKNOWN
18100646	06 / 11 / 1979	82	35 15 26	87 38 10	1,511,533	319,039	-	-	NO		-	UNKNOWN
18100666	12 / 13 / 1980	103	35 15 29	87 38 12	1,511,372	319,345	-	-	NO		-	UNKNOWN
18100809	09 / 09 / 1985	155	35 15 00	87 37 30	1,514,806	316,356	-	-	NO		-	UNKNOWN
18100812	08 / 16 / 1985	140	35 15 00	87 37 30	1,514,806	316,356	-	-	NO		-	UNKNOWN
18108033		NR	35 17 12	87 37 42	1,514,033	329,716	-	-	NO		-	UNKNOWN
18109111	NR	300	35 15 17	87 37 51	1,513,093	318,103	-	-	NO		-	UNKNOWN
20001779	03 / 15 / 2000	110	NR	NR	-	-	-	-	NO		-	UNKNOWN
20002648	05 / 18 / 2000	112	NR	NR	-	-	-	-	NO		-	UNKNOWN
95003519	07 / 28 / 1995	123	NR	NR	-	-	-	-	NO		-	UNKNOWN
96001668	04 / 22 / 1996	125	NR	NR	-	-	-	-	NO		-	UNKNOWN
96001669	04 / 25 / 1996	135	NR	NR	-	-	-	-	NO		-	UNKNOWN
97005010	10 / 16 / 1997	70	NR	NR	-	-	-	-	NO		-	UNKNOWN
98001119	03 / 27 / 1998	63	NR	NR	-	-	-	-	NO		-	UNKNOWN
98005384	10 / 29 / 1998	59	NR	NR	-	-	-	-	NO		-	UNKNOWN

Notes:
NR. Not recorded in TDEC water well record.
deg min sec - Degrees Minutes Seconds
ft. AMSL - Feet Above Mean Sea Level
ft. bgs - Feet Below Ground Surface

(1) Latitude and longitude well locations provided by TDEC converted to NAD27 easting and northing coordinates using the U.S. Army Corps coordinate conversion utility CORPSCON.
(2) Easting and northing well locations estimated from road mapping based on TDEC well location description.
(3) Ground surface elevation at well location estimated from USGS 7.5 Minute Quadrangle Map.
(4) Bottom of well bleow a water table elevation of 700 ft AMSL observed to the north of the Site.

TABLE 7.1

SUMMARY OF MONITORING WELL CONSTRUCTION DETAILS
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Monitoring Well	Ground/Pad Surface Elevation (ft AMSL)	Reference Point Elevation (ft AMSL)	Bedrock Surface Depth (ft BGS)	Bedrock Surface Elevation (ft AMSL)	Surface Casing Bottom Depth (ft BGS)	Surface Casing Bottom Elevation (ft AMSL)	Bottom of Boring Depth (ft BGS)	Bottom of Boring Elevation (ft AMSL)	Screened Interval Depth to Top (ft BGS)	Screened Interval Depth to Bottom (ft BGS)	Screened Interval Top Elevation (ft AMSL)	Screened Interval Bottom Elevation (ft AMSL)	Screened Interval Screen Mid-Point (ft AMSL)	Formation Screened	Date Completed
Overburden \ Bedrock Interface Monitoring Wells (Screened Intervals at or just below the Overburden \ Bedrock Interface)															
OW70-01	706.03	709.47	7.0	699.03	(4)	-	15.0	691.03	5	15	701.03	691.03	696.03	Dolomitic Limestone	09/14/01
OW73-01	704.29	706.24	6.0	698.29	(4)	-	18.0	686.29	8	18	696.29	686.29	691.29	Dolomitic Limestone	09/21/01
Shallow Bedrock Monitoring Wells (Screened Interval Mid-Point Elevation greater than 665 ft AMSL)															
OW11-85	716.20	716.60	NA	-	NA	-	20.5	695.70	15	20	701.20	696.20	698.70	Dolomitic Limestone	1985
OW13-85	717.75	717.95	NA	-	NA	-	21.0	696.75	15	20	702.75	697.75	700.25	Dolomitic Limestone	1985
OW15-85	718.09	718.44	NA	-	NA	-	20.0	698.09	14.8	19.8	703.29	698.29	700.79	Dolomitic Limestone	1985
OW19-85	714.28	714.78	NA	-	NA	-	21.5	692.78	14.8	19.8	699.48	694.48	696.98	Dolomitic Limestone	1985
OW21-86	710.76	713.66	NA	-	NA	-	24.5	686.26	18.5	23.5	692.26	687.26	689.76	Dolomitic Limestone	1985
OW23-86	707.66	710.86	NA	-	NA	-	24.5	683.16	19	24	688.66	683.66	686.16	Dolomitic Limestone	1985
OW25-89	714.30	716.25	3.0	711.30	4.0	710.30	34.2	680.10	22.5	32.5	691.80	681.80	686.80	Dolomitic Limestone	04/12/89
OW27-89	714.60	716.70	3.5	711.10	4.5	710.10	31.5	683.10	20.0	30.0	694.60	684.60	689.60	Dolomitic Limestone	04/10/89
OW29-89	717.20	719.06	5.5	711.70	5.5	711.70	35.6	681.60	25	35	692.20	682.20	687.20	Dolomitic Limestone	04/16/89
OW31-89	717.80	719.70	9.2	708.60	9.2	708.60	31.0	686.80	20	30	697.80	687.80	692.80	Dolomitic Limestone	04/12/89
OW33-89	720.00	721.66	8.4	711.60	8.6	711.40	30.5	689.50	20	30	700.00	690.00	695.00	Dolomitic Limestone	04/16/89
OW35-89	723.60	725.80	9.0	714.60	9.0	714.60	30.9	692.70	20	30	703.60	693.60	698.60	Dolomitic Limestone	04/13/89
OW37-89	719.20	721.36	9.0	710.20	9.2	710.00	33.2	686.00	22.5	32.5	696.70	686.70	691.70	Dolomitic Limestone	04/14/89
OW39-89	731.70	734.04	8.5	723.20	10.7	721.00	41.0	690.70	27.5	37.5	704.20	694.20	699.20	Dolomitic Limestone	05/18/89
OW41-89	721.80	724.08	7.5	714.30	7.5	714.30	32.5	689.30	20	30	701.80	691.80	696.80	Dolomitic Limestone	04/12/89
OW43-89	734.10	737.18	9.3	724.80	11.3	722.80	36.0	698.10	25	35	709.10	699.10	704.10	Dolomitic Limestone	04/14/89
OW45-89	729.50	731.52	10.5	719.00	10.5	719.00	36.5	693.00	25	35	704.50	694.50	699.50	Dolomitic Limestone	04/16/89
OW47-89	720.00	722.44	9.5	710.50	9.5	710.50	30.0	690.00	17	27	703.00	693.00	698.00	Dolomitic Limestone	05/12/89
OW48-89	720.00	722.14	6.5	713.50	6.5	713.50	30.0	690.00	17.5	27.5	702.50	692.50	697.50	Dolomitic Limestone	05/12/89
OW49-89	721.60	723.84	6.5	715.10	6.5	715.10	30.0	691.60	17.5	27.5	704.10	694.10	699.10	Dolomitic Limestone	05/16/89
OW50-89	720.40	722.40	6.0	714.40	6.0	714.40	30.0	690.40	17.5	27.5	702.90	692.90	697.90	Dolomitic Limestone	04/18/89
OW51-89	710.20	712.60	5.0	705.20	5.0	705.20	31.9	678.30	20	30	690.20	680.20	685.20	Dolomitic Limestone	05/16/89
OW53-90	733.36	735.14	9.0	724.36	15.0	718.36	31.0	702.36	20.5	30.5	712.86	702.86	707.86	Dolomitic Limestone	4/24/90
OW55-90	746.66	746.16	20.8	725.86	32.3	714.36	45.0	701.66	32.7	42.7	713.96	703.96	708.96	Dolomitic Limestone	4/17/90
OW58-90	711.85	711.47	5.5	706.35	7.3	704.55	50.0	661.85	35.5	45.5	676.35	666.35	671.35	Dolomitic Limestone	4/03/90
OW59-90	708.71	710.45	7.0	701.71	13.0	695.71	50.0	658.71	38	48	670.71	660.71	665.71	Dolomitic Limestone	4/13/90
OW61-90	730.86	732.80	8.0	722.86	12.5	718.36	49.0	681.86	20.5	30.5	710.36	700.36	705.36	Dolomitic Limestone	4/11/90
OW64-92	716.22	715.98 (2)	7.5	708.72	8.7	707.52	53.8	662.42	42	52	674.22	664.22	669.22	Dolomitic Limestone	09/18/92
OW65-92	704.10	706.93	8.0	696.10	10.0	694.10	34.8	669.30	23	33	681.10	671.10	676.10	Dolomitic Limestone	09/19/92
OW66-95 (3)	716.62	716.62	5.5	711.12	(4)	-	32.0	684.62	22	32	694.62	684.62	689.62	Dolomitic Limestone	07/29/95
OW67-95 (3)	717.79	717.79	6.0	711.79	(4)	-	23.5	694.29	13.5	23.5	704.29	694.29	699.29	Dolomitic Limestone	07/29/95
Deep Bedrock Monitoring Wells (Screened Interval Mid-Point Elevation between 625 and 665 ft AMSL)															
OW12-85 (5)	716.23	716.53	NA	-	NA	-	61.0	655.23	54.9	59.9	661.33	656.33	658.83	Dolomitic Limestone	1985
OW14-85	717.08	717.38	NA	-	NA	-	60.8	656.28	54.5	59.5	662.58	657.58	660.08	Dolomitic Limestone	1985
OW26-89	714.20	716.20	3.0	711.20	4.0	710.20	100.0	614.20	57.5	67.5	656.70	646.70	651.70	Dolomitic Limestone	04/11/89
OW28-89	714.40	716.36	2.5	711.90	4.0	710.40	100.0	614.40	60.0	70.0	654.40	644.40	649.40	Dolomitic Limestone	03/28/89
OW30-89	717.20	719.24	5.5	711.70	5.5	711.70	100.0	617.20	65	75	652.20	642.20	647.20	Dolomitic Limestone	04/16/89
OW32-89	717.40	719.40	7.3	710.10	7.3	710.10	100.0	617.40	57.5	67.5	659.90	649.90	654.90	Dolomitic Limestone	04/12/89

TABLE 7.1

SUMMARY OF MONITORING WELL CONSTRUCTION DETAILS
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Monitoring Well	Ground/Pad Surface Elevation (ft AMSL)	Reference Point Elevation (ft AMSL)	Bedrock Surface Depth (ft BGS)	Bedrock Surface Elevation (ft AMSL)	Surface Casing Bottom Depth (ft BGS)	Surface Casing Bottom Elevation (ft AMSL)	Bottom of Boring Depth (ft BGS)	Bottom of Boring Elevation (ft AMSL)	Screened Interval Depth to Top (ft BGS)	Screened Interval Depth to Bottom (ft BGS)	Screened Interval Top Elevation (ft AMSL)	Screened Interval Bottom Elevation (ft AMSL)	Screened Interval Screen Mid-Point (ft AMSL)	Formation Screened	Date Completed
OW34-89	720.10	722.02	9.0	711.10	9.2	710.90	100.0	620.10	60	70	660.10	650.10	655.10	Dolomitic Limestone	04/16/89
OW36-89	723.40	725.78	9.0	714.40	9.0	714.40	100.0	623.40	57.5	67.5	665.90	655.90	660.90	Dolomitic Limestone	04/13/89
OW38-89	719.30	721.36	9.0	710.30	9.2	710.10	100.0	619.30	60	70	659.30	649.30	654.30	Dolomitic Limestone	04/14/89
OW40-89	731.30	734.18	11.0	720.30	12.5	718.80	100.0	631.30	59.25	69.25	672.05	662.05	667.05 (6)	Dolomitic Limestone	04/14/89
OW42-89	721.60	723.70	7.0	714.60	7.0	714.60	100.0	621.60	57.5	67.5	664.10	654.10	659.10	Dolomitic Limestone	05/02/89
OW44-89	734.50	736.86	9.8	724.70	11.8	722.70	100.0	634.50	85.7	95.7	648.80	638.80	643.80	Dolomitic Limestone	04/14/89
OW46-89	729.30	731.16	10.0	719.30	10.0	719.30	100.0	629.30	60	70	669.30	659.30	664.30	Dolomitic Limestone	04/14/89
OW52-89	710.20	712.30	6.8	703.40	6.6	703.60	100.0	610.20	67.5	77.5	642.70	632.70	637.70	Dolomitic Limestone	05/16/89
OW54-90	734.30	735.80	7.0	727.30	10.0	724.30	90.0	644.30	63	73	671.30	661.30	666.30 (6)	Dolomitic Limestone	4/10/90
OW56-90	746.64	746.16	20.8	725.84	26.9	719.74	91.9	654.74	50.3	60.3	696.34	686.34	691.34 (6)	Dolomitic Limestone	4/16/90
OW57-90	711.85	711.35	5.5	706.35	7.3	704.55	91.0	620.85	78	88	633.85	623.85	628.85	Dolomitic Limestone	3/31/90
OW68-01	705.00	706.72	6.0	699.00	7.0	698.00	59.0	646.00	48	58	657.00	647.00	652.00	Dolomitic Limestone	10/01/01
OW71-01	731.12	734.53	7.5	723.62	8.5	722.62	86.0	645.12	76	86	655.12	645.12	650.12	Dolomitic Limestone	09/20/01
OW72-01	716.50	715.92	7.0	709.50	7.0	709.50	71.0	645.50	61	71	655.50	645.50	650.50	Dolomitic Limestone	09/13/01
Deeper Bedrock Monitoring Wells (Screened Interval Mid-Point Elevation below 625 ft AMSL)															
OW24-89 (7)	707.30	709.62	6.0	701.30	6.0	701.30	97.0	610.30	85	95	622.30	612.30	617.30	Dolomitic Limestone	04/14/89
OW60-90 (7)	706.39	707.95	6.6	699.79	9.0	697.39	105.0	601.39	88	98	618.39	608.39	613.39	Dolomitic Limestone	4/02/90
OW62-90	716.69	718.31	6.5	710.19	8.5	708.19	110.0	606.69	98	108	618.69	608.69	613.69	Dolomitic Limestone	3/29/90
OW63-90	722.15	723.65	5.0	717.15	8.0	714.15	120.5	601.65	110.5	120.5	611.65	601.65	606.65	Dolomitic Limestone	4/15/90
OW69-01	704.75	707.58	6.0	698.75	7.0	697.75	94.5	610.25	84.5	94.5	620.25	610.25	615.25	Dolomitic Limestone	09/28/01

Notes:

ft AMSL Feet above mean sea level.
ft BGS Feet below ground surface.
NA Data not available.
(1) The screened interval mid-point is considered to be within the shallow bedrock.
(2) The above ground surface casing for OW64-92 was replaced by a flush mount casing in October 2001 and the reference point elevation was re-surveyed.
(3) OW66-95 and OW67-95 are piezometers.
(4) No surface casing was set for these shallow monitoring wells.
(5) Previously considered to be within the shallow bedrock, but was moved to the deep bedrock based on the screened interval mid-point elevation being less than 665 ft AMSL.
(6) Monitoring wells are considered to belong to the deep bedrock based on the greater than 90 foot boring depth and ground surface sloping from southwest to northeast.
(7) Previously considered to be within the deep bedrock, but was moved to the deeper bedrock based on the screened interval mid-point elevation being less than 625 ft AMSL.

TABLE 7.2a

OCTOBER 1998 GROUNDWATER SAMPLING ANALYTICAL DATA
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Monitoring Well	*Date Sampled*	*Concentration (µg/L)* [1]					*pH*	*Conductivity (µS/cm)*	*Temperature °C*
		PCBs	*cis-1,2-DCE*	*trans-1,2-DCE*	*TCE*	*Vinyl Chloride*			
Shallow Bedrock Groundwater Monitoring Wells									
OW27-89	10/07/98	ND[2] (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	6.91	672	22.9
OW35-89	10/07/98	6.0 U [3]	43	ND (2.0)	8.4	2.1	7.80	334	22.3
OW37-89	10/09/98	40,000 U	29,000	ND (1,000)	21,000	ND (1,000)	NM [4]	NM	NM
OW55-90	10/06/98	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	7.25	250	22.2
OW58-90	10/07/98	ND (0.5)	730	ND (50)	560	ND (50)	7.92	328	19.6
OW59-90	10/07/98	1.0 U	1,700	ND (50)	ND (50)	ND (50)	12.06	219	20.0
OW61-90	10/07/98	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	7.88	416	21.6
OW64-92	10/06/98	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	7.33	640	20.1
OW65-92	10/07/98	ND (0.5)	34	ND (1.0)	ND (1.0)	ND (1.0)	9.23	294	70.5
Deep Bedrock Groundwater Monitoring Wells									
OW30-89	10/08/98	ND (0.5)	410	ND (20)	390	ND (20)	NM	NM	NM
OW36-89	10/07/98	1.3 U	140	ND (10)	72	28	7.69	924	20.9
OW38-89	10/09/98	3,600,000 J [5]	ND (25,000)	ND (25,000)	300,000	ND (25,000)	NM	NM	NM
OW46-89	10/07/98	ND (0.5)	79	ND (2.0)	32	ND (2.0)	7.68	707	19.8
OW56-90	10/07/98	ND (0.5) / ND (0.5)	ND (1.0) / ND (1.0)	ND (1.0) / ND (1.0)	ND (1.0) / ND (1.0)	ND (1.0) / ND (1.0)	7.37	609	21.5
OW57-90	10/09/98	ND (0.5)	560	ND (20)	160	ND (20)	NM	NM	NM
Deeper Bedrock Groundwater Monitoring Wells									
OW60-90	10/09/98	1.1 U	2.1	ND (2.0)	ND (2.0)	ND (2.0)	NM	NM	NM
OW62-90	10/09/98	6.4J / 8.4	140 / 140	ND (10) / ND (50)	300 / 270	16 / ND (50)	NM	NM	NM
OW63-90	10/09/98	1.9	2.7	ND (1.0)	5.5	ND (1.0)	6.65	1,180	20.9

Notes:

[1] µg/L - micrograms per liter.
[2] ND - Not detected at the reporting limit indicated in parentheses.
[3] U - PCBs were detected in one of the method blank samples; therefore, the samples from wells OW35-89, OW36-89, OW59-89, and OW60-89 should be qualified as non-detect (U) for this parameter with the sample results becoming the detection limit.
[4] NM - Not measured.
[5] J - Estimated value.

TABLE 7.2b

OCTOBER 1999 GROUNDWATER SAMPLING ANALYTICAL DATA
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Monitoring Well	*Date Sampled*	*Concentration (mg/L)(1)*					*pH*	*Conductivity (mS/cm)*	*Temperature 0C*
		PCBs	*cis-1,2-DCE*	*trans-1,2-DCE*	*TCE*	*Vinyl Chloride*			
Shallow Bedrock Groundwater Monitoring Wells									
OW27-89	10/05/99	ND (0.5)(2)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	7.38	827	18.1
OW35-89	10/06/99	4.0	81	ND (5.0)	48	ND (5.0)	6.69	249	17.1
OW37-89	10/07/99	110,000	41,000	ND (1,000)	23,000	ND (1,000)	6.92	694	21.0
OW55-90	10/05/99	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	7.97	432	16.2
OW58-90	10/07/99	ND (0.5)	860	ND (50)	240	ND (50)	NM[3]	NM	NM
OW59-90	10/07/99	ND (0.5)	2,500	ND (200)	ND (200)	ND (200)	NM	NM	NM
OW61-90	10/05/99	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	7.17	5.94	18.0
OW64-92	10/05/99	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	7.90	428	15.9
OW65-92	10/05/99	ND (0.5) / ND (0.5)	34 J[4] / 5.5	ND (1.0) / ND (1.0)	ND (1.0) / ND (1.0)	ND (1.0) / ND (1.0)	8.03	332	16.9
Deep Bedrock Groundwater Monitoring Wells									
OW30-89	10/06/99	ND (0.5)	360	ND (100)	770	ND (100)	NM	NM	NM
OW36-89	10/06/99	0.94	460	ND (20)	250	ND (20)	6.13	653	17.8
OW38-89	10/07/99	240,000	ND (10,000)	ND (10,000)	340,000	ND (10,000)	7.39	1,120	22.9
OW46-89	10/06/99	1.1	63	ND (5.0)	16	ND (5.0)	7.89	1,040	17.1
OW56-90	10/05/99	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	7.68	373	15.8
OW57-90	10/07/99	ND (0.5)	410	ND (20)	75	ND (20)	NM	NM	NM
Deeper Bedrock Groundwater Monitoring Wells									
OW60-90	10/05/99	ND (0.5)	1.1	ND (1.0)	ND (1.0)	ND (1.0)	6.19	583	18.0
OW62-90	10/06/99	6.6	340	ND (100)	1,200	ND (100)	6.42	1,210	17.4
OW63-90	10/06/99	1.3 / 1.2	2.3 / 2.3	ND (1.0) / ND (1.0)	3.4 / 3.4	ND (1.0) / ND (1.0)	7.68	1,372	17.2

Notes:

(1) mg/L - micrograms per liter.
(2) ND(0.5) - Not detected above detection limit.
(3) NM - Not measured due to presence of dye (from 1998 dye tracer study).
(4) J - Estimated value.

TABLE 7.2c

OCTOBER 2000 GROUNDWATER SAMPLING ANALYTICAL DATA
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Monitoring Well	*Date Sampled*	*Concentration (mg/L)[1]*					*pH*	*Conductivity (mS/cm)*	*Temperature ˚C*
		PCBs	*cis-1,2-DCE*	*trans-1,2-DCE*	*TCE*	*Vinyl Chloride*			
Shallow Bedrock Groundwater Monitoring Wells									
OW27-89	10/03/00	ND[2] (0.5)	ND (1.0)	ND (1.0)	1.3	ND (1.0)	7.73	821	20.9
OW35-89	10/04/00	3.8	29	ND (1.0)	9.1	ND (1.0)	8.93	544	23.8
OW37-89	10/05/00	48,000 J[4]	29,000	ND (1,000)	8,400	ND (1,000)	7.35	752	23.1
OW55-90	10/03/00	1.1	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	7.20	381	19.2
OW58-90	10/05/00	ND (0.5 UJ[5])	760	ND (20)	190	42	7.11	426	18.3
OW59-90	10/05/00	ND (0.5 UJ)	2,600	ND (50)	ND (50)	310	7.80	401	19.4
OW61-90	10/03/00	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	7.67	673	18.4
OW64-92	10/03/00	ND (0.5) / ND (0.5)	ND (1.0) / ND (1.0)	ND (1.0) / ND (1.0)	ND (1.0) / ND (1.0)	ND (1.0) / ND (1.0)	7.75	835	19.6
OW65-92	10/04/00	ND (0.5)	41	ND (1.0)	ND (1.0)	ND (1.0)	8.87	438	18.4
Deep Bedrock Groundwater Monitoring Wells									
OW30-89	10/05/00	2.1	330	ND (10)	410	ND (10)	6.78	450	21.7
OW36-89	10/04/00	0.94	680	ND (20)	59	ND (20)	10.13	762	25.3
OW38-89	10/05/00	12,000 J	ND (10,000)	ND (10,000)	170,000	ND (10,000)	7.33	763	21.9
OW46-89	10/04/00	ND (0.5)	190	ND (5.0)	59	ND (5.0)	9.13	733	20.8
OW56-90	10/03/00	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	7.12	590	18.2
OW57-90	10/05/00	1,700	ND (1.0)	ND (1.0)	34	ND (1.0)	NM[3]	NM	NM
Deeper Bedrock Groundwater Monitoring Wells									
OW60-90	10/03/00	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	6.28	472	20.2
OW62-90	10/04/00	6.1	650	ND (20)	570	110	8.85	1,550	22.4
OW63-90	10/04/00	1.1 J / 1.4	2.3 / 2.5	ND (1.0) / ND (1.0)	ND (1.0) / ND (1.0)	ND (1.0) / ND (1.0)	7.20	1,327	19.6

Notes:

[1] mg/L - micrograms per liter.
[2] ND - Not detected at the reporting limit indicated in parentheses.
[3] NM - Not measured due to presence of dye (from 1998 dye tracer study).
[4] J - Estimated value.
[5] UJ - Estimated value.

TABLE 7.2d

OCTOBER 2001 GROUNDWATER SAMPLING ANALYTICAL DATA
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Monitoring Well	*Date Sampled*	*Concentration (µg/L)* [1] *PCBs*	*cis-1,2-DCE*	*trans-1,2-DCE*	*TCE*	*Vinyl Chloride*	*pH*	*Conductivity (µS/cm)*	*Temperature °C*
Overburden/Bedrock Interface Monitoring Wells									
OW70-01	10/09/01	3.8	ND (1.0)	ND (1.0)	9.8	ND (1.0)	6.03	123	17.8
OW73-01	10/09/01	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	7.26	515	18.2
Shallow Bedrock Groundwater Monitoring Wells									
OW27-89	10/09/01	ND[2] (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	7.45	714	16.8
OW35-89	10/10/01	2.7 / 1.1 J[3]	31 / 31	ND (1.0) / ND (1.0)	9.2 / 9.2	ND (1.0) / ND (1.0)	7.76	424	18.4
OW37-89	10/10/01	25,000,000	38,000	ND (1,400)	26,000	ND (1,400)	6.91	725	18.0
OW55-90	10/09/01	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	7.50	315	17.5
OW58-90	10/10/01	ND (0.5)	820	ND (33)	130	ND (33)	7.52	306	15.2
OW59-90	10/10/01	2.2	2,700	ND (100)	ND (100)	110	7.80	448	15.9
OW61-90	10/09/01	6.1 J / 2.5 J	ND (1.0) / ND (1.0)	ND (1.0) / ND (1.0)	ND (1.0) / ND (1.0)	ND (1.0) / ND (1.0)	7.80	734	18.3
OW64-92	10/09/01	ND (0.5)	2.9	ND (1.0)	ND (1.0)	ND (1.0)	9.20	680	16.2
OW65-92	10/09/01	ND (0.5)	55	ND (2.5)	3.1	ND (2.5)	8.11	357	16.1
Deep Bedrock Groundwater Monitoring Wells									
OW30-89	10/10/01	5.4	160	ND (50)	1,600	ND (50)	7.07	744	16.6
OW36-89	10/10/01	0.74	470	ND (20)	140	ND (20)	7.66	806	17.7
OW38-89	10/10/01	2,100,000	ND (10,000)	ND (10,000)	160,000	ND (10,000)	7.52	1,120	17.0
OW46-89	10/10/01	ND (0.5)	130	ND (5.0)	34	ND (5.0)	7.25	1,000	17.0
OW56-90	10/09/01	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	7.52	558	17.0
OW57-90	10/10/01	1.4	220	ND (10)	ND (10)	ND (10)	7.76	2,080	18.4
OW68-01	10/09/01	ND (0.5)	8.2	ND (1.0)	ND (1.0)	ND (1.0)	11.05	147	15.4
OW71-01	10/09/01	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	8.10	2,080	19.4
OW72-01	10/09/01	ND (0.5)	520	ND (25)	ND (25)	ND (25)	8.16	455	16.2
Deeper Bedrock Groundwater Monitoring Wells									
OW60-90	10/09/01	1.2	310	ND (50)	1,300	ND (50)	6.87	228	15.2
OW62-90	10/10/01	9.1	540	ND (20)	500	37	7.57	1,460	18.0
OW63-90	10/09/01	++[4]	1.5	ND (1.0)	ND (1.0)	ND (1.0)	7.34	1,370	17.6
OW63-90	10/17/01	2.3	--[5]	--	--	--	6.48	142	16.4
OW69-01	10/09/01	7.9	170	ND (7.7)	ND (7.7)	ND (7.7)	7.14	2,558	13.9

Notes:

[1] µg/L - micrograms per liter.
[2] ND - Not detected at the reporting limit indicated in parentheses.
[3] J - Estimated value.
[4] "++" - Sample container broken during shipment. The sample was re-collected on October 17, 2001.
[5] "--" - Not sampled.

TABLE 7.2e

OCTOBER 2002 GROUNDWATER SAMPLING ANALYTICAL DATA
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Monitoring Well	*Date Sampled*	*Concentration (µg/L) [1]* *PCBs*	*cis-1,2-DCE*	*trans-1,2-DCE*	*TCE*	*Vinyl Chloride*	*pH*	*Conductivity (µS/cm)*	*Temperature °C*
Overburden/Bedrock Interface Monitoring Wells									
OW70-01	10/08/02	3.3	21	ND (5.0)	230	ND (5.0)	4.68	149	18.3
OW73-01	10/09/02	ND (0.5)	1.2	ND (1.0)	ND (1.0)	ND (1.0)	6.87	175	20.4
Shallow Bedrock Groundwater Monitoring Wells									
OW27-89	10/09/02	1.4	2.4	ND (1.0)	2.8	ND (1.0)	7.38	577	20.1
OW35-89	10/09/02	4.5	25	ND (1.0)	8.8	ND (1.0)	7.56	135	20.7
OW37-89	10/10/02	14,000	28,000	ND (500)	12,000	ND (500)	6.63	582	18.5
OW55-90	10/08/02	0.86	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	5.90	332	21.4
OW58-90	10/10/02	ND (0.5)	520	ND (10)	120	15	7.42	275	16.9
OW59-90	10/10/02	ND (0.5) / ND (0.5)	2,800 / 2,600	ND (50) / ND (50)	ND (50) / ND (50)	170 / 110	6.96	183	17.3
OW61-90	10/08/02	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	5.71	587	17.8
OW64-92	10/08/02	ND (0.5)	4.2	ND (1.0)	ND (1.0)	ND (1.0)	5.68	818	16.4
OW65-92	10/09/02	ND (0.5)	48	ND (1.0)	14	ND (1.0)	6.81	278	19.1
Deep Bedrock Groundwater Monitoring Wells									
OW30-89	10/09/02	12	16	ND (5.0)	110	ND (5.0)	7.38	544	18.9
OW36-89	10/09/02	0.86 / 0.62	420 / 370	9.9 / 8.6	280 / 250	16 / 18	7.66	380	18.7
OW38-89	10/10/02	28,000	4,000	ND (2,500)	140,000	ND (2,500)	6.95	920	19.9
OW46-89	10/09/02	ND (0.5)	200	ND (2.5)	41	ND (2.5)	7.46	414	17.6
OW56-90	10/10/02	1.3	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	5.83	623	21.7
OW57-90	10/09/02	3.8	150	ND (2.0)	2.3	10	7.38	717	18.1
OW68-01	10/09/02	0.73	4.7	ND (1.0)	ND (1.0)	ND (1.0)	4.05	2970	19.1
OW71-01	10/08/02	1.1	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	5.61	2,444	19.2
OW72-01	10/08/02	ND (0.5)	320	ND (5.0)	13	14	5.67	635	18.2
Deeper Bedrock Groundwater Monitoring Wells									
OW60-90	10/08/02	ND (0.5)	390	ND (50)	1,200	ND (50)	4.08	1865	15.2
OW62-90	10/09/02	6.2	790	ND (20)	540	80	7.10	690	18.6
OW63-90	10/09/02	ND (0.5)	1.4	ND (1.0)	ND (1.0)	ND (1.0)	7.78	628	18.2
OW69-01	10/09/02	ND (0.5)	120	ND (1.0)	3	ND (1.0)	3.82	2,340	17.6

Notes:

[1] µg/L - micrograms per liter.
[2] ND - Not detected at the reporting limit indicated in parentheses.
[3] J - Estimated value.

TABLE 7.3a

OCTOBER 1998 SURFACE WATER SAMPLING ANALYTICAL DATA

MALLORY CAPACITOR CO. SITE

WAYNESBORO, TENNESSEE

Sample Location	***Date Sampled***	***Concentration (µg/L)*** [1]							
		PCBs	***cis-1,2-DCE***	***trans-1,2-DCE***	***TCE***	***Vinyl Chloride***	***pH***	***Conductivity (µS/cm)***	***Temperature ^0C***
Green River									
Green River Upstream	10/06/98	ND[2] (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	7.07	154	23.0
Green River Midstream	10/06/98	ND (0.5) / ND (0.5)	ND (1.0) / ND (1.0)	ND (1.0) / ND (1.0)	ND (1.0) / ND (1.0)	ND (1.0) / ND (1.0)	7.45	131	23.7
Green River Downstream	10/06/98	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	7.34	190	24.1
Cold Water Creek									
Cold Water Creek Upstream	10/06/98	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	5.99	258	22.9
Cold Water Creek Midstream	10/06/98	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	6.24	246	23.0
Cold Water Creek Downstream	10/06/98	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	6.60	263	23.1

Notes:

[1] µg/L - micrograms per liter.

[2] ND - Not detected at the reporting limit indicated in parentheses.

TABLE 7.3b

OCTOBER 1999 SURFACE WATER SAMPLING ANALYTICAL DATA
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Sample Location	*Date Sampled*	*Concentration (µg/L)* [1]					*pH*	*Conductivity (µS/cm)*	*Temperature ^{0}C*
		PCBs	*cis-1,2-DCE*	*trans-1,2-DCE*	*TCE*	*Vinyl Chloride*			
Green River									
Green River Upstream	10/04/99	ND[2] (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	7.36	165	17.9
Green River Midstream	10/04/99	ND (0.5) / ND (0.5)	ND (1.0) / ND (1.0)	ND (1.0) / ND (1.0)	ND (1.0) / ND (1.0)	ND (1.0) / ND (1.0)	7.64	122	17.6
Green River Downstream	10/04/99	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	7.66	130	17.5
Cold Water Creek									
Cold Water Creek Upstream	10/04/99	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	7.15	185	19.3
Cold Water Creek Midstream	10/04/99	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	7.18	215	18.0
Cold Water Creek Downstream	10/04/99	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	7.20	203	18.1

Notes:

[1] µg/L - micrograms per liter.

[2] ND - Not detected at the reporting limit indicated in parentheses.

TABLE 7.3c

OCTOBER 2000 SURFACE WATER SAMPLING ANALYTICAL DATA
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Sample Location	*Date Sampled*	*Concentration (µg/L)* [1]					*pH*	*Conductivity (µS/cm)*	*Temperature ^0C*
		PCBs	*cis-1,2-DCE*	*trans-1,2-DCE*	*TCE*	*Vinyl Chloride*			
Green River									
Green River Upstream	10/02/00	ND[2] (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	7.76	109	26.0
Green River Midstream	10/02/00	ND (0.5) / ND (0.5)	ND (1.0) / ND (1.0)	ND (1.0) / ND (1.0)	ND (1.0) / ND (1.0)	ND (1.0) / ND (1.0)	8.22	114	27.2
Green River Downstream	10/02/00	ND (0.5)	ND (1.0)	ND (1.0)	1.4	ND (1.0)	8.32	111	25.2
Cold Water Creek									
Cold Water Creek Upstream	10/02/00	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	6.59	248	26.3
Cold Water Creek Midstream	10/02/00	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	7.28	208	26.4
Cold Water Creek Downstream	10/02/00	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	7.27	224	23.9

Notes:

[1] µg/L - micrograms per liter.

[2] ND - Not detected at the reporting limit indicated in parentheses.

TABLE 7.3d

OCTOBER 2001 SURFACE WATER SAMPLING ANALYTICAL DATA
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Sample Location	*Date Sampled*	*Concentration (μg/L)* [1]					*pH*	*Conductivity (μS/cm)*	*Temperature ^0C*
		PCBs	*cis-1,2-DCE*	*trans-1,2-DCE*	*TCE*	*Vinyl Chloride*			
Green River									
Green River Upstream	10/08/01	ND[2] (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	8.41	147	20.4
Green River Midstream	10/08/01	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	8.13	108	19.3
Green River Downstream	10/08/01	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	8.19	168	19.9
Cold Water Creek									
Cold Water Creek Upstream	10/08/01	ND (0.5) / ND (0.5)	ND (1.0) / ND (1.0)	ND (1.0) / ND (1.0)	ND (1.0) / ND (1.0)	ND (1.0) / ND (1.0)	6.6	1,984	20.2
Cold Water Creek Midstream	10/08/01	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	6.75	1,928	17.5
Cold Water Creek Downstream	10/08/01	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	7.18	199	17.3

Notes:

[1] μg/L - micrograms per liter.

[2] ND - Not detected at the reporting limit indicated in parentheses.

TABLE 7.3e

OCTOBER 2002 SURFACE WATER SAMPLING ANALYTICAL DATA
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Sample Location	*Date Sampled*	*Concentration (μg/L)* [1]					*pH*	*Conductivity (μS/cm)*	*Temperature ^{0}C*
		PCBs	*cis-1,2-DCE*	*trans-1,2-DCE*	*TCE*	*Vinyl Chloride*			
Green River									
Green River Upstream	10/07/02	ND[2] (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	7.87	150	19.3
Green River Midstream	10/07/02	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	7.50	138	18.3
Green River Downstream	10/07/02	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	6.79	55	18.1
Cold Water Creek									
Cold Water Creek Upstream	10/07/02	ND (0.5) / ND (0.5)	ND (1.0) / ND (1.0)	ND (1.0) / ND (1.0)	ND (1.0) / ND (1.0)	ND (1.0) / ND (1.0)	6.41	100	18.7
Cold Water Creek Midstream	10/07/02	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	6.74	107	18.7
Cold Water Creek Downstream	10/07/02	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	6.61	115	18.4

Notes:

[1] μg/L - micrograms per liter.

[2] ND - Not detected at the reporting limit indicated in parentheses.

TABLE 7.4

SUMMARY OF SEDIMENT PCBs ANALYTICAL DATA
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Sample Date	PCBs Concentration (mg/kg) [1] Former Sample Locations 270	271	272	274	881	882
Aug. 11, 1997	-- [2]	--	10	--	--	--
Sep. 10, 1997	--	--	92	--	--	--
Oct. 1, 1997	23	ND(1) [3]	ND(1)	5.7	ND(1)	ND(1)
Nov. 4, 1997	ND(1)	ND(1)	4.3	4.5	--	--
Dec. 3, 1997	--	--	2.6	9.1	--	--
Dec. 23, 1997	--	--	3.4 / 2.4	5.5 / 3.6	--	--
Jan. 13, 1998	--	--	2.8	--	--	--
Feb. 3, 1998	--	--	14	--	--	--
Mar. 5, 1998	ND(0.033)	0.3J / ND(0.033)	0.6J [4]	1.1J / 0.52J	--	--
Apr. 1, 1998	--	--	6	--	--	--
May 4, 1998	--	--	1.6	--	--	--
Jun. 5, 1998	--	--	10	--	--	--
Jul. 7, 1998	--	--	6.3	--	--	--
Aug. 4, 1998	--	--	7.8	--	--	--
Sep. 9, 1998	--	--	12	--	--	--
Oct. 7, 1998	ND(0.033)	0.22	0.98 / 1.2	8.2	--	--
Nov. 6, 1998	--	--	1.5 / 0.85	4	--	--
Dec. 8, 1998	--	--	0.35 / 0.51	2.8	--	--
Jan. 5, 1999	--	--	0.55 / 0.66	0.46	--	--
Feb. 5, 1999	--	--	0.74	--	--	--
Mar. 1, 1999	--	--	9.6J	--	--	--
Apr. 9, 1999	--	--	4.3	--	--	--
May 7, 1999	--	--	ND(0.033)	--	--	--
Jun. 3, 1999	--	--	2.1	--	--	--
Jul. 8, 1999	--	--	9.8J	--	--	--
Aug. 11, 1999	--	--	ND(0.033)	--	--	--
Sep. 8, 1999	--	--	0.12	--	--	--

TABLE 7.4

SUMMARY OF SEDIMENT PCBs ANALYTICAL DATA
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Sample Date	***PCBs Concentration (mg/kg)*** [(1)] ***Former Sample Locations***					
	270	***271***	***272***	***274***	***881***	***882***
Oct. 7, 1999	--	--	0.19	--	--	--
Nov. 4, 1999	--	--	0.36	--	--	--
Dec. 2, 1999	--	--	25	--	--	--
Jan. 7, 2000	ND(0.033)	ND(0.033)	ND(0.033)	ND(0.033)	--	--
Feb. 3, 2000	--	--	ND(0.16)	--	--	--
Mar. 10, 2000	--	--	ND(0.033)	--	--	--
Apr. 7, 2000	--	--	ND(0.033)	--	--	--
May 4, 2000	--	--	ND(0.033)	--	--	--
Jun. 2, 2000	--	--	ND(0.033)	--	--	--
Jul. 7, 2000	--	--	ND(0.033)	--	--	--
Aug. 9, 2000	--	--	0.67	--	--	--
Sep. 8, 2000	--	--	0.098	--	--	--
Oct. 5, 2000	--	--	13	--	--	--
Nov. 2, 2000	ND(0.033)	ND(0.033)	0.26	0.33	--	--
Dec. 6, 2000	--	--	0.46	--	--	--
Jan. 4, 2001	--	--	0.043	--	--	--
Feb. 7, 2001	--	--	ND(0.033)	--	--	--
Mar. 7, 2001	--	--	ND(0.033)	--	--	--
Apr. 11, 2001	--	--	ND(0.033)	--	--	--
May 2, 2001	--	--	ND(0.033)	--	--	--
May 17, 2001	--	--	0.2	--	--	--
Jun. 6, 2001	--	--	ND(0.033)	--	--	--
Jul. 11, 2001	--	--	ND(0.033)	--	--	--
Aug. 8, 2001	--	--	ND(0.033)	--	--	--
Sep. 19, 2001	--	--	0.6	--	--	--
Oct. 10, 2001	--	--	0.13	--	--	--
Nov. 7, 2001	--	--	0.36	--	--	--

TABLE 7.4

SUMMARY OF SEDIMENT PCBs ANALYTICAL DATA
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Sample Date	***PCBs Concentration (mg/kg) (1)*** ***Former Sample Locations***					
	270	***271***	***272***	***274***	***881***	***882***
Dec. 6, 2001	--	--	ND(0.033)	--	--	--
Jan. 10, 2002	--	--	ND(0.033)	--	--	--
Feb. 13, 2002	--	--	ND(0.033)	--	--	--
Mar. 7, 2002	--	--	ND(0.033)	--	--	--
Apr. 11, 2002	--	--	ND(0.033)	--	--	--
May 9, 2002	--	--	ND(0.033)	--	--	--
Jun. 7, 2002	--	--	ND(0.033)	--	--	--
Jul. 12, 2002	--	--	ND(0.033)	--	--	--
Aug. 2, 2002	--	--	ND(0.033)	--	--	--
Sep. 6, 2002	--	--	0.052	--	--	--
Oct. 10, 2002	--	--	ND(0.033)	--	--	--
Nov. 14, 2002	--	--	ND(0.033)	--	--	--
Dec. 13, 2002	--	--	0.44	--	--	--

Notes:

(1) mg/kg - milligrams per kilogram.
(2) "--" - Not sampled.
(3) ND(1) - Not detected above detection limit indicated in parentheses.
(4) J - Estimated value.

TABLE 7.5a

AVERAGE EXTRACTION WELL AND TREATMENT SYSTEM FLOW RATE DATA - 1998
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Flow Measurement Interval		*Average Extraction Well Flow Rates (1) (GPM)*					*Treatment System Flow Rates (2) (GPM)*	
from	*to*	*EW-1*	*EW-2*	*EW-3*	*EW-4*	*EW-5*	*Influent*	*Effluent*
1998 (July 31, 1997 through December 3, 1998)								
31-Jul-97	27-Aug-97	0.10	43.0	2.70	0.00	3.70	50	49
28-Aug-97	01-Oct-97	0.00	40.8	1.80	0.45	3.50	47	43
02-Oct-97	04-Nov-97	0.05	42.0	2.30	0.09	3.60	48	46
05-Nov-97	03-Dec-97	0.09	46.0	4.30	0.13	4.50	55	52
04-Dec-97	31-Dec-97	0.09	43.0	4.90	0.13	4.40	53	51
01-Jan-98	29-Jan-98	0.12	46.0	1.80	0.13	4.70	52	54
30-Jan-98	05-Mar-98	0.17	44.0	3.60	0.08	4.40	53	52
06-Mar-98	01-Apr-98	0.21	43.0	4.40	0.19	4.50	52	52
02-Apr-98	30-Apr-98	0.18	43.0	5.30	0.14	4.50	53	51
01-May-98	04-Jun-98	0.17	42.0	5.00	0.12	4.60	56	50
05-Jun-98	02-Jul-98	0.11	39.0	3.80	0.08	3.90	40	45
03-Jul-98	04-Aug-98	0.12	39.0	3.90	0.05	5.10	50	48
05-Aug-98	03-Sep-98	0.11	39.9	3.50	0.06	4.50	50	42
04-Sep-98	01-Oct-98	0.11	37.1	3.80	0.05	5.10	46	43
02-Oct-98	29-Oct-98	0.11	38.3	3.10	0.05	4.80	45	42
30-Oct-98	03-Dec-98	0.11	40.3	3.20	0.06	2.80	46	45
Average 1998 Flow Rates Based on Monthly Measurements		0.12	41.7	3.6	0.11	4.3	50	48
Total Accumulated Flow as of July 31, 1997 (Gallons)		2,885,566	21,996,267	7,831,477	2,370,366	3,041,421	38,125,097	36,357,795
Total Accumulated Flow as of Dec. 3, 1998 (Gallons)		2,977,642	51,543,710	10,345,369	2,451,105	6,067,607	73,385,433	70,710,314
Average 1998 Flow Rates Based on Accumulated Flow (3)		**0.13**	**41.9**	**3.6**	**0.11**	**4.3**	**50**	**49**

Notes:

GPM Gallons per minute.

(1) The average flows listed for the extraction wells are less than the instantaneous flow rate set for each well since the average flow rates account for the several system shut downs and pumping rate adjustments that occurred.

(2) The difference between the influent and effluent flow readings is due to the accuracy tolerances of the meters (±2 percent) and water loss due to air stripping (±2.5 percent).

(3) The average flow rates based on the accumulated flows are applied in the mass removal estimates presented in Table 7.7.

TABLE 7.5b

AVERAGE EXTRACTION WELL AND TREATMENT SYSTEM FLOW RATE DATA - 1999
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Flow Measurement Interval		*Average Extraction Well Flow Rates (1) (GPM)*					*Treatment System Flow Rates (2) (GPM)*	
from	*to*	*EW-1*	*EW-2*	*EW-3*	*EW-4*	*EW-5*	*Influent*	*Effluent*
1999 (December 4, 1998 through December 31, 1999)								
04-Dec-98	31-Dec-98	0.11	41.3	3.6	0.09	5.7	51	49
01-Jan-99	28-Jan-99	0.11	43.1	3.9	0.10	5.7	53	50
29-Jan-99	26-Feb-99	0.11	41.4	5.0	0.11	5.7	52	49
27-Feb-99	26-Mar-99	0.13	40.3	5.3	0.13	5.5	51	48
27-Mar-99	30-Apr-99	0.15	36.3	5.3	0.11	5.3	48	44
01-May-99	28-May-99	0.14	39.3	5.5	0.08	5.6	51	49
29-May-99	02-Jul-99	0.13	30.9	5.4	0.06	5.7	42	41
03-Jul-99	30-Jul-99	0.11	33.4	4.5	0.06	4.6	43	41
31-Jul-99	03-Sep-99	0.12	35.7	4.6	0.03	4.9	45	44
04-Sep-99	01-Oct-99	0.11	34.5	5.1	0.03	5.4	45	44
02-Oct-99	29-Oct-99	0.10	32.5	4.4	0.02	5.1	42	40
30-Oct-99	03-Dec-99	0.07	35.7	3.9	0.04	5.2	45	44
04-Dec-99	31-Dec-99	0.08	35.1	4.4	0.05	5.4	45	44
Average 1999 Flow Rates Based on Monthly Measurements		0.11	36.9	4.7	0.07	5.4	47	45
Total Accumulated Flow as of Dec. 3, 1998 (Gallons)		2,977,642	51,543,710	10,345,369	2,451,105	6,067,607	73,385,433	70,710,314
Total Accumulated Flow as of Dec. 31, 1999 (Gallons)		3,042,323	72,331,899	13,003,812	2,490,701	9,102,027	99,970,767	96,271,099
Average 1999 Flow Rates Based on Accumulated Flow (3)		**0.11**	**36.8**	**4.7**	**0.07**	**5.4**	**47**	**45**

Notes:

GPM Gallons per minute.

(1) The average flows listed for the extraction wells are less than the instantaneous flow rate set for each well since the average flow rates account for the several system shut downs and pumping rate adjustments that occurred.

(2) The difference between the influent and effluent flow readings is due to the accuracy tolerances of the meters (±2 percent) and water loss due to air stripping (±2.5 percent).

(3) The average flow rates based on the accumulated flows are applied in the mass removal estimates presented in Table 7.7.

TABLE 7.5c

AVERAGE EXTRACTION WELL AND TREATMENT SYSTEM FLOW RATE DATA - 2000
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Flow Measurement Interval		*Average Extraction Well Flow Rates [1] (GPM)*					*Treatment System Flow Rates [2] (GPM)*	
from	*to*	*EW-1*	*EW-2*	*EW-3*	*EW-4*	*EW-5*	*Influent*	*Effluent*
2000 (January 1, 2000 through December 29, 2000)								
01-Jan-00	28-Jan-00	0.09	35.6	4.2	0.07	5.4	46	45
29-Jan-00	25-Feb-00	0.09	36.3	4.4	0.08	5.6	46	45
26-Feb-00	31-Mar-00	0.14	35.5	4.7	0.09	5.3	46	45
01-Apr-00	28-Apr-00	0.15	37.2	5.0	0.09	5.2	48	46
29-Apr-00	26-May-00	0.13	34.4	4.9	0.08	5.6	45	43
27-May-00	30-Jun-00	0.11	32.7	5.0	0.06	4.7	43	41
01-Jul-00	28-Jul-00	0.11	31.5	5.4	0.06	5.4	42	39
29-Jul-00	01-Sep-00	0.10	32.5	3.9	0.04	5.6	42	38
02-Sep-00	29-Sep-00	0.09	29.5	1.2	0.04	4.9	36	34
30-Sep-00	27-Oct-00	0.10	31.5	4.9	0.03	5.9	42	39
28-Oct-00	01-Dec-00	0.10	32.2	5.4	0.05	5.8	43	40
02-Dec-00	29-Dec-00	0.10	33.9	6.2	0.06	5.4	46	44
Average 2000 Flow Rates Based on Monthly Measurements		0.11	33.6	4.6	0.06	5.4	44	42
Total Accumulated Flow as of Dec. 31, 1999 (Gallons)		3,042,323	72,331,899	13,003,812	2,490,701	9,102,027	99,970,767	96,271,099
Total Accumulated Flow as of Dec. 29, 2000 (Gallons)		3,098,811	89,917,936	15,419,203	2,522,859	11,931,189	122,890,003	118,094,575
Average 2000 Flow Rates Based on Accumulated Flow [3]		**0.11**	**33.6**	**4.6**	**0.06**	**5.4**	**44**	**42**

Notes:

GPM Gallons per minute.
(1) The average flows listed for the extraction wells are less than the instantaneous flow rate set for each well since the average flow rates account for the several system shut downs and pumping rate adjustments that occurred.
(2) The difference between the influent and effluent flow readings is due to the accuracy tolerances of the meters (±2 percent) and water loss due to air stripping (±2.5 percent).
(3) The average flow rates based on the accumulated flows are applied in the mass removal estimates presented in Table 7.7.

TABLE 7.5d

AVERAGE EXTRACTION WELL AND TREATMENT SYSTEM FLOW RATE DATA - 2001
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Flow Measurement Interval		*Average Extraction Well Flow Rates (1) (GPM)*					*Treatment System Flow Rates (2) (GPM)*	
from	*to*	*EW-1*	*EW-2*	*EW-3*	*EW-4*	*EW-5*	*Influent*	*Effluent*
2001 (December 30, 2000 through December 28, 2001)								
30-Dec-00	02-Feb-01	0.10	33.0	5.2	0.07	5.3	44	39
03-Feb-01	02-Mar-01	0.14	36.8	6.3	0.09	5.8	49	45
03-Mar-01	30-Mar-01	0.16	33.9	5.6	0.11	6.3	46	43
31-Mar-01	27-Apr-01	0.16	33.7	6.2	0.11	5.9	46	43
28-Apr-01	01-Jun-01	0.12	27.0	3.8	0.07	5.4	36	34
02-Jun-01	29-Jun-01	0.12	32.9	3.4	0.06	6.5	43	41
30-Jun-01	27-Jul-01	0.11	31.8	5.4	0.05	6.3	44	41
28-Jul-01	31-Aug-01	0.10	32.1	5.4	0.05	6.2	44	40
01-Sep-01	28-Sep-01	0.08	25.2	3.1	0.04	4.6	33	31
29-Sep-01	26-Oct-01	0.10	32.7	4.1	0.04	6.3	43	40
27-Oct-01	30-Nov-01	0.09	28.6	4.1	0.04	6.2	37	36
01-Dec-01	28-Dec-01	0.11	34.0	6.0	0.05	6.7	47	42
Average 2001 Flow Rates Based on Monthly Measurements		0.12	31.8	4.9	0.07	6.0	43	40
Total Accumulated Flow as of Dec. 29, 2000 (Gallons)		3,098,811	89,917,936	15,419,203	2,522,859	11,931,189	122,890,003	118,094,575
Total Accumulated Flow as of Dec. 28, 2001 (Gallons)		3,159,057	106,529,157	17,970,222	2,556,546	15,053,335	145,168,322	138,808,655
Average 2001 Flow Rates Based on Accumulated Flow (3)		**0.12**	**31.8**	**4.9**	**0.06**	**6.0**	**43**	**40**

Notes:

GPM Gallons per minute.
(1) The average flows listed for the extraction wells are less than the instantaneous flow rate set for each well since the average flow rates account for the several system shut downs and pumping rate adjustments that occurred.
(2) The difference between the influent and effluent flow readings is due to the accuracy tolerances of the meters (±2 percent) and water loss due to air stripping (±2.5 percent).
(3) The average flow rates based on the accumulated flows are applied in the mass removal estimates presented in Table 7.7.

TABLE 7.5e

AVERAGE EXTRACTION WELL AND TREATMENT SYSTEM FLOW RATE DATA - 2002
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Flow Measurement Interval		*Average Extraction Well Flow Rates [1] (GPM)*					*Treatment System Flow Rates [2] (GPM)*	
from	***to***	***EW-1***	***EW-2***	***EW-3***	***EW-4***	***EW-5***	***Influent***	***Effluent***
2002 (December 29, 2001 through December 27, 2002)								
29-Dec-01	01-Feb-02	0.12	32.3	5.1	0.05	7.0	45	42
02-Feb-02	01-Mar-02	0.13	30.7	4.4	0.06	6.9	42	40
02-Mar-02	29-Mar-02	0.15	32.0	6.4	0.09	7.3	46	43
30-Mar-02	03-May-02	0.15	30.7	7.0	0.08	6.9	45	41
04-May-02	31-May-02	0.14	30.9	4.3	0.06	7.7	43	40
01-Jun-02	28-Jun-02	0.11	29.2	5.6	0.05	7.3	42	38
29-Jun-02	02-Aug-02	0.10	29.4	5.9	0.03	7.1	43	38
03-Aug-02	30-Aug-02	0.09	28.5	5.9	0.03	6.9	41	37
31-Aug-02	27-Sep-02	0.09	28.3	6.1	0.03	6.9	41	37
28-Sep-02	01-Nov-02	0.10	29.9	6.7	0.04	6.8	43	38
02-Nov-02	29-Nov-02	0.12	31.4	5.7	0.04	7.4	45	40
30-Nov-02	27-Dec-02	0.11	26.8	7.0	0.04	7.6	42	36
Average 2002 Flow Rates Based on Monthly Measurements		0.12	30.0	5.8	0.05	7.2	43	39
Total Accumulated Flow as of Dec. 28, 2001 (Gallons)		3,159,057	106,529,157	17,970,222	2,556,546	15,053,335	145,168,322	138,808,655
Total Accumulated Flow as of December 27, 2002 (Gallons)		3,221,413	122,290,413	21,047,132	2,582,874	18,796,270	167,838,107	159,302,560
Average 2002 Flow Rates Based on Accumulated Flow [3]		**0.12**	**30.2**	**5.9**	**0.05**	**7.2**	**43**	**39**

Notes:

GPM Gallons per minute.

(1) The average flows listed for the extraction wells are less than the instantaneous flow rate set for each well since the average flow rates account for the several system shut downs and pumping rate adjustments that occurred.

(2) The difference between the influent and effluent flow readings is due to the accuracy tolerances of the meters (±2 percent) and water loss due to air stripping (±2.5 percent).

(3) The average flow rates based on the accumulated flows are applied in the mass removal estimates presented in Table 7.7.

TABLE 7.6a

SUMMARY OF EXTRACTION WELL ANALYTICAL DATA - EW-1
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Date Sampled	*EW-1 Concentration (µg/L)*											
	PCBs			*TCE*			*cis-1,2-DCE*		*trans-1,2-DCE*		*Vinyl Chloride*	
	Result	*Dup. Result*	*Value Applied in Average (1)*	*Result*	*Dup. Result*	*Value Applied in Average (1)*	*Result*	*Dup. Result*	*Result*	*Dup. Result*	*Result*	*Dup. Result*
1998 (August 11, 1997 through November 6, 1998)												
Aug. 11, 1997	25	-	25.0	51,000	-	51,000	ND(2,500)	-	ND(2,500)	-	ND(2,500)	-
Sep. 10, 1997	58	-	58.0	14,000	-	14,000	ND(1,000)	-	ND(1,000)	-	ND(1,000)	-
Oct. 1, 1997	24	-	24.0	22,000	-	22,000	ND(1,000)	-	ND(1,000)	-	ND(1,000)	-
Nov. 4, 1997	9.8	-	9.8	32,000	-	32,000	ND(2,500)	-	ND(2,500)	-	ND(2,500)	-
Dec. 3, 1997	120	-	120.0	50,000	-	50,000	ND(5,000)	-	ND(5,000)	-	ND(5,000)	-
Jan. 13, 1998	130	-	130.0	50,000	-	50,000	ND(2,500)	-	ND(2,500)	-	ND(2,500)	-
Feb. 3, 1998	66	-	66.0	37,000	-	37,000	ND(2,500)	-	ND(2,500)	-	ND(2,500)	-
Mar. 5, 1998	100	31	65.5	30,000	-	30,000	ND(1,000)	-	ND(1,000)	-	ND(1,000)	-
Apr. 1, 1998	16	-	16.0	27,000	-	27,000	ND(1,000)	-	ND(1,000)	-	ND(1,000)	-
May. 4, 1998	11	-	11.0	5,000	-	5,000	440	-	ND(200)	-	ND(200)	-
Jun. 5, 1998	14	-	14.0	6,700	-	6,700	370	-	ND(250)	-	ND(250)	-
Jul. 7. 1998	9	-	9.0	7,900	-	7,900	270	-	ND(200)	-	ND(200)	-
Aug. 4, 1998	4.1	-	4.1	7,300	-	7,300	ND(250)	-	ND(250)	-	ND(250)	-
Sep. 9, 1998	13	-	13.0	7,800	-	7,800	ND(500)	-	ND(500)	-	ND(500)	-
Oct. 7, 1998	ND(13)	-	-	9,100	-	9,100	ND(500)	-	ND(500)	-	ND(500)	-
Nov. 6, 1998	12	-	12.0	10,000	-	10,000	ND(500)	-	ND(500)	-	ND(500)	-
Average 1998 Concentrations (m g/L)			**38.5**			**22,925**						
1999 (December 8, 1998 through December 2, 1999)												
Dec. 8, 1998	11	-	11.0	13,000	-	13,000	310	-	ND(250)	-	ND(250)	-
Jan. 5, 1999	5.6	-	5.6	8,200	-	8,200	ND(250)	-	ND(250)	-	ND(250)	-
Feb. 5, 1999	37	-	37.0	7,800	-	7,800	ND(1,000)	-	ND(1,000)	-	ND(1,000)	-
Mar. 1, 1999	13	-	13.0	5,000	-	5,000	ND(500)	-	ND(500)	-	ND(500)	-
Apr. 9, 1999	31	-	31.0	26,000	-	26,000	ND(2,000)	-	ND(2,000)	-	ND(2,000)	-
May. 7, 1999	8.3	-	8.3	32,000	-	32,000	ND(1,000)	-	ND(1,000)	-	ND(1,000)	-
Jun. 3, 1999	6.9	-	6.9	29,000	-	29,000	760	-	ND(500)	-	ND(500)	-
Jul. 8, 1999	7.6	-	7.6	30,000	-	30,000	ND(2,500)	-	ND(2,500)	-	ND(2,500)	-
Aug. 11, 1999	1.6	-	1.6	48,000	-	48,000	ND(2,500)	-	ND(2,500)	-	ND(2,500)	-
Sep. 8, 1999	5.2	-	5.2	46,000	-	46,000	ND(2,500)	-	ND(2,500)	-	ND(2,500)	-
Oct. 7, 1999	23	-	23.0	64,000	-	64,000	1,500	-	ND(1,000)	-	ND(1,000)	-
Nov. 4, 1999	55	-	55.0	6,900	-	6,900	ND(500)	-	ND(500)	-	ND(500)	-
Dec. 2, 1999	41	-	41.0	3,200	-	3,200	210	-	ND(100)	-	ND(100)	-
Average 1999 Concentrations (m g/L)			**18.9**			**24,546**						
2000 (January 7, 2000 through December 6, 2000)												
Jan. 7, 2000	11	-	11.0	2,600	-	2,600	100	-	ND(50)	-	ND(50)	-
Feb. 3, 2000	3.3	-	3.3	1,600	-	1,600	110	-	ND(100)	-	ND(100)	-
Mar. 10, 2000	6.1	-	6.1	13,000	-	13,000	ND(500)	-	ND(500)	-	ND(500)	-
Apr. 7, 2000	9.8	-	9.8	18,000	-	18,000	800	-	ND(500)	-	ND(500)	-
May. 4, 2000	5.9	-	5.9	21,000	-	21,000	660	-	ND(500)	-	ND(500)	-
Jun. 2, 2000	9.2	-	9.2	18,000	-	18,000	ND(1,000)	-	ND(1,000)	-	ND(1,000)	-
Jul. 7, 2000	7.4	-	7.4	25,000	-	25,000	ND(1,000)	-	ND(1,000)	-	ND(1,000)	-
Aug. 9, 2000	18	-	18.0	12,000	-	12,000	480	-	ND(250)	-	ND(250)	-
Sep. 8, 2000	10	-	10.0	22,000	-	22,000	730	-	ND(500)	-	ND(500)	-
Oct. 5, 2000	7.0	-	7.0	27,000	-	27,000	1,000	-	ND(1,000)	-	ND(1,000)	-
Nov. 2, 2000	5.6	-	5.6	30,000	-	30,000	ND(1,000)	-	ND(1,000)	-	ND(1,000)	-
Dec. 6, 2000	3.6	-	3.6	46,000	-	46,000	1,000	-	ND(1,000)	-	ND(1,000)	-
Average 2000 Concentrations (m g/L)			**8.1**			**19,683**						
2001 (January 4, 2001 through December 6, 2001)												
Jan. 4, 2001	5.4	-	5.4	43,000	-	43,000	1,900	-	ND(1,000)	-	ND(1,000)	-
Feb. 7, 2001	11	-	11.0	37	-	37	ND(1.0)	-	ND(1.0)	-	ND(1.0)	-
Mar. 7, 2001	110	-	110.0	27,000	-	27,000	1,300	-	ND(500)	-	ND(500)	-
Apr. 11, 2001	59	-	59.0	25,000	-	25,000	770	-	ND(50)	-	ND(50)	-
May. 2, 2001	27	-	27.0	28,000	-	28,000	ND(1,000)	-	ND(1,000)	-	ND(1,000)	-
Jun. 6, 2001	31	-	31.0	39,000	-	39,000	ND(1,000)	-	ND(1,000)	-	ND(1,000)	-
Jul. 11, 2001	95	-	95.0	29,000	-	29,000	1,100	-	ND(1,000)	-	ND(1,000)	-
Aug. 8, 2001	11	-	11.0	41,000	-	41,000	1,200	-	ND(1,000)	-	ND(1,000)	-
Sep. 19, 2001	41	41	41.0	21,000	20,000	20,500	ND(500)	ND(500)	ND(500)	ND(500)	ND(500)	ND(500)
Oct. 10, 2001	13	-	13.0	37,000	-	37,000	1,400	-	ND(1,000)	-	ND(1,000)	-
Nov. 7, 2001	56	-	56.0	22,000	-	22,000	ND(1,000)	-	ND(1,000)	-	ND(1,000)	-
Dec. 6, 2001	3.9	-	3.9	25,000	-	25,000	960	-	ND(500)	-	ND(500)	-
Average 2001 Concentrations (m g/L)			**38.6**			**28,045**						

TABLE 7.6a

SUMMARY OF EXTRACTION WELL ANALYTICAL DATA - EW-1
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Date Sampled	*EW-1 Concentration (µg/L)*											
	PCBs			*TCE*			*cis-1,2-DCE*		*trans-1,2-DCE*		*Vinyl Chloride*	
	Result	*Dup. Result*	*Value Applied in Average* (1)	*Result*	*Dup. Result*	*Value Applied in Average* (1)	*Result*	*Dup. Result*	*Result*	*Dup. Result*	*Result*	*Dup. Result*
2002 (January 10, 2002 through December 13, 2002)												
Jan. 10, 2002	6.4	-	6.4	52,000	-	52,000	ND(2,500)	-	ND(2,500)	-	ND(2,500)	-
Feb. 13, 2002	11	-	11.0	16,000	-	16,000	1,900	-	ND(500)	-	ND(500)	-
Mar. 7, 2002	4.8	-	4.8	42,000	-	42,000	1,900	-	ND(1,000)	-	ND(1,000)	-
Apr. 11, 2002	4.9	-	4.9	50,000	-	50,000	1,800	-	ND(1,000)	-	ND(1,000)	-
May. 9, 2002	4.9	-	4.9	49,000	-	49,000	ND(2,500)	-	ND(2,500)	-	ND(2,500)	-
Jun. 7, 2002	4.4	-	4.4	56,000	-	56,000	2,200	-	ND(1,000)	-	ND(1,000)	-
Jul. 12, 2002	4.5	-	4.5	60,000	-	60,000	ND(2,500)	-	ND(2,500)	-	ND(2,500)	-
Aug. 2, 2002	4.1	-	4.1	55,000	-	55,000	ND(2,500)	-	ND(2,500)	-	ND(2,500)	-
Sep. 6, 2002	3	-	3.0	66,000	-	66,000	2,900	-	ND(2,500)	-	ND(2,500)	-
Oct. 10, 2002	7.7	-	7.7	47,000	-	47,000	1,800	-	ND(1,000)	-	ND(1,000)	-
Nov. 14, 2002	3.3	-	3.3	30,000	-	30,000	1,400	-	ND(500)	-	ND(500)	-
Dec. 13, 2002	5.2	-	5.2	40,000	-	40,000	1,700	-	ND(500)	-	ND(500)	-
Average 2002 Concentrations (mg/L)			**5.4**			**46,917**						

Notes:

µg/L Micrograms per liter.
ND(200) The analyte was not detected above the method detection limit indicated in parentheses.
[box] The analyte was positively identified. The numerical value indicated is approximate.
(1) The average of the duplicate samples were applied in the average annual concentration provided the result was less than 100,000 µg/L as per note (2).
(2) Detected concentrations greater than 100,000 µg/L are indicative of free product in the extraction well influent and do not reflect actual aqueous phase concentrations. As a result, these concentrations were not applied in the calculation of the average or geometric mean concentration.

TABLE 7.6b

SUMMARY OF EXTRACTION WELL ANALYTICAL DATA - EW-2
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Date Sampled	*EW-2 Concentration (μg/L)*											
	PCBs			*TCE*			*cis-1,2-DCE*		*trans-1,2-DCE*		*Vinyl Chloride*	
	Result	*Dup. Result*	*Value Applied in Average* (1)	*Result*	*Dup. Result*	*Value Applied in Average* (1)	*Result*	*Dup. Result*	*Result*	*Dup. Result*	*Result*	*Dup. Result*
1998 (August 11, 1997 through November 6, 1998)												
Aug. 11. 1997	210	-	210.0	5,500	-	5,500	2,800	-	ND(200)	-	ND(200)	-
Sep. 10, 1997	130	-	130.0	6,200	-	6,200	2,500	-	ND(250)	-	ND(250)	-
Oct. 1, 1997	150	-	150.0	6,400	-	6,400	2,700	-	ND(250)	-	ND(250)	-
Nov. 4, 1997	71	-	71.0	4,900	-	4,900	2,000	-	ND(250)	-	ND(250)	-
Dec. 3, 1997	930	140	535.0	4,700	4,400	4,550	2,100	2,000	ND(500)	ND(500)	ND(500)	ND(500)
Jan. 13, 1998	78	-	78.0	5,800	-	5,800	2,000	-	ND(250)	-	ND(250)	-
Feb. 3, 1998	80	-	80.0	4,900	-	4,900	1,800	-	ND(200)	-	ND(200)	-
Mar. 5, 1998	100	75	87.5	5,000	-	5,000	2,200	-	ND(200)	-	ND(200)	-
Apr. 1, 1998	80	-	80.0	4,500	-	4,500	1,900	-	ND(200)	-	ND(200)	-
May. 4, 1998	64	46	55.0	4,900	4700	4,800	1,600	1,600	ND(200)	ND(200)	ND(200)	ND(200)
Jun. 5, 1998	61	-	61.0	4,700	-	4,700	1,900	-	ND(200)	-	ND(200)	-
Jul. 7, 1998	130	40	85.0	4,000	4200	4,100	2,000	2,100	ND(200)	ND(200)	ND(200)	ND(200)
Aug. 4, 1998	110	-	110.0	5,700	-	5,700	2,100	-	ND(200)	-	ND(200)	-
Sep. 9, 1998	52	-	52.0	4,300	-	4,300	2,100	-	ND(200)	-	ND(200)	-
Oct. 7, 1998	120	-	120.0	4,100	-	4,100	2,000	-	ND(200)	-	ND(200)	-
Nov. 6, 1998	41	42	41.5	3,200	3200	3,200	1,900	2,000	ND(250)	ND(250)	ND(250)	ND(250)
Average 1998 Concentrations (μg/L)			**121.6**			**4,916**						
1999 (December 8, 1998 through December 2, 1999)												
Dec. 8, 1998	82	-	82.0	3,900	-	3,900	2,000	-	ND(250)	-	ND(250)	-
Jan. 5, 1999	43	48	45.5	3,500	4,100	3,800	1,400	1,600	ND(250)	ND(250)	ND(250)	ND(250)
Feb. 5, 1999	78	-	78.0	3,800	-	3,800	1,400	-	ND(100)	-	ND(100)	-
Mar. 1, 1999	70	-	70.0	3,300	-	3,300	1,600	-	ND(100)	-	ND(100)	-
Apr. 9, 1999	110	-	110.0	3,000	-	3,000	1,600	-	ND(200)	-	ND(200)	-
May. 7, 1999	68	70	69.0	3,700	3,700	3,700	1,400	1,500	ND(100)	ND(100)	ND(100)	ND(100)
Jun. 3, 1999	19	22	20.5	4,500	2,700	3,600	800	1,500	ND(200)	ND(100)	ND(200)	ND(100)
Jul. 8, 1999	42	52	47.0	2,400	2,100	2,250	1,100	1,100	ND(250)	ND(250)	ND(250)	ND(250)
Aug. 11, 1999	21	30	25.5	2,400	2,600	2,500	1,000	1,300	ND(200)	ND(100)	ND(200)	ND(100)
Sep. 8, 1999	29	-	29.0	2,800	-	2,800	1,500	-	ND(50)	-	ND(50)	-
Oct. 7, 1999	32	-	32.0	3,000	-	3,000	1,600	-	ND(100)	-	ND(100)	-
Nov. 4, 1999	15	-	15.0	2,100	-	2,100	1,200	-	ND(100)	-	ND(100)	-
Dec. 2, 1999	26	-	26.0	2,700	-	2,700	2,600	-	ND(100)	-	ND(100)	-
Average 1999 Concentrations (μg/L)			**50.0**			**3,112**						
2000 (January 7, 2000 through December 6, 2000)												
Jan. 7, 2000	58	-	58.0	3,000	-	3,000	1,200	-	ND(100)	-	ND(100)	-
Feb. 3, 2000	160	-	160.0	2,400	-	2,400	1,200	-	ND(100)	-	ND(100)	-
Mar. 10, 2000	63	-	63.0	2,700	-	2,700	1,200	-	ND(100)	-	ND(100)	-
Apr. 7, 2000	48	-	48.0	3,400	-	3,400	1,600	-	ND(100)	-	ND(100)	-
May. 4, 2000	50	-	50.0	3,200	-	3,200	1,200	-	ND(100)	-	ND(100)	-
Jun. 2, 2000	52	-	52.0	2,500	-	2,500	1,100	-	ND(100)	-	ND(100)	-
Jul. 7, 2000	48	-	48.0	2,500	-	2,500	1,400	-	ND(100)	-	ND(100)	-
Aug. 9, 2000	31	-	31.0	2,100	-	2,100	1,200	-	ND(100)	-	ND(100)	-
Sep. 8, 2000	44	30	37.0	2,000	2,100	2,050	1,200	1,200	ND(50)	ND(50)	ND(50)	ND(50)
Oct. 5, 2000	70	-	70.0	23,000	-	23,000	14,000	-	ND(500)	-	ND(500)	-
Nov. 2, 2000	54	-	54.0	2,300	-	2,300	1,300	-	ND(100)	-	ND(100)	-
Dec. 6, 2000	56	-	56.0	2,600	-	2,600	1,300	-	ND(50)	-	ND(50)	-
Average 2000 Concentrations (μg/L)			**60.6**			**4,313**						
Geometric Mean of 2000 Concentrations (μg/L) (3)			**-**			**3,098**						
2001 (January 4, 2001 through December 6, 2001)												
Jan. 4, 2001	71	-	71.0	2,500	-	2,500	1,300	-	ND(100)	-	ND(100)	-
Feb. 7, 2001	56	-	56.0	2,900	-	2,900	1,100	-	ND(50)	-	ND(50)	-
Mar. 7, 2001	37	-	37.0	2,700	-	2,700	1,100	-	ND(50)	-	ND(50)	-
Apr. 11, 2001	44	-	44.0	2,200	-	2,200	1,000	-	ND(50)	-	ND(50)	-
May. 2, 2001	42	-	42.0	2,200	-	2,200	1,000	-	ND(50)	-	ND(50)	-
Jun. 6, 2001	49	-	49.0	2,800	-	2,800	1,100	-	ND(100)	-	ND(100)	-
Jul. 11, 2001	25	-	25.0	2,100	-	2,100	1,100	-	ND(50)	-	ND(50)	-
Aug. 8, 2001	59	-	59.0	2,400	-	2,400	1,200	-	ND(50)	-	ND(50)	-
Sep. 19, 2001	600	-	600.0	2,500	-	2,500	870	-	ND(100)	-	ND(100)	-
Oct. 10, 2001	2,700	130	1,415.0	2,100	2,100	2,100	1,200	1,200	ND(100)	ND(100)	ND(100)	ND(100)
Nov. 7, 2001	40	45	42.5	2,100	1,900	2,000	1,000	1,000	ND(100)	ND(100)	ND(100)	ND(100)
Dec. 6, 2001	61	-	61.0	2,200	-	2,200	1,000	-	ND(50)	-	ND(50)	-
Average 2001 Concentrations (μg/L)			**208**			**2,383**						

TABLE 7.6b

SUMMARY OF EXTRACTION WELL ANALYTICAL DATA - EW-2
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Date Sampled	*EW-2 Concentration (μg/L)*											
	PCBs			*TCE*			*cis-1,2-DCE*		*trans-1,2-DCE*		*Vinyl Chloride*	
	Result	*Dup. Result*	*Value Applied in Average (1)*	*Result*	*Dup. Result*	*Value Applied in Average (1)*	*Result*	*Dup. Result*	*Result*	*Dup. Result*	*Result*	*Dup. Result*
2002 (January 10, 2002 through December 13, 2002)												
Jan. 10, 2002	35	-	35.0	1,800	-	1,800	1,100	-	ND(50)	-	ND(50)	-
Feb. 13, 2002	32	-	32.0	2,400	-	2,400	1,300	-	ND(100)	-	ND(100)	-
Mar. 7, 2002	66	-	66.0	42,000	-	42,000	1,900	-	ND(1,000)	-	ND(1,000)	-
Apr. 11, 2002	36	-	36.0	2,400	-	2,400	1,100	-	ND(50)	-	ND(50)	-
May. 9, 2002	ND (5.0)	-	-	2,100	-	2,100	1,100	-	ND(100)	-	ND(100)	-
Jun. 7, 2002	35	-	35.0	2,200	-	2,200	1,200	-	ND(50)	-	ND(50)	-
Jul. 12, 2002	27	-	27.0	1,700	-	1,700	1,100	-	ND(50)	-	ND(50)	-
Aug. 2, 2002	30	-	30.0	1,800	-	1,800	1,200	-	ND(50)	-	ND(50)	-
Sep. 6, 2002	22	-	22.0	1,800	-	1,800	1,100	-	ND(50)	-	ND(50)	-
Oct. 10, 2002	45	-	45.0	2,100	-	2,100	930	-	ND(100)	-	ND(100)	-
Nov. 14, 2002	55	-	55.0	2,900	-	2,900	1,500	-	ND(100)	-	ND(100)	-
Dec. 13, 2002	460	-	460.0	3,600	-	3,600	1,200	-	ND(100)	-	ND(100)	-
Average 2002 Concentrations (μg/L)			**77**			**5,567**						
Geometric Mean of 2002 Concentrations (μg/L) (3)			**-**			**2,811**						

Notes:

μg/L Micrograms per liter.
ND(200) The analyte was not detected above the method detection limit indicated in parentheses.
The analyte was positively identified. The numerical value indicated is approximate.
(1) The average of the duplicate samples were applied in the average annual concentration provided the result was less than 100,000 μg/L as per note (2).
(2) Detected concentrations greater than 100,000 μg/L are indicative of free product in the extraction well influent and do not reflect actual aqueous phase concentrations. As a result, these concentrations were not applied in the calculation of the average or geometric mean concentration.
(3) A geometric mean was applied due to the highly variable concentration values and was applied in the mass removal estimates presented in Table 7.7.

TABLE 7.6c

SUMMARY OF EXTRACTION WELL ANALYTICAL DATA - EW-3
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Date Sampled	***EW-3 Concentration (µg/L)***											
	PCBs			***TCE***			***cis-1,2-DCE***		***trans-1,2-DCE***		***Vinyl Chloride***	
	Result	***Dup. Result***	***Value Applied in Average (1)***	***Result***	***Dup. Result***	***Value Applied in Average (1)***	***Result***	***Dup. Result***	***Result***	***Dup. Result***	***Result***	***Dup. Result***
1998 (August 11, 1997 through November 6, 1998)												
Aug. 11, 1997	110	-	110	18,000	-	18,000	2,200	-	ND(1,000)	-	ND(1,000)	-
Sep. 10, 1997	130	-	130	13,000	-	13,000	2,000	-	ND(1,000)	-	ND(1,000)	-
Oct. 1, 1997	97	-	97	15,000	-	15,000	2,000	-	ND(1,000)	-	ND(1,000)	-
Nov. 4, 1997	190	-	190	14,000	-	14,000	1,200	-	ND(500)	-	ND(500)	-
Dec. 3, 1997	170	-	170	14,000	-	14,000	ND(2,500)	-	ND(2,500)	-	ND(2,500)	-
Jan. 13, 1998	460	160	310	14,000	19,000	16,500	2,000	2,300	ND(500)	ND(1,000)	ND(500)	ND(1,000)
Feb. 3, 1998	1,200	-	1,200	12,000	-	12,000	1,300	-	ND(500)	-	ND(500)	-
Mar. 5, 1998	3,000	1,100	2,050	13,000	-	13,000	1,300	-	ND(1,000)	-	ND(1,000)	-
Apr. 1, 1998	430	1,900	1,165	9,100	8,800	8,950	1,300	1,000	ND(250)	ND(250)	ND(250)	ND(250)
May. 4, 1998	300	-	300	7,800	-	7,800	1,300	-	ND(500)	-	ND(500)	-
Jun. 5, 1998	350	300	325	6,900	7,600	7,250	1,000	1,100	ND(500)	ND(500)	ND(500)	ND(500)
Jul. 7, 1998	1,200	-	1,200	7,900	-	7,900	1,000	-	ND(500)	-	ND(500)	-
Aug. 4, 1998	50	52	51	7,900	8,000	7,950	830	830	ND(500)	ND(500)	ND(500)	ND(500)
Sep. 9, 1998	27	23	25	6,300	6,500	6,400	820	810	ND(500)	ND(500)	ND(500)	ND(500)
Oct. 7, 1998	ND(20)	ND(19)	-	6,200	7,200	6,700	970	990	ND(500)	ND(500)	ND(500)	ND(500)
Nov. 6, 1998	85	-	85	12,000	-	12,000	1,200	-	ND(500)	-	ND(500)	-
Average 1998 Concentrations (µg/L)			**494**			**11,278**						
1999 (December 8, 1998 through December 2, 1999)												
Dec. 8, 1998	66	57	62	11,000	16,000	13,500	1,200	1,700	ND(500)	ND(500)	ND(500)	ND(500)
Jan. 5, 1999	100	-	100	32,000	-	32,000	2,900	-	ND(1,000)	-	ND(1,000)	-
Feb. 5, 1999	650	860	755	24,000	24,000	24,000	1,700	2,000	ND(1,000)	ND(1,000)	ND(1,000)	ND(1,000)
Mar. 1, 1999	280	270	275	20,000	18,000	19,000	2,300	1,700	ND(1,000)	ND(1,000)	ND(1,000)	ND(1,000)
Apr. 9, 1999	1,000	410	705	17,000	16,000	16,500	1,500	1,700	ND(1,000)	ND(1,000)	ND(1,000)	ND(1,000)
May. 7, 1999	3,600	-	3,600	19,000	-	19,000	1,800	-	ND(500)	-	ND(500)	-
Jun. 3, 1999	2,100	-	2,100	14,000	-	14,000	1,700	-	ND(500)	-	ND(500)	-
Jul. 8, 1999	440	-	440	18,000	-	18,000	1,400	-	ND(1,000)	-	ND(1,000)	-
Aug. 11, 1999	120	-	120	22,000	-	22,000	ND(1,000)	-	ND(1,000)	-	ND(1,000)	-
Sep. 8, 1999	670	620	645	19,000	21,000	20,000	1,500	1,500	ND(500)	ND(500)	ND(500)	ND(500)
Oct. 7, 1999	69	66	68	24,000	24,000	24,000	1,700	1,700	ND(1,000)	ND(1,000)	ND(1,000)	ND(1,000)
Nov. 4, 1999	20	79	50	24,000	24,000	24,000	1,700	1,300	ND(1,000)	ND(1,000)	ND(1,000)	ND(1,000)
Dec. 2, 1999	130	220	175	32,000	35,000	33,500	3,900	3,900	ND(1,000)	ND(1,000)	ND(1,000)	ND(1,000)
Average 1999 Concentrations (µg/L)			**700**			**21,500**						
2000 (January 7, 2000 through December 6, 2000)												
Jan. 7, 2000	93	79	86	21,000	20,000	20,500	1,600	1,500	ND(500)	ND(500)	ND(500)	ND(500)
Feb. 3, 2000	100	120	110	28,000	25,000	26,500	2,500	2,400	ND(1,000)	ND(1,000)	ND(1,000)	ND(1,000)
Mar. 10, 2000	940	910	925	26,000	28,000	27,000	2,600	2,800	ND(500)	ND(500)	ND(500)	ND(500)
Apr. 7, 2000	160	270	215	17,000	17,000	17,000	2,000	2,000	ND(500)	ND(500)	ND(500)	ND(500)
May. 4, 2000	260	270	265	22,000	26,000	24,000	1,600	1,900	ND(500)	ND(500)	ND(500)	ND(500)
Jun. 2, 2000	110	85	98	32,000	45,000	38,500	2,500	3,500	ND(1,000)	ND(2,500)	ND(1,000)	ND(2,500)
Jul. 7, 2000	40,000	130,000 (2)	40,000	46,000	37,000	41,500	3,000	3,000	ND(1,000)	ND(1,000)	ND(1,000)	ND(1,000)
Aug. 9, 2000	89,000	1,300,000 (2)	89,000	33,000	34,000	33,500	2,100	2,000	ND(1,000)	ND(1,000)	ND(1,000)	ND(1,000)
Oct. 5, 2000	2,300	2,400	2,350	27,000	26,000	26,500	2,000	2,000	ND(500)	ND(500)	ND(500)	ND(500)
Nov. 2, 2000	800,000 (2)	13,000	13,000	28,000	28,000	28,000	2,200	2,100	ND(1,000)	ND(1,000)	ND(1,000)	ND(1,000)
Dec. 6, 2000	10,000	88,000	49,000	36,000	36,000	36,000	3,300	2,700	ND(1,000)	ND(1,000)	ND(1,000)	ND(1,000)
Average 2000 Concentrations (µg/L)			**17,732**			**29,000**						
Geometric Mean of 2000 Concentrations (µg/L) (3)			**1,657**									

TABLE 7.6c

SUMMARY OF EXTRACTION WELL ANALYTICAL DATA - EW-3
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Date Sampled	EW-3 Concentration (µg/L) PCBs Result	PCBs Dup. Result	PCBs Value Applied in Average [(1)]	TCE Result	TCE Dup. Result	TCE Value Applied in Average [(1)]	cis-1,2-DCE Result	cis-1,2-DCE Dup. Result	trans-1,2-DCE Result	trans-1,2-DCE Dup. Result	Vinyl Chloride Result	Vinyl Chloride Dup. Result
2001 (January 4, 2001 through December 6, 2001)												
Jan. 4, 2001	780,000 (2)	110,000 (2)	-	27,000	28,000	27,500	2,900	3,000	ND(1,000)	ND(1,000)	ND(1,000)	ND(1,000)
Feb. 7, 2001	520,000 (2)	1,900,000 (2)	-	29,000	25,000	27,000	24,000	21,000	ND(1,000)	ND(500)	ND(1,000)	ND(500)
Mar. 7, 2001	15,000,000 (2)	5,400,000 (2)	-	17,000	27,000	22,000	2,500	2,600	ND(500)	ND(500)	ND(500)	ND(500)
Apr. 11, 2001	1,600	-	1,600	13,000	-	13,000	1,300	-	ND(500)	-	ND(500)	-
May. 2, 2001	82,000	-	82,000	12,000	-	12,000	1,500	-	ND(250)	-	ND(250)	-
Jun. 6, 2001	200,000 (2)	-	-	8,600	-	8,600	2,700	-	ND(500)	-	ND(500)	-
Jul. 11, 2001	7,400	-	7,400	23,000	-	23,000	2,400	-	ND(500)	-	ND(500)	-
Aug. 8, 2001	120,000 (2)	-	-	28,000	-	28,000	2,100	-	ND(1,000)	-	ND(1,000)	-
Sep. 19, 2001	450,000 (2)	-	-	14,000	-	14,000	3,900	-	ND(500)	-	ND(500)	-
Oct. 10, 2001	7,300,000 (2)	-	-	14,000	-	14,000	2,000	-	ND(500)	-	ND(500)	-
Nov. 7, 2001	60,000	-	60,000	22,000	-	22,000	1,700	-	ND(1,000)	-	ND(1,000)	-
Dec. 6, 2001	7,800	-	7,800	17,000	-	17,000	2,600	-	ND(500)	-	ND(500)	-
Average 2001 Concentrations (m g/L)			**31,760**			**19,008**						
Geometric Mean of 2001 Concentrations (m g/L) [(3)]			**13,536**									
2002 (January 10, 2002 through December 13, 2002)												
Jan. 10, 2002	8,100	-	8,100	18,000	-	18,000	2,100	-	ND(500)	-	ND(500)	-
Feb. 13, 2002	2,900	-	2,900	17,000	-	17,000	2,300	-	ND(500)	-	ND(500)	-
Mar. 7, 2002	160	-	160	14,000	-	14,000	2,000	-	ND(500)	-	ND(500)	-
Apr. 11, 2002	4,700	-	4,700	18,000	-	18,000	2,200	-	ND(500)	-	ND(500)	-
May. 9, 2002	17,000	-	17,000	16,000	-	16,000	2,200	-	ND(500)	-	ND(500)	-
Jun. 7, 2002	1,300	-	1,300	21,000	-	21,000	2,800	-	ND(500)	-	ND(500)	-
Jul. 12, 2002	290	-	290	21,000	-	21,000	2,900	-	ND(500)	-	ND(500)	-
Aug. 2, 2002	4,700	-	4,700	15,000	-	15,000	2,400	-	ND(500)	-	ND(500)	-
Sep. 6, 2002	1,000	-	1,000	16,000	-	16,000	2,300	-	ND(250)	-	ND(250)	-
Oct. 10, 2002	950	-	950	15,000	-	15,000	2,100	-	ND(500)	-	ND(500)	-
Nov. 14, 2002	970	-	970	16,000	-	16,000	2,300	-	ND(500)	-	ND(500)	-
Dec. 13, 2002	4,500	-	4,500	17,000	-	17,000	2,100	-	ND(250)	-	ND(250)	-
Average 2002 Concentrations (m g/L)			**3,881**			**17,000**						
Geometric Mean of 2002 Concentrations (m g/L) [(3)]			**1,900**									

Notes:

µg/L Micrograms per liter.
ND(200) The analyte was not detected above the method detection limit indicated in parentheses.
[box] The analyte was positively identified. The numerical value indicated is approximate.
(1) The average of the duplicate samples were applied in the average annual concentration provided the result was less than 100,000 µg/L as per note (2).
(2) Detected concentrations greater than 100,000 µg/L are indicative of free product in the extraction well influent and do not reflect actual aqueous phase concentrations. As a result, these concentrations were not applied in the calculation of the average or geometric mean concentration.
(3) A geometric mean was applied due to the highly variable concentration values and was applied in the mass removal estimates presented in Table 7.7.

TABLE 7.6d

SUMMARY OF EXTRACTION WELL ANALYTICAL DATA - EW-4
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Date Sampled	*EW-4 Concentration (µg/L)*											
	PCBs			*TCE*			*cis-1,2-DCE*		*trans-1,2-DCE*		*Vinyl Chloride*	
	Result	*Dup. Result*	*Value Applied in Average* (1)	*Result*	*Dup. Result*	*Value Applied in Average* (1)	*Result*	*Dup. Result*	*Result*	*Dup. Result*	*Result*	*Dup. Result*
1998 (August 11, 1997 through November 6, 1998)												
Aug. 11, 1997	1,200	-	1,200	6,600	-	6,600	840	-	ND(200)	-	ND(200)	-
Sep. 10, 1997	7,700	-	7,700	8,200	-	8,200	1,200	-	ND(250)	-	ND(250)	-
Oct. 1, 1997	1,400	-	1,400	1,800	-	1,800	250	-	ND(50)	-	ND(50)	-
Nov. 4, 1997	63,000	-	63,000	11,000	-	11,000	1,900	-	ND(1,000)	-	ND(1,000)	-
Dec. 3, 1997	170,000 (2)	-	-	11,000	-	11,000	2,500	-	ND(2,500)	-	ND(2,500)	-
Jan. 13, 1998	44,000	-	44,000	23,000	-	23,000	3,400	-	ND(1,000)	-	ND(1,000)	-
Feb. 3, 1998	3,900	-	3,900	23,000	-	23,000	3,600	-	ND(1,000)	-	ND(1,000)	-
Mar. 5, 1998	2,500	3,000	2,750	27,000	-	27,000	3,100	-	ND(1,000)	-	ND(1,000)	-
Apr. 1, 1998	5,000	-	5,000	27,000	-	27,000	2,800	-	ND(1,000)	-	ND(1,000)	-
May. 4, 1998	4,100	-	4,100	19,000	-	19,000	2,100	-	ND(500)	-	ND(500)	-
Jun. 5, 1998	4,300	-	4,300	17,000	-	17,000	2,800	-	ND(1,000)	-	ND(1,000)	-
Jul. 7, 1998	1,200,000 (2)	-	-	13,000	-	13,000	1,900	-	ND(500)	-	ND(500)	-
Aug. 4, 1998	2,100	-	2,100	14,000	-	14,000	1,600	-	ND(50)	-	ND(50)	-
Sep. 9, 1998	1,500	-	1,500	10,000	-	10,000	1,400	-	ND(500)	-	ND(500)	-
Oct. 7, 1998	950	-	950	10,000	-	10,000	2,000	-	ND(500)	-	ND(500)	-
Dec. 2, 1999	150	-	150	4,800	-	4,800	1,300	-	ND(500)	-	ND(500)	-
Average 1998 Concentrations (µg/L)			**10,146**			**14,150**						
Geometric Mean of 1998 Concentrations (µg/L) (3)			**3,259**			**11,729**						
1999 (December 8, 1998 through December 2, 1999)												
Dec. 8, 1998	190	-	190	8,000	-	8,000	2,400	-	ND(250)	-	ND(250)	-
Jan. 5, 1999	21,000	-	21,000	29,000	-	29,000	3,900	-	ND(1,000)	-	ND(1,000)	-
Feb. 5, 1999	5,500	-	5,500	26,000	-	26,000	2,700	-	ND(2,500)	-	ND(2,500)	-
Mar. 1, 1999	2,900	-	2,900	25,000	-	25,000	4,500	-	ND(1,000)	-	ND(1,000)	-
Apr. 9, 1999	2,200	-	2,200	29,000	-	29,000	4,500	-	ND(2,000)	-	ND(2,000)	-
May. 7, 1999	410	-	410	29,000	-	29,000	3,900	-	ND(1,000)	-	ND(1,000)	-
Jun. 3, 1999	9,000	-	9,000	12,000	-	12,000	6,400	-	ND(1,000)	-	ND(1,000)	-
Jul. 8, 1999	34,000	-	34,000	15,000	-	15,000	2,700	-	ND(1,000)	-	ND(1,000)	-
Aug. 11, 1999	25,000	-	25,000	15,000	-	15,000	2,500	-	ND(500)	-	ND(500)	-
Sep. 8, 1999	39,000	-	39,000	9,300	-	9,300	2,300	-	ND(50)	-	ND(50)	-
Oct. 7, 1999	1,000	-	1,000	4,600	-	4,600	1,100	-	ND(100)	-	ND(100)	-
Nov. 4, 1999	2,500	-	2,500	7,900	-	7,900	2,300	-	ND(500)	-	ND(500)	-
Dec. 2, 1999	510	-	510	7,200	-	7,200	3,700	-	ND(200)	-	ND(200)	-
Average 1999 Concentrations (µg/L)			**11,016**			**16,692**						
Geometric Mean of 1999 Concentrations (µg/L) (3)			**3,669**			**14,052**						
2000 (January 7, 2000 through December 6, 2000)												
Jan. 7, 2000	240,000 (2)	-	-	18,000	-	18000	2,400	-	ND(500)	-	ND(500)	-
Feb. 3, 2000	1,900	-	1900	18,000	-	18000	2,900	-	ND(1,000)	-	ND(1,000)	-
Mar. 10, 2000	10,000	-	10000	23,000	-	23000	4,400	-	ND(500)	-	ND(500)	-
Apr. 7, 2000	140,000 (2)	-	-	24,000	-	24000	4,400	-	ND(500)	-	ND(500)	-
May. 4, 2000	110,000 (2)	-	-	26,000	-	26000	3,300	-	ND(1,000)	-	ND(1,000)	-
Jun. 2, 2000	5,300	-	5300	19,000	-	19000	3,100	-	ND(1,000)	-	ND(1,000)	-
Jul. 7, 2000	8,800	-	8800	18,000	-	18000	3,300	-	ND(500)	-	ND(500)	-
Aug. 9, 2000	1,400	-	1400	12,000	-	12000	2,900	-	ND(250)	-	ND(250)	-
Sep. 8, 2000	4,000	-	4000	12,000	-	12000	3,300	-	ND(250)	-	ND(250)	-
Oct. 5, 2000	15,000	-	15000	9,700	-	9700	2,900	-	ND(250)	-	ND(250)	-
Nov. 2, 2000	19,000	-	19000	7,900	-	7900	2,800	-	ND(250)	-	ND(250)	-
Dec. 6, 2000	940	-	940	12,000	-	12000	2,500	-	ND(500)	-	ND(500)	-
Average 2000 Concentrations (µg/L)			**7,371**			**16,633**						
Geometric Mean of 2000 Concentrations (µg/L) (3)			**4,791**			**15,618**						

TABLE 7.6d

SUMMARY OF EXTRACTION WELL ANALYTICAL DATA - EW-4
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Date Sampled	*EW-4 Concentration (μg/L)*											
	PCBs			*TCE*			*cis-1,2-DCE*		*trans-1,2-DCE*		*Vinyl Chloride*	
	Result	*Dup. Result*	*Value Applied in Average* (1)	*Result*	*Dup. Result*	*Value Applied in Average* (1)	*Result*	*Dup. Result*	*Result*	*Dup. Result*	*Result*	*Dup. Result*
2001 (January 4, 2001 through December 6, 2001)												
Jan. 4, 2001	2,300	-	2300	23,000	-	23000	4,200	-	ND(1,000)	-	ND(1,000)	-
Feb. 7, 2001	150,000 (2)	-	-	25,000	-	25000	4,500	-	ND(500)	-	ND(500)	-
Mar. 7, 2001	2,800	-	2800	25,000	-	25000	3,700	-	ND(500)	-	ND(500)	-
Apr. 11, 2001	700	-	700	27,000	-	27000	3,400	-	ND(500)	-	ND(500)	-
May. 2, 2001	130,000 (2)	-	-	24,000	-	24000	2,900	-	ND(1,000)	-	ND(1,000)	-
Jun. 6, 2001	4,000	-	4000	36,000	-	36000	3,900	-	ND(500)	-	ND(500)	-
Jul. 11, 2001	10,000	-	10000	17,000	-	17000	2,300	-	ND(500)	-	ND(500)	-
Aug. 8, 2001	6,000	-	6000	14,000	-	14000	1,900	-	ND(500)	-	ND(500)	-
Sep. 19, 2001	8,100	-	8100	11,000	-	11000	1,100	-	ND(1,000)	-	ND(1,000)	-
Oct. 10, 2001	430	-	430	7,100	-	7100	1,700	-	ND(250)	-	ND(250)	-
Nov. 7, 2001	3,000	-	3,000	8,400	-	8,400	1,600	-	ND(500)	-	ND(500)	-
Dec. 6, 2001	2,400	-	2,400	15,000	-	15,000	2,800	-	ND(500)	-	ND(500)	-
Average 2001 Concentrations (μg/L)			**3,973**			**19,375**						
Geometric Mean of 2001 Concentrations (μg/L) (3)			**2,776**			**17,428**						
2002 (January 10, 2002 through December 13, 2001)												
Jan. 10, 2002	620	-	620	17,000	-	17000	2,900	-	ND(500)	-	ND(500)	-
Feb. 13, 2002	14,000	-	14000	19,000	-	19000	4,400	-	ND(500)	-	ND(500)	-
Mar. 7, 2002	12,000	-	12000	20,000	-	20000	4,500	-	ND(500)	-	ND(500)	-
Apr. 11, 2002	440	-	440	30,000	-	30000	4,200	-	ND(500)	-	ND(500)	-
May. 9, 2002	11,000	-	11000	28,000	-	28000	4,400	-	ND(1,000)	-	ND(1,000)	-
Jun. 7, 2002	28	-	28	26,000	-	26000	4,100	-	ND(500)	-	ND(500)	-
Jul. 12, 2002	1,700	-	1700	24,000	-	24000	4,500	-	ND(500)	-	ND(500)	-
Aug. 2, 2002	1,200	-	1200	16,000	-	16000	3,500	-	ND(500)	-	ND(500)	-
Sep. 6, 2002	510	-	510	14,000	-	14000	4,100	-	ND(200)	-	ND(200)	-
Oct. 10, 2002	2,700	-	2,700	11,000	-	11,000	2,200	-	ND(500)	-	ND(500)	-
Nov. 14, 2002	1,000	-	1,000	4,200	-	4,200	890	-	ND(100)	-	ND(100)	-
Dec. 13, 2002	1,100	-	1,100	20,000	-	20,000	2,900	-	ND(500)	-	ND(500)	-
Average 2002 Concentrations (μg/L)			**3,858**			**19,100**						
Geometric Mean of 2002 Concentrations (μg/L) (3)			**1,370**			**17,264**						

Notes:

μg/L Micrograms per liter.
ND(200) The analyte was not detected above the method detection limit indicated in parentheses.
The analyte was positively identified. The numerical value indicated is approximate.
(1) The average of the duplicate samples were applied in the average annual concentration provided the result was less than 100,000 μg/L as per note (2).
(2) Detected concentrations greater than 100,000 μg/L are indicative of free product in the extraction well influent and do not reflect actual aqueous phase concentrations. As a result, these concentrations were not applied in the calculation of the average or geometric mean concentration.
(3) A geometric mean was applied due to the highly variable concentration values and was applied in the mass removal estimates presented in Table 7.7.

TABLE 7.6e

SUMMARY OF EXTRACTION WELL ANALYTICAL DATA - EW-5
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Date Sampled	*EW-5 Concentration (µg/L)*											
	PCBs			*TCE*			*cis-1,2-DCE*		*trans-1,2-DCE*		*Vinyl Chloride*	
	Result	*Dup. Result*	*Value Applied in Average* (1)	*Result*	*Dup. Result*	*Value Applied in Average* (1)	*Result*	*Dup. Result*	*Result*	*Dup. Result*	*Result*	*Dup. Result*
1998 (August 11, 1997 through November 6, 1998)												
Aug. 11, 1997	850	-	850	450	-	450	430	-	ND(50)	-	ND(50)	-
Sep. 10, 1997	8,500	-	8,500	390	-	390	290	-	ND(25)	-	ND(25)	-
Oct. 1, 1997	1,700	-	1,700	390	-	390	390	-	ND(20)	-	ND(20)	-
Nov. 4, 1997	3,200	-	3,200	750	-	750	400	-	ND(50)	-	ND(50)	-
Dec. 3, 1998	6,900	-	6,900	620	-	620	330	-	ND(50)	-	ND(50)	-
Jan. 13, 1998	2,100	-	2,100	1,200	-	1200	520	-	ND(100)	-	ND(100)	-
Feb. 3, 1998	610	-	610	1,200	-	1200	400	-	ND(50)	-	ND(50)	-
Mar. 5, 1998	9,900	2,400	6,150	1,100	-	1100	410	-	ND(100)	-	ND(100)	-
Apr. 1, 1998	380	-	380	860	-	860	360	-	ND(50)	-	ND(50)	-
May. 4, 1998	86	-	86	810	-	810	270	-	ND(25)	-	ND(25)	-
Jun. 5, 1998	3,700	-	3,700	4,900	-	4900	990	-	ND(200)	-	ND(200)	-
Jul. 7, 1998	1,300	-	1,300	360	-	360	250	-	ND(10)	-	ND(10)	-
Aug. 4, 1998	2,500	-	2,500	570	-	570	290	-	ND(20)	-	ND(20)	-
Sep. 9, 1998	310	-	310	160	-	160	200	-	ND(10)	-	ND(10)	-
Oct. 7, 1998	ND(220)	-	-	170	-	170	230	-	ND(10)	-	ND(10)	-
Nov. 6, 1998	5,800	-	5,800	280	-	280	210	-	ND(20)	-	ND(20)	-
Average 1998 Concentrations (µg/L)			**2,939**			**888**						
Geometric Mean of 1998 Concentrations (µg/L) (3)			**1,629**			-						
1999 (December 8, 1998 through December 2, 1999)												
Dec. 8, 1998	590	-	590	210	-	210	210	-	ND(20)	-	ND(20)	-
Jan. 5, 1999	1,800	-	1,800	580	-	580	380	-	ND(20)	-	ND(20)	-
Feb. 5, 1999	3,600	-	3,600	790	-	790	240	-	ND(50)	-	ND(50)	-
Mar. 1, 1999	17,000	-	17,000	1,100	-	1100	420	-	ND(20)	-	ND(20)	-
Apr. 9, 1999	9,400	-	9,400	700	-	700	210	-	ND(100)	-	ND(100)	-
May. 7, 1999	5,400	-	5,400	480	-	480	160	-	ND(20)	-	ND(20)	-
Jun. 3, 1999	33,000	-	33,000	250	-	250	170	-	ND(10)	-	ND(10)	-
Jul. 8, 1999	23,000	-	23,000	150	-	150	93	-	ND(20)	-	ND(20)	-
Aug. 11, 1999	1,600	-	1,600	36	-	36	59	-	ND(20)	-	ND(20)	-
Sep. 8, 1999	3,500	-	3,500	63	-	63	99	-	6.0	-	ND(5.0)	-
Oct. 7, 1999	4,200	-	4,200	39	-	39	97	-	ND(2.5)	-	ND(2.5)	-
Nov. 4, 1999	3,100	-	3,100	180	-	180	100	-	ND(10)	-	ND(10)	-
Dec. 2, 1999	1,500	-	1,500	120	-	120	150	-	ND(1.0)	-	ND(1.0)	-
Average 1999 Concentrations (µg/L)			**8,284**			**361**						
Geometric Mean of 1999 Concentrations (µg/L) (3)			**4,457**			-						
2000 (January 7, 2000 through December 6, 2000)												
Jan. 7, 2000	270	-	270	660	-	660	200		ND(10)		ND(10)	
Feb. 3, 2000	550	-	550	890	-	890	290		ND(20)		ND(20)	
Mar. 10, 2000	1,100	-	1,100	490	-	490	120		ND(20)		ND(20)	
Apr. 7, 2000	260	-	260	240	-	240	100		ND(10)		ND(10)	
May. 4, 2000	180	-	180	510	-	510	130		ND(10)		ND(10)	
Jun. 2, 2000	240	-	240	400	-	400	110		ND(50)		ND(50)	
Jul. 7, 2000	1,300	-	1,300	240	-	240	120		ND(10)		ND(10)	
Aug. 9, 2000	35	-	35	74	-	74	64		1.2		ND(1.0)	
Sep. 8, 2000	330	-	330	19	-	19	52		ND(1.0)		ND(1.0)	
Oct. 5, 2000	160	-	160	64	-	64	63		ND(5.0)		ND(5.0)	
Nov. 2, 2000	11	-	11	36	-	36	59		1.1		ND(1.0)	
Dec. 6, 2000	600	-	600	140	-	140	84		ND(5.0)		ND(5.0)	
Average 2000 Concentrations (µg/L)			**420**			**314**						
Geometric Mean of 2000 Concentrations (µg/L) (3)			**235**			**184**						

TABLE 7.6e

SUMMARY OF EXTRACTION WELL ANALYTICAL DATA - EW-5
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Date Sampled	*EW-5 Concentration (μg/L)*											
	PCBs			*TCE*			*cis-1,2-DCE*		*trans-1,2-DCE*		*Vinyl Chloride*	
	Result	*Dup. Result*	*Value Applied in Average (1)*	*Result*	*Dup. Result*	*Value Applied in Average (1)*	*Result*	*Dup. Result*	*Result*	*Dup. Result*	*Result*	*Dup. Result*
2001 (January 4, 2001 through December 6, 2001)												
Jan. 4, 2001	920	-	920	360	-	360	130	-	ND(10)	-	ND(10)	-
Feb. 7, 2001	180	-	180	230	-	230	71	-	ND(5.0)	-	ND(5.0)	-
Mar. 7, 2001	9,600	-	9600	490	-	490	110	-	ND(20)	-	ND(20)	-
Apr. 11, 2001	330	140	235	380	420	400	81	82	ND(10)	ND(10)	ND(10)	ND(10)
May. 2, 2001	170	2,300	1235	260	260	260	57	60	ND(10)	ND(10)	ND(10)	ND(10)
Jun. 6, 2001	260	160	210	370	350	360	70	72	ND(10)	ND(10)	ND(10)	ND(10)
Jul. 11, 2001	76	47	61.5	220	210	215	72	66	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)
Aug. 8, 2001	760	230	495	230	230	230	70	-	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)
Sep. 19, 2001	550	-	550	720	-	720	150	-	ND(20)	-	ND(20)	-
Oct. 10, 2001	300	-	300	150	-	150	60	-	ND(10)	-	ND(10)	-
Nov. 7, 2001	510	-	510	88	-	88	47	-	ND(2.0)	-	ND(2.0)	-
Dec. 6, 2001	140	52	96	230	230	230	110	80	ND(10)	ND(10)	ND(10)	ND(10)
Average 2001 Concentrations (μg/L)			**1,199**			**311**						
Geometric Mean of 2001 Concentrations (μg/L) (3)			**412**			-						
2002 (January 10, 2001 through December 13, 2002)												
Jan. 10, 2002	50	50	50.0	510	520	515	87	89	ND(20)	ND(20)	ND(20)	ND(20)
Feb. 13, 2002	39	50	44.5	640	300	470	150	130	ND(10)	ND(10)	ND(10)	ND(10)
Mar. 7, 2002	11	9.8	10.4	290	330	310	72	92	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)
Apr. 11, 2002	26	28	27.0	140	83	111.5	54	44	ND(5.0)	ND(2.0)	ND(5.0)	ND(2.0)
May. 9, 2002	11	16	13.5	170	170	170	58	58	ND(10)	ND(10)	ND(10)	ND(10)
Jun. 7, 2002	16	1,300	658.0	51	49	50	45	45	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Jul. 12, 2002	17	22	19.5	63	64	63.5	45	45	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Aug. 2, 2002	12	27	19.5	69	69	69	51	52	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Sep. 6, 2002	9	13	11.1	28	28	28	36	37	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Oct. 10, 2002	16	22	19.0	120	120	120	51	51	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)
Nov. 14, 2002	7.1	8.4	7.8	75	76	75.5	54	51	ND(2.5)	ND(5.0)	ND(2.5)	ND(5.0)
Dec. 13, 2002	27	23	25.0	300	270	285	120	110	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)
Average 2002 Concentrations (μg/L)			**75**			**189**						
Geometric Mean of 2002 Concentrations (μg/L) (3)			**26**			-						

Notes:

μg/L Micrograms per liter.
ND(200) The analyte was not detected above the method detection limit indicated in parentheses.
[box] The analyte was positively identified. The numerical value indicated is approximate.
(1) The average of the duplicate samples were applied in the average annual concentration provided the result was less than 100,000 μg/L as per note (2).
(2) Detected concentrations greater than 100,000 μg/L are indicative of free product in the extraction well influent and do not reflect actual aqueous phase concentrations. As a result, these concentrations were not applied in the calculation of the average or geometric mean concentration.
(3) A geometric mean was applied due to the highly variable concentration values and was applied in the mass removal estimates presented in Table 7.7.

TABLE 7.7

EXTRACTION WELL PCBs AND TCE MASS REMOVAL ESTIMATES
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Extraction Well	*Average Extraction Well Pumping Rate (GPM)*	*Average PCBs Concentration (µg/L)*	*Average TCE Concentration (µg/L)*	*Estimated PCBs Mass Removed (1)*		*Estimated TCE Mass Removed (1)*	
				(kg)	*(lbs)*	*(kg)*	*(lbs)*
1998 (August 11, 1997 through November 6, 1998)							
EW-1	0.13	38.5	22,925	0.012	0.027	7.3	16.2
EW-2	41.9	121.6	4,916	12.6	27.7	508	1,119
EW-3	3.6	494	11,278	4.4	9.7	100	221
EW-4	0.11	3,259	11,729	0.88	1.95	3.2	7.0
EW-5	4.3	1,629	888	17.3	38.0	9.4	20.7
Estimated Total Mass Removed (August 11, 1997 through November 6, 1998)				35	77	627	1,383
1999 (December 4, 1998 through December 31, 1999)							
EW-1	0.11	18.9	24,546	0.004	0.010	5.8	12.7
EW-2	36.8	50	3,112	3.9	8.7	245	539
EW-3	4.7	700	21,500	7.0	15.5	216	476
EW-4	0.07	3,669	14,052	0.55	1.21	2.1	4.6
EW-5	5.4	4,457	361	51.4	113.4	4.2	9.2
Estimated Total Mass Removed (December 4, 1998 through December 31, 1999)				63	139	473	1,042
2000 (January 1, 2000 through December 29, 2000)							
EW-1	0.11	8.1	19,683	0.002	0.004	4.3	9.5
EW-2	33.6	60.6	3,098	4.0	8.9	207	455
EW-3	4.6	1,657	29,000	15.1	33.3	265	584
EW-4	0.06	4,791	15,618	0.57	1.26	1.9	4.1
EW-5	5.4	235	184	2.5	5.6	2.0	4.3
Estimated Total Mass Removed (January 1, 2000 through December 29, 2000)				22	49	479	1,057
2001 (December 30, 2000 through December 28, 2001)							
EW-1	0.12	38.6	28,045	0.009	0.020	6.7	14.7
EW-2	31.8	208	2,383	13.1	28.9	150	331
EW-3	4.9	13,536	19,008	131.6	290.1	185	407
EW-4	0.06	2,776	17,428	0.33	0.73	2.1	4.6
EW-5	6.0	412	311	4.9	10.8	3.7	8.2
Estimated Total Mass Removed (December 30, 2000 through December 28, 2001)				150	331	348	766
2002 (December 29, 2001 through December 27, 2002)							
EW-1	0.12	5.4	46,917	0.001	0.003	11.2	24.6
EW-2	30.2	77	2,811	4.6	10.2	168	371
EW-3	5.9	1,900	17,000	22.2	49.0	199	439
EW-4	0.05	1,370	17,264	0.14	0.30	1.7	3.8
EW-5	7.2	26	189	0.37	0.82	2.7	6.0
Estimated Total Mass Removed (December 29, 2001 through December 27, 2002)				27	60	383	844
Estimated Total Mass Removed (August 11, 1997 through December 27, 2002)				298	656	2,310	5,093

Note:

(1) Mass removed equals the average extraction well pumping rate multiplied by the average detected concentration multiplied by the duration of the evaluation period.

TABLE 7.8

SUMMARY OF EXTRACTION WELL PCBs AND TCE MASS REMOVAL ESTIMATES SINCE STARTUP
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

	EW-1				*EW-2*				*EW-3*				*EW-4*				*EW-5*				
	Estimated PCBs Mass Removed (1)		*Estimated TCE Mass Removed (1)*		*Estimated PCBs Mass Removed (1)*		*Estimated TCE Mass Removed (1)*		*Estimated PCBs Mass Removed (1)*		*Estimated TCE Mass Removed (1)*		*Estimated PCBs Mass Removed (1)*		*Estimated TCE Mass Removed (1)*		*Estimated PCBs Mass Removed (1)*		*Estimated TCE Mass Removed (1)*		*Source Where Reported*
Date	*(kg)*	*(lbs)*	*(kg)*	*(lbs)*	*(kg)*	*(lbs)*	*(kg)*	*(lbs)*	*(kg)*	*(lbs)*	*(kg)*	*(lbs)*	*(kg)*	*(lbs)*	*(kg)*	*(lbs)*	*(kg)*	*(lbs)*	*(kg)*	*(lbs)*	
Nov.1993 - Dec. 1994 (2)	2.5	5.4	39.9	88.0	7.5	16.6	558.4	1,231.0	11.1	24.4	105.4	232.3	0.5	1.1	31.2	68.9	30.5	67.3	192.1	423.5	CRA (1995; Tables 2.2 and 3.1) (3)
Dec. 1995 - Jun. 1996	0.4	0.8	32.7	72.1	27.2	59.9	859.2	1,894.6	33.6	74.1	227.9	502.5	1.9	4.2	25.0	55.2	48.4	106.7	67.7	149.3	CRA (1996; Table 4.2) (4)
Jul. 1996 - Jan. 1997	0.3	0.6	15.6	34.3	8.9	19.7	328.0	722.0	21.3	46.9	246.0	541.0	1.2	2.6	20.1	44.2	77.0	169.4	104.0	229.0	CRA (1998; Table 5.2) (5)
Feb. 1997 - Jul. 1997	0.03	0.07	23.1	50.8	29.6	65.1	180.0	396.0	6.9	15.3	14.2	31.2	0.3	0.7	1.6	3.5	1.9	4.3	8.7	19.2	CRA (1998; Table 5.2) (5)
Aug. 1997 - Nov. 1998	0.012	0.027	7.3	16.2	12.6	27.7	508.0	1,119.0	4.4	9.7	100	221	0.88	1.95	3.2	7.0	17.3	38.0	9.4	20.7	Table 7.7
Dec. 1998 - Dec. 1999	0.004	0.010	5.8	12.7	3.9	8.7	245	539	7.0	15.5	216	476	0.55	1.21	2.1	4.6	51.4	113.4	4.2	9.2	Table 7.7
Jan. 2000 - Dec. 2000	0.002	0.004	4.3	9.5	4.0	8.9	207	455	15.1	33.3	264	584	0.57	1.26	1.9	4.1	2.5	5.6	2.0	4.3	Table 7.7
Jan. 2001 - Dec. 2001	0.009	0.020	6.7	14.7	13.1	28.9	150	331	131.6	290.1	185	407	0.33	0.73	2.1	4.6	4.9	10.8	3.7	8.2	Table 7.7
Jan. 2002 - Dec. 2002	0.001	0.003	11.2	24.6	4.6	10.2	168	371	22.2	49.0	199	439	0.14	0.30	1.7	3.8	0.37	0.82	2.7	6.0	Table 7.7
Total Mass Removal	3.2	6.9	146.6	322.9	111.5	245.7	3,203.6	7,058.6	253.2	558.3	1,557.5	3,434.0	6.4	14.1	88.9	195.8	234.3	516.3	394.5	869.4	

Total Estimated PCBs Mass Removal (kg)	**609**
Total Estimated PCBs Mass Removal (lbs)	**1,341**
Total Estimated TCE Mass Removal (kg)	**5,391**
Total Estimated TCE Mass Removal (lbs)	**11,881**

Notes:

(1) Mass removed equals the average extraction well pumping rate multiplied by the average detected concentration multiplied by the duration of the evaluation period.
(2) The Phase I RA was shut down in December 1994 following a 1 year data collection period. The start-up of the Phase II RA occurred in December 1995.
(3) CRA, February 1995, Technical Evaluation, Phase I Remedial Action, Groundwater Extraction and Treatment Systems, Mallory Capacitor Co. Site, Waynesboro, Tennessee.
(4) CRA, August 1996, Technical Evaluation, Phase II Remedial Action, Groundwater Extraction and Treatment Systems, Mallory Capacitor Co. Site, Waynesboro, Tennessee.
(5) CRA, March 1998, Final Technical Evaluation, Phase II Remedial Action Modifications, Groundwater Extraction and Treatment Systems, Mallory Capacitor Co. Site, Waynesboro, Tennessee.

TABLE 8.1

TOXICOLOGICAL DATA
MALLORY CAPACITOR CO. SITE
WAYNESBORO, TENNESSEE

Chemical		***Toxicological Classification***		***RfDo(1) (mg/kg-day)***		***RfDi(2) (mg/kg-day)***		***CSFo(3) (mg/kg/day)-1***		***CSFi(4) (mg/kg/day)-1***	
		Data from 1991 RI	***Current (2003) Data***	***Data from 1991 RI***	***Current (2003) Data***	***Data from 1991 RI***	***Current (2003) Data***	***Data from 1991 RI***	***Current (2003) Data***	***Data from 1991 RI***	***Current (2003) Data***
Polychlorinated biphenyls		B2 (5,6)	B2 (9)	--	--	--	--	7.7 (6)	2.0 (11)	--	2.0 (11)
Trichloroethene		B2 (6)	UR (9,10)	--	3.0E-04 (12)	--	1.0E-02 (12)	0.11 (7,8)	4.0E-01 (13)	4.6E-03 (7) 1.7E-02 (8)	4.0E-01 (13)
1,2-Dichloroethene	cis	--	--	--	1.0E-02 (13)	--	--	--	--	--	--
	trans	--	--	2.0E-02 (6)	2.0E-02 (11)	--	--	--	--	--	--

Notes:

(1) RfDo = Oral Reference Dose
(2) RfDi = Inhalation Reference Dose
(3) CSFo = Oral Cancer Slope Factor
(4) CSFi = Inhalation Cancer Slope Factor
(5) EPA Weight of Evidence Ranking: B2 Probable Human Carcinogen (Sufficient Animal Data)
(6) IRIS = Integrated Risk Information System Database, July 1990
(7) SPHEM = Superfund Public Health Evaluation Manual, EPA / 540 / 1-86 / 060, October 1986
(8) HEAST = Human Effects Assessment Summary Tables, OERR 9200.6-303-(89-4), October 1989
(9) IRIS, Accessed March 7, 2003
(10) UR = Under Review
(11) USEPA Region III RBC Table, October 9, 2002, value from IRIS
(12) USEPA Region III RBC Table, October 9, 2002, provisional value from EPA-NCEA
(13) USEPA Region III RBC Table, October 9, 2002, value from HEAST

APPENDIX A

NORTH WIND REPORT

Comments and Recommendations Regarding the Performance of Groundwater Remediation Activities at the Mallory Capacitor Site, Waynesboro, TN

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Prepared for the
U.S. Environmental Protection Agency Technical Support Project

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The following was prepared in response to a request to review the performance of the remedial action at the Mallory Capacitor Site in Waynesboro, TN. The following discusses the results of the review of several site documents (listed below) in the context of three specific areas related to the overall remedy performance: the performance/efficiency of the groundwater extraction and treatment system, options to address the off-site migration of site contaminants, and the adequacy of the monitoring network/program. Recommendations are provided for each of these three areas.

Documents Reviewed

This report based on the review of the following documents:

- Remedial Investigation/Feasibility Study Report
- Dye Tracer Study Report/Comments/Responses
- Phase II Technical Evaluation

General Comments

A stated above, comments are presented in three areas: the overall effectiveness of the groundwater extraction and treatment system, options to address the off-site migration of contaminants, and finally the adequacy of the monitoring well network/program for characterizing site conditions and monitoring remedy performance and future actions. Following this discussion of comments in these three areas, recommendations are summarized.

Performance of the Pump and Treat System. This issue consists of two sub-issues, the effectiveness of the system at removing contaminant mass, and the ability of the system to provide adequate capture of the contaminant plume and prevent off-site migration. The groundwater extraction wells were located in the contaminant source area rather than downgradient to prevent mobilization of source contamination off-site. We agree with this approach. We evaluated the effectiveness of the pump and treat system at removing contaminant mass by looking at the magnitude of the mass removed by the system and how that mass removal rate has changed over time. As presented in the 2001 Annual Report (Table 5.4), approximately 11,000 pounds of TCE and 1,295 pounds of PCBs have been removed by the pump and treat since November 1993. This is a significant amount of mass removal. The next issue is how has that mass removal changed over time. Figures 1A and 1B show the cumulative mass removed for both TCE and PCBs, respectively. As can be seen in these figures, the system is still removing a significant amount of mass from the aquifer, more than 700 pounds of TCE and 341 pounds of PCBs in 2001. It is unlikely that any other remediation technology that would be considered for use at this site can remove mass at that rate. For this reason, it is recommended that the pump and treat operations in the source area be continued until mass removal rates decrease significantly. The use of other technologies can be considered at that time. In the interim, improvements to the existing pump and treat system can be made. Suggestions for possible improvements are discussed below.

The other important issue regarding the effectiveness of the pump and treat system is plume capture – is the pump and treat system effectively preventing the off-site migration of contaminants? The presence of site contaminants in wells immediately adjacent to and across the Green River suggests that capture is not being fully achieved. In order to improve capture within the source area, there are several possible actions that can be considered. The first option is to implement a pulsed pumping approach using the existing system. As the historical data show, when the system was not operating for some period of time (in 1994 when the Phase II system was being installed and then in 1997 when the bottoms of the extraction wells were grouted back up), mass removal increased, particularly in wells EW-2 and EW-3, the wells that produce the most contaminant mass. The cycling of the extraction system on and off may improve the mass removal compared to continuous operation, especially in wells EW-2 and EW-3, as was shown during previous periods of downtime. This approach would have to be implemented using a trial and error approach, experimenting with the pump-on/pump-off durations until the mass removal rate was optimized. This may require a period of relatively intense data collection in the extraction wells in order to determine the most effective operating strategy.

If pulsed pumping is not an option, or is unsuccessful at improving mass removal and plume capture, then additional action can be taken to augment the existing system. As discussed above, we agree with the position that extraction wells should be confined to the source area in order to prevent mobilization of source contamination downgradient. Given this, we propose that further action be considered in the source area in order to mitigate downgradient flux. Because this is a fractured rock system, the yield of an extraction well is determined by the fracture zones that are intersected by that well. Given this, the placement of additional extraction wells to enhance pumping and mass removal should be determined not by what locations appear to provide adequate aerial coverage, but by the orientation of highly yielding fracture zones. In order to locate highly yielding fracture zones and select the locations of additional extraction wells, it is recommended that the well logs of the existing extraction wells be reviewed. If the existing logs (and any other data from well installation/testing) provide information on the locations and trends of high yield fracture zones, then the locations of new extraction wells can be selected to intersect these features. If these data do not exist, it is recommended that the existing extraction wells be logged in order to map the depths and orientation of fracture zones within each well. We have found that a logging technique called acoustic borehole televiewer logging is an excellent technique to provide this type of data. The acoustic televiewer is a geophysical borehole-imaging tool that provides an orientated 360° acoustic (density/velocity contrast) image of the borehole wall. The tool creates the acoustic image by measuring the return echo transit time and strength (amplitude) of an ultrasonic sound emitted by a transducer in the tool. An example of an acoustic borehole televiewer log produced from a well in a fractured aquifer is attached as Figure 2. As is shown in Figure 2, the fracture zones are clearly distinguishable from the dense rock. It is also possible to determine the width and orientation of fractures using this technique.

In addition to, or in combination with, the use of additional extraction wells, production rates in the existing wells can also be improved by enhancing the permeability of the formation surrounding the extraction wells. This can be achieved using a hydraulic fracturing technique in the existing extraction wells to enhance the fracture network through the creation of new fractures, thus improving aquifer transmissivity and hopefully contaminant mass removal. Well EW-3 is a particularly good candidate for this approach because of its high mass removal but relatively low groundwater extraction rate. If the groundwater extraction rate can be increased, it may be possible to extract even more contaminant mass from this location. Depending on the radius of influence of the fracturing at each extraction well, it may be possible to create a network of fractures that are connected, thus improving aquifer permeability and mass removal throughout the source area. Care must be taken when using this approach not to create fractures into the deeper aquifer zone, and thereby providing a conduit for contaminant transport to the deeper aquifer zone.

Off-Site Contaminant Migration. The presence of site contaminants in wells located adjacent to and across the Green River indicates that contamination is not being fully contained and additional action may be required to prevent continued off-site migration. As stated above, we concur with the decision to not locate extraction wells downgradient of the source area. Rather we recommend a combination of source area actions (as described above) to mitigate downgradient flux. In addition to these source area actions, we recommend the consideration of a monitored natural attenuation (MNA) approach for the downgradient edges of the plume. The presence of TCE biodegradation products cis-1,2-dichloroethene (cis-1,2-DCE) and vinyl chloride (VC) clearly indicates that natural attenuation via anaerobic reductive dechlorination (ARD) is occurring at the site. However, in order to evaluate the potential for MNA to effectively address off-site migration, it is necessary to develop a monitoring plan to more thoroughly characterize the extent of these processes. The general components of the evaluation of an MNA remedy include: the distribution of monitoring wells within the contaminant plume, the frequency of monitoring, and the analytes being monitored. The density of monitoring locations required are specific to the size and nature of the particular contaminant plume. In general, monitoring locations need to be sufficient to define the extent of contamination and document the attenuation of contaminants. Specifically, monitoring should be conducted at locations both longitudinal and transverse to groundwater flow. The scale of monitoring is largely determined by the groundwater flow velocity and rate of attenuation of contaminants. At the Mallory Site, additional monitoring locations are required downgradient of the source area in each of the three aquifer units in order to document the attenuation of contaminants longitudinally along the flowpath. The specific locations of additional monitoring wells are presented in Figures 3, 4, and 5, and are discussed further below in the Monitoring Well Network section.

The monitoring frequency required will also be determined by site-specific properties – largely the groundwater flow velocity and the rate of contaminant attenuation. If the groundwater flow velocity is relatively high, then monitoring will be required on a relatively frequent basis – perhaps monthly – in order to document contaminant attenuation. Similarly, if the contaminant attenuation mechanism occurs rapidly, frequent monitoring will be required in order to collect data sufficient to document that process. If the groundwater flow velocity and attenuation mechanism occur relatively slowly, then less frequent monitoring – such as quarterly or semi-annually – may be sufficient. Once the site-specific attenuation processes and rates are documented and understood, the frequency of long-term monitoring may be reduced. The general types of analytes required for monitoring MNA (via ARD) include: hydrologic parameters, contaminant concentrations (parent and daughter compounds), electron donor parameters, oxidation-reduction parameters, biological activity parameters, and water quality parameters.

Monitoring Well Network. The existing network of monitoring wells at the site was evaluated for its adequacy to define the extent of contamination and plume capture, and for its ability to evaluate natural attenuation processes at the site. Figures 4.1, 4.2, and 4.3 of the 2001 Annual Groundwater and Surface Water Sampling Results and Additional Monitoring Well Installation Report (from Conestoga-Rovers and Associates [CRA] to Loften Carr, dated January 9, 2002) and Figure 1 of the July 12, 2002, transmittal from CRA to Loften Carr were used to determine what wells existed at the site in the shallow, deep, and deeper aquifer zones, respectively.

The existing monitoring program (well locations and monitoring frequency) yields data for three purposes: 1) determine the extent of contamination in the three aquifer zones, 2) define the effectiveness of the pump and treat for preventing off-site migration of contamination, and 3) evaluate natural attenuation processes that may be occurring at the site. The following evaluates the distribution of monitoring locations at the site in four areas: the source area, northern area, eastern area, and upgradient area, in the context of providing data to address these objectives. For purposes of this report, the source area is defined as the area bounded to the north by Belew Circle Drive, to the east by Cole Street, to the south by the existing warehouse structure, and to the west by the driveway into the site proper. The northern area is defined as everything north of Belew Circle Drive. The eastern area is defined as everything east of Cole Street. Finally, the upgradient area is defined as the area west of the site driveway and the existing warehouse structure. In each of these plume quadrants, locations within the shallow, deep, and deeper aquifer zones are discussed. The attached Figures 3, 4, and 5 present the existing monitoring locations in the shallow, deep, and deeper zones, respectively, and also present the approximate locations of recommended new wells as discussed below.

For the source area, the locations of existing monitoring wells appear to provide good coverage of the majority of the source area in the shallow and deep aquifer zones, with the exception of the westernmost area. However, it appears that only four of the monitoring wells in this area (two from each aquifer unit) are monitored on a regular basis (shallow wells OW37-89 and OW35-89 and deep wells OW38-89 and OW36-89). Despite the relatively small number of data points, this monitoring strategy, combined with data from the five extraction wells, is probably sufficient to characterize the contaminant distribution in the source area. Also, if additional extraction wells were installed in the source area (as discussed above), this would provide additional data to complete the picture of contaminant concentrations in this area. Also, additional existing wells can be incorporated into the regular monitoring program to complete the dataset. These wells should be chosen based on historical data and to provide good aerial coverage of the source area. Based on this initial review, it is recommended that shallow wells OW47-89 or OW50-89 and deep wells OW42-89 or OW34-89 be considered as possible locations to add to the monitoring program. In the deeper aquifer zone, there are two wells in the source area (OW-63 and OW62-90), and these appear to be monitored on a regular basis. This approach is likely sufficient to characterize the contaminant distribution in the source area. Given this, and the possibility of providing a conduit for vertical contaminant migration into the deeper aquifer through well drilling activities, additional monitoring locations in the deeper aquifer are not recommended at this time.

In the northern portion of the plume, there appears to be a gap in the monitoring network along the plume axis between the source area wells and the wells located adjacent to the Green River. Wells OW58-90 and OW59-90 are located on either side of the plume axis, and provide a good transect of the plume as it migrates downgradient, however, monitoring locations along the axis to document plume behavior longitudinally are absent. As described above, data along the longitudinal axis of the plume are required in order to evaluate MNA mechanisms that are occurring during transport downgradient. It is recommended that one additional shallow well be located between the source area and OW70-01 (approximate location is shown on Figure 3) in order to collect data for an evaluation of MNA as described above. In the deep aquifer, coverage in the northern area is not as dense as in the shallow aquifer. Also, it appears that the extent of contamination is misrepresented by the contour line on Figure 4.2 of the 2001 Report. The extent of contamination in fact extends to the northwest to include OW72-01 as indicated by the presence of cis-1,2-DCE at a concentration of 520 μg/L. It is recommended that one additional well be located between OW38-89 and OW68-01 (as shown in Figure 4) in order to support an MNA evaluation as described above. Finally, in the deeper zone, there are no monitoring locations between the source area and the Green River. Because migration of site contaminants in the deeper zone is occurring (as evidenced by cis-1,2-DCE in OW-69-01), it is necessary to document the attenuation of contaminants along the flowpath from the source area. In order to do this, it is recommended that one additional well be installed at the location shown on Figure 5.

The eastern area is defined as the portion of the plume east of Cole Street. Currently, two wells are monitored in this area, one shallow (OW27-89) and one deep (OW30-89). There are no wells in the deeper aquifer in this area. In the shallow aquifer, it may be desirable to include well OW23-86 (located across the Green River) in the regular monitoring program in order to document the extent of plume migration and capture and to support the MNA evaluation. These data could also be particularly useful to the evaluation of the effectiveness of any of the enhancements made to the pump and treat system as described above. In the deep aquifer, it appears as though wells across the Green River have poor recovery and are therefore not useful for monitoring. Given this, it is not recommended that additional wells be located in the deep aquifer in this area. However, it may be useful to consider including the existing well OW26-89 in the regular monitoring program as it is located close to the southern edge of the contaminant plume and can therefore be used to define the plume boundary and any changes that occur as a result of the enhanced source removal activities described above. Also, it provides a monitoring location to evaluate MNA mechanisms along the flowpath from OW36-89 (located in the source area) downgradient to the east. Finally, it is recommended that deeper well OW24-89 be included in the monitoring program to evaluate both plume capture and MNA mechanisms in the deeper aquifer.

The upgradient area is loosely defined as that area west and south, and in general, upgradient of the source area. Currently the monitoring locations in the shallow aquifer are well outside the contamination plume. In the shallow aquifer, it is recommended that well OW45-89 be included in the monitoring program because of its proximity to the presumed plume boundary as drawn in Figure 4.1 of the 2001 Annual Report. As in the eastern area, monitoring at this location can assist in the evaluation of the effectiveness of the source area actions described above. In the deep aquifer, coverage on the western plume boundary is adequate, but no locations defining the southern boundary are monitored regularly. For this reason, it is recommended that well OW40-89 be included in regular monitoring. Finally, in the deeper aquifer zone, there are currently no wells in this portion of the plume. It may be beneficial to install a single well in this area (approximate location shown on Figure 5) in order to document the extent of contaminant migration in this portion of the deeper aquifer, verifying the contour lines as drawn on Figure 4.3 of the 2001 Annual Report.

Summary and Recommendations

The site was evaluated in the context of three objectives: the overall effectiveness of the groundwater extraction and treatment system, options to address the off-site migration of contaminants, and finally the adequacy of the monitoring well network/program for characterizing site conditions and monitoring remedy performance and future actions. In general it is our opinion that the activities conducted at the site to date and the summary of site conditions as presented in the reviewed documents represents a good effort to move the site toward effective remediation. The site owners and their contractors face a challenging problem and it appears as though every effort is being made to achieve the most efficient and cost-effective remediation. Based on our comments presented above, we make the following recommendations for modifications to the ongoing remediation efforts.

In general the existing monitoring well network has provided adequate data to define the plume extent for the majority of the plume. In order to define the plume boundary in specific zones of the plume and to evaluate natural attenuation processes that may be occurring at the site, we recommend that nine existing wells be included in the regular monitoring program (3 shallow, 3 deep, and 1 deeper) and also that four new wells as shown on Figures 3, 4, and 5 be installed. These wells will provide the data necessary to evaluate the effectiveness of additional source area activities and will support the evaluation of MNA at the site.

We concur with the current approach to confine extraction wells to the source area in order to avoid enhanced migration of source material off-site. In order to improve mass recovery and plume capture we make the following recommendations for enhancements to the existing pump and treat system.

- Evaluate the well logs from the extraction wells and identify significant fracture zones.
- If logs are not available, log the wells. Consider the use of the acoustic borehole televiewer logging technique in order to determine fracture width and orientation.
- Use the logging results to attempt to locate additional extraction wells to intersect significant fracture zones in order to achieve additional groundwater yield and mass recovery.
- Another possibility is to enhance formation permeability surrounding the extraction wells using a hydraulic fracturing technique. If this approach is used, care must be taken to not create migration pathways from the shallow and deep aquifer zones to the deeper zone.

For the off-site contamination, we recommend that an MNA approach be considered. The use of this approach relies on having an adequate monitoring well network and a plan for the collection and evaluation of MNA data. The additional wells recommended above were located with this objective in mind. If necessary, we can provide assistance with the development of an MNA Plan for this site.

References

EPA, 1998, Technical Protocol for the Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water: Office of Research and Development, EPA/600/R-98/128, September 1998.

EPA, 1999, Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites: Office of Solid Waste and Emergency Response Directive Number 9700.4-17P, April 21, 1999.

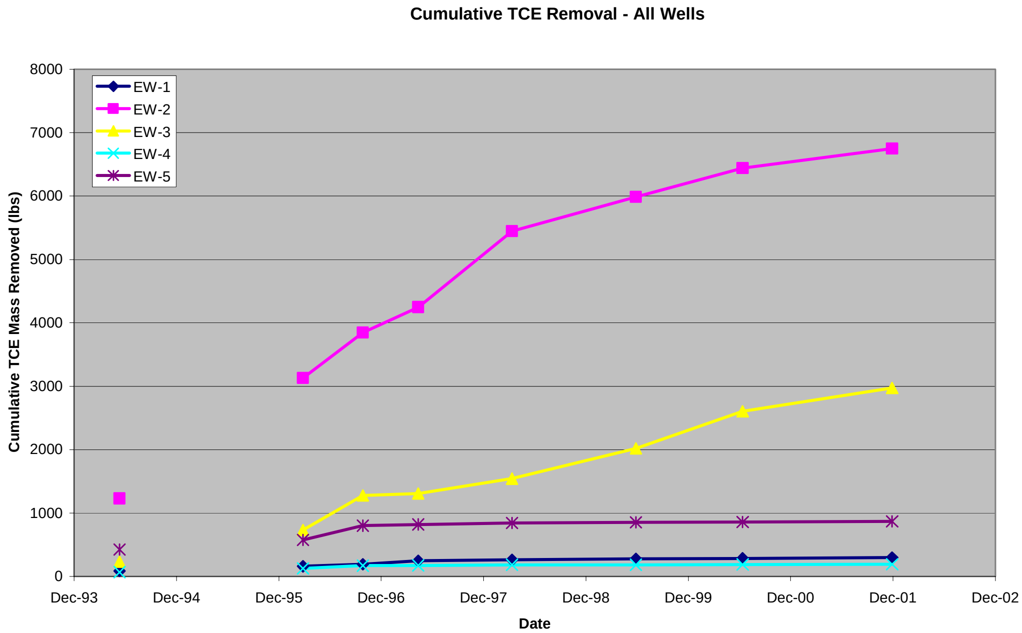


Figure 1A. Cumulative TCE removal from all extraction wells.

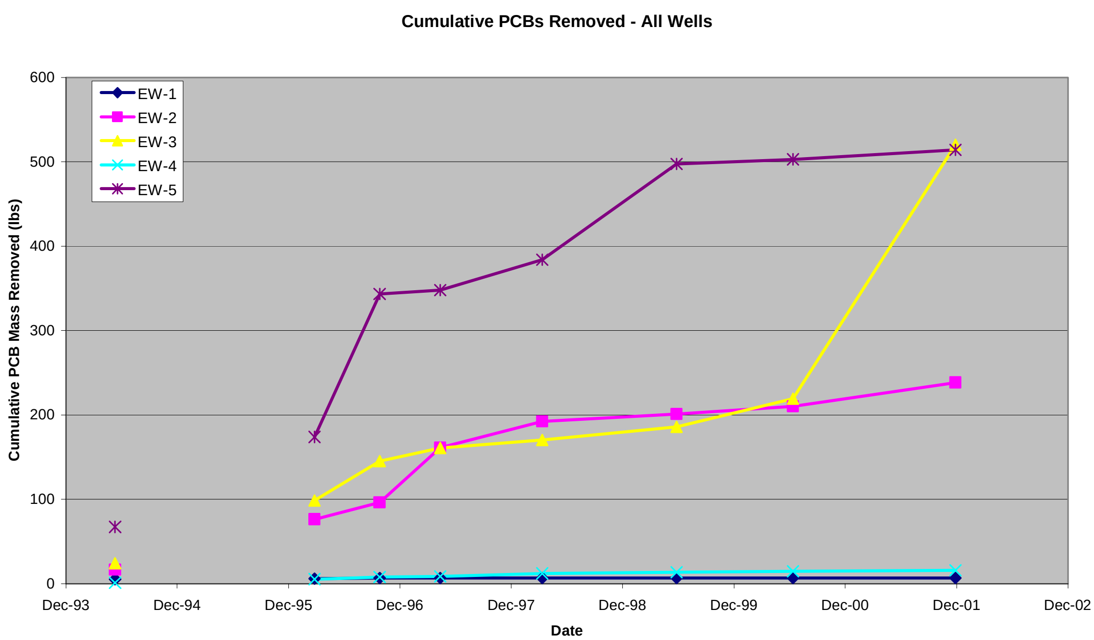
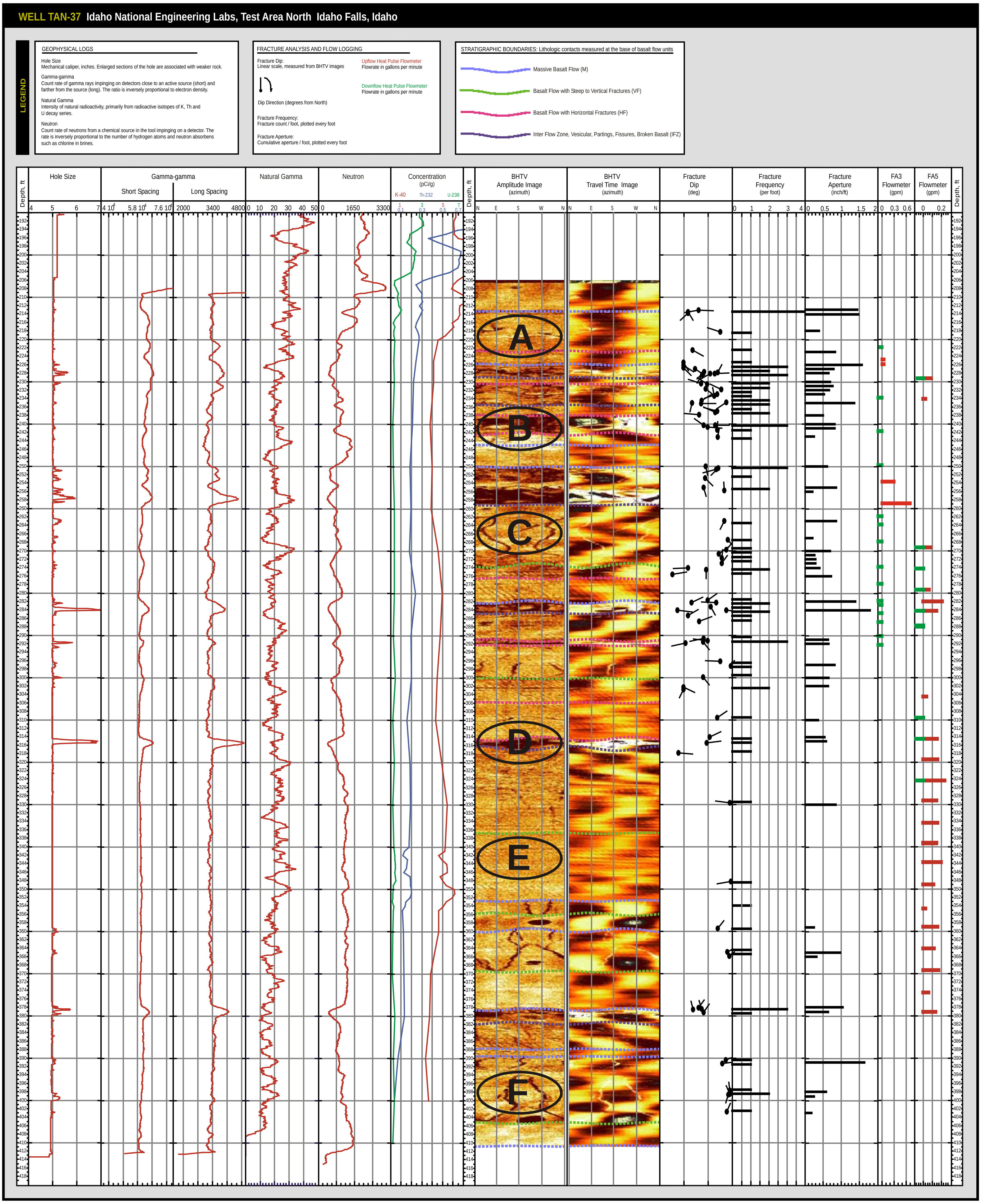


Figure 1B. Cumulative PCBs removal from all extraction wells.



A, E - Dense basalt

B, D - Interflow zones

C, F - Discrete vertical fractures

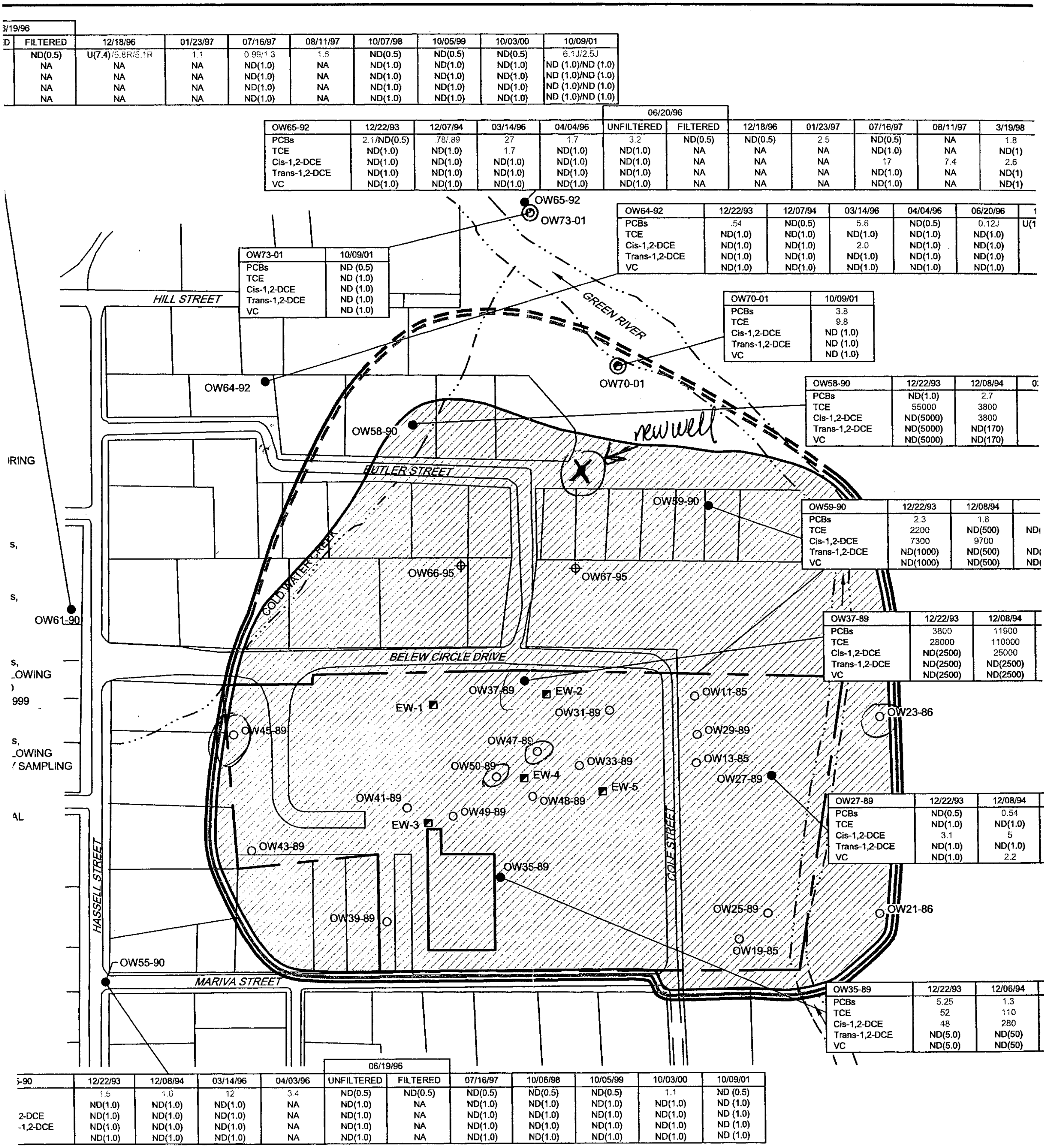
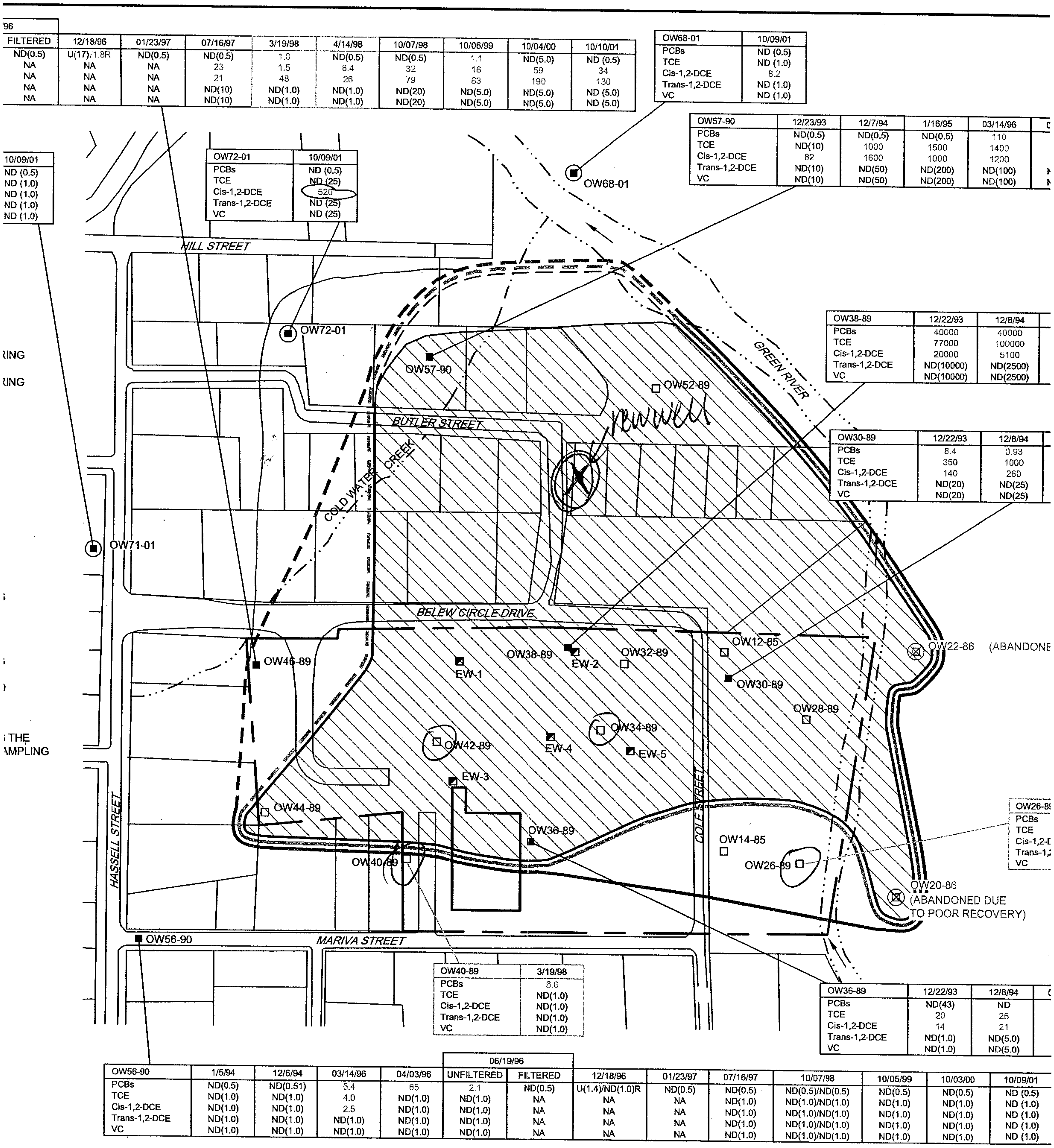


Figure 3. Recommended well locations for the shallow zone.



'96 FILTERED	12/18/96	01/23/97	07/16/97	3/19/98	4/14/98	10/07/98	10/06/99	10/04/00	10/10/01
ND(0.5)	U(17)/1.8R	ND(0.5)	ND(0.5)	1.0	ND(0.5)	ND(0.5)	1.1	ND(5.0)	ND (0.5)
NA	NA	NA	23	1.5	6.4	32	16	59	34
NA	NA	NA	21	48	26	79	63	190	130
NA	NA	NA	ND(10)	ND(1.0)	ND(1.0)	ND(20)	ND(5.0)	ND(5.0)	ND (5.0)
NA	NA	NA	ND(10)	ND(1.0)	ND(1.0)	ND(20)	ND(5.0)	ND(5.0)	ND (5.0)

OW68-01	10/09/01
PCBs	ND (0.5)
TCE	ND (1.0)
Cis-1,2-DCE	8.2
Trans-1,2-DCE	ND (1.0)
VC	ND (1.0)

OW57-90	12/23/93	12/7/94	1/16/95	03/14/96	0
PCBs	ND(0.5)	ND(0.5)	ND(0.5)	110	
TCE	ND(10)	1000	1500	1400	
Cis-1,2-DCE	82	1600	1000	1200	
Trans-1,2-DCE	ND(10)	ND(50)	ND(200)	ND(100)	N
VC	ND(10)	ND(50)	ND(200)	ND(100)	N

10/09/01
ND (0.5)
ND (1.0)
ND (1.0)
ND (1.0)
ND (1.0)

OW72-01	10/09/01
PCBs	ND (0.5)
TCE	ND (25)
Cis-1,2-DCE	520
Trans-1,2-DCE	ND (25)
VC	ND (25)

OW38-89	12/22/93	12/8/94
PCBs	40000	40000
TCE	77000	100000
Cis-1,2-DCE	20000	5100
Trans-1,2-DCE	ND(10000)	ND(2500)
VC	ND(10000)	ND(2500)

OW30-89	12/22/93	12/8/94
PCBs	8.4	0.93
TCE	350	1000
Cis-1,2-DCE	140	260
Trans-1,2-DCE	ND(20)	ND(25)
VC	ND(20)	ND(25)

OW26-8
PCBs
TCE
Cis-1,2-D
Trans-1,2
VC

OW40-89	3/19/98
PCBs	6.6
TCE	ND(1.0)
Cis-1,2-DCE	ND(1.0)
Trans-1,2-DCE	ND(1.0)
VC	ND(1.0)

OW36-89	12/22/93	12/8/94
PCBs	ND(43)	ND
TCE	20	25
Cis-1,2-DCE	14	21
Trans-1,2-DCE	ND(1.0)	ND(5.0)
VC	ND(1.0)	ND(5.0)

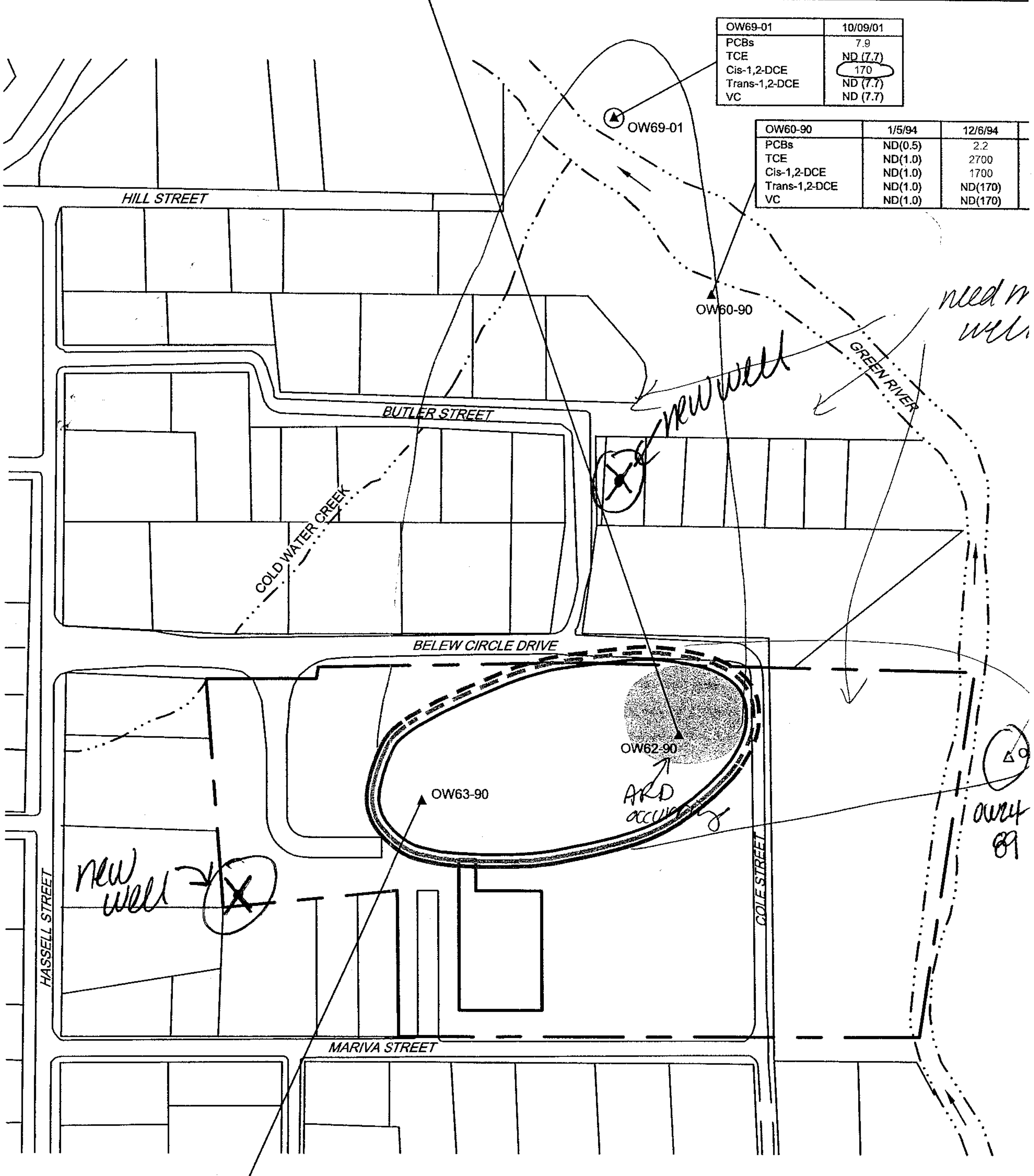
OW56-90	1/5/94	12/6/94	03/14/96	04/03/96	06/19/96 UNFILTERED	06/19/96 FILTERED	12/18/96	01/23/97	07/16/97	10/07/98	10/05/99	10/03/00	10/09/01
PCBs	ND(0.5)	ND(0.51)	5.4	65	2.1	ND(0.5)	U(1.4)/ND(1.0)R	ND(0.5)	ND(0.5)	ND(0.5)/ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)
TCE	ND(1.0)	ND(1.0)	4.0	ND(1.0)	ND(1.0)	NA	NA	NA	ND(1.0)	ND(1.0)/ND(1.0)	ND(1.0)	ND(1.0)	ND (1.0)
Cis-1,2-DCE	ND(1.0)	ND(1.0)	2.5	ND(1.0)	ND(1.0)	NA	NA	NA	ND(1.0)	ND(1.0)/ND(1.0)	ND(1.0)	ND(1.0)	ND (1.0)
Trans-1,2-DCE	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	NA	NA	NA	ND(1.0)	ND(1.0)/ND(1.0)	ND(1.0)	ND(1.0)	ND (1.0)
VC	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	NA	NA	NA	ND(1.0)	ND(1.0)/ND(1.0)	ND(1.0)	ND(1.0)	ND (1.0)

Figure 4. Recommended well locations for the deep zone.

OW62-90	1/5/94	12/06/94	1/16/94	03/13/96	06/21/96	12/18/96	01/23/97	07/16/97	10/09/98	10/06/99	10/04/00	10/10/01
PCBs	ND(0.5)	3.9	2.6	99	180J/94J	U(140)/46R	12	9.2	6.4J/8.4	6.6	6.1	9.1
TCE	U(3.8)	4700	2000	8000	2300J/1700J	1800	NA	750	300/270	1200	570	500
Cis-1,2-DCE	ND(1.0)	610	5100	9000	4700J/3800J	2700	NA	1300	140/140	340	650	540
Trans-1,2-DCE	ND(1.0)	ND(250)	ND(500)	ND(500)	ND(200)/ND(100)	ND(100)	NA	ND(20)	ND(10)/ND(50)	ND(100)	ND(20)	ND (20)
VC	ND(1.0)	ND(250)	ND(5.0)	ND(500)	ND(200)/ND(100)	ND(100)	NA	160	16/ND(50)	ND(100)	110	37

OW69-01	10/09/01
PCBs	7.9
TCE	ND (7.7)
Cis-1,2-DCE	170
Trans-1,2-DCE	ND (7.7)
VC	ND (7.7)

OW60-90	1/5/94	12/6/94
PCBs	ND(0.5)	2.2
TCE	ND(1.0)	2700
Cis-1,2-DCE	ND(1.0)	1700
Trans-1,2-DCE	ND(1.0)	ND(170)
VC	ND(1.0)	ND(170)



OW63-90	1/5/94	12/06/94	03/13/96	04/04/96	06/21/96	12/18/96	01/23/97	07/16/97	10/06/98	10/06/99	10/04/00	10/09/01
PCBs	ND(0.5)	ND(0.52)	25	110/130	280	U(65)/35R	6.4	35	1.9	1.3/1.2	1.1 J/1.4	2.3
TCE	U(7.4)	ND(1.0)	6	35/38	29	4.6	NA	5.8	5.5	3.4/3.4	ND(1.0)/ND(1.0)	ND (1.0)
Cis-1,2-DCE	ND(1.0)	ND(1.0)	14	2.5/2.9	ND(2.5)	4.6	NA	2.6	2.7	2.3/2.3	2.3/2.5	1.5
Trans-1,2-DCE	ND(1.0)	ND(1.0)	ND(5.0)	ND(2.0)/ND(2.5)	ND(2.5)	ND(1.0)	NA	ND(1.0)	ND(1.0)	ND(1.0)/ND(1.0)	ND(1.0)/ND(1.0)	ND (1.0)
VC	ND(1.0)	ND(1.0)	ND(5.0)	ND(2.0)/ND(2.5)	ND(2.5)	ND(1.0)	NA	ND(1.0)	ND(1.0)	ND(1.0)/ND(1.0)	ND(1.0)/ND(1.0)	ND (1.0)

Figure 5. Recommended well locations for the deeper zone.

APPENDIX B

PUBLIC NOTICE

NOTICE

A Five-Year Review is being conducted of the clean up activities taken at the Mallory Capacitor Co. Site in Waynesboro, Tennessee. A copy of the report will be placed in the Administrative Record & Information Repository files located in the EPA Record Center, 11th Floor, 61 Forsyth Street, SW, Atlanta, GA 30303.

The remedies implemented at the Site included: soil excavation/offsite disposal, groundwater extraction/treatment/discharge and monitoring.

The Five Year Review process will evaluate the remedies implemented at the site and determine if they are still protective of human health and the environment.

EPA will also conduct a number of telephone interviews with nearby residents, local officials, state officials, and others to obtain their opinion on the clean up process. If you would like to speak with us about this Site, please call Diane Barrett, EPA Community Involvement Coordinator, at 1-800-435-9233 or 404-562-8489.

If you have any technical questions, please contact Loften Carr, EPA Site Project Manager at 404-562-8804.

APPENDIX C

LIST OF DOCUMENTS REVIEWED

LIST OF DOCUMENTS REVIEWED

Crawford and Associates, Inc., October 1998, Dye Tracer Study of the Mallory Capacitor Company Site, Waynesboro, Tennessee, Final Report.

Crawford and Associates, Inc., September 1998, Dye Tracer Study of the Mallory Capacitor Company Site, Waynesboro, Tennessee, Status Report.

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Conestoga-Rovers & Associates, January 15, 2003, Quarterly Progress Report, Mallory Capacitor Co. Site, Waynesboro, Tennessee.

Conestoga-Rovers & Associates, December 17, 2002, Annual Groundwater and Surface Water Sampling Results, Mallory Capacitor Co. Site, Waynesboro, Tennessee.

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Conestoga-Rovers & Associates, February 1999, Technical Evaluation, Continued Phase II Remedial Action Operations, Groundwater Extraction and Treatment Systems, Mallory Capacitor Co. Site, Waynesboro, Tennessee.

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Conestoga-Rovers & Associates, February 1996, Final Construction Report, Phase II Groundwater Extraction and Treatment Systems, Mallory Capacitor Co. Site, Waynesboro, Tennessee.

Conestoga-Rovers & Associates, August 1995a, Phase II Design Report – Final, Groundwater Extraction and Treatment Systems, Mallory Capacitor Co. Site, Waynesboro, Tennessee.

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APPENDIX D

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST AND SITE INSPECTION MEETING MINUTES

Five-Year Review - Site Inspection Checklist

I. SITE INFORMATION	
Site name: Mallory Capacitor Site	**Date of inspection:** 11/07/2002
Location and Region: Waynesboro TN	**EPA ID:** TND075453688
Agency, office, or company leading the five-year review: U.S.EPA	**Weather/temperature:** Warm , sunny, clear

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** David Hill, Conestoga Rovers — Site Manager — 11/7/2002
   (Name / Title / Date)
   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. ______________
   Problems, suggestions; ☒ Report attached ______________________________

2. **O&M staff** Adam Fox & Chip Cole w/ CRA — O&M Staff — 11/7/2002
   (Name / Title / Date)
   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. ______________
   Problems, suggestions; ☒ Report attached See Interview Form

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 Waynesboro

	Name	Title	Date	Phone no.
Contact	Victor Lay	City Manager	3/05/03	931-722-5458

Problems; suggestions; ☒ Report attached

Agency Wayne County Health Department

	Name	Title	Date	Phone no.
Contact	Brian Pope	Envr. Director for Groundwater Protection	3/06/03	931-722-6433

Problems; suggestions; ☒ Report attached

Agency

	Name	Title	Date	Phone no.
Contact				

Problems; suggestions; ☐ Report attached

Agency

	Name	Title	Date	Phone no.
Contact				

Problems; suggestions; ☐ Report attached

4. **Other interviews** (optional) ☒ Report attached., Various citizens.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - [X] O&M manual — [X] Readily available [X] Up to date [ ] N/A
   - [X] As-built drawings — [X] Readily available [X] Up to date [ ] N/A
   - [X] Maintenance logs — [X] Readily available [X] Up to date [ ] N/A

   Remarks____

2. **Site-Specific Health and Safety Plan** [X] Readily available [X] Up to date [ ] N/A
   - [X] Contingency plan/emergency response plan [X] Readily available [X] Up to date [ ] N/A

   Remarks Posted by office door

3. **O&M and OSHA Training Records** [X] Readily available [X] Up to date [ ] N/A

   Remarks____

4. **Permits and Service Agreements**
   - [ ] Air discharge permit — [ ] Readily available [ ] Up to date [X] N/A
   - [ ] Effluent discharge — [ ] Readily available [ ] Up to date [X] N/A
   - [ ] Waste disposal, POTW — [ ] Readily available [ ] Up to date [X] N/A
   - [ ] Other permits____________________ — [ ] Readily available [ ] Up to date [X] N/A

   Remarks____

5. **Gas Generation Records** [ ] Readily available [ ] Up to date [X] N/A

   Remarks____

6. **Settlement Monument Records** [ ] Readily available [ ] Up to date [X] N/A

   Remarks____

7. **Groundwater Monitoring Records** [X] Readily available [X] Up to date [ ] N/A

   Remarks Complete log from 1994

8. **Leachate Extraction Records** [ ] Readily available [ ] Up to date [X] N/A

   Remarks____

9. **Discharge Compliance Records**
   - [ ] Air — [X] Readily available [X] Up to date [ ] N/A
   - [ ] Water (effluent) — [X] Readily available [X] Up to date [ ] N/A

   Remarks Quarterly Reports and Correspondence

10. **Daily Access/Security Logs** [X] Readily available [X] Up to date [ ] N/A

    Remarks Good

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**
- ☐ Readily available ☐ Up to date
- ☐ Funding mechanism/agreement in place

Original O&M cost estimate____________ ☐ Breakdown attached

MALLORY CAPACITOR COMPANY SITE
WAYNESBORO, TENNESSEE

Period	Costs
January 1998 - December 1998	$393,948[1]
January 1999 - December 1999	$290,408
January 2000 - December 2000	$295,999
January 2001 - December 2001	$464,090[2]
January 2002 - December 2002	$338,626

Notes:
1) Includes dye tracer study costs.
2) Includes additional off-Site groundwater monitoring well installation costs.

3. **Unanticipated or Unusually High O&M Costs During Review Period**
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____________________

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: Two years ago someone turned off a switch on a an extraction well. No permanent damage. Switch now locked.

2. **Land use changes on site** ☐ N/A
Remarks None

3. **Land use changes off site** ☐ N/A
Remarks None

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 Grass Maintained: cut and well vegetated. Building maintained: by local contractors through Kraft. The GW extraction system is maintained according to the Phase II Remedial Action Operation, Maintenance and Monitoring Plan.

VII. LANDFILL COVERS ☐ Applicable ☒ **N/A**

NOTE: LANDFILL INSPECTION CHECKLIST PAGES REMOVED

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: All wells are active and in good working order.

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☒ Good condition ☐ Needs Maintenance
Remarks: Quarterly reports and Annual reports document and detail all.
Equipment maintenance pad and sump in good condition.

3. **Spare Parts and Equipment**
☒ Readily available ☒ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks: Quarterly reports and Annual reports document and detail all

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

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

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: Bag Filters and Resin filtration canisters.
☐ 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___23 million gallons ________
☐ 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: Randomly inspected Monitoring wells 25 and 26. And extraction well EW-2. See Attached Northwind Environmental Report

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.).

The pump and treat remedy should contain the contaminant plume and remove significant contaminant mass from the groundwater. The groundwater extraction system is providing hydraulic containment of the site contaminant plume in the aquifers beneath the site. The system has removed approximately 11,000 pounds of TCE and 1,295 pounds of PCBs from 1993 to 2001.

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.

The remedy is in compliance with the Phase II Remedial Action Operation, Maintenance and Monitoring Plan. A monitored natural attenuation (MNA) evaluation of the remedy is planned and will be conducted to determine if natural degradation of TCE is occurring at the more distant edges of the plume at a rate that would allow the use of an additional MNA component to the remedy in the future. A groundwater monitoring well network review is planned for the next annual sampling event. See Attached: Northwind Environmental Report, Meeting minutes, November 7, 2002, and the Kraft / CRA response in the Five Year Review.

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. See Attached: Northwind Environmental Report, Meeting minutes, November 7, 2002, and the Kraft / CRA response in the Five Year Review.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. See Attached: Northwind Environmental Report ; Meeting minutes dated November 7, 2002, and the Kraft / CRA response in the Five Year Review.

CONESTOGA-ROVERS & ASSOCIATES

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MEETING MINUTES

Reference No. 2319

PROJECT: Mallory Capacitor Company Site, Waynesboro, Tennessee (Site)

CLIENT: Battery Properties, Inc.

RE: USEPA 5-Year Review

LOCATION: Waynesboro, Tennessee DATE: November 7, 2002 TIME: 9AM - 4PM

Participants:

Dave Hill, CRA	Chip Cole, CRA	Steve Harris, CRA	Loften Carr, USEPA
Jennifer Martin, North Wind Environment, Inc.	Newt Gibbs, TDEC Division of Superfund		

Distribution:

☒File ☒Participants	Phil McAndrew, Kraft	Richard Pico, Kraft	Jack Michels, CRA

Item	*Description*	*Action By*
1.	**Review of North Wind Environmental, Inc.'s (North Wind's) draft letter report entitled, "Transmittal of Comments and Recommendations Regarding the Performance of Remediation Activities at the Mallory Capacitor Site, Waynesboro, TN" (Draft C&R) dated August 30, 2002.**	
1a)	North Wind's Recommendation of Pulse-Pumping: CRA identified that that the increase in mass removal observed during the two re-start conditions referenced in the Draft C&R are a result of increased pumping (i.e., following implementation of the Phase II RA) and re-focussing of pumping from the shallow and deep bedrock where groundwater concentrations are highest (i.e., following grouting of the bottom portions of the extraction wells). As a result, the potential implementation of pulse-pumping is not supported by historical data and is not warranted at the Site.	Loften Carr/Jennifer Martin Concurred.
1b)	North Wind's Recommendation of Delineating Increased Fracture Zones On-Site with the Intent of Locating Additional On-Site Extraction Wells in these Zones to Increase Source Area Mass Removal: CRA identified that the concept of delineating highly fractured zones on	CRA to address in 5-Year Review Report.

Item	*Description*	*Action By*
	Site with the intent of locating new extraction wells in these zones to increase mass removal is accompanied by significant uncertainty. It is not likely that fracture correlation/connectivity could be defined with a high degree of confidence. In this regard, and considering that the existing groundwater extraction system presently is achieving good mass removal, pursuing the delineation of highly fractured zones is not warranted at the Site. Loften Carr agreed, adding that some investigation into methods to increase mass removal/mass destruction on Site should be considered since this will make the implementation of a MNA remedy to address the off-Site plume more attractive. Jennifer Martin suggested the concept of potentially adding nutrients and/or substrates to enhance the biodegradation already occurring on Site. Jennifer Martin suggested that introduction of nutrients and/or substrates into the deeper bedrock at OW62-90 might be a possible initial field pilot study.	
1c)	North Wind's Recommendation of Hydraulic Fracturing: The concept of hydraulic fracturing to increase the bedrock permeability is accompanied by too much risk of mobilizing product, particularly to the deeper bedrock, and is not appropriate for the Site.	Loften Carr/Jennifer Martin Concurred.
1d)	North Wind's Recommendation of a Monitored Natural Attenuation (MNA) Remedy to Address the Off-Site Groundwater Plume: CRA concurred that a MNA remedy to address the off-Site plume is appropriate. Loften Carr agreed and indicated that a MNA evaluation would have to conducted consistent with USEPA Region IV guidance. Loften Carr indicated that it could be recommended in the 5-Year Review Report that a work plan for a MNA evaluation be developed and carried out following this 5-Year Review.	CRA to address in 5-Year Review Report.
1e)	North Wind's Recommendation of Incorporating Existing Monitoring Wells into Monitoring Network to Assist in Evaluating MNA: North Wind recommended including the following existing wells in the groundwater quality monitoring network: • Shallow Bedrock – OW47-89 or OW50-89, OW45-89, and OW23-86; • Deep Bedrock – OW42-89 or OW34-89, OW40-89, OW26-89, and OW52-89; and • Deeper Bedrock – OW24-89. CRA indicated that a review of historical groundwater quality data would be required to assess whether sampling these additional wells would provide meaningful data. Following this assessment, for those additional wells where it is deemed suitable, CRA recommended one-time sampling during the next annual monitoring event followed by an evaluation of whether inclusion in the monitoring network is warranted. Loften Carr agreed with this approach.	CRA to address in 5-Year Review Report.
1f)	North Wind's Recommendation of New Monitoring Wells: North Wind recommended installing a new off-Site shallow/deep/deeper bedrock monitoring well nest approximately mid-way between the existing shallow wells OW58-90 and OW59-90 to assess mid-plume conditions. CRA concurred with this recommendation considering that this well nest will improve our understanding of plume behavior off Site and will aid in the MNA evaluation for the off-Site plume. North Wind	CRA to address in 5-Year Review Report.

Item	*Description*	*Action By*
	also recommended installing a new on-Site deeper bedrock monitoring well southwest and upgradient of the existing deeper bedrock well OW63-90. CRA indicated that, since only low VOC concentrations are detected at OW63-90, installing an additional well upgradient of OW63-90 is not warranted. Loften Carr agreed. No further new monitoring wells were identified as being necessary.	
1g)	Manner In Which to Formally Respond to North Wind's Draft C&R: Jennifer Martin indicated that the Draft C&R would be finalized. CRA indicated that the final C&R would be included as an appendix in the 5-Year Review Report and a section would be included in the 5-Year Review Report addressing the items raised by North Wind.	North Wind to finalize Draft C&R. CRA to address in 5-Year Review Report.
2.	**Other Items Discussed.**	
2a)	Findings of Private Well Survey Conducted by CRA: The findings of the private well survey conducted by CRA were discussed. Only 5 private wells/springs exist downgradient from the Site that historically were used for potable water supply. These private wells presently are not in use and the entire area downgradient from the Site is serviced by a municipal water supply. Loften Carr indicated additional proof may be required to demonstrate that these wells are not being used for any purpose, have been properly abandoned and/or do not have any fittings/pumps that would allow ready use. If this can be demonstrated, then no further action is warranted. However, if it appears that any of the wells reasonably could be used, then sampling of these wells may be warranted. It was indicated that USEPA could assist in gaining access for sampling, if necessary. CRA indicated that attempts would be made to collect all available data to demonstrate the current status of the private wells and include these data in the 5-Year Review Report.	CRA to address in 5-Year Review Report.
2b)	Discharge of Shallow Groundwater Containing TCE to Green River: The preliminary analytical data for the October 2002 annual groundwater sampling event indicate that TCE at a concentration of 230 µg/L detected at OW70-01 (the new overburden/bedrock interface well downgradient from the Site immediately adjacent to the Green River) may be discharging to the Green River. Only low levels of TCE previously were detected at OW70-01 in October 2001. The October 2002 groundwater samples were collected under high water table conditions which likely is the cause for the recent detected TCE concentration at OW70-01. Loften Carr indicated that an evaluation would be warranted to assess the frequency that this situation may occur and evaluate the significance of TCE discharge to the Green River. CRA indicated that this evaluation could be included in the 5-Year Review Report.	CRA to address in 5-Year Review Report.

2c)	Groundwater Sampling Techniques Applied at the Site: Loften Carr indicated that a review of USEPA Region IV groundwater sampling guidance should be conducted to ensure that the sampling techniques currently applied at the Site are consistent with this guidance.	CRA to address prior to next annual sampling event.
3.	**5-Year Review Site Inspection**	
3a)	Interviews: Loften Carr indicated that he will complete the 5-Year Review interviews at a later date via telephone. The intended interviewees from CRA are Jack Michels (RA Manager), David Hill (O&M Site Manager), and Adam Fox or Chip Cole (O&M Staff).	Loften Carr will initiate interviews.
3b)	On-Site Documents and Records: All required and applicable documents and records were verified to be readily available and up to date.	NA
3c)	O&M Costs: Loften Carr indicated that a detailed breakdown of O&M costs is not necessary. CRA will provide a summary of overall annual costs for inclusion in the 5-Year Review Site Inspection Checklist.	CRA to provide cost information to Loften Carr.
3d)	General Site Conditions: No general Site condition deficiencies were observed during the Site inspection.	NA
3e)	Groundwater Remedy: The groundwater treatment system and selected extraction and monitoring wells were inspected and found to be in good condition.	NA
3f)	5-Year Review Site Inspection Checklist: Loften Carr indicated that he will provide a copy of the final 5-Year Review Site Inspection Checklist when completed for inclusion in the 5-Year Review Report.	Loften Carr to provide completed Checklist.

☐ Attachments: ______________________________

Prepared By: Steve Harris / Dave Hill   Date Issued: November 25, 2002

This confirms and records CRA's interpretation of the discussions that occurred and our understanding reached during this meeting. Unless notified in writing within 7 days of the date issued, we will assume that this recorded interpretation or description is complete and accurate.